

Emerging Markets On Turbocharged, Heat-Seeking, Robotic Fishing Poles

Applying a well-known proverb to socio-technical transformation.

IN THE BASEMENT of an office building in Bangalore, India, a housekeeper sat at a PC and painstakingly typed search terms into a browser. The PC was part of an early experiment at Microsoft Research India, which I co-founded in 2005. In the experiment, we were interested in what lower-income adults would do with an Internet-connected PC, if they had unrestricted access to one.

We were part of a larger movement called “information and communication technologies for development” (ICT4D), and at the time interest focused on what PCs and the Internet could do for international development. Digital technologies had transformed the lives of wealthy, educated people in developed countries. Could they help solve the challenges of poverty in the developing world? Proponents argued, for example, that telemedicine would revolutionize health care, that distance learning would close educational gaps, and that village telecenters would double rural incomes in even the poorest countries.

ICT4D has been gaining momentum since the late 1990s: On the one hand are technologists and entrepreneurs looking for ways to contribute to society beyond novel toys for rich folks; on the other hand, there is the international development community hoping to learn from the economic success



OLPC delivered by boat as part of OLPC Mexico Nayarit.

of the technology sector. The trend has only grown with the advent of the mobile phone, the numbers of which—over five billion accounts worldwide—comfortably exceed the total adult population of the planet.

The dominant model of ICT4D is to seek to apply technology innovations for the benefit of very low-income communities. Among the best known examples are One Laptop Per Child (OLPC), initially announced as a specially designed \$100 laptop that would fill the hole left by absent or under-

trained teachers in developing-country education; and M-PESA, a mobile payment system widely used in Kenya that allows users to send money via SMS text messages and a nationwide network of agents. Related projects have been featured previously in *Communications*.^{1,5}

I have conducted or supervised approximately 50 research projects in ICT4D, but while a few projects demonstrated meaningful impact and continue to do so in some form, the vast majority ended as temporary pilot projects with learning outcomes but



An M-PESA stand in Kenya.

little long-term effect. My experiences taught me a single, simple lesson: Technology is an amplifier of human intent and capacity, and only an amplifier.⁴ So, in well-meaning, capable hands, technology can work wonders; but absent good intentions or capability to use and support it fully, technology often ends up having zero or negative impact. Technology never guarantees net positive impact.

Technology and Societal Change

To be clear, it is not that technology cannot play a role in positive change. For example, M-PESA increases incomes in some rural areas, as urban migrants send money home with greater frequency. This kind of evidence has enamored the international development community to mobile-payment systems as a way to provide financial services to people who are “unbanked.”

But potential does not always translate to actuality. It is not at all clear that the net effect of systems like M-PESA will be positive overall, especially when one considers that they are two-way pipes between the pockets of poor, less educated people, and powerful corporations with savvy, well-funded marketing departments.

We have seen cycles of hype and disappointment before: In the 1960s, the television was hailed as a revolutionary technology that would replace the need for schools altogether. Today, it is better understood as a means by which millions of people watch reality TV.

This realization is ironic and disheartening for the technologist interested in social causes. Technology is supposed to be a means to scale the ingenuity of a few inventors for the benefit of many. We all grew up inspired by stories of Thomas Edison and Jonas Salk. Yet, with information and communication technologies, it is exactly those communities that most lack information-processing skills, a strong foundation of knowledge, and connections to influential social networks—and that are therefore poor—that are also the least interested or least able to make productive use of the technology.

Returns on Investment

Over the years, I have received many inquiries from computer scientists and engineers who say, “I’ve achieved comfort and security in my own life, but I’d now like to apply my skills for the less privileged people in the world.” Most of them then follow up with the question, “How can I apply my technical skills to the challenges of impoverished people?”

Poverty, though, cannot be engineered away, any more than a failing business’s problems can be. The deeper challenge lies with people and institutions, not technology. Perhaps sensing this issue, a few people ask a broader question: “What is the best way that someone like me can contribute to the lives of the less privileged?”

There is a well-known proverb, “If you give someone a fish, they’ll eat for

a day; if you teach them how to fish, they’ll eat for a lifetime.” The main point is obvious enough: Yes, it is great to give someone food when they are starving, but doing so is a short-term, stopgap measure. What is really worthwhile is to teach them how to grow (or catch) their own food, so that they can independently help themselves.

The saying, however, also packs several layers of additional insight that are particularly relevant for the technologist interested in international development. First, it is interesting to note what the saying does *not* say: It doesn’t say, “If you give someone a fish, they’ll eat for a day; if you give them a turbo-charged, heat-seeking, robotic fishing pole, they’ll eat for a lifetime.” That’s because, while such technology might result in more than one day of fish, it still leaves the person no better able to fend for themselves. Now, they need to adapt, maintain, and upgrade a technology—which is likely at least as great a challenge as fishing. The history of international development is full of rusting tractors, broken medical equipment, and increasingly, defunct PCs and mobile apps that worked until well-meaning specialists left when the funding dried up.

Second, if we draw an analogy between fish and technology, the saying suggests that simply providing technology (or selling it at low cost) to poor people is just another kind of charity: great as a stopgap measure, but not a long-term solution. A narrow interpretation of the analogy suggests we should instead teach people how to create technology themselves.

The larger point is that there is a world of difference between consumption of goods and production of goods—whether it be of fish, technology, or anything else. The ability to consume what you want is more a result of productive capacity than vice versa. ICT4D discourse tends to conflate the two, believing that any association with technology is good, but it is those who produce, not consume, technology that are best protected against poverty in the long term. If you had to give up one or the other, which would you rather do without...? All of the electronic devices you currently own (which will break or become obsolete within a few years), or all of your education, professional ex-

perience, leadership skills, and social contacts (which will serve you for the rest of your life, and propagate to people you raise, teach, or mentor)?

Finally, the saying implicitly recommends teaching over giving. The most meaningful contribution is to help another person grow, in knowledge, in new skills, and in forward-looking attitudes. Imagine a strange utopia in which technology feeds, heals, and generates income for the poor, so that the appearance of poverty itself is eliminated, but people remain unable to take care of themselves absent the technology. Is *that* the outcome we're seeking?

Real-World Applications

Reality, of course, is more complex than the black-and-white alternatives I have articulated in this column. Rarely are real-life choices constrained to two options of pure giving or pure teaching. In any case, we could not teach millions of non-literate people how to become world-class software engineers overnight, even if we wanted. And, just to do productive work often requires consumption of technology.

Nevertheless, the deeper wisdom of the fish proverb remains. Wherever possible, it is more meaningful, and more sustaining, to support the growth of productive capacity within people, than to simply supply technologies for them to consume.

For international development, that means that our skills as engineers, computer scientists, managers, and leaders are better applied to teaching and mentorship than for technological innovation on behalf of poor populations. The greatest contributions we can make are not displays of our own brilliance and heroism, but helping people to help themselves.

What would this mean in practice? One example was set by Patrick Awuah, who left a successful career as a program manager in the U.S. to establish a ground-breaking new private college in his home country of Ghana. Still less than 10 years old, Ashesi University just inaugurated a new campus for over 400 students in business administration, computer science, and management information systems, and it has won awards for raising the bar for tertiary educa-

tion in West Africa. Many of its graduates now write code for Ghanaian corporations or run start-up companies, thereby supplying the engine of growth for the country.

Or, consider Trish Dziko. After 15 years as a developer, designer, and manager, she founded the Technology Access Foundation (TAF), which runs educational programs that focus on science, technology, engineering, and mathematics for students of color in the Greater Seattle area. (Sometimes, the developing world is in your own backyard.) TAF provides children of low-income households hands-on exposure to robotics, chemistry experiments, and other experiences that are all too often cut from public schools. Then, through supplementary programs like internships and interview training, they prepare students for a strong future. Students who might otherwise fall through the cracks are nurtured through to college and beyond.

We do not have to be as bold as Awuah or Dziko; individuals who are less bold can also make a difference. The reason I know their stories is because I took personal leave from my job to teach calculus at Ashesi in its first year, and I am now considering how best I can volunteer time with TAF. Good organizations often need experienced employees, volunteers, board members, and mentors.

Teaching and mentorship, of course, must be tailored to the individual, and for many people in the developing world, we may have to start with the basics. Budding entrepreneurs might benefit from management advice and introductions to investors, but for illiterate children, we would need to start with simple reading skills. In between, there are rural teenagers who would benefit from exposure to careers in engineering, college students who could use a course on interviewing skills, and inexperienced computer programmers who would benefit from a good code review.

And, that brings us back to the Bangalore basement mentioned earlier. At the lab, we quickly found that free access to the Internet was most often used for entertainment. Understandably after a long day of work, the staff would search for the latest Tamil movies and watch them on YouTube.

Aishwarya Ratan, one of the researchers in my group then, was unsatisfied with this outcome. Though she acknowledged the value the staff got out of watching free movies, she felt that true development ought somehow to contribute to the staff's capabilities (along the lines argued by Nobel economist Amartya Sen³). So, she decided it was important to provide more than just the technology, and she ran a computer literacy course that taught the staff the basics of word processing, spreadsheets, and some educational software.²

For some members of the staff, this was all the encouragement they needed. One of the building's security guards began using the PC in the basement to practice data-entry skills that he learned in an outside evening class. One day, he came in and told us he was moving on. He had been offered a job in computer data entry. Though the job involved an initial cut in pay, his future prospects were much brighter, as he had effectively crossed over from a blue-collar job to a white-collar profession. He told us proudly, "Today I can stand up in front of my father and friends and say that I am no more a watchman, but I am doing a computer job." What allowed this transformation was less the technology in the basement, but a solid secondary-school education and the inspiration, instruction, and encouragement he received from Ratan and his data-entry teachers.

In short, it was the fishing lessons, not the fish, that made all the difference. ■

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