Technology Deployment in the Age of Covid
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Developing a Covid vaccine will be a daunting task. But as challenging as that task may be, it is merely the first step along the long road to halting the pandemic.

Epidemiologists estimate that we need a 70% vaccination rate to achieve the herd immunity that would allow the global economy to reopen safely and return to something resembling the pre-Covid *status quo ante*. That translates into vaccinating more than 5 billion people out of a global population 7.5 billion, half of whom live in low income countries (705 million) and lower middle income countries (3.0 billion).[1]

Reaching people in these lower income countries, many of whom live in remote rural villages or informal urban settlements, would be difficult even in the best of circumstances. Most public health care systems in these countries were already stretched to the breaking point before Covid. Now that Covid infections are on the upswing in many developing countries[2], many countries will not have the capacity to locate and treat these infected people not to mention supervise, administer, and implement a large-scale immunization program over the course of several months or years – not decades -- especially if more than one dose of vaccine is required to achieve immunity. In addition, transportation, refrigeration, distribution, the mass production of such ancillary goods as vials, swabs, and other related medical products, trained personnel to administer vaccines, and procedures for keeping track of who was vaccinated, among many other essential tasks, are all sorely lacking and inadequate for the task at hand. Compounding the problem, most health care clinics and most residents outside a few wealthy enclaves in the largest cities generally do not have access to potable water, sewerage and basic sanitation, safe transportation, or reliable power supplies. If there is scant water to drink, hand washing and other basic hygiene activities are bound to suffer. Unless and until these ancillary problems are addressed, the 70% vaccination goal will be elusive at best despite the valiant efforts of scientists to develop an effective vaccine.

Although Covid is unprecedented in terms of the trials and tribulations it has unleased on the world, the effort to conquer Covid with science, technology and innovation is likely to fall victim to the same paradox that continues to bedevil global efforts to provide more widespread access to potable water, sanitation, food security, off-grid electricity, and ICT connectivity. Simply stated, despite the undeniable need for, and increased availability of, affordable, effective technical solutions to a wide range of

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[1] Population data are from World Bank Open Data, population by country income category
https://data.worldbank.org/indicator/SP.POP.TOTL?locations=XN
[2] For details see, Schellekens, Philip and Sourrouille, Diego M., Covid-19 Mortality in Rich and Poor Countries: A Tale of Two Pandemics? (May 28, 2020). World Bank Policy Research Working Paper No. 9260. Available at SSRN: https://ssrn.com/abstract=3614141

development problems, these scientific achievements all too often end up sitting idly in the lab, producing no tangible benefits for the hundreds of millions of people in tens of thousands of communities in dozens of countries who need them to live better lives. As Dr. Akinwumi Adesina, President of the African Development Bank, noted, "Technologies to achieve Africa's green revolution exist. For the most part, they are all just sitting on the shelves."[3]

This sad state of affairs runs the risk of being just as true for the health care sector as it is for agriculture. For example, Grand Challenges Canada[4] and US Aid's Grand Challenges for Development[5] among others support the development of dozens of high-performance, cost-effective innovations specifically targeted to the health care needs of low income populations. These health care innovations, by and large, are striving to meet the challenge that Professor Ramesh Mashelkar has termed, "Much More for Much Less for Many More" or M-L-M.[6] By this he means:

- **Much More (performance)** generated by products whose performance and quality **equals or exceeds** that of goods and services consumed by the global middle class.
- **For Much Less** money. In other words, not a 10% price reduction but a 10X or greater price reduction compared to similar products currently on the market for the global middle class. The goal, according to Mashelkar, is nothing less than "radical affordability" coupled with "affordable excellence" so that
- **Many More (people)**, primarily the billions of people at the so-called "bottom of the pyramid," can benefit from these innovations.

But if these solutions exist already and more are coming on line at a fairly steady rate, what accounts for this paradoxical confluence of scientific abundance and insufficient progress on the ground, especially among the poorest segments of society? And more importantly, what will it take to convert these scientific innovations into accessible, affordable products and services that can be delivered at scale to low income communities?

Generating healthcare solutions in the lab **for** low income communities is not the same as getting those solutions **to** the residents of tens of thousands urban and rural low income communities scattered across dozens of countries. On the contrary, as Innovations in Health Care[7] hosted by Duke University has shown, improving "access to affordable, quality care for people who need it most" requires focusing with laser-like intensity on scaling up mechanisms for deployment.

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[3] "Unlocking Africa's Agricultural Potential to Create Wealth," Remarks by Dr. Akinwumi Adesina, President, Africa Development Bank at the Public Lecture of the Food and Agriculture Organization (FAO) of the United Nations, held at the FAO Head Office, Rome, Italy, August 27, 2018. Available at: https://www.afdb.org/en/news-and-events/unlocking-africas-agricultural-potential-to-create-wealth-18437

[4] Grand Challenges Canada has supported a pipeline of over 1,000 innovations in 95 countries. Detailed innovation about their portfolio is available at https://www.grandchallenges.ca/who-we-are/discover-our-innovations-and-results/

[5] Details of the USAID Grand Challenges for Development program are available at https://www.usaid.gov/grandchallenges

[6] A comprehensive discussion of MLM is available in C.K. Prahalad and R.A. Mashelkar, "Innovation's Holy Grail." Havard Business Review, July-August, 2010 available at: https://hbr.org/2010/07/innovations-holy-grail.

[7] Details of the Innovations in Health Care program are available at https://www.innovationsinhealthcare.org

In other words, harnessing STI to conquer Covid, therefore, is best thought of as a two-step process. The first step, R&D and invention, occurs when scientists and engineers develop high-performance, affordable technological solutions. But the indispensable – and frequently overlooked -- second step entails developing mechanisms to deploy these inventions at scale.

This deployment challenge is not a scientific issue, *per se*. It entails addressing and organizing a diverse array of mission-critical values, tasks, and actors which, while having little in common with research, scientists and the scientific method, have great sway in determining whether research findings will be deployed successfully. With respect to values, scientists and engineers advance the frontiers of scientific knowledge via research, reason, and logic. By comparison, successful deployment programs, as E. William Colglazier observes[8], are a function of "culture, values, ethics, trust, leadership, history, politics," as well as superstition, local customs, and social structures. If the science community ignores these non-science factors, deployment will founder irrespective of the technical merits of a scientific solution.

But deployment does not happen spontaneously, even if these non-science variables are factored into the equation. Nor does it take place in a vacuum. It requires an effective and efficient deployment ecosystem – one that empowers all the diverse actors in the deployment process to find each other and join forces to get the job done.

In terms of actors and tasks, deployment is the purview of entrepreneurs, community leaders, foundations, NGOs, equipment vendors, logistics experts, financiers, government officials, social enterprises, small local companies, large multinational corporations, and local universities (especially business and engineering faculties), among others. Their tasks include building a for-profit or not-for-profit business around specific technologies to provide an essential good or service (potable water, roof-top solar, etc.), developing and scaling sustainable business models, organizing supply chains, training skilled technicians to perform essential installation, operation, and maintenance tasks, developing community outreach programs, organizing marketing strategies, organizing and arranging payment and billing systems, and determining how to finance these operations. Compounding the problem, potential scientific solutions are often developed in one country, far from, and without consultation with, the people who will be responsible for finding the technology, determining if it meets their needs, using it, and developing successful and scalable deployment programs.

Harnessing STI to conquer Covid and achieve the SDGs, therefore, is akin to a relay race in which the baton must be passed smoothly, quickly, and efficiently from the scientists and engineers who develop new technological solutions to a completely different group of individuals who will deploy these innovations at scale. In the abstract, these two steps follow logically and inexorably from one to the other. But in the real world, there is nothing inexorable or inevitable about this process. On the contrary, there is an chasm – or series of broken circuits – hindering the transition from research to deployment.

How can we repair these broken circuits? The 2018 and 2019 Global Solutions Summits[9] which convened at UN Headquarters in New York City in conjunction with the UN Multistakeholder Forum on Science

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[8] Personal correspondence with the author.
[9] The conclusions and policy recommendations from both the 2018 and 2019 Global Solutions Summits are available here and here.

Technology and Innovation for the SDGs, discussed a wide range of practical policies and programs to scale-up the deployment of new and existing innovations emerging from research labs around the world. The overarching message from these Summits is clear: To conquer Covid and achieve the SDGs, especially in the lower and lower-middle income countries, deployment must not be relegated to an afterthought. On the contrary, local, national, regional and international government "roadmaps" for harnessing STI for Covid relief and the SDGs should pay at least as much time and attention to deployment as they do to R&D. They should focus especially on the development and implementation of policies and programs that strengthen, organize and empower key actors in the deployment ecosystem by:

- Recognizing that deployment is a contact sport. Potential consumers of development solutions, for example, will almost certainly need help identifying and evaluating available solutions and, where necessary, adapting them for local use. Potential vendors, on the other hand, will need help finding appropriate local partners, arranging financing and organizing marketing, billing, O&M, customer finance, regulatory approvals and a myriad other chores that determine the success or failure of deployment. To address these technical, logistical and matchmaking issues, countries or regional groupings of countries should establish, organize and finance indigenous Centers of Expertise, perhaps housed in local universities and modeled after the Manufacturing USA Institutes to facilitate these activities.
- Organizing and financing a Know-How Transfer Fund to help transfer successful deployment models from one country to another. NGOs, social enterprises and other groups that have developed successful deployment models in one country do not always have the financial, personnel, and organizational resources to expand their operations in other countries with similar needs. A Know-How Transfer Fund would enable these groups to train and share their lessons of experience with counterparts in other countries.
- Organizing and financing a Deployment Support Fund. Expanding into new markets, especially on a scale commensurate with the size of the global challenge, can be prohibitively expensive and time consuming, especially for social enterprises striving to reach low-income consumers. A Deployment Support Fund could help defray a portion of these expansion costs.
- Using government procurement programs to prime the pump for deployment-oriented businesses. Governments, for example, could contract with social enterprises to put rooftop solar and potable water kiosks in schools, health clinics, municipal buildings and other government facilities. By providing an initial market and assured revenues to help defray the cost of expansion into new regions, targeted procurement programs would help social enterprises gain a foothold in regions where they were previously not active.
- Developing innovative risk mitigation programs and instruments to increase the volume of public and private capital available to support these scaled-up technology deployment programs.
- Encouraging governments to set aside a portion of the Covid-support funds from the World Bank, regional development banks, bilateral development agencies, and foundations, among others to strengthen the deployment ecosystem and support programs along the lines enumerated above.

In the weeks and months ahead, the Global Solution Summit intends to convene a series of virtual panels to discuss each of these issues, and others as well, in greater detail.