> “Telemedicine, predictive diagnostics, wearable sensors and a host of new mobile applications are transforming how people manage their health”

Welcome

Technology: a tectonic movement

Three tectonic movements are reshaping the world today: technology, globalization and climate change, observes Thomas Friedman in his recent book *Thank You for Being Late*.[1] They are tectonic because their growth no longer takes the linear form that we humans are used to. And they are tectonic because they are exponentially reshaping how we create, how we collaborate, how we think and how we act. They create opportunities for individuals or small groups, even for those with limited resources in remote areas.

Giant leaps in technology have been possible as innovations rapidly built on each other, narrowing the gap between learning and adapting. In most cases, they have been tremendously efficient and beneficial. For instance, the cost of DNA sequencing per genome was US$100 million in 2001. Today it costs just US$1,000. It took only 10 years for mobile phones to be used in low-income countries from the time they were first introduced in developed countries. Mobile-phone-based money transfer such as M-Pesa has revolutionized payment systems in a number of low- and middle-income countries. Telemedicine, predictive diagnostics, wearable sensors and a host of new mobile applications are transforming how people manage their health. The eventual winners will be those who can avoid becoming patients at all.

Agriculture innovators too have made significant progress to prepare for the need to feed 10 billion people by 2050 while protecting our precious resources – land and sea. Smart technologies such as low-cost sensors for soil, irrigation and cloud computing have empowered farmers to make data-driven decisions, access best practices in real time, and minimize use of inputs, putting them in a position to conserve resources while improving productivity. Advances in genome sequencing, aerial and satellite coverage, and mobile platforms for precision farming will also benefit smallholder farmers. Further, growing cycles can be reduced and food can be grown by anyone, anywhere – even in tiny urban spaces.

Entrepreneurship: disrupting "business as usual"

Two of these tectonic movements – technology and globalization – have led to a major phenomenon: the rise in entrepreneurship in all forms in even the remotest areas of the world. Knowledge, capital and resources to launch a new venture are just "a click away." Today, more than 38 low- and middle-income countries actively report entrepreneurial activities. In the 2017 Global Entrepreneurship Report,[2] Africa is the region that reports the most positive attitudes towards entrepreneurship, with three-quarters of working-age adults considering entrepreneurship a good career choice. In Burkina Faso, for example, high rates of established business ownership are accompanied by high early-stage entrepreneurial rates; close to two-thirds of working-age adults are starting up or running their own businesses.

Achieving the World Health Assembly targets for nutrition in the sub-Saharan Africa region alone will cost US$27 billion over ten years, on top of current investments. However, if current investments and approaches continue under business as usual, the targets will not be achieved.[3] This is when social entrepreneurs are required to step in, to disrupt business as usual by tackling barriers in reaching the last-mile profitably in many domains such as microfinancing or social franchising at scale. Social entrepreneurs can tackle society's most complex issues, while functioning like a business.

> "Technology plays an increasingly important role in enabling the implementation of high-quality public health nutrition programs"

Joining forces: technology and entrepreneurship

Technology plays an increasingly important role in enabling the implementation of high-quality public health nutrition programs. Similarly, innovative entrepreneurial solutions are required to improve access to proven solutions and ensure sustainability.

We are grateful to the innovators and entrepreneurs who have contributed to this issue, providing ideas and pragmatic perspectives on how to leverage technology and entrepreneurship to reduce the extent of malnutrition facing our world today.

We are inspired to visualize innovative technologies from farm to fork in our infographic. Stuart Gillespie from the International Food Policy Research Institute (IFPRI) provides a refreshing "Food for Thought" contribution entitled Pivotal Movement, a platform that uses fitness tracking technology to turn calories burnt into increased funding for nutrition projects.

Measuring nutritional status and outcomes in low-resource settings has been a complex issue that has prevented nutrition programs from scaling up in the past. Having worked on this challenge for years, David Boyle, Katharine Kreis and Laura Anderson from PATH discuss a new generation of field-friendly diagnostics, screening devices and tools. Sun Eun Lee from John Hopkins Bloomberg School of Public Health provides a compelling example of how to fill gaps in biological knowledge and provide roadmaps to prevention through "omic" technologies that are poised to move from discovery to delivery. An entrepreneur from Germany, Heinrich Katz, and his colleague Winnie Nyakerario Akara provide an example of a technology that can be cost-effectively scaled up in resource-poor settings: the mass processing of insects for protein food or feed.

Robert Hoekman from 510 Global outlines a new direction for using Big Data for aid. He provides examples of data-driven solutions to some of the world's most difficult and dangerous challenges. Anna Allen and Dejus Abreu from a new social enterprise, Triggerise, eloquently merge technology and entrepreneurship in their "Perspective" article. Triggerise uses a mobile platform to provide results-based incentives for last-mile entrepreneurs while improving access to health and nutrition services for pregnant women. Shreya Bhatt from Medic Mobile provides a simple four-step process and a practical guide to designing, building and scaling up mHealth innovations. Srujith Lingala and I summarize successful social business models from our landscape analysis in East Africa in the article "The Nutrition Entrepreneurs." Arnold Gloor from Medudem AG describes the future of customized nutrition solutions with an overview of the growth of personalized nutrition in high-income countries, along with examples of digital platforms.

We also feature a range of creative and recent scientific contributions throughout this magazine. Jonathan Steffen connects in a clever manner a 150-year old novel, *The Belly of Paris* by French novelist Émile Zola, to the core elements outlined in the Committee for Food Security's recently published report on Nutrition and Food Systems. My colleague, Eva Monterrosa, presents findings from formative research on the sociocultural drivers of food choices in India. Jee Hyun Rah from UNICEF and key thought leaders from the Ministry of Health in Indonesia remind us of the gaps in adolescent nutrition in that country. In their roadmap, they describe the role that social media can play in motivating adolescents to improve their dietary behaviors.

In the field reports section, we have case studies and valuable lessons learnt from the use of field-friendly technologies and social business models. Holly McKee and Dr Anna Zhenchuk from BioAnalyt explain the power of portable testing, outlining how they created a miniature lab that can be used by anyone, anywhere. Leah Newman and her colleagues from 3-2-1 Online have repurposed existing technology using Interactive Voice Response, which works as a search engine in contexts where there is no internet, and allows people to use any mobile phone to select and listen to actionable nutrition information, among a range of topics. Kasim Saiyyad, Bhaskar Mittra and Prabhu Pingali from Tata-Cornell Agriculture and Nutrition Initiative provide insights into leveraging self-help groups to mobilize women entrepreneurs in rural areas and create a sustainable supply and consumption of essential micronutrients. Siddharth Tata – a budding entrepreneur – and I discuss the role of entrepreneurship in improving the profits of backyard poultry farmers. This section concludes with a thoughtful analysis of a popular social entrepreneur model, microfranchising, by my colleague Kesso Gabrielle van Zutphen.

Technology and entrepreneurial approaches will together be critical to all aspects of improving nutrition in resource-limited environments, including prevention and education, affordable product interventions, efficient supply chains, and monitoring and evaluation. This is a trend that is expected to accelerate, if not to become actually tectonic, in the next decade.

Warm regards

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