

# The One Laptop Per Child (OLPC) Project and Its Applicability to Ghana

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**Abstract-**The One Laptop Per Child (OLPC) project is an initiative that seeks to expand the use of computer technology, especially for school children, from the richer and industrial areas of the world, to the poorer and more rural areas. Not only does the OLPC project seek to narrow the “digital divide”, the project also seeks to improve educational opportunities for under-privileged children overall, by providing resources for these kids to be proactive and engaged in their own learning, through use of an internet-connected laptop. In this paper, we describe the OLPC project, its mission and goals, the XO laptop itself, and address the applicability of the OLPC project and the XO technology to Ghana, West Africa.

**Keywords-** OLPC, One Laptop Per Child, \$100 Laptop, XO Laptop, Digital Divide, ICT, Computers, Laptops, Education, Constructionist Theory, Ghana, ICT4AD, West Africa, Sub-Saharan Africa

## INTRODUCTION

The One Laptop Per Child (OLPC) project, launched out of MIT’s Media Lab in 2005, is a non-profit organization that seeks to provide laptops to children in poorer and more remote areas of the globe. The vision of OLPC is to allow children who might otherwise not have access to quality educational opportunities to use the laptops to access knowledge and provide them the opportunity to engage their own capacity for learning, regardless of their physical location or financial limitations.

Headed by Nicholas Negroponte, OLPC now has numerous corporate partners including AMD, Brightstar, Chi Mei, Citigroup, eBay, Google, Marvell, News Corporation, Nortel Networks, Quanta Computer, Nortel, and SES-Astra, and non-profit partners include the Inter-American Development Bank and The United Nations Development Programme (UNDP) [1]. Corporate sponsors provided an initial research budget of 20 million U. S. dollars and provide on-going research support, while non-profit partners support the project by providing help with deployment and funding opportunities in targeted under-developed countries [2,3]. Intel, which at first labeled the OLPC laptop a “gadget” and later launched their own low-cost laptop, the Classmate PC, has now signed on as the most recent corporate partner [4].

Through funding from its corporate partners and more than two years of research and development, significant effort has gone into the design of a system and methodology that would meet Negroponte’s vision of a low-cost laptop suitable for the developing world. The OLPC laptop has been specially designed for rugged, low or no electricity

conditions, and has a screen that is readable in direct sunlight. It hosts a stripped down version of Linux, has a modest processor speed, no hard drive, and utilizes a mesh interconnectivity network, which will automatically connect to other laptops in the mesh, and to the internet via a server if it is available. Software development has been mostly limited to operating system and essential applications, with the assumption that educational and other application software would be developed by interested individuals and third parties in parallel to launch and would grow in proportion to demand. Currently, the OLPC laptop is being sold only to governments, for distribution by the countries themselves, with assistance from non-profit partners. Now in prototype and initial launch stages, the OLPC laptop and project is being rolled out into several countries, where its effectiveness toward these goals can begin to be evaluated [4, 5].

Information about the OLPC Project is exclusively on-line ([www.laptop.org](http://www.laptop.org)) and largely in the form of a wiki maintained by OLPC ([www.wiki.laptop.org](http://www.wiki.laptop.org)). Because of the dynamic nature of on-line content, getting completely accurate and up-to-date information about the project can be difficult. This paper does not represent any original research surrounding the OLPC project, but instead is the authors’ attempt to gather and synthesize accurate information relevant to the possible expansion of the OLPC project to Ghana, West Africa. As such, this paper is a summary and compilation of facts that the authors, a visiting lecturer/researcher and a student at a Ghanaian University, believed relevant to OLPC in Ghana, and opinions of those facts. When contradictory details were discovered in on-line information, the authors attempted to validate the correct information through external news articles or email contact with representatives of the project.

## THE OLPC PROJECT

### *History and Current Status of the Project*

The OLPC project idea was formulated in 1999 when Nicholas Negroponte and his family founded a school in a remote village in Cambodia, installed a satellite and generators, and gave the children laptops. The laptops illuminated households that had no electricity. Children taught their families how to use the computers, and school attendance increased substantially [6]. Negroponte envisioned a low-budget computer for children throughout the world, and developed the idea into a non-profit

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organization through MIT's Media Lab in 2005. Founding corporate members each gave 2 million U. S. dollars to fund the initial prototype design [3].

The project originally aimed for a price of 100 U. S. dollars per unit, and for that reason was often called "The \$100 Laptop Project". In the interest of making the laptops as cheaply as possible, Negroponte has insisted on a large scale for the initial manufacture of the machine. Originally requesting orders of no less than 1 million units from interested countries, Negroponte later lowered the minimum order to 250,000 units, and according to OLPC representatives, smaller orders may be accepted [7]. As the initial full-scale production of the laptops approaches, OLPC estimates the laptops will cost 176 U. S. dollars per unit, although it is expected that the cost of the laptop will decrease over time. OLPC has produced its final beta version of the machine, the B4, in June 2007 and plans its first production run of some millions of machines by the end of 2007, for deployment in selected launch countries. Pilot trials at schools in Brazil, Nigeria, Peru, Thailand, and Uruguay are on-going, and according to OLPC representatives pilots in Ethiopia and India will commence soon [8]. Until full production begins and units are paid for and delivered, it will be difficult to tell exactly how many countries will be involved and how many units will be initially deployed. Reports range from 5 to 18 countries and 3 to 5 million units [9, 10]. Possible launch countries include Argentina, Brazil, Colombia, Costa Rica, Ethiopia, Kazakhstan, Kenya, Libya, Nepal, Nigeria, Pakistan, Panama, Peru, Romania, Russia, Rwanda, Thailand, and Uruguay. In addition, OLPC is actively working to sign up more countries; as many as 30 more countries are listed as "launch" or "post-launch" countries [11].

OLPC currently has no plans to sell their laptops to corporations or individuals; they say they may consider such options after initial launch [12]. It has been proposed that individuals might buy an XO at twice the price, thus funding one for a child in a poor country [6]. In addition, Quanta Computers, the Taiwanese firm manufacturing the laptops, has recently announced plans to sell a \$200 laptop utilizing much of the technology of OLPC [13].

Ghana is currently listed by the OLPC as a country which is currently seeking government support [11]. As of this writing, OLPC had received a serious expression of interest from relevant Ministries in Ghana to help advance OLPC in the country, and a preliminary meeting with OLPC representatives took place in September 2007 to discuss plans for moving forward with the project.

#### *OLPC Learning Goals*

All along, Negroponte has called the OLPC project an "education project, not a laptop project" [5]. Some of his critics point out, however, that by focusing on providing laptops (i.e. technology) to schoolchildren, without focusing on the educational content and methodology in which the laptops would be used, it is, in fact, a laptop project, not an education project [14]. Negroponte calls on the constructionist view of education, an educational philosophy founded by his MIT colleague and OLPC collaborator Seymour Papert, a philosophy of education in which

children learn by doing and making, where they explore and discover instead of being force-fed information [15]. Says OLPC literature, "With 1-to-1 access to connected laptops, children actively engage in knowledge construction and are not limited to passive reception of information. Each child can pursue learning in areas of strong personal interest and the classroom is not limited to a pre-determined, one-size-fits-all approach" [16].

Saturation of laptops into a community is an important aspect of the OLPC vision. Previous approaches to providing computers to schools typically involved an in-school computer lab. By issuing laptops to children, the laptops are available to the students for far longer than the just the time they are in school. The additional benefit of peer-to-peer teaching and learning is essential to the OLPC approach, since children teach each other, and their families, about what they are learning [5].

#### *Criticisms to OLPC and Response*

There are many ways to vocalize criticism to the OLPC project, from individual blogs and websites, to posting comments on the official project wiki, to posting on the independent blog [www.olpcnews.com](http://www.olpcnews.com), a self-described "independent source for news, information, commentary, and discussion of One Laptop Per Child's '\$100 laptop'." Many people question the appropriateness of the use of resources to provide laptops for children in remote areas of the globe. Some argue that food and water and basic medical care should come first. Negroponte does not disagree, although he argues, "I have not met anybody who claims they are too poor to invest in education, nor anybody that said it was a waste of money. If somebody is dying of hunger, food comes first. If somebody is dying from war, peace comes first. But if the world is going to be a better place, the tools for doing so always include education" [9]. However, to truly equip the world's children with laptops would require an enormous amount of resources. The sheer numbers is what may lead India to back out. "We cannot visualize a situation for decades when we can go beyond the pilot stage." Says India's Education Secretary. "We need classrooms and teachers more urgently than fancy tools" [7].

Other critics argue that if governments of poor nations spend what little money they have on laptops, they are necessarily spending less money on textbooks, teachers, and schools. The OLPC project holds the promise of bringing whole libraries of textbooks, and other educational resources, directly to the children. Negroponte, having seen the lack of educational resources, ineffective educational structures and methodologies, and the time it would take for some governments to bring basic educational resources to all its children, states, "Many children – especially those in rural parts of developing countries- have so little access to school – in some cases just a tree – that building schools and training teachers is only one way – perhaps the slowest way – to alleviate the situation" [5]. Other critics argue that it is simply the wrong technology, and providing internet connectivity via net-enabled cell phones, already a pervasive technology in even remote areas of the world, would be a better and cheaper solution. Negroponte responds, "Suggesting that cell phones are an alternative is like saying we can use postage stamps to read textbooks" [9].

## THE XO LAPTOP

### Overview

The OLPC laptop hardware is called the XO, a low-cost laptop for the unique environment of the developing world: a rugged environment, including rain, dirt, and wind; use of the laptop in bright sunlight; and low and erratic power conditions. The success of this research and development project is to be found in the specifications and components of this novel machine, and the successful manufacture of the Beta machines (initial prototypes in late 2006, and Beta 4 machines in June 2007). Recently, the OLPC XO was awarded the prestigious INDEX award for 2007, self-described as “the biggest design award in the world” [17].

The laptop itself is small: 224mmx228mmx30mm (9.5”x9”x1.2”). The screen is also small, 190mm (7.5”) diagonal, but pivots so that the machine can function as both a laptop and eBook reader. It is only 1.5 kg (under 3 ½ pounds), and has a dirt and moisture-resistant enclosure. Negroponte reports that the machine is so water resistant that you can pour water on the keyboard or carry it unprotected through the rain. It is similarly resistant to dust and dirt, and has passed 5-foot drop tests. [6, 18, 19]. The laptops have an internal video camera and microphone, an external microphone jack, WiFi antennae, a QWERTY keyboard (with multiple other keyboards, such as Brazilian, Portuguese, and Arabic, available), a touchpad cursor and stylus area, game cursor control keys, dual stereo internal speakers, and an SD multimedia slot. The laptop also provides 3 USB ports for external devices (such as printers, hard drives, more flash memory, or other external devices such as an inexpensive digital microscope being developed for the project) [18, 19].

Unlike modern computers, the XO is not attempting to use the latest and greatest general purpose hardware, but instead has specified exactly the hardware needed for the low-cost laptop. This does not mean that the laptop is devoid of technological innovation; in particular, its power conservation measures, screen, and ruggedness are all quite innovative.

### Processor

The XO processor is a modest AMD Geode running at 433 MHz, using only 0.8 Watt of power. Instead of a separate graphics controller, it is integrated with the Geode processor. The processor utilizes a novel “extreme suspend” technology, in which the processor goes to sleep after 2 seconds of inactivity, but can wake itself up within 0.3 sec of requested activity, thus contributing to the laptop’s low power consumption [18, 20].



Figure 1. The XO Laptop, with pivoting LCD screen

### Memory and Storage

Because of the intended rugged environment, there is no hard disk in the XO; mass storage consists of 1 Gigabyte of flash ROM with a high speed controller, and internal memory is just 256 Mbytes of DRAM. There is a separate display control chip, with memory, that allows the display to be active when the processor is suspended. This is another engineering innovation that allows for low power consumption of the laptops. Due to the modest processor, no cooling fan is necessary, further reducing necessary power consumption. Although clearly not as powerful as today’s multimedia and video game-ready computer systems, OLPC makers claim the laptop has plenty of power for its intended uses. An external hard drive or additional flash ROM could be added via USB, if desired [18, 20].

### LCD Display

The 152x114mm (6”x4.5”) LCD display screen has a higher resolution than most laptops on the market. It consists of a lower-resolution color display overlaid on top of a higher-resolution monochrome display. The 1200x900 mono resolution (200 dpi) display is reflective, allowing for high resolution viewing in full sun, while the lower resolution 800x600 (133 dpi) color display is transmissive and requires a backlight; a more robust and lower energy consuming white LED backlight is used instead of the conventional cold cathode fluorescent lamp. This overlaid display combination gives the appearance of a higher resolution (and more expensive) color display, while still providing full sun viewing capabilities. The screen uses only 0.1 Watt with no backlight, and between 0.2 and 1 Watt with the backlight on [18, 20, 21].

### Power

Depending on the use conditions (backlight, processor consumption), the overall power consumption for the XO is between 0.1 Watt and 3 Watts, less than a tenth the power usage of a typical laptop [22]. This attention to power consumption makes the XO well-qualified to conditions in which electricity is not available, or unreliable. There is a 2-pin DC power adaptor which can use 10-20V of usable input. The XO battery is fully enclosed in a hard case and is also a novel technology: there are 4 cells with 2 chemistries: Nickel Metal-Hydride (NIMH) and Lithium Ion (LiFeP); combined, the batteries will last 6 to 24 hours on a full charge. In addition, the battery has at least 2000 charge/discharge cycles (to 50% of a new battery life). It appears that there will be multiple battery charging devices available, all external: a “yo-yo” pull-cord device, a foot pedal device, a solar panel, and a hand crank. The manual power sources should provide 30 minutes of intensive computing power time for 10 minutes of effort [4, 18, 20].

### Networking

The key to the internet capabilities of the laptops is its mesh networking capability. The mesh network assumes a broadband point of internet connectivity per mesh (presumably at a school). There are several different possibilities for the internet connections, including satellite, cellular, DSL, and WiMax. The laptops themselves use the new 802.11s wireless networking standard, which has increased bandwidth and a range of up to 1.5 km (a little under a mile). When in operational mode, even if the main

processor is suspended, the laptops automatically connect to other laptops, providing router capabilities in a peer-to-peer fashion for other computers in the mesh. As long as there is at least one computer operational within range, and the same is true in a path to the internet server, then all computers in the mesh have internet access. School servers provide the internet connectivity, and also act as a repository for a set of documents that are originally assembled by the school, region, and country, and may be updated later by students and teachers in the mesh network [18, 23].

#### *Software*

For software, the OLPC project has maintained an open source philosophy. The operating system, called Sugar, is supplied by Red Hat and is a stripped down version of their Fedora (Linux) core operating system. Sugar takes up a mere 130 Mbytes of memory (by comparison, Windows XP requires 1.65 Gbytes) [4]. The user interface displays other connected laptops graphically, and allows access to tools and information on other laptops, thus providing ingenious collaborative opportunities. Icons replace written menus throughout the interface. The operating system's storage is not based on the usual hierarchical based approach, but is instead based on most recently accessed items or in terms of who is connected to the mesh [4]. Application software included with the XO are a word processor, a document and PDF viewer, Firefox web browser, email and chat facilities, media player, and drawing tools. Interpreters for several programming languages, such as Python, JavaScript, and LOGO will also be included. Other software and content, such as Wikipedia and SimCity, have been offered to OLPC as well [18, 21]. Independent software development for the XO is also taking off globally; applications being developed include a Qur'anic Studies application in Pakistan, original learning games in Brazil, and a calculator activity that "shows its work" in Argentina [24].

#### *Theft Security*

Theft protection for the laptops is important, especially in poorer areas where the sale of device valued at 100 to 200 U.S. dollars could provide desperately needed income for a family. To deter theft (and also increase durability), valuable components of the laptops are soldered onto the motherboard, and the unique design of the laptop will make them be instantly recognizable as OLPC laptops [22, 25]. Upon activation, each laptop is issued a UUID (Universally Unique Identifier), which is stored with its serial number and activation code on the school server. A stolen laptop, when reported to the school, would be deactivated via the mesh network. Furthermore, a country may request a "lease" system, in which each laptop is required to check into its mesh network every so often (e.g. 21 days, or 90 days); in that case, laptops that do not check in to their mesh networks before its lease expires are also deactivated. In case of server failure, leases may be manually extended via the activation server [25]. This does not alleviate the problem of a laptop being taken over by a relative or someone else who remains in the mesh. However, the laptops are intended to be shared by family members, who might also learn to use the technology for opportunities they would not otherwise have. By saturating schools and

villages with laptops for children, the need to steal a laptop within the mesh should be limited, as everyone would likely know someone with a laptop.

#### *Breakage*

Sustainability of the hardware is another important consideration in poorer countries. Many failure-prone design elements have been removed from the laptops; for example, the motherboard lies directly behind the LCD screen, so no connecting cable (which might fail or become dislodged) is needed. As a sealed unit with no moving parts, OLPC designers do not anticipate the need for many repairs. According to OLPC representatives, the laptop has been designed to be easily taken apart, by using a screwdriver and removing 12 screws. The LED backlight can be easily replaced for about 1 U.S. dollar. The LCD screen might be replaced through government-run repair depots, or private enterprises as they develop. If a major piece of the electronics failed, the unit may need to be replaced [20]. Governments might need to provide budgets for maintaining both the laptops themselves and the necessary servers and internet connectivity.

### APPLICABILITY TO GHANA

#### *Human Resource Development and Education*

Human resource development remains one of the principle agendas for Ghana's development. According to the Ghana Poverty Reduction Strategy II, which is currently the main development plan for Ghana, "the discerning Ghanaian electorate feels compelled to raise its sights from the minimal ambitions of preventing gross poverty and distress, and instead aim at sharing in the commonly observed standards of living in the early 2000 Global Economy. .... This is to be done by achieving the status of a middle-income economy." Later, the same report states, "The lesson is that the single most crucial key to the attainment of economic success is the educational quality of a nation's work force. Government has accordingly decided that Ghana must nurture a workforce which is equipped with more than the basic levels of educational attainment, as defined in the MDG goals" [26].

Unfortunately, the current state of primary and secondary education in Ghana is poor. The adult literacy rate is approximately 60%, with up to 40% of persons over age 6 without any formal education. In 2002, some reports state that approximately 70% of primary school-aged children attended school, but enrollments were only 24% at the junior secondary level and 6% at the senior secondary level (although there are discrepancies about these numbers). Only 3-4% of students enroll in tertiary institutions [27, 28, 29, 30]. Causes of educational issues might be classified in terms of access and quality.

#### *Access to Quality Education*

In Ghana, access to equal educational opportunities and facilities is a fundamental right guaranteed by the constitution [31]. This mandate has received the government's attention and support, represented in programs like the Free Compulsory Universal Basic Education (FCUBE) program [32]. Although tuition is free at the primary level, the poor economic status of many households, with 40% of households below the 1 U.S. dollar per day poverty line [27], results in the reality that education

is not a priority. Many children are needed at home to perform subsistence chores such as carrying firewood and water, and gathering and preparing food for their families. In addition, the need for uniforms and school supplies limit the enrollment of students at all levels. Lastly, many children in rural areas walk long distances to school, although in the last 5 years nearly 4,000 new primary and JSS school blocks have been built, which in some cases has greatly reduced travel time for students [26, 29].

Another issue of access, which also overlaps with issues of quality, is the availability of materials and resources for education. Textbooks are still not issued in a 1:1 ratio in all schools (1 textbook per subject per student), although the situation is improving. For example, the percentage of primary schools having at least one English textbook per pupil was only 21 percent in 1988 but 72 percent in 2004; for math books in Junior Secondary School (JSS) these figures are 13 and 71 percent, respectively. This still means that in 2004, up to 30% of schools did not have enough textbooks for their pupils [29]. Teachers, perhaps a student's most valuable resource, are sometimes untrained and in short supply, especially in the rural areas. In 2000, 5% of primary schools had no or one teacher for the school [33]. Nationally, basic public school teacher:pupil ratios are 28:1, with some regions as high as 50:1. Teacher qualification also makes a difference. Reports show that at the national level, 30% of basic public school teachers are untrained, with percentages as high as 50% in some regions. [30]. Recent reforms and other initiatives have improved all of these statistics over the last 25 years, although there is clearly still substantial room for improvement, especially given the centrality of education for Ghana's future development [29].

Other quality factors affecting education in Ghana are teaching quality and methodology, and relative lack of ICT resources in schools. Until recently, emphasis in the education system has been on quantity much more than on quality. The President's Report on Education Reform agrees that "public education in Ghana has failed to meet expectations in terms of its coverage, quality, equitableness and economic utility." The use of multi-class teaching methods in some basic schools, whereby more than one class is grouped together and taught by one teacher, also lessens the quality of teaching. The report also recommends more practical methods of teaching and learning which will engage students and "unlock their potentials." [33]

#### *ICT and Education*

Probably the single most relevant and comprehensive document on ICT and development in Ghana is the ICT4AD policy. The mission of the policy is to "transform Ghana into an information-rich, knowledge-based and technology-driven high income economy and society." [27] The vision of the policy statement is to use ICT as the main engine for an accelerated and sustainable economic and social growth. Some of the strategies outlined by the policy to promote ICT in education, among others, are [27]:

- Mainstream ICTs throughout the entire educational system to promote life-long learning
- Develop an educational intranet to provide educational materials and tools at all levels of the educational system.

- Promote Internet access to all educational institutions including the schools, universities and colleges
- Transform the educational system to ensure that there is uninterrupted quality education for all Ghanaians from pre-school to age 17 to reduce poverty and create the opportunity for human development.
- Introduce computers into all primary, secondary, vocational and technical schools

The 2007 Budget for Ghana might address OLPC directly: "...to further enhance the usage of computers in schools, Ministry of Education, Science and Sports will be funded to take advantage of the new technology for the production of low cost computers designed specifically for basic education. The Ministry of Communication in collaboration with the Ministry of Education, Science and Sports will oversee this initiative." [34]

#### *OLPC for Ghana*

Clearly, many of these goals for Ghana's development and improvement in educational quality and increased use of ICT might be addressed by an implementation of OLPC in Ghana. Consider the stated mission of the OLPC project: "Most of the nearly two-billion children in the developing world are inadequately educated, or receive no education at all. One in three does not complete the fifth grade. The individual and societal consequences of this chronic global crisis are profound. ... At the same time, their governments struggle to compete in a rapidly evolving, global information economy, hobbled by a vast and increasingly urban underclass that cannot support itself, much less contribute to the commonweal, because it lacks the tools to do so." [35] Their assessment of the global educational crisis and its consequences is uncannily accurate for Ghana. In many ways, Ghana is exactly the country for which OLPC was developed. It must be noted, however, that a full OLPC implementation in Ghana would require enormous financial resources; for example, to provide laptops costing 176 U. S. dollars, including the associated support services, to each of the 3-4 million primary school children might cost up to 1 billion U.S. dollars. Additional monies for maintenance and for laptops for incoming students would be required each year. This amount of money, if spent in other ways such as improved teacher training, improved facilities and equipment including computer and internet access in all schools, curriculum enhancement, or other educational initiatives, might also have a tremendous impact.

However, the OLPC project has the advantage of being ready now, and not after a new generation of teachers have been trained and deployed (a complete turnover in teachers might be 40 years away). There is also an on-going fundamental problem with teachers unwillingness to go to the more rural areas in Ghana; even with improved teacher training, this is not likely to be resolved anytime soon. The current median age in Ghana is 20 years, with estimates of 60% of the population under age 25 [36, 27]. In order for Ghana to provide a quality education to its young citizens, and hope to propel itself from a Least Developed Country to a middle-income economy, reforms need to happen sooner rather than later.

The OLPC project would obviously address both access to and quality of educational opportunities in Ghana. Access, since ownership of a laptop would enable every

student to have access to educational resources both at school and at home, via the laptop and interconnection network. And not just access for school children: as children teach their parents, aunts, uncles, and grandparents how to use the machines, not only computer literacy, but, following constructionist learning theory up the age ladder, overall literacy and educational status would likely increase throughout Ghana.

Improvement in quality of education is a more complex issue. There is no question that students who are currently receiving a substandard education would benefit, and this might rightly be considered a large minority or even majority of Ghana's population (based on textbook, trained teachers, and school enrollment statistics). However, the efficacy of constructionist learning via the OLPC project has yet to be fully studied. Since pilot projects only started a few months ago, it is unrealistic to expect long-term independently researched studies analyzing the educational merit of the machines. So far, initial reports show increased attendance and participation, and more engaged learning, in schools in which the laptops have been piloted, although little data aside from this has been publicized [37, 38, 39]. Studies of OLPC in other countries facing similar challenges might further the assessment of OLPC applicability to Ghana. However, waiting too long might simply move Ghana further back in their quest toward improving education and human resource development. An OLPC pilot project, anywhere from one school to 250,000 units, might be a good approach for Ghana, if funds are available.

Is OLPC a good choice for Ghana? A full-scale implementation of OLPC in Ghana would have clear educational and development benefits, but would require an enormous amount of resources to fully implement. The main question is, are laptops the best use for such an investment? And, a related question, who exactly would pay? These are questions that need to be debated by Ghanaians over the coming months, perhaps in parallel with an OLPC pilot project, as the country decides to participate in the project, or not.

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