

## THE \$100 LAPTOP

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The idea for a \$100 laptop suddenly has become very popular. Yet there was nothing sudden at all about its beginning. The vision of providing every needful child with an affordable personal laptop grew out of nearly thirty years of research on computers and education at the MIT Media Lab. From the start, this work has been substantially based on the theories of Seymour Papert, as well as the people who have studied with Seymour, particularly Mitchel Resnick.

In the early 1980's, the French government invited Seymour and me to design pilot computers-in-education programs for developing countries. We worked in Pakistan and Colombia and, most notably, in Senegal, where we installed a couple of hundred Apple2s, a gift from Steve Jobs, in schools outside of Dakar in 1982. For a time, these school kids commanded more computing power than did the central Senegalese government.

In 1986 we moved to Costa Rica, where Oscar Arias, the president-elect (and future Nobelist), had made computers in education part of his campaign platform. Because of the new president's enthusiasm, and Costa Rica's modest size, we were able to establish a very successful, and enduring, nationwide program.

The Costa Ricans also did something very clever. Instead of making this a government project (and thus vulnerable to shifts in the national political winds) they created the independent Omar Dengo Foundation to administer it. That foundation still thrives, and continues to do extraordinary work. In fact, we think of Costa Rica as the exemplar for the use of computers in primary and secondary education. Costa Rica today earns in excess of half its export income from integrated circuits, more than coffee and bananas combined. The Omar Dengo Foundation deserves considerable credit for this fact.

Our next program of interest was a late 1990s telecommunications project in India, where we deployed very early stage WiFi to connect the Indian

and Pakistani side of the disputed mountain territory of Kashmir. It was very low power, but very focused.

The study was interesting and successful. But since then we've decided that connectivity is not our central technological hurdle. I frequently argue with Bill Gates on this point. Bill says connectivity is a barrier. The reasons I do not agree are many. They include WiFi, WiMax, 3G, 4G, wired techniques, satellites and various other technologies for connectivity. These all are moving ahead rapidly and don't need my help or anyone else's. Connectivity is happening on its own, and will only get better and better, soon.

The really serious barriers to computing for kids in the developing world are the cost of the machines themselves, and power consumption. Your own commercial laptop consumes as much as 60 watts. Ours must not use more than two.

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Two developments directly sparked the \$100 laptop initiative. The first was a bit of an accident.

Back in 1999, when money grew on trees, my wife and I built some primary schools in rural Cambodia. Our son, Dmitri, who was living in Milan at the time, coincidentally was having girlfriend troubles. So I asked him, 'If you can suffer the indignity of working for your father, why don't you go work in Cambodia and bring computers and the internet to these primary schools we have built?' He agreed.

Thaksin Shinawatra, who is now the Prime Minister of Thailand, at the time was a telecommunications executive. He gave us a number of dishes to connect the schools to the internet. Since the village of course had no electricity, we would have to generate it ourselves.

Simply in the interest of conserving that power, I sent Dmitri 50 laptops, saying, 'Why don't you just use laptops? They are more power efficient than desktops, plus the kids can take them home'. So that's what we did.

The children took their laptops home that first night. Next morning, they reported to my son that their parents told them not to open the machines lest they break them. This was a reasonable concern among villagers whose average income is \$47 per year. But Dmitri reassured everyone it was OK to open the laptops, and the parents loved them at once. Reason: They instantly were the brightest light source in the house. In fact and in metaphor, it was an extraordinary moment.

Meanwhile, flashpoint number two unfolded. Seymour Papert persuaded Gov. Angus King of Maine to adopt a one laptop per child policy at the state level. In 2002, after the necessary legislation passed, Apple iBook laptops were introduced to seventh- and eight-graders throughout the state. Since then, Maine's schools have phased in laptops both in the lower and higher grades.

The results so far are exciting. The 80 percent or so of Maine school teachers who opposed the program now support it wholeheartedly. Truancy is down. The kids are behaving better in class. Their parents are attending parent-teacher conferences in much higher numbers. And students have surprised their teachers with a deluge of after-hour emails to discuss their academic assignments.

This is not a rigorous analysis, of course. But when you get those kinds of results, it seems to me that we can dispense with further pilot projects and more study and move to make laptops sufficiently inexpensive so we can get one to every child. That is precisely what I have been doing for the past two years.

Perhaps the best decision we've made so far is to organize ourselves into a non-profit association, which will soon become the world's largest non-profit consumer electronics company. The case for being a non-profit is compelling. It allows the board of directors to perfectly align the mission so that whenever there is a technological development that lowers the price of the laptop, the children get the lower price.

In the for-profit world, the exact opposite is true. For example, I happen to be on the board of directors of a \$40 billion company, Motorola. If our company invents something that lowers the cost of the display by \$10, guess who gets the ten bucks? It's the shareholders, for the most part. In fact, that is management's legal obligation. If a corporate president or CEO does not distribute wealth to the shareholders in this way, we throw him, or her, out. That's the way it works.

The vast scale at which we intend to operate also is an important factor, and not principally because it will allow me to buy components at favorable prices. The more important effect will be to get companies to change their strategic plans to help further our agenda.

For example, I visited one company that makes big, bright displays with perfect color, perfect pixels, perfect everything for the high-end market. I told them we do not need such size and brightness and perfection. And they replied that making a small, less-than-perfect display was not of interest to them. 'That's a shame', I said, 'because I was looking for a hundred million units a year or more'.

'Oh, well!' I quickly was told, 'perhaps we *could* take a look at this project!'

About laptop economics. Fifty percent of the cost of your personal laptop goes to cover sales, marketing, distribution and profit. We have none of that, so our hundred dollar laptop on the fair market is really a \$200 laptop. We just do not have \$100 of those costs.

Second, 75 percent or more of your laptop's computing speed today must support a grossly obese operating system. This is true of almost any piece of software, whether it is from Microsoft or Lotus or Adobe. By adding more and more features and options we have created a race of morbidly overweight monsters.

The way around these great mounds of useless flab is rugged, open-source software. A very good example of the open-source model is Wikipedia, the on-line encyclopedia that is written, and edited, by its users, hundreds of thousands of them around the world.

The gray market. We are dealing with the possibility of theft or misappropriation of the \$100 laptop in several ways. One approach will be to build a commercial machine in parallel. Another way is to make the laptops so distinctive that anyone would know, at a glance, that if you aren't a student or a teacher you shouldn't have one. Consider, for example, U.S. post office delivery trucks. They're very distinctive and you do not see too many people stealing them because there is no secondary market for post office trucks. If necessary, we will also consider technological measures to prevent the laptops from being misused.

Probably the most talked-about feature of the \$100 laptop is its hand power crank. But our customers, the national governments in developing countries, are also very keen for the machine's dual-function display. It is both a full-color LCD screen and, with a flick of a switch, a high-resolution e-book, sunlight readable.

This feature is critically important, because it will allow governments to replace, or update, texts electronically, saving a country such as Brazil, for example, a big chunk of the \$20 a year that Brazil now spends per child on traditional school texts. From our perspective, the e-book function is sort of a Trojan horse. The real magic will come when the kids are connected and the Greeks come out at night, so to speak

As of now, we plan to begin shipping the 5-10 million units of our Generation 1 machine in the first quarter of 2007. We expect the first of our large customers will be: China, Argentina, Brazil, India, Nigeria, Egypt and Thailand – our CABINET. We will also try to make at least some machines available to any other appropriate country that requests them.

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The state of Massachusetts also is included in the mix, in part because wherever I travel outside the U.S. people ask me if the \$100 laptop is such a good idea why aren't you distributing it at home. In July of last year, we met with Mitt Romney, the governor of Massachusetts, to explain our project. In September, his office called to say that tomorrow the governor would propose one laptop per child legislation for Massachusetts, and would I join him at the press conference? Next thing I knew, stories and images of the governor and me and our little model of the \$100 laptop appeared on television and in periodicals around the world.

Looking ahead, we see the \$100 laptop becoming the \$50 laptop and even the \$30 laptop as technologies – particularly display technologies – advance, allowing us to build better and better machines at lower and lower cost. But for all the innovation and expertise we can bring to bear on the laptop, the essence of one laptop per child is not technology. Rather, it is technology in service of education. Today, much that is called education in the developing world, especially in the rural parts of the developing world, is really quite minimal. Teachers often have only a sixth- or seventh-grade education themselves. They may be well-intentioned, with big hearts and compassion, but to really prepare a child to thrive in the dawning Age of Information you must leverage them as learners. As Seymour Papert has shown, the old top-down paradigm is no longer relevant. Children must become more actively engaged in their own learning. And for that, the essential tool will be the \$100 laptop.