Cautions from One Laptop Per Child

in Marketing Technological Innovation to LDCs

If the criterion for success was admiration for an innovative concept, the One Laptop Per Child (OLPC) project would be an unqualified triumph. The project, which sought to put laptop computers into the hands of tens of millions of children in the developing world, attracted early funding from Google, AMD, and News Corporation and won numerous design awards. However, if the criterion was achieving its sales goals, the project would have to be judged a failure, despite some recent glimmers of progress. In 2005, Nicolas Negroponte, the MIT professor who initiated OLPC, predicted that 150 million of its pioneering XO-1 machines would be shipped annually by 2007.[1] But midway through 2010, only about 1.6 million of them had been deployed to their intended recipients in less developed countries (LDCs).[2]

The discrepancy between the goals of OLPC management and their actual accomplishments provides an opportunity to analyze the particular challenges of propagating information and communication technologies for development (ICT4D). Although the OLPC initiative offered an innovative product, an unusually well-publicized launch, a technologically sophisticated design team, and a product assumed to be widely needed, it nonetheless failed to achieve its ambitious goals when it met its intended market. Our main argument is that OLPC's disappointing outcomes have occurred because its marketing in the broadest sense, including the product itself, did not effectively match the purchasing priorities of its intended customers: governments in developing nations.

Our analysis of this failure, which OLPC may yet reverse, is intended to help managers leverage other innovations in emerging markets with greater success. The analysis

draws principally from secondary sources, primarily interviews with and writings by experts in education and development, representatives of governments that have been asked to purchase OLPC, and individuals formerly affiliated with the project. We also examined OLPC Foundation financial statements.

We first describe the laptop product itself, its intended markets, and the incompatibility of first-stage OLPC marketing efforts with a model of purchasing criteria employed by the potential customers, LDC governments. We then discuss what OLPC management experienced and others can learn concerning the marketing of innovations internationally, particularly in developing nations. We conclude by offering strategic alternatives that might have provided, or still might provide, better results for OLPC and for other innovators. These alternatives include working with an innovator's value net of customers, suppliers, complementary organizations, and even competitors.

Tracing OLPC's Lineage

OLPC is a non-profit foundation established in 2005 "to stimulate grassroots initiatives to enhance and sustain over time the effectiveness of laptops as learning tools for children living in lesser-developed countries."[3] That mission grew out of the experience and priorities of the foundation's chairman, Professor Nicholas Negroponte. In 1982 he had collaborated with an MIT colleague, Seymour Papert, and with the French government to introduce Apple II computers and the LOGO programming language in Senegal. The vehicle for this introduction, a short-lived World Center for Information and Human Resources, was meant to be free of commercial, political, and national interests.[4]

Rising popularity of the personal computer and the Internet set the background for Negroponte to establish himself as a digital visionary through the 1980s and 1990s via columns and books. However, he again ventured into computer deployment in 2001, in

Reaksmey, Cambodia, an area lacking either electricity or Internet connectivity. Generators and satellite dishes were provided, and Negroponte believed that this deployment validated his perception that children's interests were piqued by laptops. As a follow-up, Negroponte showed a prototype OLPC laptop at the 2005 Davos World Economic Forum. Then together with U.N. Secretary General Kofi Annan he demonstrated a working unit at the 2005 World Summit on the Information Society in Tunis.

The Product and Its Intended Marketplace

OLPC envisioned that the governments of LDCs would purchase its laptops in 250,000-unit lots at a cost of $100 per laptop and distribute them through educational channels. Table 1 summarizes the main features of the machine.

Its Sugar operating system is based on the open-source software Linux rather than the Microsoft Windows operating systems and Intel microprocessors ("Wintel") that dominate personal computing. The machine offers unique hardware and software with breakthrough specifications for energy efficiency, shock resistance, and wireless network connectivity— overall, significant innovations.

Insert Table 1 about here

However, these innovations stem from priorities established by OLPC rather than input from the intended marketplace. Negroponte has expressed disdain for marketing in a manner reminiscent of the Senegalese effort's quest for ideological purity: "…our problems are swimming against very naïve views of education, which mostly come from marketing departments."[5] OLPC also looked down on the educational practices of its potential customers, the governments overseeing educational systems in LDCs. Walter Bender, former

OLPC president, is quoted as saying: "We are…advocating change because the [education] system is failing these children. It has not been that processor versus that process or that operating system versus that operating system—it's been small thinking versus big thinking"[6]

5E's and Government Priorities

Derogating the educational systems of the nations that they hoped to turn into customers was hardly OLPC's only marketing shortcoming. Its management appears to have paid little or no attention to understanding the complex and sometimes contradictory priorities of governmental purchasing. Governments have bought 90% of the OLPC laptops sold.[7] However, they might have bought 90% of a far larger total if OLPC had first developed a model of government criteria for such purchases, then employed that model in product design, pricing, promotion, and distribution.

We therefore present such a model here in Table 2, consisting of five purchase criteria. Four are from a published source intended to guide the spending of public funds: the 4Es of economy, effectiveness, efficiency, and equity.[8] Economy deals with minimizing expenditures, effectiveness with reaching goals, efficiency with maximizing outputs relative to inputs, and equity with fairly distributing the costs and benefits of purchased goods or services.

We added a fifth "E" as an additional characteristic of government purchasing, understandably not listed in published statements but unwise for marketers to ignore. That fifth "E" is expectations on the part of government employees, which take two forms. One is the assumption that given the diverse priorities of multiple constituencies, abrupt change is risky.[9] The other may be the assumption that suppliers will enrich those who control purchasing decisions, a practice labeled as corruption by those who analyze its roots.[10]

Insert Table 2 here

Each of these government purchasing criteria, to the extent that they are employed by LDCs, offers an explanation for the OLPC's lackluster performance. Indeed, the unique software, hardware and pedagogical approach associated with the computer appear in many respects to discourage successful marketing. We will outline the specific implications for managers from the early years of OLPC experience, the mismatch between product and marketplace, then move on to more recent product adaptations.

Economy Involves Total Cost Over Time

Economy as a criterion for LDC government purchasing will be considered first. The initial $100 price of the OLPC laptop placed large orders beyond the means of most developing countries for which it was intended, but that was not the only cost issue. OLPC's Linux-based "open source" operating system, Sugar, in theory offers advantages of programming flexibility and lower cost. However, the inclusion of an unfamiliar operating system led critics to observe that training could be more costly for those who would maintain the computers and implement related systems than would have been the case with long-tested hardware and software.[11]

Thus, the engineering-driven culture of OLPC failed to match the broad cost concerns—whether valid or not—of governments and education ministries. Then in April of 2007 Microsoft announced in LDCs a $3 bundle of Windows and Office for school computers that further undermined OLPC's economy claim for Linux-based software.[12]

Total cost recently has delayed or thwarted large proposed OLPC sales. Although the East African Community has announced its aim to provide 30 million of OLPC's $199

laptops to students in its five member nations by 2015, an EAC spokesman notes this "very ambitious" project will require partnerships with other people and institutions to fund the $6 billion, which it currently lacks.[13] By comparison, EAC's projected budget for fiscal year 2010/11 is slightly below $60 million, or less than a hundredth of the cost of 30 million OLPCs.[14] Similarly, a partnership with the United Nations Relief and Works Agency to provide XO laptops to a targeted 500,000 Palestinian refugee children by mid-2012 began with a contribution from charitable groups that provided only 3,600 of the targeted number by mid-2010.[15]

Effectiveness is Defined by the Marketplace

Effectiveness, a second criterion, hinges on what government purchasers perceive to be their goals,[16] presumably for this product a goal of improving education. However, marketing efforts to influence the perception that OLPC deployment would increase educational effectiveness did not occur. To Negroponte, the benefits of OLPC were obvious, and therefore explaining them was unnecessary. He stated:

> Then I am to tell you that we are going to very scientifically evaluate this technology, with control groups—giving it to some, giving it to others [sic]. This all is very reasonable until I tell you the technology is electricity, and you say "Wait, you don't have to do that." But you don't have to do that with laptops and learning either.[17]

Consequently, OLPC has not to date marshaled evidence of educational gains from computer usage. For example, only rhetorical arguments, not data, have been provided to support laptop use in Nepal[18] and Ethiopia.[19] Such reliance only on arguments, without supporting data, ignores the fact that the benefits of laptops in meeting educational objectives are by no means universally accepted.

Even in the United States researchers found no performance gains from using math and reading software.[20] Likewise, a randomized experiment in Colombia involving

computers for language instruction did not show improvements over the control group, largely due to a failure to thoughtfully integrate these computers in the learning process.[21] Meanwhile, a study in Romania found that children in low-income households that bought home computers with €200 vouchers displayed improved computer-related skills, but poorer school grades in math and English as computer use focused on games and came at the expense of doing homework and reading for pleasure.[22]

While OLPC might have suggested pilot programs to governments as an alternative to purchases of 250,000 units, allowing them to track educational outcomes or at least user reactions, no such programs were offered. Doing so might at least have enabled OLPC to suggest changes if results were less than favorable. Consequently, even Peru, which is close to blanket deployment of OLPC laptops, has not demonstrated favorable results that could be promoted elsewhere. That nation's Economic and Social Research Consortium (CIES)—an association of universities and research centers—surveyed disadvantaged southern areas to which OLPC laptops were first deployed, but found no improvement in students' grades or closing the knowledge gap to the national average.[23]

Efficiency: Evaluated Based on Perceived Competition

Was OLPC perceived as delivering the greatest benefit for what the government in an LDC would need to pay? Efficiency is the criterion that comes into play here. Given the absence of demonstrated educational outcomes by OLPC vendors, their laptops have been viewed as competing with all other tools of poverty reduction and sustainable development. While institutions like the World Bank[24] express a need to bridge the digital divide, the paucity of evidence supporting computer usage has left OLPC vulnerable to criticism on two fronts.

First, public funds and aid may be better spent on standard educational fare such as building classrooms, training teachers, and purchasing textbooks. Such investments may well be less prone to obsolescence. Second, expenditures to improve education outcomes may better focus on more immediate challenges of poverty alleviation including hunger, illness, homelessness, and the like.[25] For instance, parasitic worm infections afflict two billion people, disproportionately, poor children. Deworming medication that costs 50 cents in Kenya and $4 in India per student per year has been found to increase school enrollment rates by 20% and 25%, respectively.[26] Others concerned about school attendance in LDCs report the use of technology in a different manner: teacher absence in Udaipur, India was halved after asking teachers to take date-stamped pictures of themselves with schoolchildren to obtain pay, an innovation that cost $6 per child per year to administer.[27]

In addition, OLPC has faced industry-specific competition for government funds. Once OLPC designers eschewed Microsoft and Intel products, it should not have been surprising that Microsoft's $3 Windows bundle and Intel's Classmate laptop were introduced during OLPC's infancy.[28] The launch of Classmate is noteworthy, since Intel had never previously sold entire computers, but only components.

OLPC is hard-pressed to compete successfully with companies that offer name recognition, customer support, plus a vast number of readily available "Wintel" peripherals and software. Many governments may perceive that if students use this prevalent technology they will qualify later for jobs. However, OLPC laptops were designed not to appeal to governmental paying customers who would focus on these considerations, but to appeal to children.

Furthermore, concerns may have arisen among potential governmental buyers concerning the laptop product category itself. As its name suggests, OLPC's format tends to discourage use by multiple students, who could more easily share traditional desktop

computers in fixed locations such as computer labs. Desktop computers offer at least some modularity, allowing for incremental improvements that OLPC cannot facilitate. For governments concerned about e-waste,[29] refurbished computers also may seem a better choice, lengthening their useful life before discard. Finally, cloud computing takes advantage of modern computers' largely unused capabilities to run several terminals off a single CPU, so that shared processors and data storage can be leveraged over several users.[30] Although it is difficult to identify what alternatives to OLPC any LDC government considered, we see no evidence that OLPC designers considered how to create a competitive advantage as defined by potential buyers.

Equity Matters for Governmental Buyers

In the purchasing criteria employed by LDC governments, equity comes into play as well once the issue is expressed as one laptop per child versus, for instance, one desktop for multiple children. How many children benefit? How many teachers benefit? Governmental purchasers who think in terms of spreading benefits to large numbers are hard-pressed to choose OLPC. Although Uruguay's former President Tabare Vazquez promoted mass laptop distribution as part of a national development strategy for economic growth and social justice,[31] government officials in other nations have found it either undesirable or unfeasible to give a laptop to each child. In such cases, decision rules need to spell out who gets access to computers when and where, a task that can appear threatening to government officials.

Along with $3 software bundles for classroom computers, Microsoft now freely distributes its MultiPoint program that allows about 20 users to share a single computer by extending its use via multiple input devices.[32] Because each cursor is controlled by a separate mouse, several children can share one PC, and unique software allows them to compete or

collaborate. The developer of the software says "We jokingly call it 'One Mouse Per Child.'"[33]

Expectations are the Final Issue

The fifth and unwritten "E"—expectations—includes as noted earlier the belief that abrupt change is risky and to be avoided. However, potential government purchasers discerned the threat of change in the deep skepticism expressed by OLPC advocates concerning the conventional classroom environment, a mindset drawn from statements by Seymour Papert of MIT Media Labs. Papert had worked with the Swiss child psychologist Jean Piaget, who emphasized learning by doing and the concept of Constructivism.[34] Papert then developed ideas about children's learning without being taught through the aid of computers. He asserted that learning is more than encoding, memorization, retrieval, and application, but involves student activities to achieve self-directed learning.[35]

In contrast to instructionism common in highly structured classroom environments, Papert advocates Constructionism, building on the programming notion of "debugging" to provide opportunities for trial-and-error learning to sustain interest. His belief that computers can change the way children learn, enabling them to undertake activities rather than absorb facts, greatly influenced OLPC's design. However, a former OLPC employee notes that OLPC designers relied on the theory behind the pedagogy rather than considering its acceptability to government buyers.[36]

OLPC's design thus reflects Western biases toward individual agency, but studies in social psychology and anthropology have found meaningful differences in Eastern and Western cognitive processes.[37] Unsurprisingly, then, governments and educators with other cultural orientations expressed doubts about the compatibility of OLPC with prevailing methods of instruction. The Indian educational ministry labeled Constructionism as

pedagogically suspect, while the Chinese government expressed similar wariness about this educational philosophy.[38]

OLPC's prospects were also harmed by a second expectation: that government buyers would be able to pocket funds for themselves. Negroponte[39] identified corruption as an impediment in selling OLPCs to LDC governments, and the high-visibility launch of OLPC may have exacerbated the problem. While generating publicity can be beneficial, it may have had a downside in the OLPC context. The intuition of Hart[40] that high-profile operations tend to be targets for those seeking special privileges has hobbled OLPC. Given its hype, unscrupulous operators may have believed the OLPC operation had deep pockets to realize its goal of selling tens of millions of laptops.

Relevant to OLPC and similar products, Chapman identifies why national education systems are particularly susceptible to corruption. First, as a government unit with high-visibility representation at the community level, such a system is an attractive structure for patronage and manipulation of public sentiment. Second, gatekeepers at each level—district education officers, principals, and teachers—have considerable decision-making discretion. Third, a considerable proportion of educational funds are spent in small amounts in geographically spread out locations where weak accounting and monitoring systems are in place.[41]

Overall, then, it is understandable that the OLPC product and LDC governmental purchase criteria, explicit and implicit, have proved to be a mismatch. OLPC was not seen as offering good value for money, meeting educational objectives, reducing poverty more efficiently than other expenditures with that aim, or spreading its benefits to more individuals than competing technologies. Its proponents did not meet expectations of integrating their offering into the cultural/educational systems of prospective buyers nor did they devise and implement contingency plans to cope with expectations of corruption during procurement.

Implications for OLPC and Other International Marketers

While Negroponte set out to, in his words, "push normal market forces in a different direction"[42] it seems clear that market forces emphatically pushed back. The limited sales level to date of OLPC compared to its original target supports the view that top-down interventions introduced from "outside" have had limited success in promoting development. Easterly marshals ample empirical evidence for this generalization,[43] and it forms the basis for many of our conclusions relevant to OLPC, to other marketing innovations aimed at the "bottom of the pyramid"[44]—and also other innovative international marketing efforts. Following these conclusions, a final section will offer strategic alternatives derived from them: given the OLPC experience, what else might they have done, or still do?

Adapt Marketing Efforts to LDC Governments' Priorities

For OLPC, but hardly OLPC alone, the obvious conclusion is to target LDC governments with the sophistication that comes from recognizing their priorities. They will expect proof of effectiveness. They will compare any development-focused technology to alternatives. They will look at the number of beneficiaries. They will be suspicious of abrupt change, particularly change that counters cultural norms.

Similarly, gaining a nuanced view of where corruption may occur should help in proactively addressing these pitfalls beforehand. Hart[45] champions operating "under the radar" of corruption-prone officials to avoid this issue to the extent possible. OLPC's high profile represented the opposite approach. Ironically for OLPC, the use of information systems is often suggested in the development literature for deterring corruption. ICT-enabled transparency can help, as shown by the Indian province of Andra Pradesh; its eSeva system has moved public transactions online to increase visibility.[46] With the world's economic geography shifting to developing countries[47] managers worldwide have every incentive to

encounter in LDCs any measures that makes bidding and procurement more transparent, a

shift foreseen by Arrowsmith and Trybus.[48]

Consider Alternatives to Governments as Purchasers

One response by OLPC to their lack of success in approaching the governments of

LDCs was to target consumers in Western nations by appealing to philanthropic motives.

They created a Give One, Get One program through which Western consumers could

purchase two of the laptops for $399—one to keep, another to give to disadvantaged children.

In so doing, OLPC banked on perceived interest among Western consumers to drive its

broader mission, an example of social entrepreneurship.[49]

However, the program went through two rounds with increasingly disappointing

results. While the first round chalked up 167,000 units sold, the second round run in

conjunction with online retailer Amazon found only 12,500 takers.[50] By the end of 2008 the

OLPC Foundation balance sheet showed little cash left,[51] and early in 2009, OLPC laid off

half its staff.[52]

More recently, OLPC announced a plan for overhauling its offering. In May of 2010

the project entered a partnership with electronics manufacturer Marvell to develop XO-3

tablet computers, a change that Professor Negroponte described as a move to build scale and

thus reduce the cost of the devices, perhaps to as low as $75. The planned tablets will have

two versions, one with the OLPC Sugar operating system, but also one Marvell version that

could employ the Android operating system from Google, the Windows Mobile platform, or

Ubuntu, a variant of Linux. OLPC's leadership envisions that the price cut and greater

product flexibility, including the ability to work with Adobe Flash, will attract the consumer

marketplace.[53]

A financial analyst noted that the device is marketed on Marvell's Moby website as a low-cost alternative to the iPad for students, and Marvell apparently plans to match purchases by U.S. users by donating one Moby tablet to every student in an at-risk public school in the District of Columbia. The analyst notes that with the OLPC software, the Moby tablet should support all the same educational activities that the XO-1 does, "including the wireless mesh networking that is a key element of the foundation's 'constructionist' philosophy for computer-mediated learning."[54] However, the XO-1 design, which was supposed to fall in price through economies of scale, has gone from being the "$100 laptop" to one double in price. Meanwhile, an XO-2 mock-up shown at the 2009 World Economic Forum in Davos, Switzerland, publicized as a laptop, e-book, and tablet combined, never came to market.

Implications Beyond OLPC

It is tempting to think that the initial marketing failure of OLPC is unique—that any manager with commercial goals and an understanding of marketing principles would handle an international marketing effort with far more sophistication than OLPC initially exhibited. However, OLPC may provide lessons for many international marketers of similar innovations. We will derive them from the OLPC experience, admittedly benefiting from hindsight. We will use the same format as the one that began our description: the product, its intended market, and marketing efforts.

Given innovative products, "new, different, and better" frequently become the terms offered by their designers, to attract investors, to attract publicity, and to give those preparing promotional material something to say. With the possible exception of "better," none of those boasts appears to match LDC government purchasing criteria. Instead, the criteria lead to a prescription that can be summarized as follows: Innovate less. Meet expectations. As

identified by the work of Vachani and Smith,[55] LDC realities often mean that innovation in overcoming distribution challenges will matter more than product design challenges.

Of course, listening to potential governmental buyers, to those in target countries who are part of non-governmental organizations, and to anyone else with cultural awareness helps to determine both buyer expectations and cultural norms in a region of the world with which marketers may be less familiar than they need to be. None of these suggestions is new, but managers may require substantiation for opposing both designers who are bent on novelty for its own sake and potential investors who react more favorably to "new and different" than to "a good fit for the market."

Recommending these priorities for product design carries the assumption that if LDCs are the target market, their governments will be actual purchasers or deeply influential in the decision process. Again, this is hardly a new thought. But it does mean that a marketer whose product has only novelty as its differential advantage may need to consider other ways to attract government purchasers, or consider one or more alternatives to governments as buyers. Therefore we will offer such alternative marketing approaches for OLPC and for those who might learn from their experience.

Thinking Creatively, for OLPC and Others

Our framework for considering alternatives is the strategic art of matching products with markets in which they have some differential advantage as perceived by potential buyers. Given the range of mismatches between OLPC and LDC governments, three non-mutually-exclusive strategic possibilities come to mind. One possibility, for OLPC's managers and for others seeking to market development-focused technology, is to associate a product with an already accepted goal of the prospective buyer. A second possibility is partnership with an entity already accepted by that prospective buyer. The third is to target a

different set of buyers. We will discuss each of these possibilities in turn. All of them, it should be noted, employ the resources of other organizations.

Aligning With Goals and/or Partners

If OLPC selects the first alternative, aligning with the goals of governments in LDCs, its advocates might stress that ICT can help aid-receiving countries demonstrate that the funds they receive from development organizations count towards meeting development objectives such as the U.N. Millennium Development Goals. Two such goals are achieving universal primary education and eliminating gender disparities in education by 2015.[56] While UNESCO acknowledges that measures for ICT success in education are still under development, they do recognize their possibilities for gauging enhancement of student performance, expanding the supply of in-demand skills, and creating lifelong learning opportunities.[57] Technologies such as OLPC can help to demonstrate gains on these metrics while meeting at least some of the 5E government procurement priorities discussed earlier.

The second possibility, partnering with other organizations that have relationships with potential buyers, likewise could help OLPC. Consultations with non-government organizations (NGOs) already working in LDCs could improve service delivery, capacity building, and policy advocacy given their familiarity with adverse conditions found in the developing world.[58]

Another benefit for OLPC of working with development organizations and NGOs from the beginning would have been to establish the product's educational effectiveness during an earlier period. Before the earthquake in Haiti, the Inter-American Development Bank began studying OLPC usage there and also in Uruguay. Regardless of the study's outcome, OLPC would have been in a better place if it had initiated such studies during the

laptop's launch, to make any necessary changes and to use favorable results to establish a track record.

A Third Possibility: B2C

Our narrative so far has been the cautionary tale of an organization targeting LDC governments that has convinced few to provide one laptop per child. Might those efforts have targeted another marketplace—or might they still do so? Negroponte has expressed disdain for characterizing poor children as a "market,"[59] and others note that no great social movement in the 20th century—civil rights, gender equality, the environment, and so forth— was mobilized by market forces.[60] Despite such skepticism, another path of diffusion for development-oriented technology surely would occur to many managers: business-to-consumer marketing in LDCs. Targeted consumers could live in LDCs or in the low-income areas of more developed nations.

This alternative to targeting governments, for OLPC but also for other innovators, can significantly change purchase criteria. Economy and efficiency will still drive purchase decisions. However, the criteria of effectiveness in reducing poverty in one's nation and of equity are reduced or disappear altogether from a consumer's perspective, as quite possibly do a risk-averse bent and corruption issues.

If that B2C strategy is considered, by OLPC or other innovators, the notion of co-opetition[61] becomes relevant. The originators of this term use it to characterize an approach by which organizations view relationships with others not solely in competitive or cooperative terms but as a mixture of both.

The approach fits OLPC's mission of spreading laptop use among poor children. In a rare concession, Negroponte admitted that he would not mind if thirty million laptops manufactured by his competitors reached children's hands,[62] and OLPC does not actively

discourage competitor sales in developing markets. Therefore, their efforts can involve both competition and complementation where all parties concerned have an interest in expanding the pie—of computer use among disadvantaged children—while simultaneously vying for a greater piece of it.

Co-opetition as a framework suggests for any innovator an analysis of its own value net: customers, suppliers, complementary entities, and competitors. Figure 1, adapted from Nalebuff and Bradenburger,[63] offers an example of the value net for OLPC, but the categories are general ones. They can help any manager consider that customers may select a product more readily if it is compatible with other possible purchases, that suppliers may learn techniques that will reduce customer resistance to a novel offering, that complementary entities may make one's own offering more useful, and that competitors may become partners if the legal environment permits. The outcome can be mutually beneficial instead of win-lose or lose-lose.

Insert Figure 1 about here

For OLPC suppliers, the clearest example is the advent of the netbook format, often attributed to OLPC's launch. While more reminiscent of conventional Wintel machines in computer architecture terms, the netbook's smaller form and smaller price tag borrow elements from OLPC.

OLPC's primary supplier, the Taiwanese original equipment manufacturer Quanta, has played a key role in expanding the netbook market. Quanta's chairman, Barry Lam, thought that OLPC's mini-laptop format could be successfully adapted and persuaded Acer, another of its clients, to market something similar running Wintel.[64] Other Taiwanese firms participated in the required product adaptations as well, as is common practice.[65] In this

sense, Quanta is both a supplier of manufactured components to OLPC and a competitor translating their design ideas for other customers' efforts, specifically for the netbooks that have become OLPC rivals.

However, in a co-opetition context, the popularity of netbooks as second computers or portable alternatives in the West carries a possible advantage for OLPC. Adoption prospects for OLPC can increase if the pattern of netbook diffusion to the developing world parallels that of the cell phone, for which economies of scale and infrastructure emerged in the developed world and then diffused quickly in LDCs, a contrast to the fixed-line phones of an earlier era that were often tied to slow-moving government monopolies.[66] The cell phone precedent creates hope that if netbooks follow a smooth diffusion path in LDCs, the whole concept of a small computer will become more quickly accepted, to the eventual benefit of OLPC and, more importantly, disadvantaged children.

A second facet of co-opetition, focusing on OLPC's complementors in expanding the market for mini-laptops, returns the discussion to "Wintel." OLPC has announced that Microsoft Windows will now run on its machines, although the Sugar operating system still predominates. The change allows OLPC, Microsoft, and Intel to parlay co-opetition into expanding the market for inexpensive laptops for schoolchildren. Meanwhile, the unbundling of Sugar from the OLPC project raises the likelihood that additional software applications for the Sugar operating system will come from complementary suppliers.

Precedent for such co-opetition includes the example of breweries cooperating on the collection of empty bottles and competing on beer sales, as well as dairies cooperating on the use of standardized containers from factories and competing on selling activities. That is, they collaborate on upstream activities that help expand the market and compete in downstream activities where the value-added of classic marketing activities, including design and innovation, help to determine consumer choice.[67]

These examples have implications here. OLPC and others in its value net can cooperate on activities that help broaden their shared market. Such activities might involve sourcing components (parts from Taiwanese firms), improving physical infrastructure (transportation, storage, electricity, Internet availability), improving retail infrastructure (store presence, access to consumer credit, etc.), and ensuring fair competition in procurement. Tellingly, Negroponte has mentioned the need to be "more like Microsoft,"[68] and just as Windows' popularity has prompted the many applications that run on it, Sugar stands to benefit if software developers begin to perceive its potential for success.

Development agencies can also be cast as both customers and complementors. These agencies have continually advocated competitive markets as a basis for promoting development. Therefore, co-opetition along the lines described here would be welcome in not only broadening the pool of prospective customers who can benefit from ICT, but also ensuring fair competition. Motivated by development agencies or otherwise, resource pooling would ideally be performed in conjunction with others such as providers of electricity and Internet access.

Certainly, marketing directly to consumers could benefit from ICT that emphasizes multiple uses. A laptop can increase literacy for parents as well as children, but also can go beyond education. For instance, a remarkable range of technologies—ATMs, debit cards, the Internet, and cell phones—have been subject to reinvention as means for sending workers' remittances, which are among the most important sources of foreign exchange in developing countries.[69] Cell phones in LDCs also let farmers check prevailing market prices, allow small businesses access to wider trade networks, and reduce the need to travel. An industry study finds that for every 10% increase in cell phone ownership, countries experience a 0.59% boost to GDP.[70]

Insert Table 3 about here

Table 3 offers three contrasting approaches: the original OLPC program, more sophisticated government targeting, and the B2C alternative. If a decision is even considered to "pioneer" in marketing to individual buyers rather than to governments, the co-opetition approach discussed here at some length makes excellent sense at least to consider. Depending on legal constraints, it may not be feasible to partner with competitors in all phases of the marketing process. However, it may be entirely feasible to join with them in certain categories of manufacturing, in setting up a distribution system, in promoting a new product category, and in monitoring its successes and shortcomings as perceived by the marketplace. Certainly economies of scale can result from any of these suggestions, enabling all involved to reduce costs to buyers and thereby speed adoption. Also, a "one best" solution like the original OLPC is likely to evolve into an assortment of configurations that different buyers— funded by governments, aid agencies, or private users—may consider.

Marketing in a World of Tradeoffs

Though we describe a project that is still ongoing, OLPC and its XO-1 laptop already point to several salient issues for similar efforts aimed at financial sustainability plus economic and social development. It is unlikely that a "one size fits all" solution will emerge in any such effort, and we do not advocate one. Nations, and regions within nations, differ in economic and cultural factors and such resource issues as the ability to physically deploy technological products. Therefore, harnessing information and communication technologies for development should prompt a broader set of managerial decisions than arise in familiar product categories or familiar geographic markets.

First is the balance between purely altruistic and purely commercial motives. In the long term, many for-profit companies will benefit from a more prosperous world, and leaders in LDCs are well aware of that fact. Therefore, marketers are wise to demonstrate that their efforts are not just exploitation in a friendly disguise, by tying their financial goals to development goals such as education, health, or income. Marketing in the developing world often rules out purely commercial intent even though use of a more sophisticated marketing approach helps to meet social objectives.[71]

Second, part of that sophisticated marketing approach is deciding whether to target public or private sectors. The 5E framework is especially useful in framing the challenges of marketing to LDC governments and also in identifying likely government concerns. For instance, observed incidences of Nigerian children using laptops to access pornography online prompted OLPC to incorporate filters.[72] Considering that Nigeria has the third largest number of HIV-positive cases worldwide, computer vendors may increase the perceived effectiveness of their machines by helping to address a major health concern. Vendors can try to collaborate with health professionals affiliated with development agencies or NGOs to use laptops for age-appropriate sex education. On the other hand, selling to private buyers can give parents more discretion in determining boundaries for online exploration.

A third decision is whether to go it alone or in concert with a value net. Developing socially beneficial applications in partnership with those possessing the cultural know-how is valuable and also can reduce competitive threats. As OLPC demonstrates, its good intentions did not deter Microsoft and Intel from responding to a possible threat to their dominance. If a visible non-profit can evince fierce competitive responses from entrenched for-profits, then it is well worth exploring how co-opetition can be used by any organization to swim with and not against the tide. When interests coincide—especially in maximizing awareness, access, availability, and affordability[73]—collaborating can work well.

Such collaboration also helps managers to avoid the kind of isolation that harmed OLPC's prospects. Before innovators develop a product, they need to see it from the perspective of the target markets, whether they are government decision makers in LDCs or any other population. Cell phone giant Nokia, for instance, employs anthropological investigation to determine how its products are actually used in developing world contexts and creates their designs accordingly.[74]

Admittedly, none of these suggestions will be successful in an organizational environment where marketing is held in contempt. The first step is to market *internally* the truism that the customer governs. Had OLPC begun with that insight, many more children in the developing world might now have technology that matches both their needs and the priorities of those targeted for its purchase.

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TABLE 1. OLPC Design Features

|	
Energy efficiency	Computer 90% more energy efficient than typical "Wintel" laptop
Input Devices	Direct sensor input for Turtle Art mathematical programming
Display	Screen can be read in direct sunlight
Shock Resistance	Laptop not damaged by falls of up to five feet
Water Resistance	Unit is spill-proof
Networking	Mesh networking allows laptops to act as routers for others
Cost	$199 as of 2010

TABLE 2. 5Es of Public Procurement and Their Main Questions

Economy	Is concerned with public expenditures *Can our city, province, state, or region afford this option?* *What are the upfront and continuing costs of operation?* *What is the service life of this expenditure?* *Do other vendors provide similar, less expensive offerings?*
Effectiveness	Is concerned with meeting public goals *Can we justify this program to our taxpayers?* *How does this option help spur development in a broader sense?* *How adaptable is this option to our specific circumstances?* *Does this option help meet development objectives like the Millennium Development Goals that demonstrate progress?* *What measurable and comparable outcomes have others had with this option?*
Efficiency	Is concerned with the ratio of outputs to inputs *Can more basic poverty alleviation measures yield clearer results?* *Can we get similar or better results for less via other options?* *Does this option improve on our previous public procurement?* *Does this option allow updates to forestall obsolescence?*
Equity	Is concerned with distributing costs and benefits *What do various parties shoulder in relation to what they receive?* *Who gets to use these products and services when and where?* *Does this option, by its nature, limit public availability?* *If so, what decision rules determine access?* *Does this option create employment opportunities?*
Expectations	Is concerned with tacit assumptions *Can this innovation change cultural understandings?* *Can social systems cope with the changes innovations bring?* *Can individuals misappropriate to private and not public benefit?* *Does this innovation redistribute power and influence?* *Does this innovation disrupt our way of life?*

TABLE 3. Possible Approaches to Marketing OLPC

	Original Effort	Marketing-oriented Focus on Government Buyers	Marketing-oriented Focus on Consumer Buyers
Factors Taken into Account	Clean sheet in software, hardware, and pedagogy	Economy, efficiency, effectiveness, equity and expectations	Consumption vs. non-consumption; market-based
Marketing Message	[Skepticism about marketing concepts]	Fit with educational system; advance development metrics	Fun and learning; not just for kids
Competition	Largely unexpected	Other PCs, network configurations	Constellation of ICTs
Dealing With Corruption	No systematic approach	Ensure fair procurement	Ensure fair competition
Culture in targeted countries	Largely unconsidered	Understanding of governmental priorities in LDCs	Understanding of parents' priorities
Stakeholder Relations	Adversarial	Collaborative	Co-opetitive

FIGURE 1: OLPC's Value Net
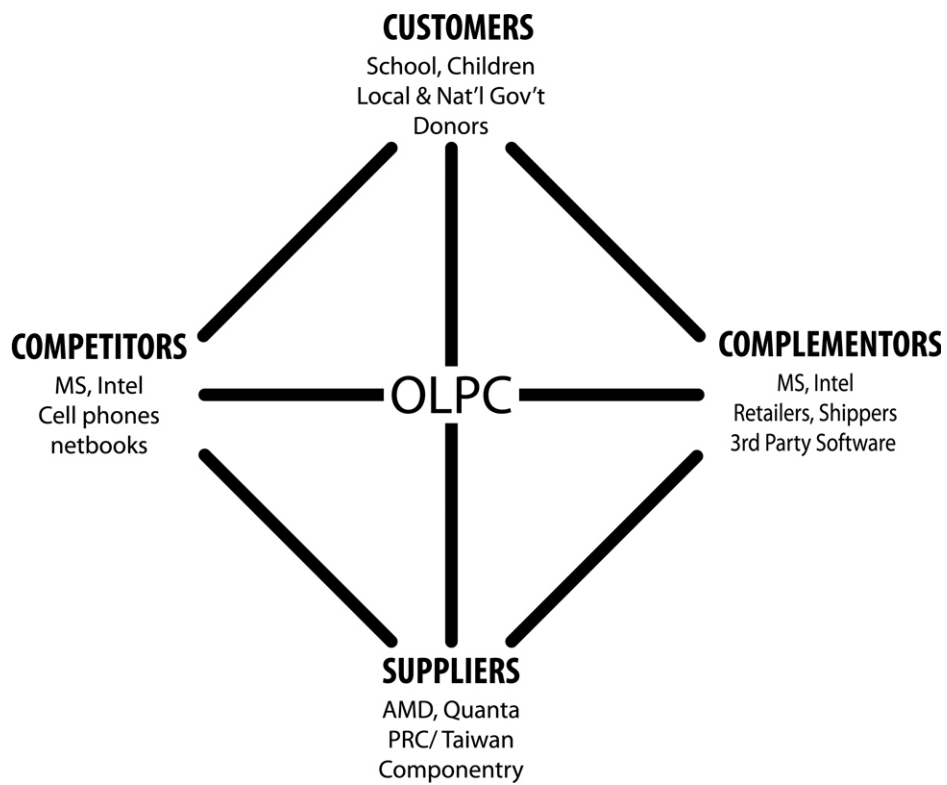
Adapted from Nalebuff and Brandenburger (1996)