Personal Computing for Education Reform in Libya

By

Ahmed Elmagarmid and Arjmand Samuel
Purdue University, USA

Lately, there is growing interest in design, manufacture and deployment of small, portable and low cost computers for use in schools across the developing world. Two initiatives, namely One Laptop Per Child (OLPC) and Intel's Classmate PC are specific examples in this regard. While these projects aim to provide a low-cost laptop, in the range of $200-$300, to the world's children, they are also developing appropriate technologies more suitable for schools in countries such as Argentina, Brazil, Chile, China, Greece, India, Libya, Mexico, Nepal, Nigeria, Peru, Rwanda, Thailand and Uruguay. Key challenges driving the design of these low-cost PCs are lack of electricity in schools, inappropriate computing infrastructure and overall lack of information technology in average homes and schools. OLPC, as well as Classmate PC are being heralded as technological feats in terms of design of low cost PCs suitable for children in the third world, however, the ultimate success of these projects involves much more than innovations in PC technology and design. In this article we analyze the numerous implementation challenges which pose serious threats to the outcome of these visionary projects, with specific reference to the OLPC project in Libya. In conclusion, we outline pertinent features of a proposed low cost PC deployment project in the third world, with the aim to bridge the technological divide between the developed countries and the developing world by elaborating key and subtle issues surrounding western perception of the third world and its technological challenges.

Some specific features of OLPC are flash drive for storage, ruggedized design suitable for children and unconventional power sources such as hand-driven crank, solar panels etc. OLPC also runs a thinned-down version of Linux operating system and is focused towards educational software. Storage, display and other system components have also been redesigned to be used in settings with very little infrastructure and is rugedized for use by children. Currently, OLPC project is either under test or is being implemented in Argentina, Brazil, Chile, China, Greece, India, Libya, Mexico, Nepal, Nigeria, Peru, Rwanda, Thailand and Uruguay.

Classmate PC is a small, mobile educational solution that has also been developed specifically for students in emerging markets. Classmate PC boasts technology similar to OLPC such as rugged design, low cost, portable and child friendly to name a few. The major difference is the presence of Intel processor and chipset as well as Microsoft Windows operating system. Classmate comes loaded with Windows software for applications such as word processing and games. One optional feature provided with the Classmate PC, and is missing in OLPC, is a digital pen system. This pen is connected to

a USB port and utilizes a small clip-on reader that can attach to any notepad or piece of paper. Using the special pen provided, one can write or draw on any paper or notepad and have the drawings or text instantly appear on the screen.

Both OLPC and Classmate are intended more as an e-reader than a laptop as most of the functionalities is optimized for reading books over the internet and not for so many of the other tasks children do on the internet such as play games, download and share videos or images. Both machines do not come with a hard disk. Printing is relegated to the hubs which are envisioned to be local schools and disk storage allocations will most likely be arranged over the internet.

According to Michail Bletsas, Chief Connectivity Officer of OLPC, "You have to look at this through the needs of a child [in the developing world]. A child doesn't want to play the latest video games. He or she wants to be able to read a book." Obviously Mr. Bletsas has not visited the many internet café's all over Libya and has missed seeing throngs of children of all ages, sitting around for hours playing computer games over the internet.

The OLPC organization is trying to convince the world that in developing countries it is fine to settle for less and pay almost the same price or even higher in the longer run. OLPC is an excellent research project for the folks at MIT and the other great organizations that are involved. It probably should be deployed on smaller scales than what is now intended and at cost to the institutions that want to see their latest research results adopted. There are new network protocols, new keyboards and display technologies involved that all have to be improved and made ready for prime time. As computer scientists who have spent most of their adult lives conducting computing research, we are of course excited about the OLPC and think it should be deployed on small scales. We envision it to be part of a bigger solution for the developed world and not the only one. In our opinion, it is not a solution where one size can fit all.

Let us explain what we mean by one size does not fit all, and show why this is not a good project for Libya and offer some alternatives. The OLPC project in Libya aims to provide 1.2 million school children (almost all school going children in the country) with a laptop priced at around US $200 by the end of 2008 (total up-front cost of the project: $250 million[1]). The project is being sponsored by various private and public foundations. The final price tag will have to be increased to include indirect costs that can not be ignored and may be a lot higher than the price of the laptops. Although work on the project has started, it would be worthwhile to point out the following issues.

The project cost does not include the effort and money required to train teachers and develop course content to effectively use OLPC in the class room. The significance of planning for the proper content and its introduction into the curriculum is even more

[1] http://www.olpcnews.com/countries/libya/one_laptop_per_libyan_child.html

pronounced in the case of OLPC since it will be an integral part of the class room experience and will be used, at times, in lieu of text books. Design of course work involves teachers, academics and government officials to collaborate and work on creating appropriate content which can augment the regular books in the schools. This is a daunting task and will require years for OLPC to be totally integrated in schools. Additionally most of the course material is to be developed in Arabic so that it can be used by the students without any language barriers. Issues of pedagogy in course design also have to be worked out and a balance between the use of regular books and OLPC has to be defined. At the end of a school day, children may be able to take the OLPC machine home, but lack of internet access at home as well as parents' expertise in using computing technology remains a barrier to wider implementation at home, hence books will still remain indispensable. While most teachers in Libyan schools are well acquainted in using books, black boards, chalk etc as teaching aids, they lack computer skills which are requisite for the successful implementation of the OLPC project. Conducting teacher training for the whole of the country will require many years as well as a substantial financial commitment from the government.

There are certain pedagogy issues that would have to be addressed for any extensive use of technology in the class room, not only in the case of OLPC, but in general. Questions related to measuring the impact on raising the standard of education as well as affecting social issues is yet to be observed. The project started with a technology design of a cheap and portable computer to be used in the third world. However, it was never designed with social implications as a major design factor. The following social and technological implications are worth investigating,

- How can parental controls be implemented on the use of OLPC, especially if the parents are not educated enough to understand the implications?
- What will be the effect of OLPC-based education on a society with very few high tech jobs?
- How does a conservative society react to children using OLPC and having access to all sorts of information on any topic under the sky?

The cost of establishing and managing supply chain operations for distribution of 1.2 Million OLPC machines and their associated equipment to each child in Libya is in itself a colossal task and requires a dedicated organizational structure; something which requires additional money, and has not been budgeted as yet.

The cost does not include repair and maintenance of not only the OLPC machine and its software, but also the internet infrastructure (satellite equipment, servers, access points, etc) that will be required in each school. Like any other machine, OLPC is also prone to breakdown, both in terms of software as well as hardware. Fixing and maintaining 1.2 million computers is a colossal task requiring skill and money. The same holds for the internet servers and satellite links to be established to link OLPC with the internet.

Additional cost of providing internet access (lease of satellite channels, ISP operation, etc) as well as recurring bandwidth charges is still not part of the overall project budget. As an example, for a similar project in Nigeria, direct infrastructure costs are around $9000 per school[2].

There are certain technical features that make the OLPC project unique, and hence interesting to the research community. However, as we will explain, these features loose their relevance in a country like Libya. Most of these unique features are designed for use of OLPC computers in an environment lacking structured schools and classrooms. An example is the dual-mode display which allows the laptop screen to be viewed under normal ambient conditions as well as in sunlight. The basic presumption here is that the users of this machine will use it under direct sunlight due to the absence of proper classrooms. This assumption does not hold much ground in the Libyan reality, as most schools in Libya have proper buildings. Another much advertised feature is the human driven power source. One can charge the OLPC battery by using a hand-crank, solar power, or a foot pedal. While this design may look very attractive in rural areas where there is no electricity, it is not relevant to a Libyan school where electricity is readily available in all communities. Yet another frequently advertised feature is the use of the Linux operating system, in case of OLPC. While using freeware software has its advantages, it is bound to create a parallel operating environment (Windows ~ Linux), adding to the usage and maintainability issues.

The OLPC project may be an excellent technology adaptation project but has yet to prove its worth as a social reform project. Effectively, third world countries such as Libya would be forced to pay the cost of this education reform research which in itself may be detrimental to its own society.

We would be remiss if we did not at least attempt to offer some alternatives that may suit the Libyan situation better than a mega deployment of OLPCs. The principles of this alternative is based on a mixed set of solutions that uses OLPC units, a personal computer per family that is subsidized so as to make it affordable, extensive use of computer labs in schools, placing computer labs in libraries and other public places. The elements of this policy are more conservative but it is similar to all societal mega problems that are solved using a multitude of approaches.

The proposed solution is based on personal choice and open market supply of products. The fundamental idea is not to assume that a bureaucrat would know better than the end users of the technology. Instead a voucher based system would be established by which students, their families and with advice from their schools would purchase what fits their needs in the open market. This not only would stimulate entrepreneurship, would enhance competition, lower prices but also will improve service. It certainly would be more responsive to the students if hundreds of computer suppliers around the country were to provide the million platforms rather than one government supplier. Furthermore, a central aspect to our strategy is to have a heterogeneous set of choices of desktops,

[2] http://www.olpcnews.com/countries/nigeria/

laptops, some more powerful and some that are entry level. For some families with a computer or a laptop at home already, the choice maybe to invest in an advanced printer or some other peripherals. A central entity will still be responsible for the introduction of computers in every house-hold and publicly available space. The following is an outline of specific steps in this approach.

- A computer in every home connected to the internet, subsidized by the government and paid for by the users
- Extensive use of computer labs in all schools including equipping a small percentage of classes in each school with a computer on each desk
- Computer in every community space such as libraries, sports and social clubs, etc
- Laptops of all kinds will complement this strategy for those that feel this is the best choice for them. It will be laptops provided by any and all vendors. These will be traditional laptops that one could buy at that time and will include Window, Linux or Mac based laptops.

The presence of computers in homes as well as public spaces will expose the complete population of the country to this new technology, hence creating larger participation. In addition to making children computer literate, parents will also be involved in this revolution.

The cost of such a project will also be significantly less as no free computers will be distributed, but rather people will invest their time and money through available commercial channels. The infrastructure required would be paid for by the parents and the community who consequently become stake holders in the project by raising money and taking operational and financial responsibility, which in case of a free OLPC is simply missing.

The OLPC project in Libya, and the proposed Classmate PC projects around the third world are marred with a number of issues outlined above which must be addressed. The most pressing issues relate to implementation details, total cost of ownership, pedagogy, and, social impact of the project. While the OLPC project may be an excellent translational research project at MIT Media Labs, the cost of conducting a social experiment should not be paid by third world countries such as Libya.