

Matching Realism with Aspiration: Challenges and Successes in the Use of Technology for Global Health

*An Interview with Emily Bancroft, David Boyd,
and Kentaro Toyama*

Technology has undeniably been integral to many great achievements in global health. The belief in technology as an automatic solution to critical and complex global health problems, however, can ignore on-the-ground realities in local communities that, if overlooked, can render innovative technologies useless. Even the most well-intentioned and carefully planned technological interventions are subject to failure or unintended consequences.

In anticipation of the 2012 Pacific Health Summit on “Affordability and Technologies for Health,” NBR’s Center for Health and Aging spoke with **Emily Bancroft** (Program Director & Group Lead, Health Systems, VillageReach), **David Boyd** (Head, European and Government Affairs, GE Healthcare), and **Kentaro Toyama** (Visiting Scholar, School of Information Studies, UC Berkeley) about best practices for health technology interventions in the developing world, and key factors and considerations in undertaking such projects, including human intentions, understanding the context of the target community, and identifying when it is appropriate to collaborate across sectors.



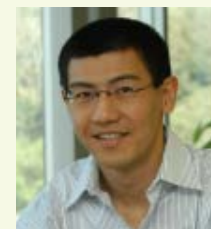
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Emily Bancroft is responsible for the design, development, and management of health system intervention programs at VillageReach, and for building new relationships and opportunities for the health systems team. Ms. Bancroft has over a decade of experience in program management, monitoring, and evaluation; community-based assessment; health informatics; and program development. Previously, she worked with the International Training and Education Center on Health (I-TECH), Physicians for Human Rights, and NPower.



David Boyd, Head, European Government & Public Affairs, GE Healthcare (United Kingdom)

David Boyd is also a participant in the Coordination Committee of the Radiological, Electro-medical and Healthcare IT Industry (COCIR), and currently serves as Chair of its Sustainable Healthcare Group. He is Vice Chair of AmCham EU’s Health Committee and is involved in U.S.-EU policy issues through the TransAtlantic Business Dialogue.



Kentaro Toyama, Visiting Scholar, School of Information, University of California, Berkeley

Previous to Kentaro Toyama’s current position at UC Berkeley, he was Assistant Managing Director of Microsoft Research India (MSR), which he co-founded in 2005. At MSR India, he started the Technology for Emerging Markets research group. Prior to his time in India, Mr. Toyama did computer vision and multimedia research at Microsoft Research in Redmond, WA, USA and Cambridge, UK, and taught mathematics at Ashesi University in Accra, Ghana.

“The history of international development is littered with rusting tractors, defunct PCs, and fancy medical equipment gathering dust.”

Kentaro Toyama

Q. Technology, in a global health context, is generally considered a means to an end—the goal being better health. From this perspective, why is it important to bring experience and practical expectations to the conversation about technology’s unique ability to address the world’s most pressing health problems?

Kentaro Toyama

The history of international development is littered with rusting tractors, defunct PCs, and fancy medical equipment gathering dust. To avoid piling onto these unintentional trash heaps, we have to remember two things: First, technology does not disseminate and operate itself. Technology is an amplifier of human or institutional intent and capacity. That means that technology will serve as a means to a given end only if there are competent people and institutions committed to that end. Without the committed people and institutions, no amount of technology will have the desired impact. Technology is an amplifier of human intent and capacity, not a substitute for it.

Second, for a technology to work, it requires much more than the gadget in hand—it also requires infrastructure (e.g., electricity, cables), human resources (e.g., technicians, customer support), policy (e.g., tariffs), social support (e.g., technology acceptance, aligned intentions), and user capacity (e.g., basic education, device training). It is not enough to provide devices by themselves; entire technology ecosystems must be built.

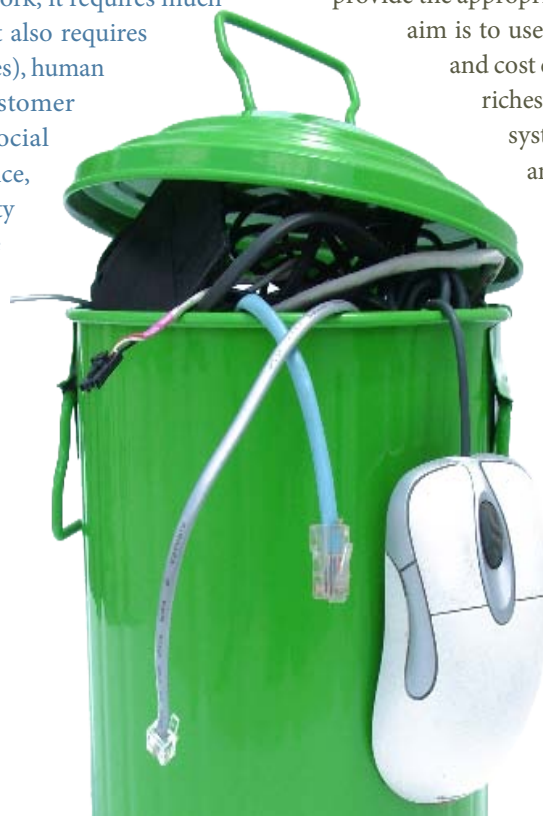
Emily Bancroft

Just like all other areas of global health, successful technology projects come out of hard work, creative thinking, and a strong understanding of the realities of the environment in which you are working. Even the “simple” solutions are not easy—implementation and appropriate support take effort, experience, and knowledge. Our world’s most serious health problems will only be solved through a holistic focus on strengthening health systems, improving economic prosperity for the world’s poor, improving governance, and ensuring that medical technologies available today are reaching those most in need.

Where technology can help to augment solutions, its contribution is very welcome. But projects that view technology—even the development of medical technologies—as the sole solution, will not have the necessary impact to address pressing global health problems due to systemic weaknesses in health systems. For example, the full impact of all the resources that have been dedicated to new vaccines and new medical diagnostics has not been realized due to weak delivery systems. Technology can be a contributor, but we need to look at the problem holistically.

David Boyd

Investment in technology itself will be of little use unless it is put into practice in the right way. There is a need to work closely on the ground with healthcare delivery organizations to provide the appropriate solutions for their needs. My company’s aim is to use technology to improve the quality, access, and cost efficiency of healthcare—for the poorest and richest alike. In places with underserved healthcare systems, we need to show that technology can, and does, improve access and patient outcomes. In those places where technology is regarded as a driver of healthcare costs, we need to show that, in fact, the right innovative technologies and solutions are good for patients, efficiencies, and improvements in delivery.



With the emerging focus across the world on the challenges of aging and chronic disease, there is a clear need for more technologies that screen, diagnose, assess, and monitor chronic diseases, but we also need technologies and solutions that strengthen the healthcare system and help make optimal use of the people within it.

Q. If an organization, government, or company wants to introduce a new health technology within a community, what factors should they consider? What essential infrastructure must be in place before individuals and communities will accept and use new technologies, and what role does, and should, the local community play in the development and implementation process?

David Boyd

Gone are the days of developing a new technology, and then trying to find or force it into a market. Thomas Edison, GE's founder, said, "I find out what the world needs. Then I go ahead and try to invent it." It sounds simple and obvious, but the starting point must be to identify the problem, and then find a solution. Any new healthcare technology must have clinical utility and efficacy, and it also has to be appropriate and relevant to solving local needs.

While companies like my own have design teams and sales and marketing and business expertise in many countries, we sometimes lack the infrastructure on the ground to take new technologies to the patients. In developing new products for emerging markets, the healthcare technology industry has learned and can continue to learn much from the communities we serve.

One key lesson we have learned through GE's keystone philanthropy program—aimed at improving healthcare capacity in Africa, Southeast Asia, and Latin America by equipping clinics with appropriate technology and training staff—is that what is actually required on the ground is often not what is perceived from afar, and what works in one country does not in another. In short, there is no substitute for having people in situ on the ground and where we do not have them we need to partner with others, like governments, NGOs, and aid groups with local presence.

Imam Abdinazar, at his office in Jalal-Abad, Kyrgyzstan, has given a boost to health education by leveraging the city's impressive network of mosques and schools. Utilizing local communities and leaders is essential to the success of many health interventions, including technologies.



Emily Bancroft

Having enough flexibility to adapt and change to match the local environment or the local workflow is crucial to overall success, and involving the community in the implementation is absolutely critical. VillageReach recently implemented a case management hotline service for pregnant women and caregivers of young children in rural Malawi. The success of this project was threatened by the novelty of a toll-free line and the potential reluctance of community members to talk on a phone about personal health issues. To overcome these barriers, we took all the necessary planning and implementation steps—involved local health staff in design and management, hired hotline staff from the local community, included local traditional leaders in planning, and focused on village-level

“...What is actually required on the ground is often not what is perceived from afar, and what works in one country does not in another.”

David Boyd

A woman in El Fasher, North Darfur, uses a water roller for easily and efficiently carrying water. With its large drum capacity (usually 75 liters), the device frees women and children from having to spend a large portion of every day dedicated to collecting water for their households.



UN Photo / Albert Gonzalez Farran

way you can tell if someone's desire is tied to the technology, and not to the problem, is to ask whether they would still be working on the problem if they had to work on it without the technology.

As noted earlier, technology is a lot more than the hardware. Supporting a full technological system often incurs costs far beyond the cost of the device, and this is particularly so in the developing world, where infrastructure and human capacity that the developed world takes for granted are in short supply. Those costs can often be more efficiently applied to lower-tech or institutional solutions that work just as well, if not better.

Nevertheless, there are plenty of people who are constrained to a technology for reasons of funding, job description, or personal inclination. For them—applying the theory of technology as amplifier—the key recommendation is to collaborate with an existing institution that is already working effectively to solve the larger problem, and then look for ways for technology to amplify its impact. If no such institution exists, the problem is social, political, economic, or institutional—in short, human—and not one that can easily be solved with technology.

outreach. In the end, the technology was adopted quickly and effectively. In the first three months since the launch, we have had no problems with demand or uptake of the service. We are already receiving repeat callers and positive community feedback. We're measuring the impact of this service with the help of a local research firm to see if it actually changes knowledge, behavior, and health outcomes—a critical piece of the puzzle and something that all technology projects need to build into their implementation.

One challenge still facing the global health sector is the lack of outcome-focused, robust evaluation design for information and communication technology (ICT) projects. There are many pilot projects, but few rigorous impact evaluations and very few projects that have scaled beyond the initial pilot. If we are going to continue to invest in technology for development—potentially at the expense of other proven interventions—there needs to be a stronger understanding and measurement of impact and cost-effectiveness of ICT for development projects.

Kentaro Toyama

Almost always, when someone wants to introduce a new technology into a developing world community, it's for the wrong reasons. The desire should not be to introduce a new technology; it should be to solve a specific health problem, and to do so with an open mind that does not restrict the space of solutions. Maybe a particular technology is the best available tool for the job, but it's counterproductive to assume that technology is necessary *a priori*. Incidentally, the best

Q. The path from an idea to on-the-ground implementation can present considerable challenges, both to the implementer and the end users. Can you provide a specific example of a successful technological intervention in health and what factors made it successful?

Kentaro Toyama

Bill Thies, a researcher at Microsoft Research India, and his colleagues developed a system that uses low-cost netbooks and inexpensive fingerprint readers to allow healthcare organizations to track clients as they either enter a healthcare facility or are administered medicine. The netbooks are connected to the mobile phone network and communicate with a central database via SMS text messages. The technical aspects of the system are simple and straightforward.

In Delhi, Operation ASHA uses fingerprint readers, known as eDots terminals, to help track, monitor, and reinforce tuberculosis treatment regimens.

The system has been used by a tuberculosis treatment program called Operation ASHA in Delhi, as well as by Swasti, a nonprofit that supports healthcare and well-being of sex workers in Bangalore. Preliminary trials suggest that the system has increased the organizations' ability to track their own operations and to increase compliance of programs which require direct patient-health worker contact.

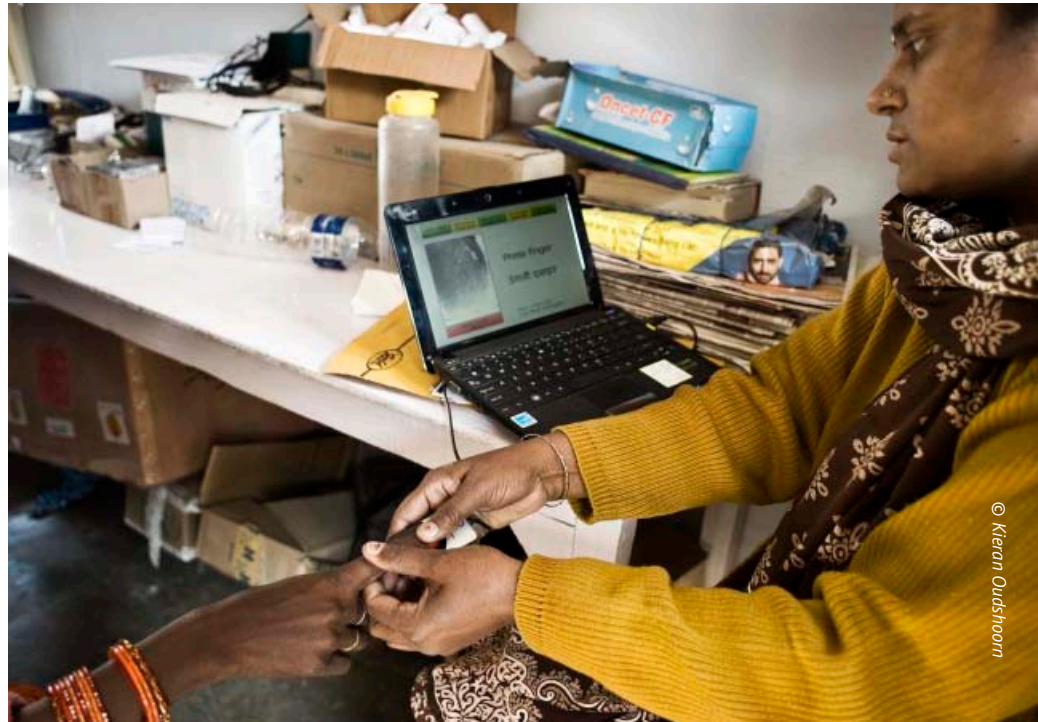
The critical element in this project is the collaboration with an organization already committed to the goal. Operation ASHA already serves 3,000 patients in Northern India, and Swasti works with hundreds of sex workers in Bangalore. Both are good at what they do. The technology simply amplifies their impact.

The same technology, if it were implemented without a host organization, or in partnership with a broken healthcare system, would serve little purpose. If a for-profit company is failing, no one imagines that its problems will be fixed with the infusion of new laptops and well-designed software. Similarly, if a healthcare system is failing, then no amount of technology, however well-designed, will be what turns it around. Technology is best applied to help institutions that are already having a positive impact, not to fix institutional problems or to substitute for capable healthcare workers.

Emily Bancroft

The Malawian NGO Baobab Health built a simple but enterprise-level hardware and software solution for guiding health professionals through clinical decision-making and data collection in government-run hospitals and health centers in Malawi.

To be successful in Malawi, Baobab had to create software and hardware that was user-focused, and specifically designed to work in low-power and low-infrastructure environments. They knew that health workers at rural health facilities would have limited experience using computers, so they built their own touch screen devices that would allow workers with no computer experience to quickly and easily navigate the system and record data. They also knew that electricity would not always be available for their deployments, so they adapted



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their servers and touch screens to work on deep-cycle batteries that can run for hours with no power, and set up their own networks to link sites where internet connectivity does not yet exist. Using local developers and local resources, Baobab was able to refine their intervention with innovative solutions to real barriers.

David Boyd

The consumer electronics boom has miniaturized and adapted technology that was once the sole preserve of the hospital, and taken it into clinics and rural locations that are remote from mainstream medical facilities. These technologies take healthcare to the patient, rather than the patient to the healthcare provider.

For example, the MAC 400 Electrocardiogram (ECG) device enables a district nurse or health assistant to run ECG in remote locations, while still using up-to-date algorithms to screen and treat patients with heart disease. Similarly, the Venue 40, a portable, tablet-sized ultrasound scanner, delivers point-of-care ultrasound in a wide variety of applications such as anesthesia, rapid abdominal and cardiac examination, or trauma, and allows safer needle-guided procedures at the patients' home or local rural clinic. Finally, with the VScan hand-held ultrasound, the technology has moved on another step, placing powerful imaging literally into a physician's pocket.

These new generation products are helping save lives, improve healthcare productivity, and importantly, increase access to healthcare in both rural and urban areas. Being poor and living remotely need no longer mean exclusion from access to essential diagnostic services.

The Misseriya village of Goleh in the Abyei district, Sudan. The harsh physical environs of rural areas can provide severe challenges for many health technology devices.



Q. Almost 61% of Asia’s population lives in rural areas, and in developing countries like Laos and Sri Lanka, almost 85% of the population is rural.¹ What are some inherent challenges of introducing a new technology to a poor or rural community? How are they being solved?

Kentaro Toyama

Rural areas of developing countries present great challenges for technology, for all of the reasons that they present challenges for economic development. They are physically harder to reach, due to their remoteness and poorer road infrastructure. They lack a workforce that could maintain and support newer technologies. They are often less open to new technologies, if only because of lack of familiarity. And, fewer people have a high level of education as occurs in cities. In short, more of the foundation for a technology ecosystem is missing in rural areas.

This does not necessarily mean that we should not put technology in rural areas. It just means that we should be realistic about the tradeoffs between different kinds of solutions: Will the cost of the whole technology ecosystem

that needs to be put into place result in at least as much benefit? And, is it in fact the most cost-effective use of the same resources? And, are we willing to invest in the total cost (usually several multiples of what the hardware alone might cost)? Only if the answer to these questions is “yes” is it worth proceeding.

Emily Bancroft

Reach is the biggest challenge. Although we have seen real growth and expansion in cell phone networks and connectivity in rural environments, the reality is that these changes in infrastructure are not enough on their own. Even if the networks exist, technology adoption has ongoing costs and needs ongoing support.

One solution that is effective in rural environments is to invest in identifying leaders in remote villages who can be advocates for health, and provide them with the technology they need to communicate and share knowledge with others. For our case management hotline service for pregnant women and caregivers of young children in Malawi, both phone access and knowledge of the intervention itself is limited. So, we have invested in community volunteers—usually part of the already existing Village Health Committees—and equipped them with phones and training to help reach rural communities.

We’ve found that one strong volunteer per village is enough to bring information and resources about the new technological solution to women who would otherwise have difficulty accessing information about the services available to them. In this example, the technology is only a small part of the solution. The real work comes in identifying and supporting the volunteers, and in providing the ongoing supervision and resources they need to provide the linkage to remote communities.

David Boyd

From a product development perspective, we have found that what is required is a new mindset to the way we do business. Traditionally, the “glocalization” business

¹ “Healthcare in Asia: The Innovation Imperative,” Economist Intelligence Unit, 2011, 9.

model has reigned, where products were developed in home markets like the U.S. and Europe, then adapted for sale elsewhere—often by reducing specifications and manufacturing locally. This model worked to some extent, but frequently the products were not suitable for local circumstances: too big, too complicated, susceptible to power fluctuations, and difficult to use and maintain in physical environments quite different from those they were originally designed for. And, despite lowering the capital cost of equipment, financial models, for their use and upkeep—based upon home market experience—did not work and were not sustainable. Increasingly, there is a movement toward an “in country, for country” approach, where research, development, and manufacturing occur in the country or region of use.

Within GE, teams with deep local knowledge and unprecedented autonomy in Latin America, India, and Southeast Asia now manage the development and production of new products to meet local needs. Our ultrasound and ECG devices are examples of that. In an interesting twist, because these new products do not compromise on quality, some are finding a use “back home” in the developed markets. This has become known as “reverse innovation” and although this has positive benefits in global markets, we must remember that first and foremost, the new technologies were designed specifically for rural and underserved markets.

“Successful multi-sector partnerships must recognize that each partner is going to have different values and different motives driving their participation.”

Emily Bancroft

Q. Do health technologies benefit from a well-rounded approach that includes support from multiple sectors and stakeholders: government, industry, academia, NGOs, and the community itself? With particular emphasis on the private sector, can you comment on how these various sectors might contribute along the path of product development and implementation, in terms of partnerships, collaborations, and effective, sustainable solutions?

Emily Bancroft

Successful multi-sector partnerships must recognize that each partner is going to have different values and different motives driving their participation. Those values and motives for participation should be identified up front, accepted, and well-understood by all partners for the collaboration to be successful. We commonly see three different types of values in technology for development work—innovation, public relations, or systems change. None of these values are inherently bad, and all have contributed to the solutions in practice in global health today. But they can easily be in conflict if they are not acknowledged and understood at the beginning of a partnership.

The private sector has built a lot of the infrastructure and technology that we now depend on to do our work. The investment in cellular network infrastructure is the obvious and common example. Cellular companies invested in this network to build their customer base. They did it because there was a promise of profitability, but many global health projects are building on this infrastructure to deliver content and information. Mobile money services are profitable for mobile phone companies, yet they are now being used to provide the equivalent of banking services to those who have been underserved by traditional banking networks.

At the same time, the private sector has overlooked areas of need because the opportunity for profit is not proven. This is where the government, academia, and NGO communities have come in to create products that fill gaps that have value for global health, but don't have sufficient market potential to encourage private sector investments. These investments are also critical to our progress as a sector, as this is where more creative solutions are developed.

David Boyd

There are many benefits to be gained from collaborations between the private and public sectors, and much cross-fertilization and learning can be achieved from working together on specific projects. I will take as an example the area

Unintended uses of technology: Omena fish lay spread out to dry on malaria bed nets by Lake Victoria in Kenya.



Minkawa et al., Malaria Journal, 2008, 7:165

of maternal and newborn health, for which the United Nations set Millennium Development Goals (MDG) in 2000, with targets for attainment by 2015.

MDG 4 aims to reduce by two-thirds the mortality rate among children under five—and deliver this by 2015. Of the 139 million babies born worldwide every year, over 3 million die in the neonatal period. With just four years to go, reaching the MDGs will require new levels of cooperation among everyone concerned, from doctors to midwives, governments to NGOs, and researchers to businesses. It also requires a reappraisal of the ways in which healthcare technologies are developed and deployed, especially in areas where neonatal mortality rates are the highest. This is something that the global healthcare community is now addressing with companies, NGOs, agencies, and governments coming together under the UN's auspices in various partnerships to help improve maternal and infant survival rates. Collectively, without collaboration, partnerships, clear thinking, and the courage to do things differently, we are unlikely to meet the MDG targets.

Kentaro Toyama

There is not anything inherently better about a collaborative effort, per se, especially if the partners are not all truly invested in a common goal. In fact, collaborations naturally incur a coordination cost that can make things more difficult. The question is not the involvement of multiple stakeholders, but the commitment of each stakeholder to the larger objective.

Often, if there is even just one competent institution dedicated to solving a problem, it will pull together other necessary stakeholders required for making an impact. So, from the point of view of the technology (or the technologist or the technology policymaker), the important thing is to work through that dedicated institution, not to put together a partnership for the sake of one.

The private sector's role should be limited to supplying the necessary expertise and technology at the lowest possible cost for the project. That is what corporations are good at, and that is the one aspect of the problem that is consistent with their own goals, namely, to increase shareholder value through the sale of expertise and technology.

Although it has become fashionable to talk of private-sector solutions to global health, the reality is that public healthcare is a public sector problem. There is no high-quality system of universal healthcare in the world that is not either run by a government or heavily regulated by a government. That is because most corporations are averse to serving the poorest clients: they are the least able to pay and the costliest to reach. The corporate inclination is to optimize operations for wealthier customers.

If meeting the needs of the poorest citizens is a goal, however, that means that another entity must purchase goods or services on behalf of the poorest. That requires a progressive intention. Governments and civil society should perform that role, and in many thriving Asian countries, that is exactly what happens.

One common conceptual error these days is to believe that the private sector, the technology industry in particular, has some magic capacity to make any project financially self-sustaining. This is a terribly misguided idea. The reason why the private sector is profitable is because it intentionally avoids projects that are not profitable, not because it can pull rabbits out of non-profitable hats.

A woman is collecting fish and sipu at sunset in the Dili District, Timor-Leste.



UN Photo / Martine Perret

Q. What affordable solutions does the digital age promise to developing countries? Thinking broadly and globally, how can innovators and implementers build programs that will effectively utilize appropriate technological tools and applications for health—in both the developing and developed worlds? What might some ideal models look like?

Kentaro Toyama

As the adage goes, “If you give a person a fish, they eat for a day; if you teach them how to fish, they eat for a lifetime.” Innovators and implementers should focus less on providing the developing world with the “right” technology, and instead emphasize the building of human capacity and institutional capacity to build and support technological systems on their own.

What is necessary is not a transfer of technology, but education and mentorship. The goal is not a world in which every country is given the technology it needs. That only continues ongoing relationships of dependence and neediness. The goal is a world in which every country has the capacity to invent or incorporate the technology it needs on its own.

“The goal is a world in which every country has the capacity to invent or incorporate the technology it needs on its own.”

Kentaro Toyama

David Boyd

In the last few decades, the changing landscape of communication technology—digitization, miniaturization, and broadband—has resulted in the near ubiquity of the mobile phone and a population that is increasingly at ease with its use. These same influences are driving the development of healthcare technologies, where the power of medical imaging, information technology, and biology are fusing together. This has resulted in a new wave of products that are transforming all aspects of healthcare delivery. Tele-consultations by video link and remote diagnosis are now readily available. Transmitting imaging scans from locations close to the patient to a specialist for interpretation who may be a considerable distance away is a reality. Population screening using digital mammography is more flexible and efficient than previous film-based systems, and the data can be easily transferred and analyzed. Digitization of records allows better data-keeping and patient tracking—vital for monitoring things like medical treatment and vaccine delivery. In developed nations, digitization will enable more of us to stay independent longer in our homes as we age.

The list, I believe, is almost endless. Ideas for new applications and solutions will arise from many sources, but the ones that will succeed will be those that help patients, reduce health inequalities, and make healthcare more sustainable, regardless of the country in which they are being used.

Emily Bancroft

There is both a growing pace of innovation and increased scale of implementation of technology in global health and development. What's driving this? Two unique movements in the technology sector suggest promise for the future: a rising level of entrepreneurial technology activity in the developed world that is focused on development, and a dramatic increase in the amount and quality of software development in low-income countries. As a result, there is a more receptive response from the development community for for-profit models that originate in developed countries, improved capacity of local technology entrepreneurs in developing nations, and more capital to finance these innovators.

India is a leading example of a country with a burgeoning entrepreneurial class in technology that was once focused primarily on the for-profit sector. Today, those entrepreneurs are applying their experiences to the challenges that the country faces in improving community health and development. Efforts to develop new technologies for health that were once segregated and distinct can now be used, and built upon by others.

Beyond this, we see additional examples of forces that further the pace of technology innovation and its application in health. Open-source initiatives spur collaboration, local development, and wealth sharing. Mobile network deployments provide the means to deliver new innovations and monitor their effectiveness. The global technology sector is finally maturing and democratizing enough to be relevant to global health and development.

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