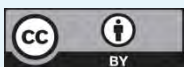# Positive disruption

Health and education
in a digital age

Executive summary

Cover Image, 12-year-old Basanti uses an
online education tool, Udaipur, Rajasthan, India.
Photograph: Ishan Tankha, Pathways Commission 2018.

Foreword

In this era marked by a growing uncertainty of what technology will mean for humanity's future — how we work, how we connect with each other, and how our economies grow — this new Pathways for Prosperity report, *Positive disruption: health and education in a digital age*, makes the case that technology, if properly harnessed, can be a transformative force for the poorest and most marginalised.

Technology has the potential to revolutionise patient health and the way students learn. For the poorest, most marginalised people living in the farthest regions of the world, technology could mean faster communication with healthcare professionals, more education opportunities for remote students, and more efficient services — thanks to tools that monitor disease outbreaks and track whether teachers are showing up for work.

But these positive outcomes are not an inevitable by-product of innovation. Technology is not a silver bullet, and cautionary tales are abundant. *Positive disruption: health and education in a digital age* argues that realising the full potential of innovation in the areas of health and education requires policymakers and practitioners to enshrine inclusion as a core goal up front as they design and scale new technologies in these areas.

Positive disruption: health and education in a digital age builds on previous reports from the Pathways for Prosperity Commission. Developing countries have an important window of opportunity to design policies that ensure technology in their countries advances in a way that improves the lives of all their people. This will require smart investments in human capital, forward-looking approaches to innovation and regulation, and a willingness to understand innovation as part of broader social and economic systems.

This report sets out a number of practical considerations for governments, industry, and civil society to consider as they work to embrace technology in a way that will drive the greatest gains in inclusivity, human well-being, and more equitable growth. We hope this report contributes to a vital and vibrant dialogue on these topics.

Melinda Gates   **Sri Mulyani Indrawati**   **Strive Masiyiwa**

Acknowledgements

About the Pathways Commission

The Pathways for Prosperity Commission on Technology and Inclusive Development is proud to work with a talented and diverse group of commissioners who are global leaders from government, the private sector and academia.

The Commission is based at Oxford University's Blavatnik School of Government. We collaborate with international development partners, developing country governments, private sector leaders, entrepreneurs, and civil society to produce cutting-edge research.

The Commission aims to catalyse new conversations and to encourage the co-design of country-level solutions aimed at making frontier technologies work for the benefit of the world's poorest and most marginalised men and women.

Pathways Commissioners:

- Melinda Gates – Co-chair of the Bill & Melinda Gates Foundation
- Sri Mulyani Indrawati – Minister of Finance, Indonesia
- Strive Masiyiwa – Founder and Executive Chairman of Econet Group
- Professor Stefan Dercon – Professor of Economic Policy at the Blavatnik School of Government and the Economics Department, and a Fellow of Jesus College, Oxford University
- Professor Benno Ndulu – Mwalimu Nyerere Professorial Chair, University of Dar es Salaam, and Visiting Professor at the Blavatnik School of Government, Oxford University
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- Shivani Siroya – Founder and Chief Executive Officer of Tala
- Dr Vera Songwe (Official Observer to the Commission) – United Nations Executive Secretary of the Economic Commission for Africa (ECA)

Executive summary

This report sets out a vision for how developing countries can significantly improve their health and education systems by making effective use of data-driven technology. It examines the potential benefits of these technologies, and offers guidance on how to achieve change. Service delivery in developing countries is notoriously complex, and this report does not shy away from the many failures of technology. But with this dose of realism, we maintain that digitally enabled technology has the potential to create more effective, efficient and equitable health and education systems by looking beyond the clinic and the classroom, to transform the underlying decision-making, management and administrative apparatus. This report describes the necessary digital building blocks to realise this vision, and provides a set of principles to help make digital technology a positive disruptor, rather than just a distraction to policymakers.

The opportunity

Digital technologies have led to progress in both health and education, setting out clear examples of what is possible. In Uganda, for example, the web-based application Mobile VRS has recently helped increase birth registration rates in the country from 28% to 70%, at the very low cost of $0.03 per registration – thus helping decision-makers track health outcomes and improve access to services. In Kenya many school children perform at learning levels more than two years lower than their grade would suggest. A new technology-aided programme, Tusome, is boosting outcomes. This national literacy programme, introduced by the Kenyan Ministry of Education, includes digitised teaching materials and a tablet-enabled teacher feedback system. If implemented effectively at national scale, programmes like Tusome can close the learning gap in early grades for under $150 per child. In India, a study of a free, after-school programme that introduced Mindspark, a digital personalised-learning software, showed improvements in mathematics assessment scores of up to 38% in less than five months, thereby dramatically reducing students' learning gaps. The Delhi-based programme could be rolled out at scale at a fraction of the cost of current per-pupil spending in schools.

Digital solutions that are *embedded* in health and education systems can improve service delivery in three ways. They can boost productivity at the point of delivery, improve interconnectivity within the system, and allow for more effective organisational designs. For example, digital monitoring tools can address motivational gaps that lead to absenteeism of workers – so long as incentives of actors within the wider system are acknowledged and addressed.

Digital data collection can improve weak management structures by supporting decision-making, improving interconnectivity, streamlining supply chains, and recording integrated data from test scores to attendance. Curated digital libraries can bridge the knowledge gaps of frontline workers. Finally, SMS reminders can increase appointment attendance, improve interconnectivity within the system, and lead to greater uptake of services by citizens.

Such progress is happening today. But in the near future, digital technologies will offer the possibility of something more: the potential to completely reimagine the delivery of health and education services. Pioneering examples already exist in developing countries which demonstrate the viability of this transformative potential. Moreover, these leading efforts suggest that with deliberately designed implementation, such approaches can be cost-effective and inclusive. In this report, we set out five visions of how technology-driven tools and the data underpinning them can improve the delivery of health and education services in the future. These visions are all interrelated: they draw on the potential of data and of technologies such as machine-learning, algorithms and communication technologies, and they reflect the consequences for both how students and patients will learn and be treated, and the associated changes in how services will be delivered and systems will be managed. The five visions are:

1. **Creating responsive learning systems.** In a *learning system,* data-driven technologies could enable feedback loops at all levels, informing decisions and continuously advising on best clinical or teaching practices by bridging the current gap between research and practice. Pockets of such systems are already taking shape, powered by digital technology such as India's Mobile-based Surveillance Quest using IT (MoSQuIT), a smartphone-based platform for malaria surveillance that enables better outbreak monitoring and real-time responses.

2. **Targeting at-risk people in health and education.** Systems could also be made *proactive* to ensure services get to the people who need them most. In the health sector, this is starting to emerge in programmes that use community data to identify high-risk patients for active outreach. In education, it will allow more precise targeting of pupils whose learning is lagging.

3. **Tailoring health and education services to individual needs.** *Personalised health and education* hold great potential to revolutionise effectiveness, efficiency and equity. For example, digital personalised learning software greatly improves test scores by tailoring content based on an individual student's proficiency level, rather than that of the rest of the class.

4. **Redefining the roles of educators and health care workers.** With digital technologies, the *roles of teachers and health workers will change.* Digital technologies including machine learning may lead to the automation of certain tasks, especially routine or codifiable parts

of the job. Consequently, frontline workers' skills will change markedly. Frontline workers will remain a crucial part of the system, but will spend less time on routine tasks and place greater focus on core strengths such as judgement, initiative, and the socio-emotional "human touch".

5. **Bringing quality healthcare and education to remote areas.** In the future, we may also see *virtual systems* which break down the walls of clinics and classrooms, including remote diagnosis via telehealth technologies, remote clinics and reaching out to students in the most remote areas to provide quality education through videoconferencing.

The challenge

Technological solutions cannot guarantee success. Too often, they fail to deliver impact, or to work at scale. To date, most innovation has been focused on the point of delivery: clinics and classrooms. This model has repeatedly failed when technological innovations ignore constraints across the wider system. For example, the One Laptop per Child programme in Peru had little effect on maths and reading test scores, and other similar programmes succeeded *only when integrated with broader changes to teaching.* Effective service delivery addresses the complexity of systems, and involves a variety of actors and end users who have different roles and motivations.

Policymakers need to take a systems approach both to better understand where the problems within health and education lie, and to better predict how the system is likely to respond to new technologies. The value of this approach is clear. New technologies – even the most advanced ones – only work well when the broader enabling environment is right. Success in adoption will depend on the system as a whole: the various actors, connections among these actors, organisational norms, and the local and national political contexts. The absence of such an enabling environment, however, should not serve as a reason to wait to introduce reforms. Indeed, even when specific elements of the system are not working perfectly, reforms made in a joined-up manner can enhance outcomes, challenging the status quo. For example, digital payrolls can stymie corruption, feedback systems can boost motivation and thereby tackle absenteeism, and data-systems can create incentives for more transparency in decision-making. And, in the process, such initial steps can start the redesign of systems.

What to do next?

The time is ripe to plan for scale, and to bring digital technologies into health and education systems. Many recent attempts towards innovation still need to prove their success. Even those with careful evaluations are typically no more than pilot studies, at relatively small scales. The potential is nevertheless clear, and the next step is to start using digital technologies to deliver at scale. This is a critical moment. Decisions made by funders and policymakers today

will determine whether the roll-out of digital technologies will be a costly way to exacerbate failings and inequalities in existing systems, and a distraction for policymakers, or a force of positive disruption towards more effective, efficient and equitable systems.

For implementation at scale, the focus will need to be on promoting innovation in the private and public sectors, ensuring that progress is inclusive, and, especially, 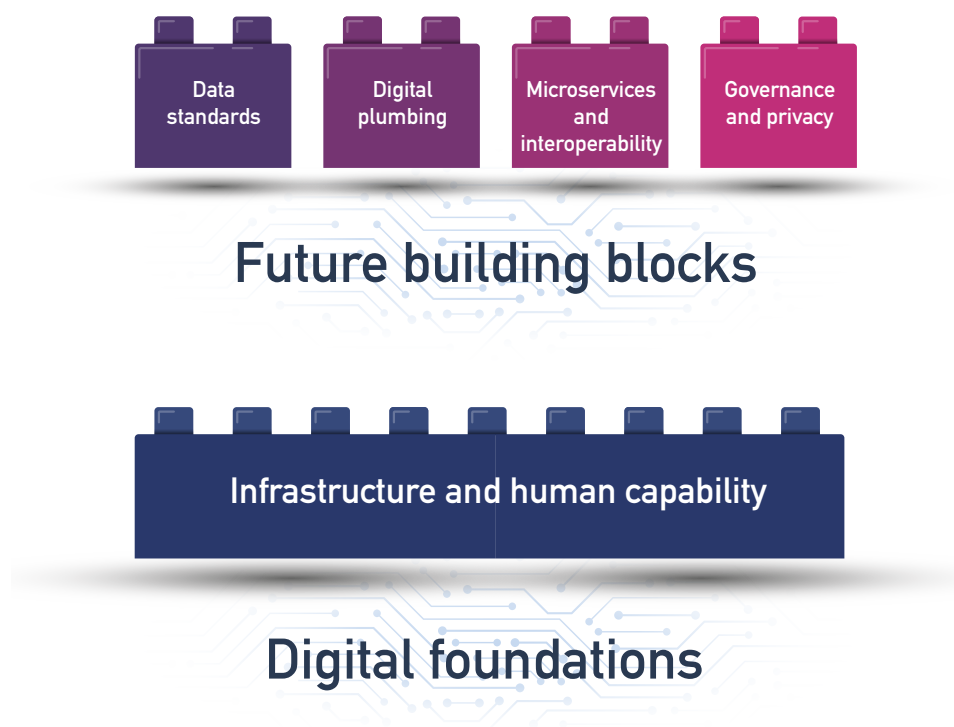creating the right digital foundations for scale. In Figure ES1, below, we have adapted a framework from our previous report, *Charting Pathways for Inclusive Growth*, which outlined policy priorities for technology-enabled growth. The same priorities are valid for innovation in health and education service delivery. The key driver for success in using digital technologies in service delivery – the effective use of data – requires a focus on creating the right enabling digital foundations and digital building blocks (explored further below). In addition, governments must create space for innovation in service delivery, both in the public sector and with private actors. Finally, ensuring that education and health are inclusive will require special attention to issues such as access, affordability and digital literacy. This report, alongside our previous work, argues that in the absence of such an explicit focus, existing inequalities by wealth or gender will be exacerbated.

Figure ES1. **A policy framework for health and education for all through digital technology**
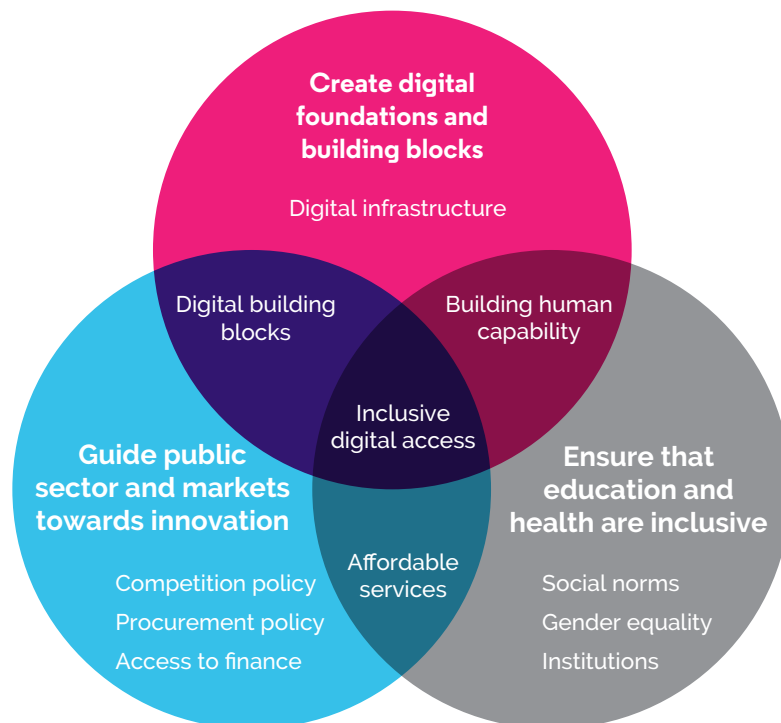
Data will be the fuel that powers future digital systems. The five future visions put forward in this report all rely on data to reimagine the design and architecture of these systems. However, many countries are working from a low existing baseline in effectively capturing and using data. Countries must ensure the right *digital foundations* are in place: even the simplest digital services require digital infrastructure, including access to electricity and internet, and digital skills. When setting up such digital foundations, inclusive access must be considered. Furthermore, truly harnessing data will require establishing the *building blocks for future digital systems*. Clear rules around data governance and privacy must be established: these future visions require significant centralisation of data about citizens, and while the potential upside is large, so, too, is the potential for harm. New regulations, protocols and rules must be established to guard against privacy violations, data misuse, and algorithmic bias. From there, data standardisation will be key to breaking down silos between programmes, and ensuring information can be compared across regions and between organisations. Likewise, countries will need to develop "digital plumbing" – metaphorical pipes that collect and transport information for data aggregation – and open digital services to ensure that the insights and value from data can be harnessed by innovators, incumbent providers, and ordinary people.

Figure ES2. **Foundations and building blocks for future service delivery systems**

Data standards

Digital plumbing

Microservices and interoperability

Governance and privacy

Future building blocks

Infrastructure and human capability

Digital foundations

How to do it?

This report offers four principles that can help everyone – citizens, workers, policymakers, funders and entrepreneurs – harness the opportunities of the digital age for better health and education, and avoid some of the previously experienced pitfalls of inappropriate adoption and poor implementation of technological innovations at scale.

1. **Deploy technology only when it offers an appropriate and cost-effective solution to an actual problem.** Policymakers and funders should invest time and effort in identifying the specific problems holding back their health and education systems, and they should only decide to use a digital solution if it is the best solution on offer. They also should be confident that an intervention will work in the local and national contexts, and be cognisant of the local political or organisational culture. Moreover, efficacy at a small scale does not fully inform impact at scale, let alone affordability. Rather, impact and costs of scaling need to be monitored carefully.

2. **Focus on the content, data sharing, and system-wide connections enabled by digital technology, not exclusively on hardware.** All too often, when policymakers look to deploy technological solutions to health and education, the focus is on procuring pieces of hardware. However, digital solutions will only have impact if they are used by everyone - frontline workers, citizens, and officials. This means that people must have access to the right inclusive digital foundations (infrastructure and skills), and that software and digital components must be crafted to serve the end users.

3. **Invest in digital building blocks, not just the bulk collection of raw data, in order to move towards the systems of the future.** Good data can inform decision-making, fuel active feedback loops in a learning system, and offer personalised services. In practice, digital building blocks provide a way to build the required domestic capability as well. These data frameworks enable system managers to learn from experience, compare interventions, and set standardised criteria for success – boosting their ability to understand their system and implement solutions at scale.

4. **Ensure that the technology genuinely works for all by making deliberate efforts to engage with and build solutions for people who are typically left behind.** This should start with explicit attempts to understand the specific wants, needs and priorities of marginalised communities. Resulting actions can be as simple as providing SMS reminders to attend clinic appointments, or as complex as a targeted outreach programme, such as the Muso community health worker programme in Mali, which uses data to improve performance and a digital supervision tool to increase impact.

Decisions made today by funders and policymakers will determine whether digital technologies can truly change education and health delivery for all. By deploying new tools, and by following the principles outlined in this report, developing countries can enhance and change the functioning of their health and education systems. They should critically monitor progress in terms of scale, impact and cost. If done carefully and judiciously, positive disruption is possible, and digital services will bring developing countries closer to the ambition of offering better health and education for all.

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