One Laptop per Child Country FAQ Sheet

Contents:

A. Manufacturing

1. Will you assemble XOs in my country?

It is possible to do assembly in-country in the future, but in order to deliver the lowest-cost laptop in the first year, final assembly needs to be done close to where the some 800 parts in the laptop are manufactured. The actual total cost of final assembly, logistics, packaging, and shipping is \$4–8 per laptop. However, the cost of logistical coordination of all the parts and their shipping for in-country final assembly would be \$13–26, plus duties and capital equipment investment as detailed below. OLPC and its manufacturing partners are happy to work with countries to explore this option in future years, and create a phased plan for in-country manufacture now.

At Quanta (in China)	
Final-assembly cost (FA)	\$1–2 per unit
Logistics	\$1–2 per laptop
Pack out	<\$1
Shipping	<\$1-3
Duties	0%
TOTAL	**<\$4–8 per laptop**
In-country estimate	
Final-assembly cost (FA)	\$3–4 per unit
Logistics	\$5–10 per laptop
Pack out	<\$1
Shipping	\$3–6
Knowledge transfer (QCI)	\$2–5
Duties	?%
TOTAL	**\$13–26 + duties + capital equipment**

Our commitment to open-source software and content allows rapid, viral growth of these industries in country, which dwarf the assembly-line manufacturing industry.

B. Costs

1. **Why isn't the $100 laptop $100?**

   $100 laptop was and remains the name because the price will be $100 or lower within three years of launch. Unlike commercial interests who introduce products at low cost and then add features, OLPC is dedicated at holding features and dropping costs to be within reach of all children in the world.

   Price drops for two reasons: one, because electronics has a natural declining cost of about 25% per year; two, because increased integration, advanced manufacturing and new technologies can make it less and less expensive to produce. Whenever OLPC can save costs, those are passed directly on to the buyers. For this reason, the price of the XO laptop floats and is repriced every three months.

   Note that on rare occasion the price could go up slightly: if raw materials increase dramatically (as nickel did in 2006—it doubled) or the likes of memory jump due to undersupply.

2. **How much is the $100 laptop?**

   The price reflects the sum of the parts and a small assembly cost. OLPC makes no profit. No one associated with OLPC receives any commission, bonus, etc., in regard to sales or marketing.

   All of the suppliers make a small profit, usually 3–4%. OLPC has not asked anybody to make parts or assemble them at a loss or for charity reasons.

3. **When will the actual cost be $100?**

   We expect the $100 target to be reached in 2009. We pledge to continually drive costs down and even drop below our goal of $100; and the price of the laptop will always directly reflect the manufacturing costs.

4. **What is the total real cost of everything we need to make this work?**

   The total equipment cost is the sum of the cost of the laptops themselves, school servers, and the telecommunications and power infrastructures.

Countries may additionally wish to offer spare batteries—we recommend one per child (at about $9). We have been using a rule of thumb that it will cost $200 per laptop to launch 1M in the first year. Part of that cost is the start phase itself. If one launches in low density and very remote places, the cost per laptop may be higher; in urban areas, lower.

Deployment, teacher preparation, and maintenance infrastructure need to be covered by each country. We have base examples for rural and urban equipment set-up and deployment, teacher preparation, and maintenance approaches and are working closely with each country to determine the approaches it will use.

5. **Why do you request the $20M in cash down?**

   In the interest of keeping costs as low as possible, risk is removed from as much of the supply chain as possible and financing is kept at zero. In this sense, the cash deposit primes the pump. Thereafter, each shipment is paid for upon arrival until the last shipment, which is in effect free. This advance eliminates any need for suppliers to embed added costs to cover payment contingencies.

6. **What happens if a cheaper, similar laptop comes on the market after we sign the contract?**

   One of OLPC's strategies is to use its scale and ability to innovate to offer the best performance for the lowest cost. Because OLPC does not have the cost of marketing, distribution, or profit, it will be very difficult for another manufacturer to offer a lower-cost laptop without dumping or other predatory practices. Further, as a non-profit organization OLPC also does not have a corporate responsibility to increase shareholder equity, hence we have no incentives other than to get the best-possible learning tool into the hands of children. If a time comes when a more effective and less-costly laptop becomes available, OLPC will take all necessary steps to make it the machine we ship.

C. Schedule

1. **Why be a launch country?**

   The most commonly quoted reason is regional leadership and national pride. Launch countries have expressly not wanted to be followers. To mitigate the inherent risk, a very close working relationship is established with OLPC—a design partnership versus a vendor/sales relationship. We liken this to the difference between designing a house and buying a car.

   Where possible, modest subsidies will be provided, including, but not limited to, cost-free pilots. In addition, raising private-sector funding, especially from high-net-worth individuals, is far more attractive at launch.

   And the sooner started, the sooner benefits accrue.

2. **What happens if shipping is delayed?**

   OLPC is not like a state-owned company. All of its suppliers face penalties for shipping delays and components are almost never sole-sourced. As a non-profit itself, OLPC is far more transparent and free to disclose the status of all deliveries.

3. **What number of machines should we expect going forward?**

   However many you order. With a rolling 12-month forecast and a locked in four-month lead time, Quanta, OLPC's manufacturing partner, will be in a position to manufacture 1M units per month by the end of this year. By the end of 2008, the capacity can be as high as 10M per month. Note that the current total worldwide production of conventional laptops is about 5M per month.

4. **When can I expect to start receiving laptops in my country?**

   Immediately, for small test quantities. Volume production will start in Q4 of 2007. A signed agreement for at least 3M units is needed for this to happen. At least one country has expressed interest in not being hostage to what others decide and for this reason a single order could trigger OLPC if it were big enough, i.e., at least 3M units.

5. **When can I see the final software for the laptop?**

    We are releasing almost daily snapshots of the software for the laptops based on feedback from the development community and in-country testing. Currently, we release periodical “stable” builds; later, we will freeze system software development—about one month before the laptops are to be released to manufacturing. Until then, we will undergo a process of continuous feedback and improvement. A process of regular updates—transparent to the children—will be used for distributing improvements post-manufacturing freeze. We use the same model for application development, however, new applications will be made available as they are created by OLPC and the community. In this sense, there is no “final” software.

6. **What is the software schedule and what will be included?**

    Our software development cycle is largely date driven: we are scheduled to have a stable, robust core system available well ahead of the start of manufacturing at the end of the summer. This core includes basic operating system functionality, a security model, updates, backups, etc. The core will also expose the features of Sugar, the laptop user interface, mesh collaboration, and the journal. Basic functionality such as web browsing, document creation, and being able to view media on the web are a given; we will also include a number of learning tools and activities.

    We are accepting input throughout our development cycle to ensure that the software environment includes features that the launch countries require.

D. Software and Content

1. **What formats should we use for content? (What formats can the laptops play/display?)**

   We recommend, whenever possible, the use of open formats for which there are free players, thus avoiding the entanglements of specific platforms or companies; ensuring your content can be used on as wide a spectrum of systems as possible, using freely available tools. Examples of these include HTML/XML/CSS for web markup, ODF for document, SVG for vector graphics, Ogg Vorbis for audio, and Ogg Theora for video.

   Markup systems are almost always preferable to page description systems such as PDF, so that content can be optimized for use on displays of all resolutions. Accessibility adds further considerations: some widely used formats such as Flash are very hard for blind users to interpret successfully.

   The laptop can play almost all data formats commonly in use, including HTML, DOC, PDF, Flash, MP3, Real Video, H.263, and MPEG4 (within the processing capabilities of the laptop), etc. However, some proprietary formats may require, in some jurisdictions, negotiation of patent licenses and payments of fees. (We have shown them to work on the laptop, but they will be vendor provided. OLPC will help establish relationships with these vendors, most of whom are willing to offer their materials under a license agreement at no cost.)

   The sheer size of OLPC's distribution gives it enormous leverage with software suppliers; we use that leverage on behalf of children to create the most favorable circumstances worldwide. OLPC has pledged to use our critical mass to move as much software and content into the public domain as possible.

2. **What software and content will be made available from OLPC when the machines ship?**

   The laptop comes preloaded with free (and legal) software tools for exploring knowledge: web browser; electronic-book reader; multimedia player; games; etc. It also comes preloaded with free tools for expressing: word processing; graphics tools; software-programming environments;

music composition; and video capture and editing. In addition, free basic communications tools will be on every laptop: email, chat, voice-over-IP. Finally, a built-in journal enables the child to have a chronology of his or her learning that helps the teacher, the child, and the parents assess progress.

This is not an exhaustive list of the software that can run on the laptop: essentially any Linux program can be run with little or no modification. It is a general-purpose laptop, not a limited special-purpose machine. However, we recommend that software, where possible, be tuned to the user interface and the needs of children learning. Engaging the local and international open-source communities in this process is an important development opportunity.

The school servers—and the laptops themselves—are intended to provide storage for common reference materials and community-generated materials. We are working with the community to prepare some artifacts for basic literacy, English-language skills, mathematics, science, and the arts. However, OLPC will not provide curricula or instructional materials; we leave that to the federal and regional ministries of education. What we will do, however, is help connect ministries of education and educationalists worldwide. Typically, of all the ministries in any nation, education is the least globalized.

We will also provide tools and guidance for the preparation and delivery of country-specific (and other) materials, including video, electronic books, PDFs, and web-based materials. In general, migrating legacy material to the laptops should require minimal effort and new materials generated for the laptops will port to legacy systems.

Our focus on collaboration as a fundamental element of learning drives our commitment to editable document formats (e.g., wiki books), revision tracking, and careful attribution of authors and sources. Networks of XOs, and the publishing tools that come with them, will make possible the development and free sharing of learning materials customized to every locale and culture.

We would encourage each country to participate in an open exchange with the other OLPC launch countries, sharing best practices.

E. Education

1. **Why is the concept of one laptop per child the most promising approach for delivering the needed changes in education and social equity?**

   The computer is the most powerful learning tool yet invented. The growth of knowledge in the world enabled by the computer is unprecedented. The use of computers for expression, construction, modeling reflection, and discussion enables these dramatic improvements.

   Seymour Papert of OLPC and MIT changed how the world viewed the capabilities of children, and how computers could revolutionize their learning. Papert and his colleagues transformed the role of computers in education from a presentation device to a creative tool for the development of critical thinking. Concepts considered out of the reach of children were proven to be attainable. Learning has been enhanced through immersive access to computers, not only in mathematics and science, but in every discipline, including basic literacy, reading, writing, music, and the arts.

   Innovative educators around the world have adapted and further developed creative approaches to learning with computation and have proven that these incredible learning results are not limited to the elite. To the contrary, countless examples have illustrated how children from the most disadvantaged backgrounds as well as those who have not succeeded in traditional educational environments are able to develop to their full potential with such approaches. These children lack opportunity, not capability.

   We can certainly achieve basic improvement merely through inclusion and bringing connectivity to children. We can achieve a mega-improvement by re-thinking activity, content, and collaboration. We can achieve basic improvement by giving access to traditional content to all. We can achieve mega-improvement by re-designing our educational processes and re-structuring the disciplines.

   There are literally thousands of examples of using computers for such mega-improvement in learning. What has limited change to the overall system has been the high cost of computers that limited access, one consequence of which was the advent of the computer lab. The problem has not been the computer: the problem has been not having enough computers and administrative imagination.

For this reason, the key elements in the OLPC proposal are:

- Saturation (1-to-1 access for all children and teachers);
- Ubiquitous connectivity;
- Mobility;
- Immediate scale;
- Free and open.

Saturation

Adults with their own laptop computers would never want to return to a world where they have no computer or have to share intermittent access. This is because of the wide-ranging utility of computers. Computers have not totally transformed learning, yet, not because they are not valuable but because there has not been critical mass. With at best, one computer lab per school, with 10 computers for 40 children who attend the lab once a week for 50 minutes, on average a child has 12.5 minutes of access per week. Children love the time, but this is insufficient to transform learning.

The computer lab winds up as a place for peripheral activity: the teaching of IT skills and browsing. It brings value, but it is insufficient to change the way children learn mathematics, science, history (or any subject). When all children have laptops at all times, learning can be active, customized, collaborative, and creative, taking advantage of the protean power of the computer.

Ubiquitous Connectivity

The learning life of children is not limited to the classroom. Children with 24-hour access to connected laptops learn not only with their classmates, but they and their classmates learn with others around their community, around their country, or around the world. Connectivity through mesh networking brings learning home to the family. In our laptop project in Costa Rica, not only did families move into the rural community so that their children could benefit, the vast majority of parents entered adult education. Children taught their parents and grandparents computer use and these elders worked with the children on their mutual interests.

Families and communities moved closer together, benefiting the emerging learning culture.

Mobility

Rather than being forced to create de-contextualized and abstract situations, the whole world becomes the classroom and learning lab.

Scale

Prior efforts towards change were effective, but only at a small scale. Universities, companies, and NGOs did not create content, activities, applications and services because critical mass did not exist. Tools for creation were limited to a few. With large-scale access to laptops and connectivity, all those included can create content, share and collaborate, and truly learn to learn. It is also only at scale that the culture of learning can change. Small-scale “pilots” are suppressed by the immune system of the status quo.

Free and Open

Open and free access to software and content are also key to scale and high quality. Without these elements, the ability to share and collaborate is greatly diminished. Further, computation affords the opportunity for children to appropriate, transform, and use knowledge. The web grew exponentially as people everywhere were able create their own web-based content and applications, since they had the freedom to see what others had created in order to appropriate it, modify it, and make it their own. Content for learning will also grow exponentially when enabled by such appropriation. This freedom must also not be impaired.

2. **Where can we find more information about previous experiments and test cases that prove the validity of the pedagogy?**

All the elements for success—powerful learning by all, incredible progress in education in developing countries, 1-to-1 access to laptops, community-based initiatives—have already been demonstrated. One laptop per child puts them all together.

Mega-improvement in learning with computers has a long and documented history starting with Papert, best expressed in his book *Mindstorms*, but also demonstrated in 40 years of books, papers, reports, and articles from educators around the world. Perhaps the best example of the 1-to-1 use of laptops is in Australia; this is described in *Transforming Learning: An Anthology of Miracles in Technology-Rich Classrooms*, edited by Jenny Little and Bruce Dixon (See also http://www.techlearning.com/db_area/archives/TL/012001/australia.php).

Professor Michael Russell of Boston College has also documented the superiority of 1-to-1 access where children bring laptops home over both conventional classrooms and classrooms with 1-to-1 access where the laptops remain in school.

Other Previous Experiments:

- In 1989 the Methodist Ladies College in Melbourne, Australia began requiring all incoming students from the fifth to twelfth grades to arrive with their own laptops;
- The U.S. State of Maine where the state legislature four-years ago began issuing all middle school students their own permanent laptops;
- An estimated 1000 U.S. school districts have followed Maine's example;
- There are two similar programs currently underway in France, including one in Marseilles, the nation's second-largest city, and another in a poor town with enormous ethnic and cultural diversity.

Comprehensive report on previous experiments:

The most extensive study to date, a four-year investigation of 50 schools across the U.S. conducted by Saul Rockman, a widely-respected educational consultant, ratifies the constructionist theories of Papert that underpin the One Laptop per Child philosophy. Among Rockman's key findings:

Learning environments are transformed:

- *Educators involved in laptop programs … promote collaborative learning and … provide individualized instruction;*
- *… students and teachers move around more. Instead of staying put to do "seat work", students gather to work on projects;*

- *… (this) frees teachers to roam about the room helping those who have problems or need remediation;*
- *… learning in laptop classrooms is often more self-directed.*

Assessment techniques change:

- *Teachers in laptop classrooms are more willing to assign presentations and multimedia projects to students, and score them using customized, project-driven rubrics and even self-assessments.*

Students are highly engaged:

- *Like teachers, students also show improved technology skills and sophistication.*

Productivity increase:

- *Students develop better organizational skills because they are needed to keep track of what's on their computer and to accomplish complex project work in a timely manner.*

Attitudes toward writing improve:

- *76% of students said they enjoy writing more on the laptops than on paper;*
- *80% indicated laptops make it easier to rewrite and revise their writing;*
- *73% said they earn better grades for laptop work;*
- *The data demonstrate shifts in not only students' writing attitudes, but also in their practices. These are changes we've also observed in language arts teachers' writing instruction strategies, and in the attitudes and practices of other content area teachers.*

3. How can we best prepare our teachers to make the most use of this initiative?

Connected laptops enable new approaches to teacher preparation beyond standardized, centralized, hierarchical approaches. We can create pockets of excellence, connected communities of practice, strong exemplars of powerful learning activities, new content, and mechanisms for the spread of ideas.

A significant impact of OLPC will be the degree to which connectivity affords support to the teachers. Typical “training” efforts have been limited by the amount of time and the degree of access to the teachers in order to support their ongoing development. Because OLPC ensures that teachers will have their own laptops and high-bandwidth connectivity, we have a means of supporting them that previously did not exist. Teachers, parents, and concerned experts can join in to create new learning networks to improve educational thinking and practices.

We certainly don't need to train children how to use the laptop. Likewise, approaches that infantilize teachers, or do not respect them or believe in their capabilities, or only focus on teaching IT skills and office tools, have proven to have limited impact on education despite the investment of millions of dollars. The point is not to have teachers re-create the same lessons in PowerPoint. The point is to help them learn using technology and reflect on this learning. We need to engage them in those learning methodologies that are enhanced by connected laptops: the design and construction of personally meaningful objects using a variety of computational and traditional materials—a more diversified, humanistic, holistic approach to learning than previously was logistically possible. This process is ultimately liberating.

4. What are the metrics by which we should evaluate the impact of OLPC?

Any evaluation metric must appreciate the importance of "knowledge capital" and that cognitive skills are "more-powerful predictors of economic development than the average number of years of formal education." If we shift the primary focus to the development of knowledge capital and creating mechanisms for organic growth and development, and use existing metrics such as years in school and test scores as secondary, then it leads to different ideas for how to proceed in regard to evaluation.

Examples of increased knowledge capital from laptop programs abound: when children bring the laptops home with them, many parents began adult education courses at night using the laptops. Many families chose to move into communities with laptop programs. Children develop the skills to do normal maintenance on their laptops. Most important, though, is that the children engage more deeply in learning and school work over the year; the computer helps deepen this interaction.

The typical measures of test scores and years in school are important, but miss the key points that make quality education critical for human and social development. A child who learns to read but hates it so much that he refuses to read may test well, but is really an example of educational system failure. A child who does not learn to think, imagine, and create with or without new technology will have difficulty with full social and economic inclusion in the modern world.

Knowledge capital is a better indicator of success than years in school. Children who develop a passion for knowledge; who retain the curiosity with which they all enter school; who maintain the desire to continue to learn and the knowledge of learning to learn are children who have the ongoing capacity to develop to their full potential and will form the foundation for a countriy that has the capacity to develop to its full potential. For a valid assessment of a child's development, the whole child must be taken into account.

We need to evaluate:

- the potential to enhance learning by children due to immersive presence, new methodology, new content, and collaboration;
- the potential to support teachers more closely, more contextually, more personally, and more continuously;
- the difference in attitude between attending a class periodically in a computer lab and owning one's personal laptop;
- the potential impact on family and community and the development of knowledge capital throughout the community and beyond the school; and
- the potential to create full inclusion on a large scale, not merely through connectivity to the web but as primary participants towards developing full participation and fluency in a digital world.

Questions related to design and implementations of the laptop program are numerous; examples include:

- Did the laptops get distributed to the children in the manner expected?
- Did the communications infrastructure perform adequately both within the mesh and the Internet as a whole?
- Did the school server operate as anticipated?
- Were there any systemic hardware failures?
- Were there problems with security? With software updates?
- Did the children learn to perform the normal maintenance of their laptops themselves?
- Were the laptops used at school? Were they used at home?
- Were they used by teachers? By parents? By siblings?

The evaluation must also consider the whole child:

- What was the impact on the children's personality, psyche, self-esteem, and dealings in home, community, and school?
- What was the affect on the children's cognitive development?
- Do children with laptops engage in different types of activities outside of school than their peers without laptops?
- Do they acquire a love for learning?

And community impact must also be measured:

- Is education more inclusive? Is there a positive impact on access? Enrollment? Truancy (drop-outs and retention)?
- What were the perceptions of parents, teachers, and community leaders? Does the learning spread beyond the child to the community?
- Does the relationship between children, their parents, and their teachers change?
- What are its implications for academics in terms of teaching learning processes?
- What was the impact of support for the teacher that the connected laptops enable?

Finally, more traditional metrics should also be examined:

- How does one laptop per child enhance learning? Did new methodology, new content, and new ways of collaboration emerge?
- Who is performing better in school—children with or without laptops?
- Have different provinces or districts done better than others (e.g., urban vs. rural; north vs. south; etc.)? What are the factors responsible for this?
- Are girls performing better than boys?

Collectively, we need to ask: Are there lessons for others who would like to do similar interventions?

F. Technology

1. **Why did you change the CPU, DRAM and flash recently?**

   In early March, we explored with representatives of the launch countries two scenarios: (1) the previous Geode GX plan of record, with a refresh in 2008 using the Geode LX; and (2) a slightly higher initial cost, but longer-lived Geode LX system on almost the same production schedule, with more memory and flash as well.

   The countries unanimously wanted a single product that would span a longer period of time. The first-generation systems will also be much more capable: many programs run on the LX processor at approximately twice the speed of the GX due to changes in the architecture unrelated to clock speed, which has also increased, and these programs run with lower power consumption.

   From OLPC's perspective, we also preferred this option, as we can now focus on a much lower-cost second-generation system rather than an immediate refresh.

2. **Why don't the batteries work?**

   This is a case where the low-level software running the machine contained several bugs. We have fixed these bugs as of firmware Q2B81, which was released 2007 March 18. The batteries now work.

3. **Why aren't applications working?**

   While the basic components we use in the laptop are part of the standard set of utilities distributed with Linux, with any new platform, there is a development and debugging process. Vast improvements have been made to the base activities in the short time between the release of our B1 and B2 machines.

   A challenge posed by our high-resolution display is most obvious with the web browser: most applications assume a 96DPI display; ours is 200DPI. This presents some scaling mismatches. As of Build 330, the web browser is now based on a version of xulrunner (part of the Firefox web engine) that has facility for scaling; page layout is greatly improved. We will continue to improve the browser with time. (The Opera web browser, which has been ported to the laptop, also has the facility to work at 200DPI.)

Adobe's Flash 9 and Sun's Java plug-ins also have been tested and run on the laptop. (We do not distribute them as part of our standard package for licensing reasons, but they are available for download.) HelixPlayer (aka RealPlayer) has been ported to the laptop, along with a browser plug-in. Document viewing (e.g. PDF) is also available through the browser.

4. What is Sugar?

The Sugar user interface is designed to engage young children, ill-served by the conventional “messy desk” desktop. Before children can read, these user interfaces are extremely frustrating; we avoid dialog boxes with inscrutable text warnings that often find themselves hidden behind other windows. But the intent of Sugar is not just to be a gateway to a conventional desktop environment; it is one of the first redesigns of the user interface since the advent of the Internet and it draws its inspiration from the collaborative nature of the net: we have chosen to put collaboration at the core of the user experience. The presence of other members of the learning community will encourage children to take responsibility for others' learning as well as their own. The exchange of ideas amongst peers can both make the learning process more engaging and stimulate critical-thinking skills.

A standard desktop environment will run on this machine (and we will make it possible to run “standard” application in Sugar), but it will not be able to take advantage of the unique features of the laptop, nor will it be an inherently collaborative experience, as Sugar has been designed to be.

5. Why aren't things working on the mesh?

The “mesh” is really two things: an ad-hoc network that extends the reach of current wireless networks, and the user interface that children and teachers will use to see each other and collaborate.

The “mesh” encompasses the whole networking stack from the low-level wireless firmware to the end-user applications. OLPC is developing new code for all of these layers. The month of March was dedicated to making the low-level “bit piping” work; this level of the mesh forms automatically in an ad-hoc fashion when laptops are switched on and come within each other's vicinity. This enables functionality such as browsing over the mesh rather than through a direct connection to an access point. We have begun building the user interface that allows the user to select between available connectivity options. In April we will focus on service discovery (i.e., finding who is on the mesh and what they are doing and/or are willing to do). This will be the basis of the "mesh activities."

Now that there is some stability in the networking parts of the mesh, the user interface piece of the mesh, beyond basic internet access, will start to be incorporated into the system, which includes the ability for children to communitcate and collaborate in activities even when there are no access points around.

6. **When will we be able to show a true out-of-the-box experience?**

   The laptop experience is in a stage of rapid evolution. Each new build brings more stability and a richer set of features. The end-of-March experience includes a working mesh network, a properly-scaled web browser, PDF viewing, an accurate battery status indicator, video streaming, and numerous improvements to the base activities. April will see the inclusion of basic journal interactions and richer mesh interactions including chat. We will start to see mesh-based activity interactions, and possibly even video conferencing. When the B3 laptops are available in mid-May, overall system performance will be enhanced, due to the hardware changes discussed elsewhere in this document; and the basic experience will be greatly enhanced as a result, albeit built on the same principles.

7. **What happens to OLPC patents?**

   We are patenting to assure that the children of the world have access to our designs and work. We are exploring methods to assure this.

8. **Can I put Windows on this machine?**

   Yes, Microsoft is working on this now.

9. **Why isn't OLPC using Windows?**

   Costs aside, Windows is not open source; OLPC believes that this will limit the children's opportunities to learn. We consider each child with an XO as not just a passive consumer of knowledge, but an active participant in a learning community. As children grow and pursue new ideas, the software, content, resources, and tools should be able to grow with them. The very global nature of OLPC demands that growth be driven locally, in large part by the children themselves. Each child with an XO can leverage the learning of every other child. They teach each other, share ideas, and through the social nature of the interface, support each other's intellectual growth. Children are learners and teachers.

OLPC also wants to ensure that there is no inherent external dependency on being able to localize software, fix the software to remove bugs, and repurpose the software to fit local needs. Nor should there be any restriction with regard to redistribution; OLPC cannot know and should not control how the tools we create will be re-purposed in the future.

In our context—learning—knowledge must be able to be appropriated in order to be used; it is most suitable for knowledge to be free. Further, every child has something to contribute; we need a free and open source system as a receptacle for those contributions.

10. What can my laptop do that the XO cannot?

Not much. The XO will do almost everything. It is a general-purpose multimedia laptop, not a limited special-purpose machine. What it will not do is store a massive amount of data on-board.

11. Can you please compare the XO to Classmate and other "low-cost" laptop initiatives?

We applaud the efforts of the other companies and welcome them. Objectively, our technology is better suited for the constraints of children learning and our price is dramatically lower.

The XO has three things no other laptop has at the moment:
(1) extremely low power, suitable for cranking and other methods;
(2) a dual-mode, sun-light readable display; and
(3) a mesh network.

Putting it simply, the XO is designed for children and the environment that most children live in: it has a large, beautiful, high-resolution display that you can use outdoors, a 15 hour battery life in ebook mode, a mesh network that vastly extends the range of internet access even when the laptop is turned off, and it has no internal moving parts that will break in the field that need expensive replacement. And all this is at a vastly lower cost than anything you can buy on the market today. The Classmate PC and other "low-cost" initiatives are just inexpensive laptops.

The XO has a novel bi-modal screen; in reflective mode it can be used in direct sunlight; children often are taught or must study out doors. Other computers are unusable in bright light. The screen is also very high resolution, 200 dots per inch. The number one reason people prefer to read paper rather than computer screens has to do with resolution. The XO laptop has equivalent resolution to printed paper. The screen is very low power, drawing about 100 mW in sunlight, and about one watt with the backlight on.

The Classmate consumes as much power as conventional adult laptops andmany times the power of the XO; the Classmate cannot suspend itself while still displaying the screen, limiting battery lifetime in most usage modes.

The XO is engineered to be powered or charged using power at hand (e.g., car batteries, solar panels, and/or generators) without additional expensive converters. The XO's power usage is low enough that much cheaper solar panels can be used to charge it individually or by group charging at a school. A Classmate requires a standard “power brick,” and would require additional converters, adding cost and logistical headaches, and much higher power usage, which translates to expensive fuel and generator use.

The XO's power consumption has recently been measured in eBook mode (with processor suspended, wireless enabled, and screen active in reflective mode) at slightly over one watt; 15 hours or more in eBook mode are expected with 20-watt-hour batteries. Power consumption in this mode in production units will be even slightly lower.

The XO can forward packets while using less than one-half-watt of power. This spreads the reach of the network, does not require additional electricity and network infrastructure to be installed, and, by its extreme power savings, encourages the children to leave the mesh enabled for many hours or days at a time. The Classmate does not currently support mesh networking, and if it did, the battery would only be able to last a few hours, as it would require the processor to be powered up.

The XO is robust. For example, the laptop survives a 5-foot drop directly on an antenna ear. The machine is water and dust resistant, particularly in the keyboard area. Its batteries are safe. It is environmentally friendly due to its very low power usage and its largely recyclable design.

A comparison of the OLPC XO to the Intel Classmate PC.

	Intel Classmate PC	**OLPC XO**
Price (US$)	~$400	~$175
Availability	Q2'07	Q3'07
Laptop architecture	Flash (no hard drive) •	* Flash (no hard drive) * NEW: CPU goes into rapid sleep and wake states to allow extreme low power laptop operation while WiFi and LCD can continue operation.
Processor	ULV Dothan ZC 900MHz	AMD Geode LX-700@0.8W
Chip set	915GMS or ATI410MX	AMD CS5536 South Bridge
Memory	256MB	256MB
Ports	* 2 USB 2.0 * Audio in headphone * DC power * SD memory slot	* 3 USB 2.0 Ports * Headphone and microphone * Audio I/O * Wide-range DC power (8–25V) * Analog data input * SD memory slot
Storage	1 GB NAND flash	1 GB NAND flash
Audio	Integrated stereo speakers and microphone	Integrated stereo speakers and microphone
Network	* 802.11b wireless * 10/100 Ethernet	* Mesh networked (If one laptop is connected to the Internet, then all of the XO laptops are connected.) * 802.11b/g wireless * IPV6 (more IP addresses in the developing world)
Built-in camera		Still and motion capture camera 640×480, 30 frames per second
Graphical user interface	Windows	NEW: Sugar, a language-independent, collaborative user interface

OS	Windows / Linux	Linux / Windows
Display	7" 16:9 Diagonal Color LCD WVGA 800×480	30% more display area than Classmate 7.5" 3:4 diagonal dual-mode * B&W sunlight-readable mode 1200×900 (200dpi) * Color transmissive mode ~800×600 (133dpi)
Touch pad	Capacitive finger touch pad	* Capacitive finger touch pad * 6"-wide resistive drawing tablet for stylus use
Power Supply	Li-ion battery pack 4 hours 6-cell safety: burns at 1000C 500 cycles replacement cost ~$40	* NiMH battery pack 4–8 hrs 2000 cycles safety burns at 100C replacement cost ~$10 or * LiFeP battery pack 5–10 hrs 2000 cycles safety burns at 100C replacement cost ~$10
Alternative power input		* car battery charge * solar recharge (option) * hand crank recharge (option) * pull-string recharge (option) * foot pedal recharge (option) * gang charging (option)
Power adapter	65W	18W
Typical laptop power draw	~10–15W typical	* 0.5W mesh mode * 1W eBook mode * ~2–4W typical * ~4–8W power user
Form factor	Clamshell	* Laptop mode * eBook mode * Multimedia mode * Television mode * Mesh-router mode
Industrial design		Numerous awards
Ruggedness	No internal moving parts	* Rubber-sealed keyboard and touch pad * Sealed in closed position * Humidity and dust resistant ports * 5-foot drop resistance on antenna ears * No internal moving parts

G. Infrastructure

Network

1. **How many servers will we need per school?**

   We have two basic configurations: one for a rural setting and another for urban environments. Each urban-setting server will run about $200 and serve about 150 children. For rural settings, the cost will be lower: about $100 each and will serve more than 20 children.

2. **How many access points will we need per school?**

   It depends on the number of laptops and the size of the school. The access point is in the school server. Each server can support 3 WiFi radios and each radio can support ~35 laptops. We expect that number to grow as we tune the low-level network stack on the laptops.

   We are also developing low-cost stand-alone mesh repeaters that will extend the school network's reach in the area around the school.

3. **What kind of network infrastructure do we need in the country?**

   OLPC and its partners are working closely with the launch countries to determine the best way to deploy with the existing country infrastructure.

   We would like all schools to have an always-on connection to the Internet. We don't prefer any access technology over another; however we don't like extremely asymmetric connectivity options since we want to encourage kids to be both producers and consumers of information.

   We believe that with the right technology components, local access networks can grow organically by their users and preferred connectivity options that encourage bottoms-up growth.

4. **Will the children be able to connect from home?**

   Yes, as long as a child has an uninterrupted chain of links back to a point of access. The exact distance the mesh spreads into the community depends on where the other children live and the environment. The $40 solar-powered mesh repeaters can extend the reach of the mesh to insure all the children can connect from home.

Power

1. **What are typical power requirements for a school?**

   The laptop in typical operation consumes about two watts. The maximum power consumption is about eight watts. The school server will require ~10 watts. The minimum power requirements for a school are power for the group chargers, school servers, and connectivity hardware. We could get by with as little as 200 watts for a school with 50 laptops (on a 24-hour basis).

2. **What group-charging, solar-charging, and human-charging solutions do you have? How much do they cost?**

   Group charging: in order that individual desks need not be wired, we have made some prototype group charging systems that will allow the child to run off of battery power at all times. The idea is to provide two batteries per laptop; one is charged, while the other is in use. The child leaves school with a charged battery. This group charger can run off of main power, a car battery, solar input, or alternative energy. Several prototypes have been sent to potential launch countries already.

   Solar: we can supply 50 watt solar solution on flexible, unbreakable panels for $100–150. Five-watt unbreakable solar panels that charge a laptop for about $12 each, and 2-watt solar panels for about $4–5 each.

   Human charging: we have options for a string pull system (called a “yoyo”) and a crank that allows the child to charge the laptop when charging by solar power is not an option. We can achieve a ratio of six minutes of crank time to provide one hour of charge time while using the XO in eBook mode.

3. **What equipment do we need to have when the school is connected to the grid and when it is not?**

   When the school is connected to the grid, we recommend an inexpensive UPS for the school servers and connectivity hardware. In the case of a non-grid school, we recommend a generator (diesel or gasoline depending on availability and cost) charging a bank of car batteries, which in turn run the equipment. If solar cells are practical from a cost and environmental perspective, they should be added to the system. Whatever alternative energy is used locally can be leveraged. The deployment team will make detailed configuration recommendations and plans for all deployment areas.

Other

4. **What additional infrastructure do we need in the country (e.g., backups, content and update servers)?**

   For countries with limited external connectivity, local content and update caches will improve the children's experience dramatically. Backups will be handled by the school servers with automatic (optional) replication to second-level servers inside the country (via a local data cache), or externally (via gmail), or both, depending on connectivity.

5. **Why is Sugar so important to making the infrastructure low cost?**

   A large amount of the infrastructure cost associated with computers and laptops is related to fixing the laptops when they break and putting people on site when something bad happens. Part of the Sugar interface design is related to how machines are managed and maintained. Its emphasis on simplicity means that it is very easy to re-install a machine should it have problems; adding and removing applications/activities is also easy. Backups and the restoration of a child's data are trivial in Sugar. As a result, software can be locally managed and fixed. Without Sugar, the costs of infrastructure go up considerably.

6. **Do I have to throw away my existing infrastructure?**

   Absolutely not. The XO is designed to take advantage of any kind of existing infrastructure. It can connect to a normal WiFi access point, independent of the mesh network and it can talk to any existing servers.

7. **Will this work in my country, with its unusual environment?**

   We have designed this laptop to function in hot and cold countries, low and high altitudes, and arid and humid environments. It is dust resistant. It is droppable. It is meant to be used outside; its screen is sunlight readable.

H. Deployment

1. **Can you recommend a deployment strategy in my country?**

   Yes, but we need to work closely with you to help you determine what is best for your country. In every case, it is important to assemble a task force team (to oversee all aspects of deployment), build a core deployment team (to handle the planning phase), and implementation teams (to manage three implementation processes).

   The task force should include the main ministries concerned: Education and IT. The program should also include philanthropists, intellectuals, and the private sector. The scope of the task force is both oversight and imagination, in areas of hardware, software, usability, content, connectivity, communications and international collaboration (with other launch countries).

   The make-up of the core deployment team is critical. A team of 4–6 people is needed, with mixed backgrounds including education, Linux, telecommunications, software development, human coordination, and government bureaucracy. Some members of this team should spend time at OLPC and most definitely attend the April 2007 inter-country meeting. The responsibility of this group initially is to develop a full launch plan, picking and preparing sites.

   Placing the first machines is key and must follow some simple rules: clustering laptops in large, not small numbers, so the mesh works extensively and the initial machines serve as a learning tool. This in turn suggests picking places with the full spectrum of socio- and geo-political features: rural-urban, and so on. That said, running 200 sites is not wise. Limiting the initial deployment to 30 or fewer sites, circa 30–50,000 laptops each, is very important. It is important that the density of deployment be such that everyone in the community feels ownership of the program.

   There are also three phases to the logistics that every deployment will face: site preparation; laptop distribution; and program support.

   Site preparation involves ensuring power, Internet connectivity, and the installation of the school server at each deployment school. This preparation must precede the distribution of the laptops. Roughly speaking, we estimate it takes two days per site for this level of preparation.

Laptops will be delivered in shipping containers from the factory. There will be approximately 5000 laptops per container. Each container will service on average 20 schools. Assuming one school per day, one truck can unload an entire container once every three to four weeks. Therefore, each truck can unload 12–18 containers per year.

There are three phases of implementation: (1) information gathering; (2) infrastructure deployment; and (3) laptop deployment.

Information gathering involves a visit to each school in order to:

- collect data on the number of students, teachers, geo location, etc.;
- assess electricity and connectivity needs (including any needed environment and theft protection);
- identify contact points within the community;
- explain the initiative to the local communicate and set expectations; and
- identify accommodation, food, transportation, and communication for the teams to follow.

Infrastructure deployment includes:

- build and/or connect the required power infrastructure (generators, solar panels, group chargers, etc.);
- deploy connectivity; and
- install servers.

The laptop deployment team will assign a person to stay at the school (or several schools in the case of rural communities) for the initial one- or two-month period of deployment. Each person from this team is a knowledge engineer who:

- works with teachers and children;
- distributes the laptops and accounts for them;
- involves the community in the process; and
- ensures sustainability (maintenance, generators, contact points, etc.).

2. **How much support will you provide us in preparing the deployment team?**

   Once the teams have been selected, we will be able to:

   - point the team members to documentation and information on the Internet that will help them come up to speed and begin their planning;
   - answer any questions they have and discuss the various aspects of deployment with them as needed;
   - provide the tools (mailing lists, wikis, etc.) and venues (meetings at Cambridge or elsewhere) to allow teams to communicate and exchange knowledge; and
   - host any team members in our offices in Cambridge.

   We will be very glad to discuss, accommodate, and use any ideas you have on this topic.

I. Maintenance

1. **How many spare parts should we get?**

   We have designed the laptop to be robust in light of the conditions in which they will be used. We have eliminated the two most common points of failure for laptop computers: there is no hard disk to crash; and the backlight is redundant and easily (and inexpensively) replaced. Nonetheless, some parts will break. We are in the process of working with our manufacturers to determine what will break and how frequently.

2. **Who will handle repairs? Who will train local repair teams?**

   In our thirty-plus years of experience working with children and computing, we have seen time and again that the children themselves will provide much of the maintenance. This represents yet another opportunity for learning within the school community. Talented teenagers will be identified in each deployment area to be the first line of debugging, simple repair, and parts swapping. (They will be trained by the deployment team.)

   Supplemental maintenance will be provided by the same entrepreneurs who run local electronics and TV/PC repair shops, etc. Motherboards and displays will have to go to a central location for further repair, but, in general, the need for a centralized maintenance program will be minimal. There is no inherent dependency on international corporations for maintenance—it is purely an in-country enterprise. Self-sufficiency is the goal.

3. **Can we pay Quanta or a third party to do the maintenance/or for a longer warranty? How much will that cost?**

   Yes, we are determining the full cost for this service, including shipping charges from each country. This will be a more expensive option than developing in-country repair, but it will be available.

4. **What are the plans for software support and updates? Can we do our own software support?**

   Of course. Open source software provides the best opportunity available for local software support and development industries to grow and evolve because anyone can become an expert in the system without having to ask permission from any particular company or person. Support is also available from local experts, in-country support organizations, ministries of education, in-country commercial companies, and services from multi-national corporations such as Red Hat. There will be an initial offering of support from Red Hat, but these options can be exercised in combination and change over time as in-country expertise expands.

5. What role will Red Hat play in regard to software support?

Depending on country interest, Red Hat is likely to maintain the base system software and will offer an annual support package through OLPC for software updates. We recommend that, at least in the initial stages of deployment, every country stay in synchrony regarding the core operating system to be able to leverage the work and effort of all the other countries.

J. Shipment

1. **What are all the logistical aspects that we will be responsible for until the laptops arrive in our port (e.g., insurance, shipping, dock storage, etc.)?**

   You will take title to the laptops at our manufacturing factory (Ex-Works), located in China (likely in Shanghai). Transportation to your home port will be at your own cost. OLPC can work with you and our logistics partners to make arrangements to deliver the laptops to the port of your selection. Any shipping, insurance, and storage charges are not included in the price of the laptop.

2. **How often will the laptops ship?**

   Typically, laptops will ship monthly according to the delivery schedule set in your sales agreement.

3. **What kind of support will we have for shipping within the country?**

   This will be handled by the deployment team and its vehicles.

K. Vision

1. What is the OLPC vision?

The OLPC technology and price are stunning; however, there is a larger reason to do one laptop per child. The XO is the embodiment of a transformation of education. The opportunity, access, and entrepreneurial opportunities it creates are staggering. It provides a bright, open future to the next generation of children.

One thing is certain: computers and connectivity will only become more and more present, sooner or later. If one believes that the technology provides potential pathways for learning and development on both the individual and system levels that were previously extremely difficult to obtain, then creating equitable access to enable the highest possible quality of education in school, in the community, in the home, and on-line —sooner rather than later—is critically important. No one can afford another lost generation, a certainty if there is not widespread and profound educational improvement.

The intransigence of education problems in the face of conventional solutions—combined with pervasive poverty and the growing need for high-quality lifelong learning in order for inclusion in the global knowledge-based economy—warrant new thinking. Laptops can be affordable and children are more capable than they are given credit.

2. Why is equity important?

Poor children lack opportunity, not capacity for learning. By providing laptops to every child without cost to the child, we bring the poor child the same opportunities for learning that wealthy families bring to their children.

If your children have computers, you already know the transformative impact the networked computer has. We have it in our power to give all children this access and creation tool.

L. Other

1. **What about medical use of the laptop in local health care facilities, microfinance, etc?**

   Initially, our main focus is primary education. We will encourage and support expansion to a variety of other socially beneficial programs in the future.

2. **What are the biggest local business opportunities relating to the laptop?**

   Serving the OLPC "ecology" will create business opportunities. There are numerous devices ranging from solar panels, generators, point-to-point wireless hardware to extend the network, novel, inexpensive educational accessories to be used with the laptop, and so on that can and will be invented in a grassroots, bottom-up fashion.

   Software is also an opportunity: systems such as the XO will enable both commercial and non-commercial software to be built to address needs in the majority of the world where computing has not been available due to lack of suitable computers and networks.

   Launch countries, in particular, have the chance to learn what these opportunities are early and to capitalize on this experience.

3. **What are some useful pages in the wiki?**

   For general interest:

   - http://wiki.laptop.org/go/Current_events
     (the latest news, updated weekly)
   - http://wiki.laptop.org/go/OLPC_Human_Interface_Guidelines
     (a detailed overview of Sugar)
   - http://wiki.laptop.org/go/Library_Release_Notes
     (how to use the OLPC content library)
   - http://wiki.laptop.org/go/Localization/www.laptop.org
     (how to localize www.laptop.org)

   For developers:

   - http://mailman.laptop.org/mailman/listinfo
     (OLPC-related mailing lists)
   - irc.freenode.net (#OLPC and #sugar)

(OLPC IRC channels)
http://wiki.laptop.org/go/Developers_Program
(information for software developers)
http://wiki.laptop.org/go/BTest-2_Release_Notes
(uptodate status of the B2 software and hardware)
http://wiki.laptop.org/go/Autoreinstallation_image
(updated for every stable build)
http://dev.laptop.org/query
(view and submit bug reports)
http://dev.laptop.org/git.do
(OLPC source-code repository)
http://wiki.laptop.org/go/Project_hosting
(how to host a project)
http://wiki.laptop.org/go/School_Server_Specification
(information about the School Server)
http://wiki.laptop.org/go/RestrictedFormats
(how to use Java, Flash, etc.)