A SCOPING STUDY: TRANSFORMING EDUCATION THROUGH TECHNOLOGY

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Executive summary

This Second-Stage Report follows an initial scoping study (the 'Inception Report') and is intended to provide the Department for International Development (DFID) with support for the 2018 launch of its Education Technology Hub for Research and Innovation. This report seeks to provide actionable understanding of the EdTech 'landscape' in seven focal countries: Bangladesh, India, Jordan, Kenya, Lebanon, Malawi, and Rwanda. Country profiles in this landscape report address five categories of information: innovative initiatives; government buy-in and political will; innovation hubs and networks; research (activities and personnel); and funding. Each country profile concludes with an analysis section and recommendations identifying areas where additional inquiry and/or fielding of initiatives could be pursued.

Methods centred on web-based research, complemented by interviews with knowledgeable respondents and email communications with those respondents and with others. Focal countries were selected to ensure a mix of higher-achieving countries – with initiatives and institutions supporting a range of higher-impact and innovative initiatives – and countries with greater need for capacity and solutions in relation to education technology. (We must acknowledge here that this review was not intended to be conclusive, its assessments should be considered advisory and, to a degree, provisional; we have not attempted to determine the reliability of any individual study cited.)

EdTech and EdTech innovations

Following DFID, we define EdTech as 'digital, innovative and emerging technologies (used) to support teaching and learning'. Innovation, in this context, is considered to be both 'the creation and implementation of new ideas, technologies and methodologies,' and the application of 'approaches taken from other contexts and adapted … to achieve better teaching and learning outcomes.'

The Inception Report

The Inception Report for this activity addressed 28 DFID-priority countries in Sub-Saharan Africa, South Asia and the Middle East North Africa (MENA). That report included brief assessments of each country based on the same five information categories as are used here. To view a table of results and methods followed for tabulating those results, review Country ratings.

International researchers

In several of the countries addressed in this report, education researchers have not had the opportunity to build expertise in the design and implementation of Randomised Controlled Trials (RCTs), Difference in Difference (DiD) studies, or other experimental means of assessing the impact of EdTech initiatives on learning outcomes. To facilitate additional inquiry by the Education Technology Research and Innovation Hub, we have identified seven education researchers who are based outside the countries profiled, and who have the experience and expertise to contribute to understanding the EdTech initiatives and their impact. The list of international researchers is by

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1. This definition is taken from the summary business case for the Education Technology Hub for Research and Innovation.
2. An RCT involves comparison of changes resulting from a particular intervention in a randomly generated treatment group with results from a control group (which does not participate in the treatment) randomly generated from the same population. DiD studies involve comparison of changes over time (e.g., from baseline to the end of the project, etc.) in treatment and control groups.
no means exhaustive; there are many other excellent and committed researchers in development education. Our goal is to enable DFID to design and plan effective research.

**Key points**

Broadly contextualised observations about the state of EdTech include:

- **EdTech tools are appropriate and ‘ready’ for deployment in development education**, largely as a result of private-sector growth in mobile devices, mobile broadband, and other consumer technologies.

- **The need for usable research is critical** as a response to the proliferation of innovative solutions and the concomitant responsibility to understand which of these is most effective and offers the highest Value for Money (VfM) in a given situation.

- **EdTech is increasingly linked to the development of 21st-century skills** as governments identify creative problem-solving and similar abilities in the workforce as critical to improving economic and social well-being.

- **National education systems in many countries, and as aggregated in regions and internationally, represent a powerful source of potential demand for new solutions**, whereas current practice primarily entails re-purposing of hardware, software, networking, and services developed for consumer markets.

**Country profiles**

The country profiles in this report address the five information categories previously identified. The following are brief summaries of findings and observations regarding each country. The seven countries profiled were selected to enable a 'cluster-based' approach, in which practices of EdTech leaders could be studied and shared with other EdTech-capable education systems.

**Bangladesh**

Funding by the Government of Bangladesh for education is below regional means (both as a percentage of Gross Domestic Product (GDP) and as a percentage of the national budget). Despite policies and efforts that appear to be aspirational rather than concrete, the Government of Bangladesh has completed several projects intended to spark the use of EdTech in schools, such as the development of a media-learning portal for Open Education Resources (OER). Our inquiry has not discovered assessments of the impact of these initiatives.

In addition, Bangladesh hosts an active and diverse network of Non-Governmental Organisations (NGOs) and international NGOs (iNGOs), which support extensive systems of village schools and other non-formal education (NFE) initiatives. These organisations and their education activities provide opportunities to field and assess several EdTech solutions from other regions and countries. At least one NGO, BRAC, has organised activities suggesting support for low-cost private schools for the poor, which in several countries provide an alternative pathway to the improvement of student learning.

Partnering with one or more of the country's education-focused NGOs likely represents a good opportunity and should be explored. Similarly, replication of NFE projects profiled in this report (e.g. the Arabic literacy initiative Qysas, Digital Education Initiative supporting self-organising learning, etc.) among Rohingya refugees presents a good opportunity for learning and impact.
India

India has seen the emergence of numerous active and innovative organisations using EdTech to improve engagement and outcomes for students in what is the largest education system in the world. Decentralisation, in which responsibility for primary and secondary education resides primarily with state governments, limits the potential for nationwide initiatives without impinging on the potential for scale.

Among Indian initiatives profiled is the Digital Education Initiative of Pratham Education, which combines a pedagogical approach based on Self-Organised Learning Environments (SOLE, a term originating with Prof Sugata Mitra) and tablet-provided multimedia resources to build engagement with learning among youth. Also profiled is StoryWeaver, an initiative by Pratham Books (distinct from Pratham Education) that empowers users to write, illustrate, and translate children's books and make them available online.

EdTech in India reflects the country's education system in that it is diverse and dynamic. Determining effective next steps entails decisions regarding public vs. private schools, formal vs. non-formal approaches, and many other questions best addressed in relation to policy and opportunity. Additional inquiry on the part of DFID country offices is required.

Jordan

EdTech in Jordan remains centralised, with initiatives channelled through the Queen Rania Foundation (QRF). These initiatives include the Jordan Education Initiative (JEI), originally launched as a novel Public Private Partnership (PPP) at the World Economic Forum to focus on the nationwide provision of multimedia learning resources via school computer labs. While JEI continues, the necessary infrastructure in schools appears to lag behind. Funding from the Google Foundation to QRF, however, seeks to adapt the Edraak platform (currently providing services to higher-education institutions as a platform to deliver OERs to all Arabic-speaking secondary students).

Other initiatives in Jordan focus on providing improved education to Syrian refugee children living there. Initiatives include Qysas, an initiative by Little Thinking Minds that was supported by All Children Reading (ACR), LearnSyria, an initiative by Rumie in Canada that received funds via the Google Impact Challenge, and EduApp4Syria, a competition selecting a game-based-learning approach to literacy that has been funded by Norad. (Upcoming programmes for refugees include the launch of Can't Wait to Learn, in which War Child Holland will make curriculum-linked educational games available based on the organisation's success in Sudan, and several initiatives using mobile devices that are supported by Dubai Cares.)

Refugee-centred initiatives should be explored in relation to their potential replication among other populations in countries such as Kenya and Bangladesh. The centralised nature of education and of civil-society activity likely requires follow-up with QRF to determine the ways in which support from the Education Technology Hub can best be channelled.

Kenya

Kenya has given rise to an active private-sector technology scene, which in turn has led to the emergence of several EdTech start-ups, including Eneza Education, which serves interactive
learning resources via virtual tutors, and BRCK Education, which offers the Kio Kit integrated classroom solution, among others.

In a move of perhaps of greater importance, the Government of Kenya launched its Digital Literacy Programme (DLP) in which 1.2 million Year 1 students were to receive tablets running on the Android operating system as of 2017. As an outgrowth of the DLP, the Government of Kenya has entered into a PPP, the Digital Literacy Trust, which brings together private-sector content providers (e-Kitabu), donor agencies (UNICEF), and other organisations to help ensure that the provision of tablets results in improved learning outcomes.

Content development in relation to DLP appears to be an extremely active and fertile field. Discussion with the Digital Literacy Trust, which includes the Kenya Institute of Curriculum Development (KICD) should be pursued.

**Lebanon**

Although small and with a history of conflict, Lebanon hosts several innovative initiatives. In addition, the government's policies and plans are informed, comprehensive, and cogent. Some Government of Lebanon initiatives, such as the Reaching All Children with Education (RACE) II portal, offering interactive learning resources, appear to overlap with other initiatives in the MENA (e.g. Edraak in Jordan).

The government's proactive and well-informed approaches to date, in combination with activity by NGOs (e.g. Little Thinking Minds) and the private sector (e.g. Microsoft) suggest that government personnel will have clear and actionable ideas regarding high-impact EdTech investments and activities in Lebanon.

**Malawi**

While there is a limited range of activity in EdTech in Malawi, activities there have great potential and are well supported by research. The Unlocking Talent initiative, designed by onebillion.org, implemented by Voluntary Service Overseas, and supported by the Ministry of Education, Science, and Technology (MOEST) has demonstrated via RCTs significant improvement in literacy and numeracy learning by Year 1 and Year 2 students. During the 2017–18 academic year (AY), the initiative is being scaled up to more than 5,000 primary schools in Malawi. In addition, the designing organisation, onebillion.org, has been selected based on Unlocking Talent as a Global Learning xPrize finalist; a Kiswahili version of onebillion's support for literacy and numeracy learning is currently being field-tested in Tanzania.

Unlocking Talent poses additional questions (such as what the longer-term effects of the intervention are when students are mainstreamed into Year 3 classes that do not feature Unlocking Talent support). The development of a Kiswahili version for deployment in Tanzania also is enabling a non-formal learning project currently underway in rural Kenya.

In addition to the research questions that are emerging into view, the success of Unlocking Talent in Malawi suggests that the Education Technology Hub can immediately launch efforts to harvest protocols for scaling and lessons learned from this process. In addition, discussion with

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3 Kio Kit is a classroom-ready array of tablets with charging units and BRCK hubs, providing connectivity and pre-loaded learning resources.

4 Throughout this report, we use 'Year' to refer to a specific cohort-year in school, generally associated with specific curricula. Cognate terms in other education systems are 'class', 'grade', and 'form'.
onebillion.org (which is based in the United Kingdom [UK]) should be undertaken so as to determine currently planned and potentially needed next steps.

**Rwanda**

Rwanda has accrued more than 10 years' experience of ambitious, nationwide technology and EdTech initiatives that have failed to achieve their goals. These include the largest deployment of One Laptop Per Child (OLPC) in Africa, other initiatives by the OLPC-implementing organisation, and the collapse of the TerraCom company prior to the delivery of fibre-optic connectivity. In addition, Government of Rwanda policies and strategies appear to establish a 'centralisation straightjacket', in which initiatives that are not sufficiently equitable or that otherwise do not meet Government of Rwanda needs are not able to succeed.

With that in mind, the government's strong and public commitment to equity and to participation in a global knowledge economy suggests that there is high potential for the introduction of an integrated school solution (e.g. Kio Kit, oneclass, etc.). In light of the great need for learning on the part of primary and secondary students, moreover, there is likely an opportunity to develop and test a technology-supported version of a proven literacy-learning programme (such as Save the Children's Literacy Boost [LB]).

Discussion with the government should centre on the feasibility of smaller-scale but intensively researched pilot projects; discussion with international NGOs (iNGOs) working in education in Rwanda should be initiated to determine the possibility of initiatives that take place without high levels of government support.

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5 oneclass, like the Kio Kit, offers a collection of tablets with (solar) charging units, networking and learning resources.
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List of abbreviations

ACR  All Children Reading
AKDN  Aga Khan Development Network
AIMS  Africa Institute for Mathematical Sciences
ASREN  Arab States Research and Education Network
AY  Academic Year
CERD  Centre for Education Research and Development
CFJ  Clooney Foundation for Justice
CITE  Centre for IT in Education
DiD  Difference in Difference
DLP  Digital Learning Programme
DOT  Digital Opportunity Trust
EDT  Education Development Trust
EMIS  Education Management Information System
ERSAP  Education Reform Strategy and Action Plan
G1G1  Give One Get One
HEART  Health and Education Advice and Resource Team
ICT  Information and Communication Technology
ICT4E  Information and Communication Technology for Education
IDP  Internally Displaced Person
IEA  International Education Association
IIIT  Indian Institute for Information Technology
ITU  International Telecommunications Union
JEI  Jordan Education Initiative
J-PAL  Abdul-Lateef Jameel Poverty Action Lab
KICD  Kenya Institute of Curriculum Development
LB  Literacy Boost
MAREN  Malawi Research and Education Network
MEHE  Ministry of Education and Higher Education
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>MENA</td>
<td>Middle East North Africa</td>
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<tr>
<td>MHRD</td>
<td>Ministry of Human Resource Development</td>
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<td>MOEST</td>
<td>Ministry of Education, Science, and Technology</td>
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<td>MUST</td>
<td>Malawi University of Science and Technology</td>
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<td>NESP</td>
<td>National Education Sector Plan</td>
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<td>NFE</td>
<td>Non-Formal Education</td>
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<td>NREN</td>
<td>National Research and Education Network</td>
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<td>NTP</td>
<td>National Teachers Platform (India)</td>
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<td>OER</td>
<td>Open Education Resource</td>
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<td>OLE</td>
<td>Open Learning Exchange</td>
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<td>OLPC</td>
<td>One Laptop Per Child</td>
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<td>PPP</td>
<td>Public Private Partnership</td>
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<td>PRIMR</td>
<td>Primary Maths and Reading</td>
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<td>PwC</td>
<td>PricewaterhouseCoopers</td>
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<tr>
<td>QRF</td>
<td>Queen Rania Foundation</td>
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<td>RACE</td>
<td>Reaching All Children with Education</td>
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<td>RCT</td>
<td>Randomised Controlled Trial</td>
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<td>RENCP</td>
<td>Rwanda Education NGO Coordination Platform</td>
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<td>RTI</td>
<td>Research Triangle International</td>
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<td>SDG</td>
<td>Sustainable Development Goal</td>
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<td>SOLE</td>
<td>Self-Organising Learning Environments</td>
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<td>TPD</td>
<td>Teacher Professional Development</td>
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<td>UNHCR</td>
<td>UN High Commission on Refugees</td>
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<td>UPE</td>
<td>Universal Primary Education</td>
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<tr>
<td>VC</td>
<td>Venture Capital</td>
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<tr>
<td>VfM</td>
<td>Value for Money</td>
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<td>VVOB</td>
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1 Introduction

This Second-Stage Report is intended to provide DFID with effectively researched information about sources and potential sources of EdTech innovation in seven 'deep dive' countries. The purpose of this information is to support rapid start-up of activities by the DFID Research and Innovation Hub on Technology for Education, scheduled to launch in 2018. This hub will support the use of technology to increase access and improve the quality of education for all, including children who might be marginalised by gender, country of origin, ethnicity, disability, or other factors. The Research and Innovation Hub will provide decision makers with evidence about EdTech interventions that are effective in terms of improved learning outcomes and VfM.

The report addresses five areas of inquiry: innovative initiatives; government 'buy-in'; innovation networks and hubs; research capacity; and funding.

- **Innovative initiatives** are briefly described in relation to the organisations involved, populations served, and approaches.
- **Government buy-in** is determined based on a review of relevant policies, government actions in terms of initiatives, funding and partnerships, and interview information.
- **Innovation networks and hubs** are considered broadly as creating a 'climate of innovation' in relation to education and technology. Descriptions of this climate are based, first, on a review of centres or hubs for innovation in the technology sector and by the presence of a National Research and Education Network (NREN), a high-speed network-supporting collaboration among higher-education institutions, and on relevant interviews where conducted. Technology hubs for our purposes include organisations that serve as start-up incubators and accelerators; we do not, however, include organisations that serve only as co-working spaces.
- **Research capacity** is based on a review of the relevant academic journals, on interviews, correspondence, and on other reports and documentation as cited. (Identification of researchers with the potential to design and lead effective impact assessments is frequently not found in the countries examined. We have included a separate section on international education and EdTech researchers working in the focal countries.)
- **Funding** assesses the primary sources of funding available for education and EdTech initiatives, including government, donor, and other international and domestic philanthropic sources.

1.1 Focal countries

The five areas of inquiry are each addressed in relation to the seven focal countries:

- Bangladesh
- India
- Jordan
- Kenya
- Lebanon
- Malawi
- Rwanda

Country selection. These countries have been selected to support the formation of clusters (i.e. Sub-Saharan Africa, MENA, and South Asia) in which inquiry into the factors that have contributed to the achievements of higher-performing countries generates information and approaches that
can be replicated in other countries with fewer ongoing EdTech activities. Thus, India and Kenya (and Jordan, in some ways\(^6\)) are seen as having the potential to serve as bellwethers in their respective regions. While some of these countries have emerging economies and growing middle-class cohorts, in all of them there are substantial populations in poverty as well as populations that are marginalised based on other factors, such as gender, refugee status, and disability.

The remaining countries that have been selected currently host less activity and demonstrate less capacity; however, in terms of infrastructure, funding, government perspective, or other criteria, they satisfy minimum conditions to enable effective EdTech innovation and thus fruitful research. Several of the countries profiled in the assessment report lacked substantial EdTech activity and in several instances presented infrastructure and capacity constraints that would likely render effective research into such activity impossible.

Selection of these focal countries follows the development of the Inception Report (see Summary of the Inception Report, p. 1), which included examination of 28 DFID priority countries in relation to the five areas of inquiry identified previously.

1.2 Key points

Although we present primary observations emerging from our investigations in the section, findings and recommendations, several broader observations have emerged over the course of this inquiry. Whereas observations in findings and recommendations stem directly from the investigation of the ‘EdTech topography’ of each of the focal countries and of other DFID priority countries, the key findings that we present here emerge from the same investigations seen within the broader context of the education sector and of EdTech as a subsector within it. Thus, observation of the current ‘readiness’ of EdTech solutions for widespread deployment in development education emerges from consideration of the roughly 20 years of use of less-ready and less-appropriate tools.\(^7\) Similarly, the observed shift in focus to the development of 21st-century skills should be complemented by awareness of prior efforts and achievements in relation to Universal Primary Education (UPE).

These overarching observations include the following:

- **EdTech tools are appropriate and ‘ready’ for deployment in development education.**
  
  In part as a result of the expansion of private-sector markets, the technologies available to development education are much more appropriate for use in development contexts than they were previously. Mobile devices entail lower costs, reduced complexity, and more manageable power requirements than their predecessors, such as desktop computers and fixed-line internet. These factors, in turn, make larger-scale and even nationwide initiatives feasible.

  (While these tools have been available and consumer markets have been developing for most of the past decade, support for EdTech has lagged behind consumer adoption. One plausible explanation is that the challenges encountered by prior efforts to make use of technology in education – with tools that were limited and less ready for use in development contexts – have shaped donor strategies, leading to limited support.)

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\(^6\) As articulated in the Jordan country profile, the government has centralised many elements, notably through the QRF and the JEI, that in high-performing countries are decentralised.

\(^7\) For purposes of discussion, we date the introduction of EdTech into development education from the launch of World Links for Development in Uganda in 1997 (Bhatnagar et al., 2002). That project involved the use of desktop computers and fixed-line internet accessed via dial-up connection to introduce collaborative learning among students in Wyoming in the USA, and Kampala in Uganda.
The increased appropriateness of mobile devices and mobile broadband for use in schools has sparked innovation, which has led to the emergence of improved solutions and activity in areas that include direct instruction, teacher development, and data collection and management.

- **The need for usable research is critical.**
  For governments, donors, and other organisations considering how to best make use of EdTech solutions, in-depth understanding of those solutions and of the evidence for their impact is critical, whether these solutions address literacy and numeracy learning or the development of higher-order cognitive skills (or both). As EdTech support for both nationwide programmes and for alternative pedagogies, such as personalised learning and design-based learning, is maturing, the need for research into the effectiveness of these pedagogies, the technologies that support them, and the VfM that they offer in advance of government and donor commitment is critically important.

- **EdTech is increasingly linked to the development of 21st-century skills.**
  While literacy and numeracy skills retain their primacy as goals of many developing-country education systems, governments in emerging economies (e.g. Lebanon, Jordan, India, etc.) and some developing countries (e.g. Rwanda, etc.) are increasingly identifying the development of 21st-century skills as critical to improving economic and social well-being over the coming decades. (One early example of this shift in priorities is Rwanda's Vision 2020 plan, launched in 2000.) These government aspirations for participation in a global knowledge economy are exerting 'upward pressure' on the use of EdTech to support development of creative problem-solving skills. EdTech is increasingly considered a means of overcoming barriers to the development of such skills – such as intractable curricula or low teacher capacity – through the introduction of pedagogical alternatives to rote learning.

- **EdTech in many countries and regions internationally represents a powerful source of potential demand.**
  School systems comprise large potential implementers of EdTech solutions. Because such solutions can be replicated, repurposed, or marketed in other countries and contexts, and because challenges, such as the high cost of science-lab facilities, are confronted in common by national school systems, the potential aggregated demand for education solutions on a regional or international basis is larger still. In terms of hardware, software, connectivity, and services, however, EdTech in schools relies on products developed for consumer markets (e.g. mobile devices, mobile broadband, etc.). Some solutions – such as the Edraak platform in Jordan – are designed to achieve regional impact by offering learning resources with region-wide value. In other instances, such as the Global Learning xPrize, competitions have been launched to channel (or identify) design innovations that can later be 'internationalised' via open licensing. However, the demand for such solutions based on problems-in-common, and design or development in response to that demand, remains largely unexplored.

These observations, plus findings and analyses appearing throughout this report, can help build the impression that wicked problems in relation to learning have been solved – what remains is to capture these solutions, assess them, and replicate them, or provide incentives for their replication. However, this report, while it presents several effective initiatives and the organisations and processes that support them, does not attempt to reach the level of detail – in design or in

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8 Private-sector technology activity also plays a role in shaping demand in relation to education. In countries with vigorous technology-sector communities, such as India, Kenya and Lebanon, such activity is increasing (beneficial) pressure on education systems to support creative problem solving – although not necessarily on a widespread or equitable basis.

9 At roughly the same time, government and donor priorities are shifting their priorities from education access to education quality (in part as a result of the shift from the Millennium Development Goals to the Sustainable Development Goals [SDGs]). Whereas in the past EdTech was proposed as a means of increasing access to school – via support for community teachers, direct instruction at a distance, etc. – EdTech is now more frequently considered a means of improving the quality of school-based learning.
implementation – that distinguishes successful approaches from failed ones. That work comprises a rich field for future inquiry.

### 1.3 Methods

The primary methods for the development of this report and the associated Inception Report are internet-based research, plus interviews with EdTech 'thought leaders', with all efforts focused on the five primary areas of inquiry.

In developing the Inception Report, we applied an ‘inquiry template’ to initiatives. This template outlined the following information needs in relation to each inquiry area:

- **Initiatives**  
  Problem statement; place; objectives (in relation to solving the problem); EdTech (what are the tools being used?); approach (how are tools, etc., marshalled to achieve objectives?); tools-in-context (contexts could include low connectivity, low installed base, low-capacity personnel, etc.); start date and current stage; evidence of impact, including challenges or limitations; who the actors are; engagement with marginalised populations; scaling.

- **Government buy-in**  
  Policies, plans, vision statements drafted, and approved; strongest points of government support; start and end points for support, if any; objectives, goals, motivation (e.g. economic strengthening, psychosocial well-being, etc.); changes or programmes that have resulted from policies, plans, and vision statements.

- **Innovation networks and hubs**  
  Mission or goal; key members or members of interest; location; date established; activities and outputs to date; challenges, barriers, or problems.

- **Research capacity**  
  Leading researchers (name and other contact information, including institution; research focus; contributions to policy or strategy; bibliographic summary); institutions (e.g. the Centre in ICT for Development, University of Cape Town); publications (e.g. periodical academic publications focused on education).

- **Funding**  
  EdTech and/or education projects funded to date; amounts; areas of EdTech or education activity (e.g. Teacher Professional Development [TPD], Education Management Information Systems [EMIS], etc.); geographic interests.

In the event, these methods incur limitations arising from constraints in terms of time and other factors. The primary limitation is that no inquiry has been exhaustive; there are many initiatives, policies, researchers and other entities that have escaped our search, and others that have been identified without completion of all inquiry categories. Conversely, these methods as implemented in the Inception Report produced too much information. In order to frame a report with results from 28 countries, some aspects – notably descriptions of initiatives – were shifted to an annex. Other aspects were narrowed; thus, inquiries with regard to funding focused on philanthropic sources, such as Aga Khan Foundation, while inquiries regarding government buy-in focused on policies, plans, and vision statements.

#### 1.3.1 Thought leader interviews

Interviews were conducted with more than 20 individuals identified by the researchers and by DFID, and were generally structured to gather responses with regard to the five inquiry areas. However, interviews also:
• Provided respondents with opportunities to share insights in areas of focus and/or expertise;
• Invited respondents to consider five- and 10-year trends; and
• Invited respondents to consider differences in EdTech use in developed and developing countries.

Respondents were contacted by email. All respondents were asked to participate in interviews via telephone or Voice Over Internet Protocol or to respond to our long-answer questionnaire via email. Twelve respondents communicated in interviews; four provided their responses as written communication (email or .docx files).

(These interviews were extremely helpful in relation to this report and the Inception Report; much of the value that our outputs provide to the DFID Education Technology Hub results directly from these conversations. We are grateful to all individuals who contributed their time, thoughts, and opinions. Please refer to the Acknowledgements for a complete listing of respondents and others who contributed to this report.)

To the maximum extent possible, this Second-Stage Report mitigates methodological limitations of the Inception Report. However, this review was not intended to be conclusive, nor is it so; we have not attempted to determine the reliability or quality of any individual study cited. Our assessments should be seen as advisory.

Nonetheless, our inquiry and the presentation of information has been systematic within the above limits. Initiatives are described concisely in relation to beneficiary populations, EdTech tools, and objectives. In addition to funding for EdTech, when discoverable, donor-provided funding for education is catalogued. Our approach to researchers, who in most cases are not resident in either DFID-priority countries or in the focal countries of this report, are supplemented by a list of several international researchers who have expressed interest in supporting and/or have the expertise to support the research activities of the Education Technology Hub.

While the limitations, and most the critically limitations of time, are important, they have generally not impeded our ability to formulate accurate characterisations of the EdTech topography of each country.

1.3.2 A caveat

This report has been developed to support the launch of the Education Technology Hub for Research and Innovation by DFID, and as such does not present an exhaustive view of EdTech. Primary methods in developing the report are web-based inquiry and review coupled with interviews and correspondence with persons knowledgeable about the field of education technology, or about the contexts of education and/or technology in the seven focal countries. While we have consulted research articles to determine the impact of EdTech initiatives, our ability to search for, review, and assess multiple sources has been limited. Of perhaps greater importance, crucial first-hand perspectives – of students and teachers, of families, of NGOs, or ministry personnel – have not been captured by our process. In recognition of these limitations, many of the recommendations framed in this report refer to additional inquiry and to activities that could confirm or challenge our observations.
2 EdTech and EdTech innovations

‘EdTech’, within this review, is defined as:

the use of digital, innovative, and emerging technologies to support teaching and learning. It has transformative potential to accelerate education development, both for improving the quality of education that a student receives and for reaching the most marginalised and disadvantaged children.

‘Innovation’, again within this review, is defined as:

the creation and implementation of new ideas, technologies and methodologies and/or approaches taken from other contexts and adapted to the current context, to achieve better teaching and learning outcomes by addressing existing problems or serving unmet needs.

DFID’s operative definition of innovation includes two elements that have proven critical to the current report and to consideration of EdTech in developing countries.

First, innovation as framed includes a focus on problems and unmet needs; the DFID definition requires that innovation be problem-based, and that it exemplify applied creativity rather than creativity for its own sake.

Second, innovation as defined includes the re-purposing of existing approaches to respond to new contexts. Innovation is not limited to leading-edge application of learning science or to the introduction of personalised, game-based, or other pedagogical approaches that are proliferating (primarily in developed countries) as a result of the affordances of technology.

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10 Definitions in this section are drawn from materials developed and/or provided by DFID and EDT in relation to contracting this assignment.
3 Summary of the Inception Report

The Inception Report for this assignment comprised an initial scoping inquiry addressing EdTech innovation in 28 countries to which DFID has assigned priority in Sub-Saharan Africa, South Asia, and MENA. The objective of that effort was to provide DFID with broadly conceived and efficiently researched information about sources and potential sources of EdTech innovation in the priority countries. That information was intended to serve, and in the event has served, as a foundation for this Second-Stage Report, which focuses more intently on a few countries in each of the three regions.

We designed our approach in that activity to identify drivers of innovation in EdTech that are national in origin and focus. Such drivers could include policy documents promoting the use of EdTech to improve learning outcomes, the presence of business mentoring, or efforts to improve connectivity or internet use, among others. Our objective was to enable accurate assessment of the national environment for EdTech innovation. (Our provisional scoring of the 28 countries is included as Country ratings.) That report found a range of achievement and awareness among the 28 countries. In South Africa, for example, internet regulatory policy has led to the emergence of a cluster of initiatives promoting access to literature via mobile devices. In countries with less favourable environments, such as Kyrgyzstan, policies that promote the study of information technology (ICT) as a subject have been accompanied by the introduction of costly and ineffective computer labs in schools.

Predictable factors influencing EdTech innovation include current and recent conflict, and recent political challenges – both of which are negatively correlated with EdTech activity and innovation – and the presence of national, non-governmental funding such as that provided by charitable foundations, which correlates positively with EdTech innovation.

Our brief scoping inquiry addressed in each of the 28 countries the five areas of inquiry listed above. This Second-Stage Report provides additional information about those five categories in the seven focal countries.

3.1 Country assessments

The Inception Report includes numerical assessments of the EdTech environments in the countries investigated. These ratings, while not definitive, are provided to enable rapid grasping and comparison of the current support for EdTech innovation in each country, and by extension the capacity for EdTech innovation in the near-term future. Ratings were determined by the application of a five-point scale in relation to each of the five areas of inquiry.

Our provisional findings suggest the following groupings:

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11 Philanthropic giving in support of education is linked to national economic performance, with links too to levels of EdTech innovation. In India, one of our focal countries, successful entrepreneurs such as Nandini Nielekani have provided both financial and technical support for EdTech innovation. Globally, consortia of funders with the impetus of philanthropists – such as the Global Learning xPrize, started by the entrepreneur Elon Musk – have also spurred the development of innovative uses of technology to address education problems. In India, however, several exemplary and innovative initiatives, such as the Digital Education Initiative of Pratham Education, are driven by leaders of change in education (in this instance, Madhav Chauhan) who are not directly connected to specific philanthropists. To be categorised as 'innovative', an initiative must take advantage of current technologies (e.g., mobile devices, mobile broadband, on-board or local storage, alternative energy, etc.), pedagogies focused on developing 21st-century skills (e.g., game-based learning or gamification, project-based learning, collaborative learning, personalised learning, etc.), or must make use of an older technology (e.g., SMS) in a new way (e.g., to support EMIS-style reporting).
• **High achievers**
  India, Jordan, Kenya, South Africa

• **Moderate achievers**
  Bangladesh, Lebanon, Malawi, Nepal, Rwanda, Tanzania, Zambia

• **Low achievers**
  Ethiopia, Ghana, Liberia, Mozambique, Nigeria, Occupied Palestinian Territories, Uganda

• **Very low achievers**
  Afghanistan, Burma, Democratic Republic of Congo, Iraq, Kyrgyzstan, Pakistan, Sierra Leone, Syria, Tajikistan, Yemen, Zimbabwe

Our assessment of achievement at the country level contours our overall understanding of the environment for EdTech innovation. High-achieving countries, seen from this perspective: host several innovative initiatives; support the use of EdTech to improve learning outcomes (rather than establishing ICT as an examinable subject); host hubs for innovation in private-sector technology or in education; support a research community; and have engaged a wide range of funders. Countries that achieve at a lower rate fail in one or more of these categories. Very low achievers demonstrate the correlation between conflict and/or governmental instability and poor performance in relation to EdTech innovation. In some instances (e.g. Nigeria), countries give rise to private-sector innovation in technology without providing an avenue for the support of public education or government schools. Refer to Country ratings for country scores and scoring methods.
4 International researchers

This section lists international education researchers (i.e. researchers who are not residing in any of the focal countries) who are able to design, conduct, and complete analysis of initiatives such as those described in this report. While the governments of the countries in question support higher-education institutions with research faculty, we have not been able in all instances to identify education researchers who are experienced leaders of impact assessments. The following are education researchers of exceptional capacity who are familiar with and in some instances connected to the countries in question.

We strongly support efforts to develop in-country and regional research capacity. At a minimum, such efforts should include co-authorship as a means of ensuring end-to-end collaboration among international researchers and researchers in national institutions. Effective co-authorship and collaboration will likely act as stronger incentives when opportunities for future partnerships and engagements are also at hand. However, efforts to develop research capacity should aim to achieve regional scope, engaging researchers in institutions known for the quality of their research (e.g. the University of Cape Town).

Researchers have been listed based on their known ability to design and manage impact assessments and/or policy studies of education technology in developing countries or technology-for-development (ICT4D) initiatives. Listed researchers have published such studies in peer-reviewed journals within the past five years.

Based on several interviews, including some with research-oriented respondents who focus on education or EdTech outside of development contexts, we strongly recommend that all researchers supported by the Education Technology Research and Innovation Hub should have substantial experience in development contexts. It is crucial that researchers have experience with and understanding of the challenges of organisational capacity, human capacity, infrastructure, and other factors that condition education systems in developing countries.

In several instances, the listed researchers are affiliated with private-sector firms or with iNGOs. While their direct participation might not in some cases be possible or appropriate, these persons will be able to identify others who can conduct appropriate assessments.

This section lists researchers, in alphabetical order. Contact information for researchers listed here and throughout this report is available on request.
Table 1: International education researchers

<table>
<thead>
<tr>
<th>International researchers</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amy Jo Dowd</td>
<td>Senior Director, Education Research&lt;br&gt;Save the Children US&lt;br&gt;Dr Dowd has completed research in many DFID-priority countries and elsewhere. She has collaborated on research with Elliott Friedlander.</td>
</tr>
<tr>
<td>Polly Gaster</td>
<td>Head of ICT4D, Centre for Informatics&lt;br&gt;Eduardo Mondian University, Mozambique&lt;br&gt;Although her research does not focus on education strictly speaking, Dr Gaster is a well-known and widely respected investigator of technology-for-development. Her perspective is frequently sceptical.</td>
</tr>
<tr>
<td>Elliott Ware Friedlander</td>
<td>Founder and director, International Network Facilitating Education Research&lt;br&gt;Dr Ware has conducted research in Malawi, Rwanda, and other DFID-priority countries. He has collaborated with Amy Jo Dowd and has worked at Save the Children US.</td>
</tr>
<tr>
<td>Amber Gove</td>
<td>Director of Research, Research Triangle International (RTI)&lt;br&gt;Dr Gove has designed, led, and contributed to education research projects in Kenya and in other DFID-priority countries.</td>
</tr>
<tr>
<td>Francine Menashy</td>
<td>Assistant Professor, Dept. of Leadership in Education&lt;br&gt;School of Education and Human Development&lt;br&gt;University of Massachusetts&lt;br&gt;Dr Menashy's research addresses, among other issues, aid channels, and the topography of donor support for education and private-sector participation in education.</td>
</tr>
<tr>
<td>Nicola Pitchford</td>
<td>Associate Professor, School of Psychology&lt;br&gt;University of Nottingham&lt;br&gt;Dr Pitchford's research includes RCTs in Malawi, Kenya, and the UK, assessing the impact of the onebillion.org approach. Her academic network and current interests include research possibilities in MENA and South Asian countries. She specialises in the study of children's cognitive development.</td>
</tr>
<tr>
<td>Zeena Zakharia</td>
<td>Assistant Professor of International and Comparative Education&lt;br&gt;College of Education and Human Development&lt;br&gt;University of Massachusetts&lt;br&gt;Dr Zakharia has collaborated with Francine Menashy, and has worked with UNICEF, Save the Children, the Government of Syria, and many other organisations engaged in development education.</td>
</tr>
</tbody>
</table>

As is the case throughout this report, this list is not exhaustive. There are many other excellent and committed researchers in development and development education. Our goal has been to provide DFID with the information necessary to take initial steps towards the design and planning of effective research.

In this section and in other sections, this report has no bearing on DFID's procurement processes or outcomes.
5   Country profiles

The following sections present the profiles of the seven focal countries selected for additional inquiry and reporting. Information-gathering methods centred on internet-based research, complemented by virtual interviews with respondents\textsuperscript{12} and email communication. Interview respondents and email correspondents are listed in the Acknowledgements; information provided in interviews and in correspondence is summarised and/or paraphrased, in part to respect and help maintain the anonymity of respondents.

5.1   Bangladesh country profile

Education in Bangladesh is a story of relative success. Following on from the achievement of Millennium Development Goals for enrolment and UPE, government funding is shifting from primary education to secondary education (Ridwanul, 2017). As in many countries, however, student learning and the relevance of the curriculum remain low.

Available funding could pose challenges to the fielding of EdTech in Bangladeshi schools. Spending is low as a proportion of GDP and of overall government spending (World Bank, 2016). As noted in Table 3, plans in some cases remain unspecific; in the case of plans that are more specific in terms of actions, evidence that these actions (e.g. procurement) have been funded has not been discovered.

5.1.1   Innovative initiatives

We have not discovered technology or EdTech initiatives helping to meet the needs of the hundreds of thousands of Rohingya who have migrated from Myanmar to Bangladesh as refugees. However, evidence shows that Rohingya children have ready access to mobile devices (e.g. smartphones) and that they use them for communication, planning and to achieve other objectives while they are 'on the move' (Thorpe and Supaporn, 2017).

\textsuperscript{12} Interview methods relied on Skype and email.
**Table 2: Innovative initiatives, Bangladesh**

<table>
<thead>
<tr>
<th>Innovative initiatives</th>
<th>(Unless otherwise noted, results in relation to teaching and learning are anecdotal, unsupported by research or evaluation of impact.)</th>
</tr>
</thead>
</table>
| **BBC Janala**                                      | BBC Janala is designed to enable millions of people in Bangladesh to learn English, in part as a means of improving their employment prospects.  
BBC Janala provides audio- and game-based learning opportunities to users who dial in (at reduced rates). The initiative also provides learning materials on a website. The primary programme, English in Action, has scored well in DFID reviews, and has been determined (English in Action, 2015) to improve English-language learning at scale.  
The initiative is scheduled to be completed in 2018. |
| **Audio-visual materials for English-language learning** | Save the Children provided curriculum-linked audio-visual materials for English-language learning to a Ministry of Education (MOE) website designed to host such materials. Materials were developed in 2014–15. |
| **ICT integration training for teachers**            | BRAC initiated TPD to help teachers increase their computer skills, specifically centring on use of PowerPoint as a tool to support whole-class instruction. The initiative helps teachers build their capacity to develop presentations of their self-generated lesson plans and other materials.  
(The scale is 25 teachers trained per year.) |
| **Computer-aided learning**                         | BRAC piloted and scaled (to 50 schools) this initiative, in which school computer labs are provided with Compact-Disc-Read-Only-Memory-based interactive learning resources (with resources also uploaded to a central web portal). Among the goals of the initiative is to facilitate transition from a teacher-centred model to one that is more interactive. |

Note that the fifth iteration of BRAC's Frugal Innovation Forum, convened in November 2017, addressed education as the main topic, with additional attention on improving quality and achieving scale. Many representatives of private-school systems were listed on the agenda, as were donor-agency personnel, including DFID representatives Ian Attfield, Fahmida Shabnam, and Annette D'Oyly.

### 5.1.2 Government buy-in and political will

The initiatives listed in Table 2 are not funded by the Government of Bangladesh, although it is a partner in them. The Government of Bangladesh is a partner in the Bangladesh Korea ICT Training Centre for Education, established in 2007. In addition, the office of the prime minister runs the Access to Information programme, which aims to promote development by providing access to information and through support for entrepreneurs and social innovators.
Table 3: Policies and plans, Bangladesh

<table>
<thead>
<tr>
<th>Relevant policies and plans</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT strategic vision and plan (2014)</td>
<td>This plan, ascribed to the Directorate of Primary Education, outlines specific, actionable measures, focusing most concretely on the provision of EdTech hardware, software, and networking to schools and teacher colleges. (We did not find evidence of procurement.)</td>
</tr>
<tr>
<td>ICT in Education Masterplan (2012–2021)</td>
<td>Developed with support from UNESCO Bangkok as a complement to the 2010 National Policy on Education, the masterplan acknowledges the need to close digital inequities in relation to infrastructure, skills, and use. The plan is comprehensive and addresses the need for funding, but lacks concrete detail, and appears more aspirational than actionable as a result.</td>
</tr>
<tr>
<td>Digital Bangladesh (2008)</td>
<td>Digital Bangladesh is a statement proposed by the Awami League, one of the country's two major political parties, to promote development of the technology sector as a pro-poor measure.</td>
</tr>
<tr>
<td>Vision 2021 (2007)</td>
<td>This vision statement outlines measures to enable Bangladesh to participate in a global knowledge economy by the time of its 50th anniversary as a nation (2021). Goals range across democratisation, decentralisation, and poverty relief, among others.</td>
</tr>
</tbody>
</table>

In addition to these activities, the Government of Bangladesh hosted the 2016 meeting of the E9 (the nine most populous developing countries), addressing renewed commitments to SDG4, the sustainable development goal that addresses education.

5.1.3 Innovation networks and hubs

One indication of the state of technology innovation in Bangladesh is the involvement of state actors. In other countries included in this study (e.g. India, Kenya, Lebanon, etc.), support for innovation has been undertaken by the national and transnational private sectors.

Table 4: Innovation hubs and networks, Bangladesh

<table>
<thead>
<tr>
<th>Innovation hubs and networks</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BdREN</td>
<td>BdREN is the Bangladesh NREN, established in 2009 and currently featuring 100 member institutions.</td>
</tr>
<tr>
<td>Bangladesh Korea ICT Training Centre for Education</td>
<td>Established in 2007, the Centre provides many online courses intended to promote the development of technical skills among job seekers.</td>
</tr>
<tr>
<td>Coders Trust</td>
<td>Coders Trust, an initiative of Danida, is intended to support the development of technical skills among Bangladeshi youth so as to enable their entry into the freelance marketplace.</td>
</tr>
<tr>
<td>Startup Bangladesh</td>
<td>Startup Bangladesh is a Government of Bangladesh initiative with the objectives of launching an accelerator programme and linking Venture Capital (VC) to innovative technology start-ups.</td>
</tr>
<tr>
<td>SD Asia</td>
<td>SD ASIA was launched in partnership with Grameenphone Ltd. as an accelerator programme. SD Asia operates as a development platform for technology start-ups in Bangladesh. The programme is designed to provide local start-ups with the resources they need to build and grow, with services that include a four-month boot camp, and access to seed funding, expert mentors, top-notch curricula, and other resources.</td>
</tr>
</tbody>
</table>
5.1.4 Research

No researchers in Bangladeshi higher-education institutions were found.\(^{13}\) (Search terms used in Google Scholar were 'education Bangladesh' and 'education technology Bangladesh'; 95 records and all education-related abstracts were reviewed.) A recent review of the EdTech component of the United States Agency for International Development (USAID) project Reading Enhancement for Advancing Development features the ICT in education manager of Save the Children, Aklima Sharmin, who is based in Bangladesh, as lead author. Also featured is Shirin Lutfeali, advisor in basic literacy and numeracy in international programmes to Save the Children (Sharmin and Lutfeali, 2017).

5.1.5 Funding

Funding for EdTech in Bangladesh, as mentioned, is not robust. A substantial proportion of EdTech projects are funded directly by INGOs, such as Save the Children and BRAC (which is headquartered in Bangladesh). While 'direct' funding is provided by these organisations, original sources of funds—which could include privately made charitable contributions and funds from foreign governments [e.g. UK, US, etc.]—are not known.

Table 5: Funding institutions, Bangladesh

<table>
<thead>
<tr>
<th>Programme funders and partners</th>
<th>(This table includes overall funding for education, not for EdTech alone, except as noted.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government of Bangladesh</td>
<td>Government spending as a percentage of the federal budget has remained steady at about 2% per year (Rahman, Khan and Sabbih, 2016). Estimated spending is GBP 620 billion (United States Department of Agriculture, 2016).</td>
</tr>
<tr>
<td>USAID</td>
<td>Total spending by USAID in Bangladesh in FY 2016 was GBP 184 million. However, education comprises a small part of expenditure, GBP 2.1 million (USAID, 2017). No funding was specifically linked to EdTech.</td>
</tr>
<tr>
<td>DFID</td>
<td>Overall funding by DFID for education in Bangladesh in FY 2017 is GBP 43.1 million. No funding is specifically linked to EdTech.</td>
</tr>
<tr>
<td>World Bank</td>
<td>World Bank provided funds for BdREN, among other initiatives, as part of the GBP 64 million Higher Education Quality Enhancement Project, running from 2009 to 2018.</td>
</tr>
</tbody>
</table>

5.1.6 Analysis and recommendations

While the technology and EdTech landscapes in Bangladesh are not as vibrant as in India and some of the other countries included in this study, civil society is active, with many effective NGOs— including BRAC, the largest NGO in the world, and the Grameen organisations, including Grameenphone. BRAC, in addition, operates one of the world's largest networks of non-formal schools.

While there are challenges stemming from collaboration with the government, the organisations and activities in civil society can support both trialling of smaller-scale EdTech innovations and scaling-up of those that are successful.

In addition, Bangladesh has in the past three years taken in hundreds of thousands of refugees from Myanmar. UNICEF is, during FY 2017–18, launching 1,500 learning centres to meet the needs of 200,000 Rohingya children (ReliefWeb, 2017).

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\(^{13}\) Respondents at DFID have suggested that education researchers in Bangladesh are known to them.
Recommendations include the following possible near-term actions:

- **Localise and replicate Pratham Education’s Digital Education Initiative among refugee populations in Bangladesh and assess the initiative’s impact on psychosocial well-being, engagement, information literacy, and readiness to learn.**

  The Digital Education Initiative is designed to engage small groups of disaffected youth in lifelong learning via shared mobile devices. Youth and children in refugee populations who have experienced trauma are known to learn at lower rates than their non-refugee peers (Aber et al., 2017). The Distributed Education Initiative is in the process of localisation for several languages (it has previously been localised into Bengali).

  The Education Technology Hub for Research and Innovation can support localisation and implementation among Rohingya youth in refugee camps in Bangladesh, complemented by research to determine the programme’s impact on psychosocial well-being (using a measure such as the Children and Youth Resilience Measure, developed by the Resilience Research Centre (resilienceresearch.org), as well as other impacts.

- **Localise, deploy, and assess the EduApp4Syria learning games.**

  The Education Technology Hub can support localisation and assessment of the EduApp4Syria learning games among refugee populations.

  Localisation should include not only translation into appropriate languages but also adaptation of images as necessary. Also, as mentioned, as per Thorpe and Supaporn (2017), Rohingya children demonstrate widespread use of mobile devices.

  In addition, the Education Technology Hub can pursue localisation of the EduApp4Syria games into Bangla and a Bangladeshi context, then leverage the existing experiences of iNGOs (e.g. BBC Janala, Save the Children) with initiatives using EdTech and specifically mobile telephony to support literacy learning.

- **Localise, deploy, and assess one or more integrated EdTech solution in a non-formal school system.**

  The proliferation of integrated school systems – systems that support direct instruction, TPD, and management functions – likely suits several of the larger systems of non-formal schools. Versions of these systems include UNICEF’s MobiSchool, oneclass by onebillion.org, and the BRCK Kio Kit.

  The Education Technology Hub can localise and deploy one or more of these systems in the extensive and dynamic context of NFE in Bangladesh. The scale of non-formal systems in Bangladesh likely establishes an appropriate environment for comparison testing of these solutions.

5.2 **India country profile**

India features the largest education system in the world, with 1.1 million government schools plus 320,000 private schools. In addition, India hosts the largest number of higher-education institutions of any country, with more than 700 universities (Gupta, 2017). As discussed briefly in this section, this large system is decentralised, with control over curricula and quality largely devolved to state directorates. The quality of India’s higher-education institutions, many of which are government funded, is generally high. However, government-funded primary and secondary schools have in many states been shown to be ineffective. In part as a result, enrolment in private schools is high.

The India EdTech landscape accordingly features a panoply of initiatives, ranging from projects that take advantage of mass media (e.g. PlanetRead and Galli Galli Sim Sim) to projects that frame and explore innovative approaches to systemic problems in education (e.g. the Digital Education Initiative).
5.2.1 Innovative initiatives

It is not possible within the scope of this inquiry to address most Indian initiatives; we have instead identified initiatives that are, from our perspective, unique, that hold promise either for scaling-up as they are conceived or as tools for the scaling-up of other initiatives, or that are representative of involvement by the Government of India.

Table 6: Innovative initiatives, India

<table>
<thead>
<tr>
<th>Innovative initiatives</th>
<th>(Unless otherwise noted, results in relation to teaching and learning are anecdotal, unsupported by research or evaluation of impact.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>StoryWeaver</td>
<td>StoryWeaver, an initiative of Pratham Books, is similar to the African Storybook Project (and to a lesser extent to ACR support for the Bloom authoring tool). StoryWeaver, however, places greater emphasis on professional writers and illustrators. Pratham Books hosts the online StoryWeaver portal, which offers a user-updated catalogue, enabling users to translate, write and/or illustrate books. The current catalogue of more than 7,000 Creative Commons-licensed books includes books in 104 languages.</td>
</tr>
<tr>
<td>PlanetRead</td>
<td>PlanetRead is a pioneer of same-language subtitling, in which songs (e.g. songs in Bollywood movies) are subtitled to promote non-formal literacy acquisition. PlanetRead pursues partnerships with Indian broadcasters so as to enable 300 million non-formal learners to progress from early-stage literacy (e.g. letter and word recognition, etc.) to reading fluency. Same-language subtitling has been shown in RCTs to improve reading fluency among learning-disabled students with a high return of VfM (McCall and Craig, 2009).</td>
</tr>
<tr>
<td>Play.Connect.Learn</td>
<td>Play.Connect.Learn was a 2016–17 initiative supported by ACR and implemented by Sesame Workshop India Trust. The initiative was based on the successful Sesame Workshop India television programme, Galli Galli Sim Sim. The initiative provided Year 1 and Year 2 students with interactive reading apps running on feature phones to improve early literacy learning. The initiative took place in Maharashtra State, delivering reading instruction in the Marathi language. The end-of-project evaluation of Play.Connect.Learn found a significant positive impact on learners' literacy skills (School-to-School International, 2017b) and determined that the project was scalable.</td>
</tr>
<tr>
<td>EkStep Platform</td>
<td>The EkStep platform, a project by the EkStep Foundation, is a large-scale, open-source platform for the creation, cataloguing, and discovery of digital learning resources. In addition, EkStep provides usage analytics and a (just-released) system for accessing stored content on Android devices offline. EkStep serves as the platform for the Government of India's National Teachers Platform (NTP) repository of OERs.</td>
</tr>
<tr>
<td>EkStep Genie</td>
<td>EkStep Genie offers Android users a virtual learning environment app that serves the EkStep platform's catalogue offline (including game-based learning apps). Genie, developed by GoodWorksLabs, is available as a beta-test download on Google Play.</td>
</tr>
<tr>
<td>Digital Education Initiative</td>
<td>Pratham Education's Digital Education Initiative (also 'Hybrid Learning Initiative') has distributed three thousand tablets in three states to explore the potential of self-organising NFE in villages as a means of increasing 'engagement' with learning. Learners in groups of five, with five to six groups per village, access the video and other content that they choose. The Digital</td>
</tr>
</tbody>
</table>

14 School-to-School International is an extremely credible source, and generally applies a well-structured composite method to their assessments of scalability. However, we are unaware of any determinations made by them that have found ACR-supported initiatives to be unscalable.
The overall commitment of the Government of India to 'digital India' is strong. However, commitment to primary and secondary education, and to the use of EdTech for school improvement, likely gives way to more pressing needs and to activities that have immediate and visible impact in areas of greater central control. The majority of government attention is focused on higher education and on high-capacity networks and agencies, such as the National University of Educational Planning and Administration, an organisation established under the Ministry of Human Resource Development (MHRD). (MHRD, occupying the role of an MOE, subsumes two departments: the department of school education and literacy and the department of higher education. However, in relation to primary and secondary education MHRD must work in partnership with state education directorates.)

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15 Mr Chauhan received the WISE Prize for Education in 2012. The award is frequently referred to as the 'Nobel Prize for Education'.
Table 7: Policies and plans, India

<table>
<thead>
<tr>
<th>Relevant policies and plans</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital India Programme</td>
<td>Digital India is a suite of plans and programmes, most of which are connected to the Ministry of Electronics and IT; they stem from a 'vision statement' by Prime Minister Narendra Modi. These programmes focus on governance but extend to infrastructure, transport, healthcare, employment, and other sectors or activity areas.</td>
</tr>
<tr>
<td>National policy on education</td>
<td>This policy originated in 1986 and was revised in 1992. (The original policy does not reference ICT in any detail.)</td>
</tr>
<tr>
<td>National Policy on ICT in School Education (2012)</td>
<td>This policy links to the National Policy on Education and states that the Government of India will deploy EdTech to achieve programme goals. The policy is specific and comprehensive, addressing: The use of EdTech to provide access to learning resources, and specifically mentions the need to develop interactive resources; Three stages of technology literacy for all students and teachers. Primary activities include the delivery of technology literacy training at all secondary schools, and the development of an 'ICT literacy curriculum'; The catalytic support that technology can provide learners who have special needs suggests that relevant standards should be adopted and vigorously supported.</td>
</tr>
</tbody>
</table>

The Government of India's statements express its commitment to leveraging EdTech to improve learning in higher-education institutions and in secondary schools, generally within the framework of the 25-year-old National Policy on Education. As part of this commitment, the National Mission on Education through ICT assumes responsibility for training 10,000 teachers in improved pedagogy; however, these teachers are in the electrical engineering faculties of higher-education institutions.

5.2.3 Innovation networks and hubs

Cataloguing technology hubs in India can focus on cities (and states) rather than on specific firms or NGOs. Bangalore, Hyderabad, Chennai, Mumbai, Delhi (Noida and Gurgaon), Pune, and Kolkata all host substantial numbers of technology firms. As an example of the scale of technology-related activity, WhatsApp, the most used chat application in the world, has its largest market, 200 million users, in India (TechCrunch, 2018).
Table 8: Innovation hubs and networks, India

<table>
<thead>
<tr>
<th>Innovation hubs and networks</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EduGild</td>
<td>EduGild, based in Pune, is a 'global' EdTech accelerator focused on the support of formal and non-formal learning at all levels. EduGild services include mentoring, capital generation, networking, resource development, co-working, brand development, marketing, and other activities. EduGild, announced in 2016, and founded in partnership with Maharashtra Institute of Technology, states that it is the first EdTech accelerator programme in India.</td>
</tr>
<tr>
<td>EdTech Summit</td>
<td>The EdTech Summit takes place in New Delhi in February 2018.</td>
</tr>
<tr>
<td>EdTech Review</td>
<td>The EdTech Review is an India-based online clearing house for news and information about India's EdTech sector (edtechreview.in)</td>
</tr>
<tr>
<td>GoodWorksLabs</td>
<td>GoodWorksLabs is a technology firm based in Bangalore, with offices in Kolkata, San Francisco, and New York state. The firm is focused on app design and developed the Genie app for EkStep Foundation. The firm's mission includes 'changing the world through technology and design'.</td>
</tr>
<tr>
<td>Centre for IT in Education (CITE)</td>
<td>This research lab in the Indian Institute for Information Technology (IIIT), Hyderabad, has as its mission the development of EdTech tools suited to the Indian context and supporting formal and NFE. Projects include the development of a virtual physics lab supported by MHRD, with 40 interactive simulations in English and Telugu.</td>
</tr>
</tbody>
</table>

As with the situation globally, a great number of start-ups and hubs in India are focused on realising opportunities that arise from the privatisation of education. While low-cost private schools in many circumstances deliver valuable, high-quality services in comparison to government schools, private-sector investments can seek to harvest revenues from a 'grey market' of test preparation and tutoring – often without evidence supporting their effectiveness. Additionally, opportunities in higher education drive investment and innovation.

5.2.4 Research

As is the case in several countries addressed in this report, several of the potential lead researchers are expatriates. However, with its well-developed system of higher-education institutions, India also features numerous researchers able to design, implement, and conclude experimental assessments of impact. (Given the large number of higher-education institutions and of researchers in India, search methods centred on research of faculties at institutions, such as CITE, known to be engaged in research and development of EdTech initiatives. Expatriate researchers include several of the best-known and/or most-accomplished investigators of ICT4D and development education, and again are not intended to comprise an exhaustive list.)
Transforming Education Through Technology

Table 9: Potential lead researchers, India

<table>
<thead>
<tr>
<th>Potential lead researcher</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Jyianthi Sivaswamy</td>
<td>Director, CITE research lab IIIT Hyderabad</td>
</tr>
<tr>
<td></td>
<td>Dr Sivaswamy directed the development of CITE's virtual physics lab. Her primary areas of interest are robotics, optics and vision systems (not education specifically).</td>
</tr>
<tr>
<td>Kavita Vemuri</td>
<td>Senior research scientist, CITE research lab IIIT Hyderabad</td>
</tr>
<tr>
<td></td>
<td>Dr Vemuri's areas of interest include the neuroscience of empathy, game design, innovation, and entrepreneurship, among others. She is the sole faculty member of IIIT's Serious Gaming group.</td>
</tr>
<tr>
<td>Ashok Jhunjhunwala</td>
<td>Professor, Department of Electrical Engineering IIIT Madras</td>
</tr>
<tr>
<td></td>
<td>Dr Jhunjhunwala is among the most honoured figures in technology in India. The focus of his research and development has been on increasing internet access and use, rather than on learning outcomes specifically; however, his students have gone into many different sectors as researchers, innovators, and entrepreneurs – frequently engaging in combinations of these three roles.</td>
</tr>
</tbody>
</table>

Notable expatriate researchers, education researchers, and EdTech researchers include the following.

Table 10: Expatriate lead researchers, India

<table>
<thead>
<tr>
<th>Expatriate lead researcher</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Raj Reddy</td>
<td>Chairman, IIIT Emeritus professor, Carnegie Mellon University</td>
</tr>
<tr>
<td></td>
<td>Dr Reddy is the first Indian national to win the Turing Award (1994). In addition to his work on artificial intelligence he has collaborated with key figures in learning science, including Alan Kay, Seymour Papert, and Terry Winograd. (Dr Reddy is a native of the state of Madras.)</td>
</tr>
<tr>
<td>Sugata Mitra</td>
<td>Professor of educational technology Newcastle University</td>
</tr>
<tr>
<td></td>
<td>Dr Mitra was awarded the Technology, Entertainment, Design Prize in 2013. While Dr Mitra's research findings are worthy of further inquiry, the impact of his 'hole-in-the-wall computer' experiments on projects such as Pratham Education's Digital Education Initiative has been substantial. (Dr Mitra is a native of the state of Bengal.)</td>
</tr>
<tr>
<td>Abhijit Banerjee</td>
<td>Professor of economics, Massachusetts Institute of Technology Co-founder, Abdul-Lateef Jameel Poverty Action Lab (J-PAL)</td>
</tr>
<tr>
<td></td>
<td>Dr Banerjee is credited with introducing the rigour of RCTs into policy-making and decision-making. (Dr Banerjee is a native of the state of Bengal.)</td>
</tr>
<tr>
<td>Sendil Mullainathan</td>
<td>Robert C. Wagner Professor of economics, Harvard University Co-founder, J-PAL</td>
</tr>
<tr>
<td></td>
<td>Dr Mullainathan is a professor of economics at Harvard University, and a noted scholar of development economics, including research on poverty. (Dr Mullainathan is a native of Tamil Nadu.)</td>
</tr>
</tbody>
</table>

5.2.5 Funding

Funding for EdTech in India, as opposed to other countries included in this study, involves substantial involvement of philanthropic organisations. International organisations of this type include Google Foundation (as per Table 11) and individual philanthropists.
Table 11: Funding institutions, India

<table>
<thead>
<tr>
<th>Programme funders and partners</th>
<th>(This table includes overall funding for education, not for EdTech alone, except as noted.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government of India</td>
<td>The majority of government financial support for primary education is provided by state governments, with per-student levels varying widely (although these levels correlate loosely to per-capita income). Higher-spending states include Haryana, Gujarat, Uttaranchal, and Jammu and Kashmir. Lower-spending states include Bihar, Jharkhand, and West Bengal (Dongre, Kapur, and Tewary, 2015).</td>
</tr>
<tr>
<td>USAID</td>
<td>Education comprises a very small part of USAID expenditures in India, approximately GBP 3.3 million out of total spending of GBP 127 million in 2016 (USAID, 2017). No funding was specifically linked to EdTech.</td>
</tr>
<tr>
<td>DFID</td>
<td>Overall funding by DFID for education in India in FY 2017 is GBP 7.9 million. No funding is specifically linked to EdTech.</td>
</tr>
<tr>
<td>Google.org</td>
<td>The Google Foundation is contributing GBP 2.57 million to Pratham Books for StoryWeaver, 2.2 million to Pratham Education Foundation for the Digital Education Initiative, 850,000 to Million Sparks Foundation, and 350,000 to the Learning Equality Foundation.</td>
</tr>
<tr>
<td>Central Square Foundation</td>
<td>Central Square Foundation provides grant-based funding to NGOs and social enterprises to improve the Indian school system.</td>
</tr>
</tbody>
</table>

Table 12: Philanthropists, India

<table>
<thead>
<tr>
<th>Philanthropic funders of EdTech</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rajesh Jain</td>
<td>The founder of Netcore and Novatium, Rajesh Jain has contributed the equivalent of millions of GBP to issues surrounding rural connectivity and learning. Investment in these areas has included development of the Novatium 'sub-$100 network PC', a low-power laptop that was at the time a leader in price/performance.</td>
</tr>
<tr>
<td>Azim Premji</td>
<td>Billionaire Azim Premji has given over one quarter of his wealth to the Azim Premji Foundation. The Foundation's mission is to contribute to achieving high-quality universal education that facilitates a just, equitable, humane, and sustainable society. Among the first initiatives of the foundation was the development of a Computer Assisted Learning Programme, intended to enhance the learning experience of students in government schools.</td>
</tr>
<tr>
<td>Nandini Nilekani</td>
<td>Nandini Nilekani established the EkStep Foundation with a US $10 million private contribution.</td>
</tr>
</tbody>
</table>

Many other individuals contribute time and money to funding institutions (such as Central Square Foundation), or as volunteers to EdTech networks and initiatives (such as the Granny Network started by Prof Sugata Mitra).

5.2.6 Analysis and recommendations

Several respondents suggested that an effective approach in India, given the country’s size and diversity, involves communicating with people with local knowledge – in-country offices, if available, and with persons who have developed networks enabling them to identify opportunities. Nevertheless, based on our inquiry thus far we can suggest several pathways for further exploration.

- Replicate the Digital Education Initiative (of Pratham Education in India) among refugee populations in Bangladesh, assessing the initiative’s impact on psychosocial well-being, engagement, information literacy, and readiness to learn.
  
  Please refer to analysis and recommendations in the Bangladesh country profile.
• Formalise and implement effective assessment of AKDN’s locally developed EdTech pilot tests.

The Education Technology Hub for Research and Innovation can partner with AKDN to improve research practice and to assess the impact of actions intended to improve AKDN schools.

The AKDN pilot test process, planned for 2018–19, is designed to uncover local solutions to common problems in schools. In terms of respondents, effective impact assessment with quantitative models (e.g. RCT, DiD) is likely to be outside the capacity of AKDN and its schools. The same AKDN respondents have commented on the potential for partnership and/or collaboration with DFID to improve the impact assessment of these measures as they develop.

• Further assess the potential for scaling of Connect.Play.Learn.

As noted, the end-of-project report commissioned by ACR finds that this initiative of the Sesame Workshop India Trust achieves both significant impact on learning outcomes and high ‘scalability’. The current status of the project – for which ACR funding was completed in 2016 – is unknown. The Education Technology Hub can make additional inquiry into the potential for partnership and replication and can, as warranted by this inquiry, support such replication.

5.3 Jordan country profile

The JEI remains the signature EdTech initiative in Jordan, although it launched originally in 2003. A novel PPP initiated at the World Economic Forum linked 45 organisations, including donor agencies, government, and the private sector. However, this PPP proved unwieldy and unworkable, in part due to limited support for TPD, limited EdTech infrastructure, competing interests among the private sector and public schools, lack of capacity (including management capacity) within the MOE (Abuhmaid, 2010),*** and a lack of learning resources (Hamam, Abu Abbas, Abdel-Qader and Abu-Shanab, 2008). JEI was placed under the aegis of QRF in 2013. A review of more recent literature and research (Alkhawaldeh and Menchaca, 2014) does not identify changes to the JEI model, suggesting that attention to and support for key elements (e.g. infrastructure) continues.

In addition, several EdTech initiatives support refugee children. Ustad Mobile (formerly Paiwastoon in Afghanistan) will be testing EdTech solutions in Jordan as part of the Dubai Cares Humanitarian Accelerator in 2018. (This activity, which is still evolving, will be addressed in detail in the upcoming Second-Stage Report.)

With these and the other initiatives listed in Table 13 in mind, it is important to observe that most correspondents referring to EdTech in Jordan report very limited activity. (These correspondents include a Jordanian academic, the former executive director of a Jordanian EdTech NGO, and several individuals at the World Bank.)

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16 Citing Castells, Abuhmaid links these factors to an implicit economic and technical hegemony latent in the efforts of donor agencies and transnational corporations to promote the use of technology in developing countries.
### 5.3.1 Innovative initiatives

#### Table 13: Innovative initiatives, Jordan

<table>
<thead>
<tr>
<th>Innovative initiatives</th>
<th>(Unless otherwise noted, results in relation to teaching and learning are anecdotal, unsupported by research or evaluation of impact.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>JEI</strong></td>
<td>JEl operates 100 testbed schools (‘Discovery schools’) in Amman and supports other schools nationwide to accelerate education reform through the integration of ICT in education.</td>
</tr>
<tr>
<td><strong>Qysas</strong></td>
<td>This initiative, by Little Thinking Minds, offers an interactive and animated Arabic early grade literacy app that provides over 125 eBooks. Reaching at least 10 schools and 350 students, Qysas is intended to complement JEI. Qysas was supported by ACR.</td>
</tr>
<tr>
<td></td>
<td>An ACR-sponsored evaluation (School-to-School International, 2017b) shows several areas where students in an intervention group achieved significant gains over students in a comparison group. (The intervention as fielded comprised both increased teacher focus on literacy learning and the use of EdTech. Elements of the end-of-project evaluation suggest that reading more books results in equivalent gains.)</td>
</tr>
<tr>
<td><strong>EduApp4Syria</strong></td>
<td>EduApp4Syria is a challenge-style competition funded by Norad and USAID. The initiative has supported development and testing of competing game-based learning apps to promote literacy as learners use their families’ own mobile devices. Two literacy-learning finalists were made available on Google Play in 2017, enabling them to be downloaded by Syrian refugees (and others) anywhere.</td>
</tr>
<tr>
<td></td>
<td>An evaluation managed by Digital Learning for Development is scheduled for publication in early 2018.</td>
</tr>
<tr>
<td><strong>LearnSyria</strong></td>
<td>This project by the Rumie Initiative, a Canadian NGO, builds on their two primary offerings, the Rumie tablet (ruggedized, and pre-loaded with learning resources, with their custom interface) and the LearnCloud online repository of OERs. Rumie is a 2017 winner of the Google Impact Challenge for its work with First Nations people in Canada. LearnSyria is an opportunity for private contributors to donate directly to Rumie’s efforts in relation to Syrian refugees.</td>
</tr>
<tr>
<td><strong>Can’t Wait to Learn</strong></td>
<td>Scheduled to begin in late 2017, this initiative by War Child Holland provides schools with tablets pre-loaded with curriculum-linked educational games. The initiative was piloted among Internally Displaced Persons (IDPs – people forced to leave their homes while remaining in their countries of origin) in Sudan.</td>
</tr>
<tr>
<td><strong>Ustad Mobile</strong></td>
<td>Ustad Mobile (based in United Arab Emirates (UAE) in combination with Plan International will provide TPD for kindergarten teachers in Jordan using mobile devices, with instructional resources transferred by teachers to families. Content and software development are underway, with programme launch scheduled for September 2018. A DID evaluation is planned to support assessment of the impact of the mobile devices.</td>
</tr>
<tr>
<td><strong>EduWave</strong></td>
<td>EduWave is a long-established portal for learning resources supported by the Government of Jordan.</td>
</tr>
<tr>
<td><strong>Edraak</strong></td>
<td>Edraak is currently the QRF initiative with the highest profile, although as conceived the initiative focuses on e-learning in higher-education institutions. In 2017–18, however, a version of Edraak will be developed to provide access to OERs to secondary-level Arabic-speaking learners throughout the MENA region.</td>
</tr>
</tbody>
</table>

(Ustad Mobile in addition provides a low-cost content development and virtual learning environment (eXeLearning), along with EMIS, that is intended to support the use of mobile devices for learning (www.ustadmobile.com).
5.3.2 Government buy-in and political will

The MOE of the Government of Jordan has not made education policies, including those related to EdTech, available online. Assessing the level of government buy-in, based on current activities, suggests that the Government of Jordan is opportunistic – MOE embraced JEI, which was essentially a zero-cost proposition – but that a stronger and more informed commitment could increase EdTech impact.

As observed, current nationwide initiatives (e.g. JEI) are run through QRF.

Table 14: Policies and plans, Jordan

<table>
<thead>
<tr>
<th>Relevant policies and plans</th>
<th>Education Reform for the Knowledge Economy</th>
<th>Jordan Vision 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>JEI</td>
<td>JEI can be considered the EdTech complement to ErfKE, a plan developed originally in 2002 and updated (as ErfKE II) in 2012. The plan includes increased enrolment in basic and secondary schools but also development of the skillsets required by the global knowledge economy.</td>
<td>Vision 2025 is an economic plan for development, based on assumptions of annual GDP growth ranging between 4.8 and 7.5%.</td>
</tr>
</tbody>
</table>

5.3.3 Innovation networks and hubs

Despite the challenges faced by its education system, Jordan offers a reasonable environment for foreign and domestic organisations focused on innovation. (That environment stems from factors that include government stability and relative security while providing access to countries and firms in the MENA region.) While the number of firms and their diversity is not high – all entries in Table 15 are connected in some way with the Royal Scientific Society – Jordan has a history of hosting start-ups and foreign technology firms (Krivitskaya, 2015).

Table 15: Innovation hubs and networks, Jordan

<table>
<thead>
<tr>
<th>Innovation hubs and networks</th>
<th>iPark</th>
<th>Microsoft Innovation Centre (MIC)</th>
<th>Wamda</th>
<th>Arab States Research and Education Network (ASREN)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>iPark is a Jordanian technology incubator with offices in Amman, Irbid, and Aqaba, supporting start-ups through mentorship, investment facilitation, intellectual property and commercialisation services, and networking activities.</td>
<td>One of 100 MICs worldwide, MIC Jordan focuses on the development of technology skills among local firms and personnel, with an additional focus on students in higher-education institutions. MIC Jordan has also collaborated with the UN High Commission on Refugees (UNHCR) to provide technology training to promote employment.</td>
<td>Wamda is a platform of integrated programmes that seeks to accelerate entrepreneurship across MENA. The organisation is headquartered in Dubai.</td>
<td>Jordan is a member of the Arab States Research and Education Network.</td>
</tr>
</tbody>
</table>

5.3.4 Research

No potential lead education researchers currently in Jordan were found via searches of academic literature. (Search terms used in Google Scholar were 'education research Jordan'; 95 records and
all education-related abstracts were reviewed. The persons listed in Table 16 have been suggested by colleagues and correspondents.

### Table 16: Potential researchers, Jordan

<table>
<thead>
<tr>
<th>Potential researcher</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hana Addam El-Ghali</td>
<td>Issam Fares Institute for Public Policy and International Affairs, American University of Beirut. Dr El-Ghali's recent research has addressed education access for Syrian refugees in Lebanon, Jordan, and Turkey.</td>
</tr>
<tr>
<td>Reem ALKharouf</td>
<td>Dr ALKharouf is an independent researcher based in Jordan. She has completed evaluations and research assignments for UN agencies, the Government of Jordan, and others.</td>
</tr>
<tr>
<td>Fida Adely</td>
<td>Dr Fida Adely holds the Clovis and Hala Salaam Maksoud Chair in Arab Studies in the School of Foreign Service, Georgetown University. Her areas of research focus include education in Jordan and girls' education.</td>
</tr>
</tbody>
</table>

### 5.3.5 Funding

#### Table 17: Funders, Jordan

<table>
<thead>
<tr>
<th>Programme funders and partners</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government of Jordan</td>
<td>Education funding comprised 12.7% of the Government of Jordan budget in 2015 (USAID, 2015), somewhat less than the 18–20% average among MENA countries. The overall budget in 2015 was GBP 3.85 billion.</td>
</tr>
<tr>
<td>USAID</td>
<td>USAID funding for primary education in FY 2016 was approximately GBP 24 million (USAID, 2017), which includes GBP 7.2 million for early grade reading and maths improvement, with the bulk of the remainder allocated for basic education. No funding was specifically linked to EdTech. Humanitarian funding was GBP 177 million.</td>
</tr>
<tr>
<td>DFID</td>
<td>Overall funding by DFID for education in Jordan in FY 2017 is GBP 17 million. No funding is specifically linked to EdTech.</td>
</tr>
<tr>
<td>Google.org</td>
<td>The Google Foundation is contributing GBP 2.2 million to QRF for the modification of Edraak to host OERs for MENA learners.</td>
</tr>
</tbody>
</table>

### 5.3.6 Analysis and recommendations

Based on publicly available information, EdTech inputs for Jordanian students likely centre on the provision of hardware and on infrastructure improvement. However, the presence of several initiatives focused on Syrian refugees provides opportunities for research-oriented activities.

- **Explore scaling of Qysas.**
  The ACR end-of-project evaluation of Qysas includes a seven-point qualitative ‘scalability’ assessment; this concludes that Qysas has high potential for scaling. However, the project history outlines an initial implementation, which included challenges linked to technology development, deployment and/or management, requiring an extension of the project timescale. We recommend additional investigation.
  The Education Technology Hub for Research and Innovation can undertake such investigation, focusing on whether Qysas can absorb and make use of investment on the part of DFID.

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17 The search was limited by the frequent appearance of ‘Jordan’ as a first name and as a surname. In the event, Jordanian researchers have published studies addressing EdTech use in higher-education institutions; however, none discovered during the search have addressed primary or secondary education.
investigation should include: 1) additional review of the end-of-project report previously cited; 2) discussion with ACR personnel regarding the Qysas project history; 3) discussion with QRF and/or JEI personnel regarding a potential partnership in relation to Qysas; 4) discussion with the implementing organisation, Little Thinking Minds, to assess the organisation's priorities and capacities in this regard; and 5) estimates of the resources required by scaling. If appropriate, the Education Technology Hub can support Qysas scaling.

- **Review EduApp4Syria evaluation to determine possibilities for additional support in Jordan and in MENA.**

Evaluation of EduApp4Syria is scheduled for publication in early 2018. EduApp4Syria involves specific design choices about device access and use by children that suggest that additional activities (e.g. marketing, 'conscientisation' or building appropriate awareness of families, access to internet connectivity, etc.) could result in increased impact. While these choices and issues surrounding them could, and perhaps will, prove not to limit the impact of EduApp4Syria, based on evaluation findings the Education Technology Hub could provide additional support for measures (e.g. marketing, outreach, etc.) that are necessary to increase the impact of the EduApp4Syria games. (Such support should be complemented by additional impact assessment.)

- **Review EduApp4Syria evaluation to determine possibilities for localisation among other refugee populations.**

The Education Technology Hub could, again based on the evaluation results, support the localisation of the EduApp4Syria finalists for use by other refugee populations. Refer to analysis and recommendations in the Bangladesh country profile, and to Thorpe and Supaporn (2017) for information about access to and use of smart phones by Rohingya children. Any efforts at localisation will require not only language revisions but also revisions in relation to cultural norms, practices, and identities, and their visual representation.

In addition, the proposed modification of Edraak to provide learning resources throughout the MENA presents an opportunity for research on the part of the Education Technology Hub. What are factors that influence the adoption and use of Edraak resources? What is the impact of those resources on learning outcomes?

### 5.4 Kenya country profile

Overall, Kenya is one of the more exciting developing-country environments for EdTech innovation. The country is among the leaders in Africa in terms of technology-focused innovation and has given rise to several companies that offer education-focused products and solutions. In addition, Kenya hosts several large, long-term refugee camps, in which innovative EdTech initiatives are available to children. The Government of Kenya also operates several agencies or units that support EdTech activities.

As documented in the table below, the Government of Kenya and partners are in the process of implementing a nationwide 1:1 computing initiative for Year 1 students. (This initiative is the only nationwide 1:1 programme identified in this report.) The pedagogical framework for this initiative, as well as government policy on the language of instruction suggests that early grade reading instruction should be conducted in the student's mother tongue (rather than Kiswahili or English). At present, however, mother tongue learning resources are not available in many schools.
5.4.1 Innovative initiatives

Table 18: Innovative initiatives, Kenya
<table>
<thead>
<tr>
<th>Innovative initiatives</th>
<th>(Unless otherwise noted, results in relation to teaching and learning are anecdotal, unsupported by research or evaluation of impact.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Digischools or DLP</strong></td>
<td>The Government of Kenya is well along in implementation of the DLP, a nationwide 1:1 programme that involves distributing 1.2 million Android tablets to students, with the objective of ensuring that each Year 1 student has a tablet. This initiative is successfully deploying 1.2 million tablets, as well as classroom content servers and projectors, in Kenyan schools. Additional efforts are required, however, to ensure that teachers and students can access curriculum-linked content and can make use of these devices to realise gains in teaching and learning. DLP has led to the formation of the Digital Literacy Trust, a PPP involving the Government of Kenya, EDT, UNICEF, Digital Divide Data, and eKitabu, among other organisations, intended to leverage the national investment in tablets to improve teaching and learning in Kenyan schools. Digital Literacy Trust projects include: <strong>Digital content delivery for the DLP Pilot</strong> Building on a successful four-school pilot, this project has been scaled up to include 471 schools and more than 10,000 students with learning disabilities. Teacher development is based on a cascade model. Schools in this pilot focus on education of children with visual, auditory, and cognitive disabilities. Resources have been adapted to meet the needs of these students. (This initiative is still in its implementation phase; impact assessments are not available.)</td>
</tr>
<tr>
<td><strong>Badiliko Digital Hubs</strong></td>
<td>Also known as the African Digital Schools Project, this partnership between Microsoft and the British Council has established 15 digital hub schools in Kenya, with the objective of training 20,000 teachers in the use of EdTech and in innovative teaching practices by the end of Year 1. Badiliko is part of a multi-country initiative by Microsoft.</td>
</tr>
<tr>
<td><strong>BRCK Education Kio Kit</strong></td>
<td>BRCK Education (a division of BRCK, a social enterprise focusing on appropriate networking solutions) provides the Kio Kit Digital Classroom in a Box in Kenya and 11 other African countries. The Kio Kit includes 40 Kio tablets, ruggedized and with low power usage and a SupaBRCK, a 500MB–2 TB server that provides learning resources to the tablets via wireless Local Area Network and that connects to the internet via mobile broadband. eLimu and Eneza Education are ‘content partners’. (Note that at least one interview respondent suggests that the product's complexity limits adoption and use. Figures on adoption and use in Kenya and other countries are not available.)</td>
</tr>
<tr>
<td><strong>Economic Stimulus Programme</strong></td>
<td>The Economic Stimulus Programme is a government programme that establishes computer labs in schools to support integration of EdTech across the curriculum. This effort was part of a multi-faceted programme addressing health, food security, and other issues.</td>
</tr>
<tr>
<td><strong>eLimu Kenyan Certificate of Primary Education revision</strong></td>
<td>eLimu offers a Kenyan Certificate of Primary Education app, which provides learning resources, past exams (with interactive results marking) and recommendations for remediation.</td>
</tr>
<tr>
<td><strong>eLimu Hadithi, Hadithi!</strong></td>
<td>Hadithi, Hadithi! is a literacy app for children ages six and seven, presenting curriculum-aligned stories written and illustrated by Kenyans and other East Africans, with audio recordings.</td>
</tr>
<tr>
<td><strong>Eneza Education</strong></td>
<td>Eneza Education provides interactive learning resources running in a virtual tutor. Resources are accessible via feature phones (as SMS), smartphones and tablets (as HTML5), and desktop or laptop computers (platform unknown), with support for Facebook and Telegram access. Eneza Education resources are available in Kenya, Tanzania, Ghana, and Zimbabwe.</td>
</tr>
<tr>
<td><strong>Instant Network Schools</strong></td>
<td>Instant Network Schools, a Vodafone Foundation initiative, provides tablet computers, learning resources, connectivity, a projector and teacher development to schools in the Kakuma and Dadaab refugee camps.</td>
</tr>
</tbody>
</table>
### Instant Schools for Africa

Vodacom Instant Schools for Africa, also an initiative of the Vodafone Foundation, makes more than 100,000 interactive web-based, learning, and professional development resources, linked to the national curriculum, available at no cost to learners with smartphones and mobile broadband internet access. (Because the websites are 'zero rated,' no connectivity charges apply.  

### Project Kakuma

This project, subtitled 'Educating African refugees', enables schools in the 60,000-person Kakuma refugee camp to access effective education through connection to volunteers via Skype.

### Spark a Child's Digital Future

A 2017 initiative of World Vision and Microsoft, with additional support from Intel and the British Council, this project provides computer-lab hardware and teacher development. (Current scale is less than 40 schools.)

### The Power of mLearning

This project delivers eLimu content, TPD and mobile broadband connectivity in one primary school to improve learning outcomes. The project is a partnership between Qualcomm (Wireless Reach), eLimu, bboxx Kenya (solar solutions), iHub Research, Motorola Solutions, Safaricom, and MOEST.

### Onebillion NFE pilot

onebillion.org is pilot-testing the use of their tablet-based system in direct instruction of rural children in non-formal (i.e. outside of school) settings.

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### Tusome

While not currently an EdTech programme, the Tusome initiative forms the pedagogical backbone of DLP. Tusome is an early grade reading programme funded by MOEST, USAID, and DFID, intended to reach 23,000 schools and 5.4 million Year 1 and Year 2 students with effective literacy instruction in Kiswahili and English. The primary vehicles for this instruction are improved literacy resources, intensive professional development, and a tablet-based monitoring system. Pilot research on the predecessor programme, the Primary Maths and Reading (PRIMR) initiative (Piper et al., 2015), showed high levels of impact in relation to literacy benchmarks and has led to plans to scale the programme nationwide. At present, literacy resources are provided in print-based formats. As per the DLP entry in the preceding table, digital content delivery is beginning in relation to 10,000 children with learning disabilities in the current AY.

### 5.4.2 Government buy-in and political will

With the formation of the Digital Literacy Trust and its concomitant commitment to the DLP, the Government of Kenya's commitment to EdTech appears to be solid. MOEST includes an EdTech coordinating agency, the Information and Communication Technology for Education (ICT4E) unit, which has been structured to combine educational and technical expertise. In addition, MOEST and the Government of Kenya in 2012 established the National ICT Innovation and Integration Centre to support research into EdTech tools and approaches.

However, MOEST is concurrently making plans to reform textbook procurement across all primary and secondary years, suggesting that the impact of DLP in relation to access to resources will not be apparent immediately. In addition, the linkage of EdTech and educational improvement to economic growth has not been demonstrated; poor or slow-to-emerge results in this arena could spark either strategic or political change.

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18 DLP has been branded by MOEST as the Digischools programme. DLP is also referred to as Tusome National Tablet Programme.

19 ‘Success’ appears to be equivalent to successful fulfilment: e-books were loaded onto tablets that were in turn delivered to schools. Impact of these resources on learning outcomes has not been assessed.

20 Instant Schools for Africa also serves learners in Ghana, Lesotho, Mozambique, South Africa, and Tanzania.
Other agencies relevant to EdTech and/or to DLP include the ICT Authority, which is mandated to manage procurement of tablets – from Kenyan manufacturers – and the KICD and Kenya Institute of Education, both of which are involved in learning-resource development.

Table 19: Policies and plans, Kenya

<table>
<thead>
<tr>
<th>Relevant policies and plans</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>National ICT Policy (2016)</td>
<td>The 2016 (draft) policy updates the policy adopted in 2006. The draft policy states that EdTech can help support learning in all subjects, but emphasises the development of technology skills and the technology sector to support economic growth.</td>
</tr>
<tr>
<td>Kenyan ICT Masterplan 2014–17: Towards a smarter Kenya</td>
<td>The Masterplan focuses on technology as an engine of economic growth. When education is mentioned, the focus is primarily on higher-education institutions in relation to computer science, engineering, and other technical fields.</td>
</tr>
<tr>
<td>Vision 2030 (2008)</td>
<td>Vision 2030 emphasises the linkage between education and economic development, and outlines plans for the 'mainstreaming' of EdTech in 20,000 primary schools, 6,000 secondary schools and other educational institutions.</td>
</tr>
</tbody>
</table>

Additional buy-in by the Government of Kenya is demonstrated by several tech-focused projects: the establishment of the Konza Technology Park, a vehicle to support job growth and to attract investment, and the laying of a national fibre-optic broadband system (in progress).

5.4.3 Innovation networks and hubs

With 27 organisations as of 2016 (Du Boucher), Kenya ranks in the second tier of African countries in terms of the hosting of technology hubs for innovation and entrepreneurialism, on a par with Egypt and Nigeria. (Entrepreneurial support in these countries is dwarfed by that of South Africa, which hosts 54 hubs.) Among the first and most successful, iHub has supported over 170 start-ups.
Table 20: Innovation hubs and networks, Kenya

<table>
<thead>
<tr>
<th>Innovation hubs and networks</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>iHub</td>
<td>Established in 2010 as a community-organised hub for technology start-ups, iHub has supported the development of eLimu, Eneza Education, and BRCK (including BRCK Education).</td>
</tr>
<tr>
<td>Nailab</td>
<td>Nailab is a business incubator and accelerator supporting technology-based innovations.</td>
</tr>
<tr>
<td>C4Dlab</td>
<td>C4Dlab is an incubator founded in 2013 at the University of Nairobi, supporting start-ups involved with technology but encouraging them to adopt a focus that is 'multidisciplinary' and 'social'.</td>
</tr>
<tr>
<td>Entrepreneurs Spot</td>
<td>Entrepreneurs Spot is a service-oriented incubator supporting start-ups of all kinds.</td>
</tr>
<tr>
<td>Digital Opportunity Trust (DOT) Kenya</td>
<td>DOT Kenya supports the development of young people as social innovators and social entrepreneurs. (DOT also operates in Jordan, Lebanon, and Rwanda.)</td>
</tr>
<tr>
<td>The Kenya Education Network</td>
<td>The Kenya Education Network is the NREN of Kenya.</td>
</tr>
</tbody>
</table>

There is in addition a range of funding (e.g. pitch competitions, etc.) and meet-up opportunities, plus the opportunities provided by these and other hubs and co-working spaces. Two of these opportunities are Nairobi Innovation Week (at the University of Nairobi) and the Women Entrepreneurship Forum.

5.4.4 Research

As in most countries addressed in this Second-Stage Report, research experience in large-scale EdTech is limited. One experienced EdTech researcher based in Kenya is identified below. In addition, there is a relatively large number of associate-level researchers, some affiliated with academic institutions and others working in civil society or the private sector, who are able to effectively implement and manage research projects of varying scales and complexity. (Search terms used in Google Scholar were ‘education Kenya’ and ‘education technology Kenya’; 80 records and all education-related abstracts were reviewed. Lead and associate researchers identified in this section have been identified as a result of referrals and the authors’ knowledge.)

Table 21: Potential lead researcher, Kenya

<table>
<thead>
<tr>
<th>Lead researchers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benjamin Piper, PhD</td>
<td>Senior Director of Africa Education, RTI At RTI, Dr Piper was formerly Chief of Party for PRIMR and Tusome. He is experienced in design of longitudinal studies, RCTs, and mixed-methods research. He is based in Nairobi. He has led RCTs assessing the impact of Tusome on literacy learning and the impact of EdTech on Tusome.</td>
</tr>
</tbody>
</table>
Table 22: Potential research implementers, Kenya

<table>
<thead>
<tr>
<th>Research implementation</th>
<th>Research, Monitoring, and Evaluation Lead, Digital Divide Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joash Mango</td>
<td>Mr Mango has 12 years' experience in applied research and results measurement. He has implemented RCT designs and has managed research projects for USAID, the European Commission, DFID, DANIDA, and IFAD, among others.</td>
</tr>
<tr>
<td>Zachariah Mbasu</td>
<td>Co-founder and Education Expert, Elewa Company, Ltd. Mr Mbaso has implemented and led several research projects using experimental methods. He has served as lead author on two articles and has collaborated with international researchers on regional projects. He is the founder of the African Maths Initiative.</td>
</tr>
<tr>
<td>Mike Kipkorir Bill</td>
<td>Chief Executive Officer, Elewa Company, Ltd. Mr Bill is an EdTech consultant based in Nairobi. He has completed research overviews of EdTech and of technology-for-development for donor agencies.</td>
</tr>
</tbody>
</table>

5.4.5 Funding

As with any nationwide 1:1 programme, there is substantial funding for EdTech surrounding DLP. As a result of Kenya's large size, great need, and high level of activity, however, there are many other funders and partners as well.

Table 23: Funders, Kenya

<table>
<thead>
<tr>
<th>Programme funders and partners</th>
<th>(This table includes overall funding for education, not for EdTech alone, except as noted.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government of Kenya</td>
<td>Funding for DLP is approximately GBP 207.5 million (2014–17). While these funds pay for content development by KICD, they do not include the costs of infrastructure improvements, such as extension of grid-based electricity. The Government of Kenya also funds Tusome and plans to mainstream that programme into the national budget in the next FY.</td>
</tr>
<tr>
<td>USAID</td>
<td>USAID funding for education was approximately GBP 12.9 million in 2016 (USAID, 2017).</td>
</tr>
<tr>
<td>DFID</td>
<td>Overall funding by DFID for in Kenya is GBP 142 million in FY 2017–18. In the education sector, DFID has funded PRIMR and Tusome, among other initiatives (DFID, 2017); however, ongoing funding for education does not comprise a significant part of overall funding.</td>
</tr>
<tr>
<td>Flemish Association for Development Cooperation (VVOB)</td>
<td>VVOB supports TPD and school-leadership improvement in Rwanda. The level of support is not known.</td>
</tr>
<tr>
<td>William and Flora Hewlett Foundation</td>
<td>The Hewlett Foundation has provided funding for TPD in relation to DLP (UNESCO, undated).</td>
</tr>
<tr>
<td>Airtel</td>
<td>Airtel is providing in-kind support for distance-based TPD in relation to DLP (UNESCO, undated).</td>
</tr>
</tbody>
</table>

In addition, many organisations contribute to projects via in-kind services and cost reductions. These organisations include: bbox Kenya, the Forum for African Women Educationalists, iHub, Intel, Motorola Solutions, and Safaricom, among others.
5.4.6 Analysis and recommendations

The DLP initiative in Kenya represents a tremendous opportunity for development and research, insofar as the Government of Kenya and partners are in the process of establishing what is in effect an 'EdTech infrastructure', supported by TPD addressing the use of tablets and their integration into teaching and learning. Effective, curriculum-linked content appears, however, to be required (as per the Digital Literacy Trust initiative addressing the needs of learners with disabilities – see Table 18). There are several possibilities for additional content development in relation to the DLP initiative. These include:

- **Developing e-content based on Tusome.**
  As Tusome, with proven impact, has been mainstreamed for literacy learning by the MOE, development of Android-compatible interactive resources appears to be a necessary step. This step could be taken with support and guidance from the Education Technology Hub for Research and Innovation. Engagement with the Digital Literacy Trust, a PPP, should provide guidance as to the next steps to take.

- **Localising and replicating Unlocking Talent content.**
  The Unlocking Talent initiative in Malawi, using resources developed by onebillion.org, includes literacy-acquisition lessons in Kiswahili (and Chichewa) that have been proven to be effective. (See the Malawi country profile for more information.) With support from the Education Technology Hub, these resources can likely be adapted to the Kenyan curriculum for pilot testing among DLP schools. They are currently being field-tested in Kenya in relation to NFE.

- **Developing content based on the Global Learning xPrize winner.**
  The organisation winning the Global Learning xPrize, with final field trials now underway in Tanzania, will be required to make its software available under an open-source licence. The five literacy-acquisition products in competition are currently available in Kiswahili. Once these resources are released as open-source, the Education Technology Hub can support revision of the winning product to align it with the Kenyan curriculum. There are Kenyan EdTech firms (eLimu, Eneza, etc.) that have the capacity to complete the modifications required.

All efforts at content development should be considered in partnership with KICD, which has a mandate for curriculum-linked content development. (KICD has per the Kenyan ICT Authority developed an online portal for DLP content; however, this portal does not appear to be active as of January 2018.) Other elements to consider in relation to recommendations are as follows.

- **Developing mother tongue learning resources.**
  While additional exploration with the Government of Kenya and partners is in order, we suggest that an approach based on the development, testing, and implementation of mother tongue literacy-learning resources is advisable. Such resources will be: 1) more likely to be effective, especially among rural students; and 2) more likely to be in demand by the Government of Kenya, which has adopted a policy providing for mother tongue instruction in early grades. However, support and outreach activities in relation to mother tongue instruction and resources at the local level are likely required to help overcome resistance to mother tongue literacy instruction among families and communities.

- **Partnering with Kenyan firms for resource development.**
  Technical and entrepreneurial capacity is abundant in the Kenyan private sector. In addition, the ICT Masterplan (see Table 19) prioritises the development of the technology-focused private sector as an engine of economic development, while mentioning the need to develop digital learning resources for all levels of Kenyan education. Any approach to resource development, including those described earlier in this section, should draw on private-sector technology firms.
5.5 Lebanon country profile

Lebanon is small and conflict-riven, but the level of EdTech innovation is high relative to other countries in MENA. DFID frames the Government of Lebanon engagement with education as follows:

> We have also chosen to work where we believe there is both a gap in the market and an opportunity: for example, on education, where there happens to be a visionary minister and a solid sector-wide plan (Reaching All Children with Education). This made it easier to back this sector with confidence. (DFID, 2014, p. 9)

Complementing the competent engagement of the Ministry of Education and Higher Education (MEHE), many smaller-scale initiatives are run by local/national NGOs. International Education Association (IEA), based in Beirut, runs several initiatives. In addition, transnational technology corporations support EdTech.

5.5.1 Innovative initiatives

Table 24: Innovative initiatives, Lebanon

<table>
<thead>
<tr>
<th>Innovative initiatives</th>
<th>(Unless otherwise noted, results in relation to teaching and learning are anecdotal, unsupported by research or evaluation of impact.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEA CoderMaker</td>
<td>CoderMaker intends to promote the development of software programming skills in combination with design learning, making, assembling, and other manipulations of objects and machines to improve science, technology engineering, arts, and maths learning. One key component is the Problem-solving, Entrepreneurship, Creativity/Communication/Critical Thinking skillset, an approach within CoderMaker intended to prepare youth to act effectively as agents in the global knowledge society. CoderMaker is active in 10 public schools in Lebanon.</td>
</tr>
<tr>
<td>Tabshoura in a Box – Lebanese Alternative Learning</td>
<td>Tabshoura in a Box – Lebanese Alternative Learning was accepted into the WISE Accelerator programme for 2017–18. Tabshoura in a Box provides videos, animations, and other learning resources to promote improved learning outcomes aligned with school curricula.</td>
</tr>
<tr>
<td>Second Shift Schools (for Syrian refugees)</td>
<td>Second Shift Schools, announced in mid-2017, will launch in seven schools in Lebanon, funding an afternoon shift of school to help meet the educational needs of Syrian children in refugee families. The programme ‘with the support of HP Inc., will also pilot state-of-the-art technology tools geared towards advancing learning outcomes’.</td>
</tr>
<tr>
<td>RACE II portal</td>
<td>The RACE II plan proposes the development of an ‘e-hub’ or portal of learning resources to be used by refugees and by other marginalised populations.</td>
</tr>
<tr>
<td>HP Learning Studios</td>
<td>The HP Learning Studios initiative is planned for Lebanon. (See the Jordan country profile for additional information.)</td>
</tr>
<tr>
<td>EduApp4Syria</td>
<td>EduApp4Syria is an EdTech-based NFE initiative intended to marshal game-based literacy learning on mobile devices to help improve literacy, school readiness, and psychosocial well-being among Syrian refugee children. This initiative is global in its applicability. The EduApp4Syria apps are available on Google Play. (For more information, refer to the Jordan country profile.)</td>
</tr>
</tbody>
</table>

5.5.2 Government buy-in and political will

The plans, policies, and approaches outlined by MEHE are generally detailed, comprehensive, and reflective of current good practice (without endorsing concepts that are unsupported and that occupy the ‘bleeding edge’). MEHE also includes an autonomous unit, the Centre for Education
Research and Development (CERD), with a sub-unit mandated to address EdTech, including data management; CERD additionally addresses curriculum and teacher development.

Table 25: Relevant policies and plans, Lebanon

<table>
<thead>
<tr>
<th>Relevant policies and plans</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RACE II</td>
<td>RACE II, developed in 2016, is the sector-wide plan developed by the MEHE. The plan focuses specifically on support for national data systems and on measuring learning achievement. RACE II states that school rehabilitation will include the development of EdTech labs.</td>
</tr>
<tr>
<td>Education Reform Strategy and Action Plan (ERSAP, 2011)</td>
<td>The ERSAP underscores the positive impact of EdTech tools, which include WebQuest, wikis, Google Drive, Windows Live Movie Maker, among others. However, the extent to which the use of these tools is supported system-wide by TPD or their alignment with the Lebanese curriculum is unclear (Awada et al., 2016).</td>
</tr>
<tr>
<td>Teaching and Learning in the Digital Age (2012)</td>
<td>Teaching and Learning in the Digital Age: Lebanon's national educational technology strategic plan, an MEHE document, addresses EdTech access, integration into curricula and into teaching/learning practices, as well as ensuring technology competency on the part of teachers and students, improved research, and the development of 21st-century skills. The plan appears to be a detailed, comprehensive, and informed document.</td>
</tr>
</tbody>
</table>

5.5.3 Innovation networks and hubs

In part due to its Western-style banking system, and in part due to other factors, Lebanon hosts a dynamic technology 'ecosystem'. This system has made more than GBP 50 million available as VC since 2015; in addition, this ecosystem has entered into ties with UK-based investors and the UK government (Butcher, 2015).
Table 26: **Innovation hubs and networks, Lebanon**

<table>
<thead>
<tr>
<th><strong>Innovation hubs and networks</strong></th>
<th><strong>UK Lebanon Tech Hub</strong></th>
<th><strong>Banque du Liban Accelerate</strong></th>
<th><strong>DOT Lebanon</strong></th>
<th><strong>UN Economic and Social Commission for Western Asia Technology Centre</strong></th>
<th><strong>ASREN</strong></th>
<th><strong>Wamda</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The UK Lebanon Tech Hub operates an accelerator, helps raise capital for and provides mentoring to start-ups, provides support to firms incorporating in Lebanon, and collaborates with Lebanese universities on pitch competitions and other outreach events.</td>
<td>Banque du Liban convenes an annual technology conference focused on Lebanese technology start-ups, with representatives from more than 20 countries.</td>
<td>DOT Lebanon supports the development of young people as social innovators and social entrepreneurs, including Syrian and Palestinian refugees in Lebanon. (DOT also operates in Kenya, Jordan, and Rwanda.) DOT youth provide EdTech training to teachers and community members.</td>
<td>The UN Economic and Social Commission for Western Asia Technology Centre (the only one of its kind) was established by a 2010 agreement to promote enhanced outcomes in science, technology, and innovation in academia and government, in combination with private-sector business and industry.</td>
<td>Lebanon is a member of the Arab States Research and Education Network.</td>
<td>Wamda is a platform of integrated programmes that seeks to accelerate entrepreneurship across MENA. The organisation is headquartered in Dubai.</td>
</tr>
</tbody>
</table>

5.5.4 **Research**

No potential lead education researchers currently in Lebanon were found. (Search terms used on Google Scholar were ‘education research Lebanon’; 84 records and all education-related abstracts were reviewed.) Maha Shauyb, PhD, listed in the following table, was referred to us via a personal contact.

Table 27: **Potential lead researcher, Lebanon**

| **Potential researcher** | **Director, Centre for Lebanese Studies** | **Dr Shauyb is also president of the Lebanese Association for History, and she has been a visiting scholar at the University of Oxford and the University of Cambridge. Her current areas of inquiry include education and social cohesion, refugee education, citizenship education, and history education.** |
|-------------------------|------------------------------------------|

5.5.5 **Funding**

Donor funding of education in Lebanon has increased substantially within the past three years to assist with the education of the large number of Syrian refugees who are children. As an example, World Bank funding increased its funding of RACE II and other education programmes from approximately GBP 28.8 million to 174.6 million (World Bank, 2016a). (Funding for EdTech by donors and/or the Government of Lebanon is not specified in the sources consulted.)
Table 28: Funders, Lebanon

<table>
<thead>
<tr>
<th>Programme funders and partners</th>
<th>(This table includes overall funding for education, not for EdTech alone, except as noted.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government of Lebanon</td>
<td>Funding for education in FY 2013 was 8.6% of total spending (World Bank, 2017). The national budget of Lebanon is slightly higher than GBP 9.5 billion.</td>
</tr>
<tr>
<td>USAID</td>
<td>USAID funding for basic, secondary, and post-secondary education in FY 2016 was approximately GBP 24 million (USAID, 2017). No funding was specifically linked to EdTech.</td>
</tr>
<tr>
<td>DFID</td>
<td>Overall funding by DFID for education in Lebanon in FY 2017 is GBP 30.7 million. No funding is specifically linked to EdTech.</td>
</tr>
<tr>
<td>Clooney Foundation for Justice (CFJ)</td>
<td>CFJ, as noted, funds the Second Shift Schools initiative, which includes an unspecified EdTech component. CFJ funding for the programme is GBP 2.3 million (The Guardian, 2017).</td>
</tr>
<tr>
<td>HP Inc.</td>
<td>HP is providing EdTech to the CFJ Second Shift Schools. HP's announced investment in education worldwide is approximately GBP 14.4 million.</td>
</tr>
<tr>
<td>Google.org</td>
<td>Google.org is providing at least GBP 720,000 to CFJ to support the Second Shift Schools initiative (DeveX, 2017).</td>
</tr>
</tbody>
</table>

5.5.6 Analysis and recommendations

Based on the RACE II plan and the mandate for CERD to address data management in schools, the education system in Lebanon presents among the best opportunities for support of EMIS among focal countries addressed in this report. According to RACE II, 'As a first step, CERD will be supported to identify the gaps in MEHE's current (disparate) data collection systems. This would include the generation of a unified set of protocols for data collection and a data management system to verify data compliance and credibility.' This is an appropriate first step, and one that can be investigated for the benefit of the many countries that need to consolidate disparate systems. (The proliferation of competing EMIS initiatives within a single education system is a common and problematic condition in DFID priority countries.)

- **Develop process-engineering protocols for data management consolidation.**
  Data rationalisation, such as that described in the RACE II plan, should be extensively documented, with the process systematised for replication in other countries. The Education Technology Hub for Research and Innovation can provide support for data rationalisation by MEHE, complemented by support for the observation, analysis, and documentation of the process.

- **Explore replication of Qysas in Lebanon.**
  (See the analysis and recommendations section of the Jordan country profile for additional detail.) As mentioned, Qysas – which focuses on the Syrian refugee population in Jordan – has been assessed as having high potential for scalability. The Education Technology Hub can explore the potential for replication of the project in Lebanon. (If the Education Technology Hub

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21 One of the issues that we have encountered in this sector is the need to maintain a payroll-focused human resources database, which is typically operated by a ministry of finance. While databases of this sort should categorically not be combined with EMIS records of professional achievement (to preserve privacy and financial security), such databases and MOE EMIS databases should in many instances be harmonised. (Note that the emergence of Blockchain-based databases could support the development of systems combining payroll and professional achievement.)

22 Mohamed Ragheb, PhD, is an Arabic-speaking consultant based in Egypt who is very experienced in data rationalisation nationwide and in EMIS deployment (raghebm@yahoo.com).
leadership does determine that replicating Qysas in Lebanon deserves support, the process should be exhaustively documented and analysed so as to support future efforts.)

- **Review the EduApp4Syria evaluation to determine possibilities for additional support in Lebanon and in MENA.**
  (Again, see the analysis and recommendations section of the Jordan country profile for further details.) As the EduApp4Syria games are posted on Google Play, the initiative is already available in Syria. (However, the evaluation is centred on refugees in Jordan.) While it is likely that outreach and social marketing can promote adoption, Education and Technology Hub personnel should determine the impact of barriers such as infrastructure (e.g. internet access) and phone use (e.g. do all children in a family have equal access?).

5.6 **Malawi country profile**

The level of EdTech activity in Malawi is not high. UNESCO (2015) notes that in 2007 school-based EdTech among African countries was least common in Malawi, with only 2% of primary schools having one or more computers. (More recent information is not available.) In an overview of EdTech, Wagner (2016) mentions Malawi only insofar as Ho and Thukral (2009) list it in a seminal article on Interactive Radio Instruction.

To some extent, the lack of activity reflects Malawi's challenges in relation to development. Malawi achieves a Human Development Index score of .476 (UNDP, 2017), ranking it 170th of 180 countries. In the International Telecommunications Union (ITU) ICT Development Index, an indexed measure of technology use and readiness, Malawi scored 1.74, placing it 167th of 176 countries.

For these and other reasons, the successful Unlocking Talent initiative has become the focus of the Government of Malawi and of international donors and partners.

5.6.1 **Innovative initiatives**

**Table 29: Innovative initiatives, Malawi**

<table>
<thead>
<tr>
<th>Innovative initiatives</th>
<th>(Unless otherwise noted, results in relation to teaching and learning are anecdotal, unsupported by research or evaluation of impact.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unlocking Talent Through Technology</td>
<td>A pilot test of this initiative has demonstrated improvement of numeracy-learning outcomes as assessed in RCTs in Malawi and in the UK (Pitchford, 2015). The initiative, designed by onebillion.org, a UK NGO, supports learning by Year 1 and Year 2 students via direct instruction on tablet computers, supplemented by tools for solar-based charging and projection for whole-class instruction by teachers, with data reported to offices in Lilongwe and the UK. The pilot initiative was scaled up in Malawi from one school to 63 schools, then 128 schools, with plans announced by MOEST to mainstream the project to all primary schools in the 2017 AY. A literacy component has been developed in Chichewa. Based on its approach in the Unlocking Talent initiative and on its demonstrated results, onebillion.org has been selected as a Global Learning xPrize finalist and is currently conducting field trials of Kiswahili-based literacy and numeracy tools in Tanzania.</td>
</tr>
</tbody>
</table>

onebillion.org has developed several components mobilised in Unlocking Talent. These include:

- **oneclass**, a dedicated classroom with tablets that deliver direct instruction via onebillion apps, in Chichewa, addressing both numeracy and literacy; oneclass also features a low-power server that upstreams data to MOEST and to onebillion.org and a solar-charging 'cabinet' that maintains power in the tablets and server;
- A ruggedized, solar-powered projector that enables teachers to project curated learning resources using a tablet that connects wirelessly to the project and a display; and
- Tablets and display hardware (iPads and Apple TV).

Design of the projector is available under an open licence.

5.6.2 Government buy-in and political will

With DFID support, the Government of Malawi has established a National Commission for Science and Technology, intended to foster sustainable growth and development through science and technology, which primarily serves as a web-based clearinghouse for information on regional and national events and programmes. In addition to this commission, in 2014 the Government of Malawi established the Malawi University of Science and Technology (MUST).

The MOEST website lists objectives, programmes, and achievements; these do not reference EdTech in relation to primary, secondary, or higher education. However, MOEST is a partner in the Unlocking Talent initiative, and has mainstreamed Unlocking Talent to support its scaling to all 5,300 primary schools and all Year 1 and Year 2 students.

Table 30: Relevant policies and plans, Malawi

<table>
<thead>
<tr>
<th>Relevant policies and plans</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>National ICT Policy: An ICT-led Malawi (2013)</td>
<td>The brief (16-page) ICT policy addresses a range of activities and sectors, including national security, infrastructure development, and governance. The policy statement covers ICT, broadcasting, and postal services. The policy highlights the needs to extend service to rural areas and marginalised groups. A section on 'Human capital development', identified as a priority, mentions education and highlights the role of EdTech in relation to access, quality, and management. Healthcare delivery and technical capacity of the workforce are also addressed in this section.</td>
</tr>
<tr>
<td>Education Sector Plan: 2008–17 (approved 2008)</td>
<td>The Education sector plan proposes development of infrastructure, digital learning resources, and EdTech integration. Integration of technology in this document generally refers to online access to education, resources, and other services.</td>
</tr>
</tbody>
</table>

5.6.3 Innovation networks and hubs

Despite some efforts on the part of government and in the private sector, as identified in Table 31 Malawi lags in terms of tech-sector development. One measure of this is the amount of VC investment relative to African countries as a group. In 2016, Malawian enterprises received VC investments of approximately GBP 72,000 out of a total private-sector investment of more than GBP 264 million (Phiri, 2017). (During the same period, businesses in Kenya received more than GBP 66.5 million; Rwandese businesses received investment of GBP 11.5 million.)
Table 31: Innovation networks and hubs, Malawi

<table>
<thead>
<tr>
<th>Innovation hubs and networks</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mHub</td>
<td>mHub focuses on development of youth entrepreneurship in relation to the use of technology, providing networking, support, and consultation in relation to pitching ideas for start-ups.</td>
</tr>
<tr>
<td>Malawi Research and Education Network (MAREN)</td>
<td>MAREN was the fourth NREN to be completed in an African country. (The cost of internet access for the private sector remains high and is possibly a limiting factor on innovation.)</td>
</tr>
<tr>
<td>MUST</td>
<td>Opened in 2014, MUST has as its mission the development of human resources for participation in technology-oriented research and the development of 'indigenous' technology resources.</td>
</tr>
</tbody>
</table>

5.6.4 Research

Opportunities and thus capacity for EdTech research in Malawi are limited. Malawian education researchers identified for this report are currently expatriates, conducting professional activity in South Africa and other countries. (Search terms used in Google Scholar were 'education Malawi' and 'education technology Malawi'; 78 records and all education-related abstracts were reviewed.)

Table 32: Researchers, Malawi

<table>
<thead>
<tr>
<th>Researchers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lester Brian Shawa</td>
<td>Senior Lecturer in Higher Education Training and Development, University of KwaZulu Natal, South Africa Dr Shawa's research in K12 education has focused on learner-centred pedagogies and 21st-century skills. He is a native Malawian and frequently conducts research there.</td>
</tr>
<tr>
<td>Dick Ng’ambi</td>
<td>Assistant Professor in Education, University of Cape Town Dr Ng’ambi is the head of the education school's EdTech stream and founder of its Educational Technology Inquiry Lab. He is a well-known speaker on the use of innovative technologies for learning in Africa.</td>
</tr>
</tbody>
</table>

5.6.5 Funding

Government funding for education has remained stable even as donor support has declined proportionally (Hall and Mambo, 2015). A decline in donor support for the Government of Malawi and education is likely a response to extensive corruption uncovered in 2013 (The Guardian, 2013). While donors supporting Unlocking Talent are identified in Table 33 below, the amounts of their contributions have not been discovered.
Table 33: Funders, Malawi

<table>
<thead>
<tr>
<th>Programme funders and partners</th>
<th>(This table includes overall funding for education, not for EdTech alone, except as noted.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government of Malawi</td>
<td>Funding for education in FY 2015 was more than GBP 228 million (Hall and Mambo, 2015).</td>
</tr>
<tr>
<td>USAID</td>
<td>USAID funding for education in FY 2016 was approximately GBP 20.9 million out total funding of GBP 303 million (USAID, 2017). No funding is specifically linked to EdTech.</td>
</tr>
<tr>
<td>DFID</td>
<td>Overall funding by DFID for education in Malawi is slightly more than GBP 3 million in FY 2017–18 (DFID, 2017). No funding is specifically linked to EdTech. (Although DFID has contributed to the Unlocking Talent initiative, the amount of that contribution was not discovered.)</td>
</tr>
<tr>
<td>Royal Norwegian Embassy</td>
<td>The embassy has provided funds for 53 of 63 schools in the Unlocking Talent pilot.</td>
</tr>
<tr>
<td>The Scottish Government</td>
<td>The Scottish Government has provided funds for 10 schools in the Unlocking Talent pilot.23</td>
</tr>
<tr>
<td>UNICEF Malawi</td>
<td>UNICEF Malawi has provided support for the Unlocking Talent pilot.</td>
</tr>
</tbody>
</table>

Additional in-kind support for Unlocking Talent is provided by Airtel. Support for the nationwide scaling of the initiative has not been discovered.

5.6.6 Analysis and recommendations

As mentioned, the Unlocking Talent initiative lies at the centre of EdTech activity in Malawi. This well-structured initiative has achieved success that is unusual in low-infrastructure and low-readiness environments akin to those of Malawian schools. As such, Unlocking Talent perhaps demonstrates a step-by-step pathway to achieving scaled or mainstreamed roll-out of EdTech programming to improve learning outcomes. Some of the most easily seen key elements are:

- **Introduction of appropriate hardware**
  All hardware is appropriate for solar charging and for use without internet connectivity.

- **Introduction of appropriate software**
  Interactive direct instruction activities are presented in Chichewa (with a Malawi-appropriate user interface).

- **Progressive scaling**
  The intervention began in one school, which hosted an independently conducted RCT, before expanding to 63 schools and 128 schools, leading to the current effort to scale up the initiative across all Malawian primary schools.

Other apparent components of success include partnerships (e.g. with MOEST) and the design of learning resources and learner interactions.

However, the Education Technology Research and Innovation Hub can seek to determine key factors (and extraneous or non-key factors) in the success of Unlocking Talent in order to systematise and disseminate these findings. Key factors can likely be captured via a combination of:

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23 Support for Unlocking Talent is one of many projects in the broader portfolio of work supported by the Scottish Government.
Case study style analysis
Including interviews with key personnel in onebillion.org and at MOEST.

Business-process analysis
Analysis should address both development of the initiative and use-cases in Malawian schools.

Content and pedagogical analysis
Analysis should attempt to determine key features that influence the effectiveness of learning activities.

Analysis of critical success factors
Factors from all preceding analyses should be compared and assessed to determine their criticality.

Output of this activity, in addition to documentation of analyses as described, should be a framework for initiative design, implementation, and scaling. Additional analysis and output by the Education Technology Hub could include the development of a common research framework for assessing impact.

5.7 Rwanda country profile

Rwanda experienced a very high level of EdTech activity from about 2007 to 2014. However, several factors combined to bring about the end of promising, high-profile initiatives. Government policy and planning continues to reflect a commitment to school improvement resulting from the creative, nationwide deployment of EdTech. As of early 2018, however, such activities are very limited. Respondents suggest that in light of current political structures and this history, success and/or impact requires government participation. Such participation could be enabling but could also comprise a 'centralisation straightjacket', in which promising initiatives cannot develop.

In addition to internet-based review, inquiry has involved interviews with four respondents plus private correspondence, and a review of the DFID-funded Girls' Education Challenge programme Rwandan Girls' Education and Advancement Programme 2, implemented by Health Poverty Action. These actions, however, did not lead to identification of EdTech initiatives in schools. The table that follows describes activities or programmes that were innovative at the time of their inception but that are no longer operating.
5.7.1 Innovative initiatives

Table 34: Prior innovative initiatives, Rwanda

<table>
<thead>
<tr>
<th>Prior innovative initiatives</th>
<th>(Unless otherwise noted, results in relation to teaching and learning are anecdotal, unsupported by research or evaluation of impact.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLPC</td>
<td>Rwanda implemented the largest OLPC programme – emphasising appropriate 1:1 computing – of any country in Africa. With a combination of government support, donor support and charitable contributions made under the OLPC Give One Get One (G1G1) programme, Rwandese schools received 110,000 OLPC laptops as of the start of AY 2011. The pedagogical model involved self-organising learning based on applications that enable creativity and productivity and a mesh network that supports local networking and in some instances internet connectivity. The OLPC initiative, which launched in 2005, failed to demonstrate impact, in other large adopting countries, Peru and Uruguay, and faced competition from Android and other devices. In 2018, the OLPC programme in Rwanda continues, but activities are extremely limited. (See 'Government buy-in and political will' for more information.)</td>
</tr>
<tr>
<td>TeacherMate</td>
<td>A partnership between Open Learning Exchange (OLE) Rwanda and Innovations for Learning, a US-based NGO (<a href="http://www.innovationsforlearning.org">www.innovationsforlearning.org</a>), from 2010 to 2014 TeacherMate provided support for literacy and numeracy learning via levelled readers in English and audio recording on an iPhone operating system devices and on laptops and desktop computers. TeacherMate has been replaced in the Innovations for Learning catalogue by TutorMate. TutorMate has been shown in RCTs to accelerate learning; however, the product does not appear to have been introduced in Rwanda.</td>
</tr>
<tr>
<td>Rwanda Education Commons</td>
<td>Rwanda Education Commons (educationcommons.rw), a digital library of curriculum-linked materials, was launched as a complement to the OLPC programme, with additional components addressing teacher development, connectivity, and policy. Funded by USAID (2009–13) and in 2010 by Google, Rwanda Education Commons was designed to serve users in low-bandwidth environments. Rwanda Education Commons was a project of the Ministry of Education and OLE Rwanda.</td>
</tr>
</tbody>
</table>

5.7.2 Government buy-in and political will

As noted, the Government of Rwanda has a history of embracing ambitious nationwide initiatives in EdTech and more generally in support of national IT and communication infrastructure. While assessments of the Government of Rwanda's current interest in innovation might be unreliable, innovative activities do align strongly with current plans (e.g. Vision 2020), for which the government is preparing revisions and re-commitment (e.g. Vision 2050).
Table 35: Relevant policies and plans, Rwanda

<table>
<thead>
<tr>
<th>Relevant policies and plans</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>National ICT in Education policy (2016)</td>
<td>This policy strongly reiterates the government's commitment to 21st-century skills, while presenting a shift from 1:1 technology (e.g. OLPC) to the ‘smart classroom’, based on alternative electrical power and better integration of technology use into classroom practice, via tools such as interactive whiteboards. The policy states as a goal Rwanda's commitment to 'export ICT in education models' to other countries in Africa.</td>
</tr>
<tr>
<td>Education Sector Strategic Plan – 2013/14–2017/18</td>
<td>Although this plan generally addresses technology as a subject (equivalent to science), the plan does mention the use of education technology as a means of increasing access and improving effectiveness.</td>
</tr>
<tr>
<td>Vision 2020</td>
<td>Vision 2020 outlined goals for Rwanda in terms of standard of living and socio-economic well-being, and linked attaining these goals to participation in the global knowledge society. Vision 2020 is in the process of revision to become Vision 2050, building on prior achievements to target improved quality of life, infrastructure and values, and increased prosperity.</td>
</tr>
</tbody>
</table>

5.7.3 Innovation networks and hubs

Rwanda features several technology hubs and co-working spaces (e.g. 'The Office'). In addition, the Government of Rwanda has partnered with several donor agencies to support centres of excellence and/or coordinating platforms.
Table 36: Innovation hubs and networks, Rwanda

<table>
<thead>
<tr>
<th>Innovation hubs and networks</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Think</td>
<td>Backed by Millicom but focused on Africa (and Latin America), Think provides office space, networking, and funding to start-ups.</td>
</tr>
<tr>
<td>Impact Hub, Kigali</td>
<td>Impact Hub, Kigali, established in 2015, is the second instantiation of the Impact Hub global network to launch in Africa. There are more than 80 instantiations worldwide, with eight in Africa.</td>
</tr>
<tr>
<td>kLab</td>
<td>kLab (or ‘knowledge Lab’) is among the most active and successful tech incubators in Rwanda. kLab has relationships with Carnegie Mellon University (which provides leadership and other personnel-based support) and the Japan International Cooperation Agency.</td>
</tr>
<tr>
<td>Africa Institute for Mathematical Sciences (AIMS)</td>
<td>Part of a pan-African network of centres of excellence intended to promote the advancement of science, technology, engineering, and maths education. AIMS Rwanda is linked to the parent organisation, AIMS South Africa; centres are created as part of an effort to identify and celebrate the ‘next Einstein’.</td>
</tr>
<tr>
<td>Rwanda Education NGO Coordination Platform (RENCP)</td>
<td>RENCP was formed in 2010 to provide a central mechanism for donor-supported, civil society, government, and other activities in education. (RENCP hosted Rwanda Education Commons and OLE Rwanda when these programmes were operating.) Most of RENCP’s more than 70 member entities are international organisations. Local NGO members of RENCP do not focus on EdTech.</td>
</tr>
<tr>
<td>DataHack4FI</td>
<td>DataHack4FI, funded in part by MasterCard Foundation, is a competition for programmers and others inviting them to address the use of data to improve financial decision-making by the poor. DataHack4FI is staged in six countries (including Kenya); the final is to be held in May 2018 in Kigali.</td>
</tr>
<tr>
<td>DOT</td>
<td>DOT is a Canadian NGO, with offices in Kigali, supporting the development of youth social innovators.</td>
</tr>
<tr>
<td>Rwanda Education and Research Network</td>
<td>Rwanda Education and Research Network is the Rwandese NREN. (It is unclear whether the Rwanda Education and Research Network is or is not currently functioning.)</td>
</tr>
</tbody>
</table>

In addition, as part of the Africa Centres of Excellence Project (ACE II), the World Bank in 2016 established centres focused on sustainable development, the Internet of Things, teaching and learning mathematics and science, and data sciences. These centres are intended in part to support improved research practices in the Southern and Eastern Africa regions. Funding of all four centres in Rwanda represents GBP 14.4 million over five years.

There are 24 ACE II centres scheduled for African countries. Site selection for the centres was based on a competitive process.

The ACE II centre for teaching and learning of maths and science is located at the University of Rwanda College of Education. None of the other 24 ACE II centres – including three in Kenya and two in Malawi – address education-related topics. (See the next section for additional information about this ACE II centre.)

5.7.4 Research

Education research in Rwanda is less developed than other areas of technology-focused investigation (e.g. the Internet of Things, mini-grid technologies, etc.), as a result of several factors. These include the Government of Rwanda’s strong focus on technology-for-development and its engagement with a focus on higher-education institutions (Schendel, Mazimhaka, and Ezeanya,
2013). No researchers were found; we present information about leading higher-education institutions.

Table 37: Higher-education institutions and potential research centres, Rwanda

<table>
<thead>
<tr>
<th>Higher-education institutions and potential research centres</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMU-Africa, based in Kigali, is focused on computer science and engineering; however, this institution does have a strong record of research and publication in technology-related activities.</td>
<td></td>
</tr>
<tr>
<td>University of Rwanda, College of Education, Formerly the Kigali Institute of Education, the College of Education currently hosts the World-Bank-funded African Centre of Excellence for Innovative Teaching and Learning of Mathematics and Science. Although not specifically formulated to conduct research, the centre will include post-doctoral fellows and PhD students.</td>
<td></td>
</tr>
</tbody>
</table>

Table 38: Research implementation, Rwanda

<table>
<thead>
<tr>
<th>Research implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthur Byabagambi, Founder and executive director, Research Moguls, Ltd. Mr. Byabagambi is a competent researcher and coordinator, most recently engaged in the development of the UN Common Country Report on Rwanda (Byabagambi, 2017). A former consultant for PricewaterhouseCoopers (PwC), he has implemented research projects for the World Bank and several UN agencies.</td>
</tr>
</tbody>
</table>

5.7.5 Funding

Government funding for education has declined in Rwanda over the past several years, with a corresponding decline in system performance. From FY 2014 to FY 2015, the share of national budget allocated to education dropped from 21.3 to 12.3% (with an increase in allocation for communication) (Kumar, 2016). Across a similar period, the repetition rate increased from 12.5 to 18%, and primary school completion dropped from 72.7% in 2012 to 65.2% in 2016 (Byabagambi, 2017).25

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24 Searches were conducted using Google Scholar and the terms 'education technology Rwanda' and 'education Rwanda'. No results of Rwandese-based authors writing after 2007 were discovered.

25 The results reported by Byabagambi are not supported by PwC (2017); however, both sources are credible. We are not in a position to make a final determination of the proper figure.
Table 39: Funders, Rwanda

<table>
<thead>
<tr>
<th>Programme funders and partners</th>
<th>(This table includes overall funding for education, not for EdTech alone, except as noted.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government of Rwanda</td>
<td>Funding for education in FY 2017 is GBP 248.5 million (representing 26% of the national budget, in conflict with Byabagambi, as cited above) (PwC, 2017).</td>
</tr>
<tr>
<td>USAID</td>
<td>USAID funding for education in FY 2016 was approximately GBP 28 million, including funding of the Literacy, Language, and Learning programme, focusing on early-age literacy learning in Kinyarwanda (USAID, 2017). No funding is specifically linked to EdTech.</td>
</tr>
<tr>
<td>DFID</td>
<td>Overall funding by DFID for activities in Rwanda is GBP 60.6 million in FY 2017–18, with approximately GBP 17.8 million dedicated to education. No funding is specifically linked to EdTech.</td>
</tr>
<tr>
<td>VVOB</td>
<td>VVOB supports various scholarships, including scholarships to CMU-Africa. Activities in K12 education are not known.</td>
</tr>
<tr>
<td>World Vision</td>
<td>World Vision is one of two supporters of the RENCP; the amount of funding is unknown.</td>
</tr>
<tr>
<td>Green Tec Capital</td>
<td>This German VC firm has provided US $1.5 million to ARED (the acronym is not explained) to support the introduction of its Shiriki information kiosk. (Shiriki provides device charging, free internet, and access to information resources, including educational resources.)</td>
</tr>
</tbody>
</table>

5.7.6 Analysis and recommendations

The challenge posed by centralisation is substantial, insofar as approaches of debatable effectiveness can receive support and priority. The ICT in Education Plan of 2016, for example, proposes the use of interactive whiteboards and other tools that are costly and that require high-quality electrical power. However, mobile broadband coverage and smartphone use are both high (in part as a result of government spending and regulations), suggesting that students in Rwanda might benefit from an approach leveraging curriculum-linked interactive resources, such as those of eLimu or Eneza Education in Kenya, or iSchool in Zambia, all of which take advantage of mobile devices.26

At the same time, centralisation and the government's commitment to schools possibly argues for a shift in emphasis to support increasing access to EdTech in government schools (as opposed to approaches focused on NFE). However, the government's strong commitment to TPD, equity, and technology integration, while laudable (and the outcomes of hard-learned lessons), possibly increases the barriers – in terms of scale, scope, and potential cost – for the introduction of integrated-system hardware such as the Kio Kit.

- Integrate local content servers and tablets into LB.
  
  Save the Children's LB programme is among the most effective literacy programmes implemented in developing countries (Friedlander et al., 2017). The LB NFE programme is currently operating in the focal countries of Bangladesh, India, Kenya, Malawi, and Rwanda. The programme is poised to benefit from integration of EdTech (as Raspberry Pi servers and mobile devices for community literacy coordinators).

  The Education Technology Hub for Research and Innovation can initiate an experimental programme using EdTech to support the LB model, then assessing this approach (likely via RCT or DiD) to determine the comparative effectiveness of the use of EdTech in relation to standard LB. If the use of EdTech proves to deliver impact and VfM, the assessed model can be scaled up in Rwanda. Save the Children US has recently confirmed its commitment to the

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26 iSchool in Zambia is a project of the South African enterprise, Mwabu, where the initiative has been replicated.
exploration of EdTech, increasing the likelihood of partnership or collaboration and, if appropriate, replication in other contexts.
6 Findings and recommendations

This section summarises the findings and recommendations that emerge from the development of the country profiles. These findings and recommendations are in addition to issues that persist across the short history of EdTech for development. Among these persistent issues is the need to update policy and plans in relation to the emergence of new technologies and new thinking. As an example, many policies and plans address an 'ICT curriculum' or propose solutions based on desktop computers. These two approaches are linked, in that desktop operating systems (e.g. Windows, etc.) are complex and non-intuitive. The emergence of mobile devices (and mobile broadband) introduces both hardware that is appropriate for low-infrastructure conditions and user interfaces that are less complex and more intuitive, making desktop hardware and elaborate user training unnecessary. A similarly persistent issue surrounds the balance between an EdTech solution and issues such as limited school facilities, long travel times, attitudes towards girls and towards girls' education, low teacher salaries, poor working conditions and teachers' limited capacities, among others. Addressing this issue today requires nuanced understanding of the costs and benefits of UPE as well as the factors underlying private-sector engagement in national education. (EdTech likely do not occur in zero-sum relationships to other initiatives.)

6.1 Research

Lack of reliable research demonstrating the effectiveness of EdTech limits national adoption and scaling. Several specific observations have emerged:

- **Research leadership is more readily available outside of focus countries.**
  As outlined in this report, research experience in developing countries is not extensive. For various reasons – such as research funding, professional opportunities, and potential for collaboration, among others – many highly trained researchers have emigrated from their countries of origin to developing countries with well-developed university systems, such as South Africa, or to developed countries such as the UK and the US. (Many of the international researchers interviewed for this report suggest that they have collegial contacts with researchers – often former students and current collaborators – in focus countries, and that they are able to ensure high-quality implementation of small and larger-scale research projects.)

- **Smaller initiatives and private-sector initiatives rarely include research.**
  In the case of smaller initiatives, the inclusion of research generally requires an offsetting cost reduction in terms of the scale of the initiative. (For example, an EdTech initiative by the library-focused iNGO EIFL in Ghana is able to deliver its intervention at a cost of approximately US $1,750 per library. The cost of research to determine the impact of this initiative would require offsetting by a reduction in coverage of at least 10 and probably more libraries. And there is not, in this instance, a clear pathway to scaling-up the initiative if impact were reliably shown.)
  In the case of private-sector initiatives, one respondent suggests that 'RCTs are not in the DNA of entrepreneurs', going on to observe that the objectives of entrepreneurs, even social entrepreneurs, are ill-served by the increased costs of research and by the risk that an engaging and widely adopted initiative might prove to be of limited value in relation to learning.

  The outcome of both of these situations is the same; however, many (and perhaps most) promising initiatives lack evidence to support their expansion.

- **Appropriate research methods resist standardisation.**
  The RCT model, popularised as a 'gold standard' for assessing the efficacy of medical
interventions, has been mobilised to guide development decisions in several sectors. However, it incurs different costs and reveals different limitations in assessing the effectiveness of EdTech interventions and in some instances represents an inappropriate research model. Potential limiting factors include: the desirability of shifting EdTech designs and approaches during a project based on feedback (Trucano, 2014); the need for narrow treatment and control groups in contrast to the diversity of populations that will potentially benefit from treatment (Deaton, 2009); and the need for standardisation of the approach in contrast to the complex, adaptive systems that operate in schools (Gaible, 2016).

In assessing EdTech, other research models may be more effective and appropriate. These can include: DiD, including construction of retrospective baselines; participatory methods of establishing indicators and evidence, including Most Significant Change (soliciting regular observations of impact by programme personnel); and systems-based evaluation design (Williams, 2016 – considering the intervention as part of a complex system). As Angus Deaton (2009) writes, ‘Randomisation is not a gold standard because “there is no gold standard”.

- **Benefits of ‘standardised’ tools can be over-estimated.**

  On a related note, one research-oriented interview respondent stated that the use of standardised and digitised evaluation tools, such as the Tangerine suite of Early Grade Reading Assessment and Early Grade Maths Assessment tools, can lead to unexpected and unbudgeted costs; the respondent specifically suggests that a 3,000-record dataset captured in the Tangerine Early Grade Maths Assessment requires two weeks of effort by one person (a post-doctoral student) to clean and ensure reliability.

### 6.1.1 Recommended research projects

In the course of discussion with researchers and consideration of issues in relation to EdTech, we have encountered several questions that can and perhaps should be addressed by further research. Recommendations here are in addition to investigations suggested in country profiles.

- **Meta-analytical comparison of initiatives for refugees.** There are many initiatives using EdTech to support refugees. As most or all of these initiatives have undergone or are undergoing impact assessments, the DFID Education Technology Research and Innovation Hub has the opportunity to conduct meta-analytical comparison of these initiatives. Questions can address: the impact on learning outcomes (and on literacy learning, specifically); the impact on psychosocial well-being; the impact on mainstreaming into formal education systems; and other questions as appropriate.

- **‘Mainstreaming’ of high-performing students.** Some interventions identified in this study (e.g. onebillion.org in Malawi, etc.) have demonstrated the impact on learning outcomes among students. To the extent, however, that these interventions are limited by their specific support for a year or curriculum, once students complete the form for which the intervention is designed, they

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27 RCTs (or Randomised Control Trials) are experimental studies in which an intervention is provided to a ‘treatment’ group, with findings by comparing changes in this group's results with changes found in a ‘control’ group that does not receive the intervention. Treatment and control groups should be randomly generated from the same population.

28 DiD studies are considered observational studies; they are also referred to, particularly in education, as ‘pre-/post studies’. A baseline of results is collected from two groups before the intervention is provided; the difference between these baseline results and results collected from the same groups (or a similar group) after the intervention is provided forms the basis of analysis. Thus, if the treatment group uses a tablet-based maths programme and the control group (which is similarly receiving maths instruction) does not, changes in maths learning in these two groups generate the assessment of the maths programme.

29 Meta-analysis refers to a quantitative assessment of the results of multiple previous research reports. A meta-analytical approach might assess research in several countries to determine the impact of data management on school performance (or to determine which tool or approach is likely to be most effective). Meta-analyses can also help determine where there are gaps in research. (Meta-analyses will typically set formal criteria for inclusion of research studies. These criteria might be based on region, the size of the population studied, the date of the research, and other factors.)
are 'mainstreamed' into classes taught by teachers who may lack subject-matter knowledge and awareness of the intervention or of improved outcomes. While the intervention has improved learning outcomes, the extent to which these improvements are persistent and durable within the education system is unclear.

In the near term, research can investigate learning gains among students who participate in early grade or primary-grade interventions to assess their progress in the next year of school. A longer-term investigation can seek to determine the impact of the intervention on academic attainment as well as on learning outcomes. Research outputs can help determine the impact of interventions limited to specific years and curricula, factors limiting such impact, and measures to take to mitigate those factors.

This potential inquiry is relevant to:

- onebillion (Malawi);
- DLP (Kenya);
- EduApp4Syria (Jordan, Lebanon, and other countries); and
- Other projects designed to improve literacy or numeracy attainment by children attending school.

While EduApp4Syria has been implemented as a non-formal learning initiative, many children – notably Syrian refugees in Jordan – are currently attending school and receiving formal instruction. (While the current evaluation of EduApp4Syria will likely disaggregate results of children who are in school and not in school, this analysis is not yet available.)

**Educational attainment of IDPs who are children and refugee families.** Similarly, children of families who are refugees or IDPs in some instances have the benefit of robust and potentially effective interventions – both formal and non-formal – that are intended to support improved learning outcomes. To the extent that humanitarian assistance is successful, these children will matriculate into school systems that have no records of these students' educational activities nor of any learning they have accomplished.

Research can investigate (likely via interviews and process mapping\(^{30}\)) potential processes for various transitions to be made by refugee/IDP children in terms of: matriculation into host-country schools; continuation in refugee camp schools; and matriculation into home-country schools. Research outputs can help determine the extent to which persistent, durable, and transferrable records are necessary and achievable, and can develop a top-line software requirements specification for EMIS or other support.

This potential inquiry is relevant to:

- EduApp4Syria (Jordan, Lebanon, and other countries);
- Little Thinking Minds (Jordan);
- LearnSyria (Jordan);
- Instant Network Schools (Democratic Republic of Congo, Kenya, South Sudan, Tanzania);
- Project Kakuma (Kenya);
- Reaching All Children II (Lebanon); and

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\(^{30}\) Process mapping, also referred to as 'business-process mapping', involves creating organisational diagrams and flow charts capturing roles, inputs, and workflows so as to enable processes to be captured, shared, replicated, and improved.
• Other initiatives that seek to improve learning by children who are refugees.

Instant Network Schools, part of a collaboration between Vodafone and the UNHCR, has been deployed in numerous refugee camps. To date, however, Instant Network Schools has not been deployed in an Asian country, suggesting that the initiative could be part of comparison testing among Rohingya refugees. (See Bangladesh country profile: Analysis and recommendations for additional information.)

**Applied research in replication of successful initiatives.** Several initiatives introduced in the Inception Report are being implemented in more than one country, generally by private-sector firms or by UN agencies. Such replication requires attentive and nuanced responses to organisational, cultural, and other contexts. For both types of organisations, a better understanding of measures, costs, and processes for replication, and all measures required by a shift in context, will be of value and have the potential to increase the number, the success, and the sustainability of replicated projects.

This potential inquiry is relevant to:

• EduTrac (Uganda, Afghanistan, Zimbabwe);
• MobiSchools (Uganda, Mozambique, and countries with high populations of unschooled child refugees or IDPs, such as Bangladesh and Kenya);
• Mwabu (South Africa, Zambia); and
• Other initiatives that have been replicated.

In addition, such research can have a bearing on replication of government-supported initiatives such as DLP.

**Planning and protocols.** Leadership of the Education Technology Hub for Research and Innovation should set goals for the development of protocols for replication and scaling of successful initiatives. In the early part of the Education Technology Hub’s lifecycle, such protocols or ‘process-engineering descriptions’ should be considered outcomes of a class with successful project performance and impact. In its early years, then, the Education Technology Hub can develop a suite of processes that can be applied in relation to localisation, scaling, impact assessment, or other repeated processes. While these protocols or processes can, as they are finalised, be released as public-facing resources, their primary value will likely be among Education Technology Hub personnel: they should be seen as a means of accelerating and perhaps increasing the VfM of Hub activities.

### 6.2 The emergence of local content servers

Many initiatives are basing resource-delivery, local connectivity, and internet connectivity on low-power server/hubs. There are several areas in relation to these devices that bear inquiry. These include (but are not limited to):

• **Minimum functional requirements**
  These requirements should be determined in relation to storage, local networking capacity (range, bandwidth, bandwidth per user, etc.), power consumption, etc.

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31 EduTrac is also possibly being used in Peru. As that country is outside the scope of this study, and as ‘EduTrac’ is a widely applied ‘brand’ for EMIS programmes, we have not been able to verify the use of the UNICEF-sponsored version, which was first applied in the field in Uganda.
• **Impact on resource use**
  To what extent and in what ways does the local availability of learning resources influence their use? (What is the influence of other factors, such as TPD, programme structure, internet connectivity, etc.?)

• **Comparison of approaches to reporting and decision support**
  Several initiatives adopt different approaches to the use of local content servers to track student and teacher activities. Onebillion.org, for example, receives data from programme schools in Malawi, while in other initiatives (e.g. DLP in Kenya, etc.) servers share information primarily with the ministry. How is information used, shared and presented, and with what impact on programme activities or on student and teacher performance?

This potential inquiry is relevant to:

- DLP (Kenya);
- Unlocking Talent (Malawi);
- Kio Kit (Kenya); and
- Other initiatives that channel data from the field to a central server.

The proliferation of these devices can likely be traced to the emergence of the RaspberryPi low-cost/low-power server, internationally, as a device capable of providing these features and supporting learning. The ramification of this proliferation is simply the implication that initiatives relying on internet connectivity, including connectivity provided as mobile broadband, are likely to be out of date.\(^{32}\) (One NGO working in several countries, Foundation for Learning Equality [https://learningequality.org] focuses exclusively on methods for serving learning resources locally; Learning Equality will receive GBP 36 million in funding from Google.org for their efforts [Devex, 2017].)

### 6.3 Refugees

EdTech activity among donor organisations and iNGOs supporting refugees is intensive. The ramifications of those activities, including the degree to which they spark opportunism on the part of contractors, are unknown. From the Inception Report (page 8):

> In general, we and others have observed a 'crowding in' of EdTech initiatives with regard to specific refugee populations. Our researchers found evidence of many EdTech initiatives intended to benefit Syrian refugees, in particular. A common approach appears to entail pilot testing an initiative in one population (e.g. refugees in one camp or one country), and replicating that initiative as warranted among similar populations. One report (Menashy and Zakharia, 2017) finds that 'nearly half of private actors involved in Syrian refugee education are supporting some form of educational technology'.

Menashy and Zakharia suggest that the emergence of so many supporters and initiatives occurs in response to (financial) opportunity as well as need. Their report highlights problems that emerge from: 1) children's access to mobile devices and other resources; 2) duplication and lack of coordination of efforts; 3) over-emphasis on technology as a 'panacea'.

We believe that the Education Technology Research and Innovation Hub can effectively and should support innovation in relation to refugee and IDP populations. However, such support should be contoured with awareness of the already high level of EdTech activity focused on specific refugee populations.

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\(^{32}\) As per the Inception Report, there are several initiatives based on fixed-line broadband connectivity (such as the Video on Demand initiative in Ethiopia) that are innovative precisely because they focus on methods for addressing the high cost and/or limited coverage of internet access.
Two points bear stating:

- The level of technology and EdTech activity in refugee camps in Asia is substantially lower than among Syrian refugees; and
- The effective use of mobile devices by Rohingya children 'on the move' out of Myanmar and into Bangladesh is high (see Thorpe and Supaporn, 2017, as mentioned).

We suggest that: additional inquiry should precede any effort to advance the use of EdTech in relation to Syrian refugees; contingent on the results of that inquiry, the use of EdTech in relation to refugees should focus on helping to address the needs of other populations, such as the Rohingya in Bangladesh or the sizeable refugee populations in camps in Kenya. Fewer EdTech initiatives focus on these populations than on refugees in MENA countries. In addition, as Thorpe and Supaporn have found, Rohingya children already have access to and use mobile devices – as planning tools to help their families navigate and travel, and to help prepare themselves for life upon arrival. (We have no information about access to and use of computers and mobile devices by children in camps in Kenya.)

6.4 Competitions

One recent development in EdTech is the emergence of challenges and competitions as a means of spurring activity and of disbursing funds. This emergence is only a part of an increasing emphasis on the use of competitions in the private sector – ranging from the pitch competitions staged by accelerators and incubators to coding competitions for programmers – and in government. The Government of the United States, for example, hosts the website challenge.gov, enabling private-sector firms to review and enrol in various competitions (e.g. increasing the flight time and payload of unmanned aerial flight systems). In development, this approach is used by many organisations, including USAID (with Development Innovation Ventures, among others), the World Bank (Apps for development), and DFID. (The Faraday battery challenge is among 17 competitions currently listed on the Innovation funding service website [apply-for-innovation-funding.service.gov.uk].)

In EdTech, competitions of this kind have begun to emerge as a substantial means of promoting innovation to achieve specific outcomes. Competitions include, but are not limited to:

- ACR: A Grand Challenge for Development;
- Google Impact Challenge; and
- Global Learning xPrize.

The impact of these challenges can be observed in this report. They have supported several initiatives identified in this study, including LearnSyria by Rumie (see the Jordan country profile), EduApp4Syria (see the Jordan country profile), and Unlocking Talent (see the Malawi country profile).

Interview respondents framed competitions in two ways. One respondent, whose organisation administers several competitions, suggested that these challenges ‘enable funders to act without knowing what to fund’. However, another respondent whose organisation also administers EdTech challenges suggests that competitions enable much more rapid deployment and research: ‘Where I would need a four-year timeframe to see research results under a grant, I can build results reporting into Year 2 (of a competition).’ It is likely that both of these perspectives are partially true.
If properly structured, however, challenges and competitions should enable grassroots and local innovation to emerge, ensuring relevance and effectiveness.33

### 6.5 Increasing private-sector involvement in education

One trend observed in developing and developed countries is the increasing involvement of private-sector firms in education and in EdTech. This report refers to documentation of substantial involvement in India and Kenya, among other countries.34

These developments are mirrored by the growth of private-sector engagement in higher education in the UK, the USA and other countries (Altbach, Reisberg, and Rumbley, 2010), but also in primary and secondary education (Ball, 2009). Although the implications of such increased involvement have been criticised (Unwin, 2016), the failures of government-provided school, as documented by Tooley (2009) and others (Clark, 2000), suggest that the privatisation of some services is of potential benefit. Others (Menashy, 2017) identify bias among multi-stakeholder partnerships of donors against private schools, despite evidence that they effectively fill a demand-based niche.

In relation to EdTech, in particular, the scope of private-sector involvement is broad, linking government and the technology industry inextricably. Among the more obvious examples, many initiatives in government schools (e.g. DLP, Unlocking Talent, EduTrac, Vodacom Network Schools, the Digital Education Initiative, etc.) take advantage of mobile broadband internet via agreement with telecommunications operators – which are in turn regulated by the government and in many instances offer connectivity or communications at reduced rates to discharge their universal service obligations. Less easily untangled is the effect of VC and other forms of investment on the decisions by start-up technology and EdTech firms. In Kenya, where the possibility of private investment has sparked the emergence of many EdTech start-ups, the requirements of capital for adoption and/or revenues might be one driver underlying decisions of these firms to expand outside of Kenya rather than entering into large-scale partnerships to support DLP. (Eneza Education is currently active in Ghana and Tanzania; BRCK sells kits in 11 countries [The Guardian, 2017b]). This impact of this situation in Rwanda, for example, where government engagement is likely critical to EdTech success, is unknown.

The Inception Report in addition identified several open questions and/or observations based on the opinions of interview respondents. Those sections are reproduced here.

- **EMIS: Opportunity or boondoggle?**

  One respondent suggests, 'EMIS has been an area where we’ve tried a lot and wasted a lot of money; there are too many systems all competing with each other.' Divisions within governments and even within MOEs attract budget for development or procurement of EMIS initiatives, resulting in a balkanised complex of competing interests. (Afghanistan, as per the

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33 Although our assessment precedes the completion of the evaluation of its two game-based literacy-app finalists, the EduApp4Syria competition can be considered as a lesson in structuring the challenge process. The competition specifies that the distribution of the apps will be via Google Play, which essentially mandates an approach that centres on non-formal learning. However, about 50% of refugee children in Jordan – where the evaluation is taking place – are currently attending Jordanian primary school. An unknown percentage, in addition, visit NGOs that offer literacy-learning opportunities and that, in at least several instances, provide access to mobile devices that could provide access to the apps. The competition requirements, then, obviate participatory inputs from teachers and other potential users in the early phases of designing the approach.

34 The Inception Report, in addition, detailed EdTech initiatives in Nigeria intended to facilitate private and non-formal tutoring and test preparation.
Inception Report, is an example of this situation. A second respondent, working in Africa (currently on EMIS issues in East Africa and other sub-regions), suggests that while most of EdTech has been a costly waste, ‘EMIS is the one area to start in, the area where there are challenges but the payoff is real’. The success of the EduTrac initiative, using SMS to create polling-style views of events and needs in schools supports the point of the first respondent: approaches to EMIS that rely on ‘upstream’ aggregation and analysis of structured information from individual schools are less successful and/or deliver less VfM than survey-based methods that focus on specific topics, use simpler and more familiar tools, and aggregate responses as they are entered.

- **MENA: Need for coordination?**

  Our observation in the Inception Report was that initiatives in the MENA sub-region tended to focus on several countries, in part as a result of commonalities of language and culture – and in part, no doubt, because the current refugee crisis in the sub-region stresses governments and education systems. Further observation suggests that a coordinating mechanism is needed to assess initiatives in comparison to each other (e.g. Edraak in Jordan, RACE II in Lebanon) and to help ensure that commonality and regional focus does not result in redundant and even competing efforts.

With regard to the need for coordination in the MENA, our brief review has identified several initiatives that might be designed to occupy the same niche. As discussed, the use of EdTech in relation to refugees in the region, and Syrian refugees in particular, is proliferating. In addition, some initiatives – Edraak in Jordan, RACE II in Lebanon – appear to share a single approach. Additional inquiry is advisable.

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35 Among many competing EMIS initiatives, separate solutions have been developed to link provincial education directorates for the recording of student, teacher, and school information, and to record the progress of students pursuing certification at teacher-education colleges. These systems have been developed and are operated by different divisions within the MOE; they do not interoperate.
7 Conclusion

The promise that EdTech holds for learning worldwide has been unrealised to date. However, the emergence and development of EdTech is still new, even in developed countries, and still being elaborated, assessed, and revised. Technology and donor-funded development can be thought of as members of a single cohort: the microchip is less than 60 years old, while donor-funded development – if we date it from the founding of the World Bank – began just 68 years ago (as of 2018). Both these cohort-members – technology and development, as well as public education – are still in dynamic phases.

The Education Technology Hub for Research and Innovation can at its start participate in the integration of education, technology, and development by replicating initiatives in new contexts, assessing their appropriateness and impact, and developing protocols for similar activities by other actors. Capturing, sharing, and building on good practice and knowledge is essential to achieving SDG4. Refugee children and young people in Bangladesh and in Kenya can potentially benefit from both formal and non-formal support for learning, including the Digital Education Initiative of Pratham Education and the EduApp4Syria initiative. Play.Connect.Learn, formerly supported by ACR, holds great potential for up-scaling among its original community and for replication in other parts of India.

Such actions must be supported by research that assesses impact or that enables the head-to-head comparison of similar solutions. There are several integrated school solutions (Digital School in a Box, oneclass, Instant Networked Schools, etc.) that share critical features – direct instruction, TPD, management functions – but that make use of alternatives in hardware, software, local and internet communication, and instructional design. Better understanding of the effectiveness and the appropriateness of these differences is critical to informed decision-making.

Such understanding, however, likely extends more deeply than impact assessment, and can include knowledge of the factors that are the constituents of impact. (Are there common design criteria to support improvements in learning outcomes? Which of these criteria best support 21st-century skills?) We can support repeated processes, such as localisation or scaling of EdTech, through roadmaps, specifications, templates, and guidelines. Our understanding of such processes – in combination with the ability to communicate effectively about them – is essential to ensuring that education technology can deliver on its promise across a range of different objectives and contexts. But as our education systems and the students in them adapt to meet emerging needs, we must return repeatedly to questions of pedagogy, curriculum, capacity, and other system components before we can design, develop, and field technology that is optimally effective.
Annex A  Country ratings

The information in this annex is taken from the Inception Report.

The table in this section is intended to support ‘at-a-glance’ understanding of current EdTech activity and capacity for EdTech innovation in each of the countries examined. The table addresses the five key questions defined for this assignment. Scoring is based on a possible award of five points per category. While this system is flawed in many ways (e.g. categories are not weighted in importance, special circumstances are not considered in scoring, etc.), we have endeavoured to present unbiased and objective appraisals. The chief virtue of this presentation is that it enables differences among countries to be easily grasped. To approach the appraisal process swiftly but as objectively as possible, we have adhered to the following scoring practices:

**Initiatives.** Scoring is as follows: 3 or more identified initiatives = 5 pts; 2 initiatives = 3 pts; 1 initiative = 1 pt.

Initiatives that rely on desktop computers or that launched more than 10 years ago are generally not considered innovative, unless they make use of a new or newly applied solution, tool, or approach. Desktop computers are considered not appropriate generally in that they are: more expensive to procure; more complex to operate, maintain and repair; and require higher levels – or higher-quality – electricity.

**Governmental buy-in and policy.** Scoring is as follows: one education sector plan or policy approved in the past 10 years = 1 pt; two to three education plans or policies = 3 pts; more than three policies = 4 pts. Known funding by government for EdTech adds 1 point.

As the relationships of government and donor funding in any given country can be difficult to untangle, we have focused on approval of relevant policies in our assessment of political support for EdTech. Draft policies are listed when known but are not considered in scoring. Policies that emphasise desktop computers and/or fixed-line internet are not considered in scoring.

(However, policies that emphasise either technology as a subject or EdTech contributions to economic development do contribute to a country’s score.)

**Networks and/or hubs of innovators.** Scoring is as follows: presence of two or more private-sector hubs = 3 pts; unusually active or well-known ‘tech-innovation topography’ (e.g. as in Lagos, Nairobi, Cape Town, etc.) = 4 pts; construction and operation of NREN = 1 additional pt.

There are more than 300 tech hubs currently operating in Africa, with about 50% located in South Africa, Nigeria and Kenya (and Egypt). We do not assess the quality of their activities. Other factors that we have linked to innovation or potential innovation include the

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36 Few education projects designed within the past eight years call for the use of desktop computers. An exemplary exception uncovered by our inquiry is the Video on Demand project in Ethiopia, which makes use of an innovative compression method to support access to videos via the internet. (It is likely that the compression tool runs only on desktop computers.)

37 We use 10 years as our cut-off period so as to approximate the emergence of mobile devices as a factor in education. Under mobile devices we include smartphones and tablets, but also low-cost/low-power notebook computers, such as OLPC, which launched its G1G1 campaign in 2007.
construction and operation of a NREN and government support for innovation (usually framed as 'technology innovation' by governments). 38

Researchers. Scoring is as follows: no discovered authors results in a score of 0; one to four authors results in a score of 2; any lead authors results in a score of 3; known lead authors (e.g. Marion Walton, South Africa) or research institutes (e.g. South African Institute for Distance Education) results in a score of 5.

This method does not consider the quality of research.

Our search for researchers only includes researchers who have published relevant articles or reports within the past five years and who are based in one of the 28 priority countries addressed in this report. Searches were conducted using Google Scholar and the search terms 'research ed tech NAME OF COUNTRY' and with similar searches conducted using 'ICT education' and 'technology in education.' If these searches did not generate usable results, the search was repeated using 'research education [NAME OF COUNTRY].'

Inquiry into researchers is also based on referrals from interview respondents and is incomplete at this time. Reviews of African education journals and of the Comparative Education Review are in process.

Funding. Scoring in this report is as follows: one charitable foundation within the country that has funded EdTech activities within the past five years = 3 pts; more than one such foundation is scored '4'; the award of high-profile international funding (e.g. OSI, BMGF, XPRIZE) adds 1 point to the total score for funding in that country. 39

Funders must have funded one EdTech initiative within the past five years.

We have scored only the presence of national, non-governmental funders, such as charitable foundations and the philanthropists that fund them. (As it turns out, countries that have high current levels of EdTech activity as determined by this assessment – India and South Africa – both have highly developed philanthropic funding sources. 40)

Our approach in this instance is based on the observation that government funding for education and EdTech in particular is strongly influenced by donor priorities – influencing the level of funding allocated to a country and the emphasis placed by donors on technology-based solutions – and these influences in turn can strongly affect design, procurement, and implementation. 41

The upcoming Second-Stage Report will address government buy-in and funding in the 'deep dive' countries more completely, identifying both national and international funding of EdTech initiatives.

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38 While we have made efforts to distinguish between in-process NREns and NREns that are established and operational, making this determination has not always been possible. In some instances (e.g., GarNET in Ghana), activities, affiliations and announcements further complicate verification.

39 Country profiles in the current report address donor funding and other sources as well.

40 Jordan, another country has high levels of EdTech activity, has channelled funding through QRF to support an initiative that was originally funded by international donors. We consider QRF a philanthropic source of EdTech funding in Jordan; we do not further analyse the funding stream of JEI in this report.

41 As an example, donor-provided EdTech funding in Afghanistan has supported several EMIS-related initiatives. These initiatives originate in separate agencies or departments within the MOE and are frequently in competition. At the same time, internal pressure to develop new tools rather than adapt or purchase commercial-off-the-shelf tools, in combination with security and other issues, has led to very high procurement costs. The impact of international funding, then, has transformed programme design and resource procurement.
Table 40: Inception report country ratings

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<th>Country</th>
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<th>Buyin / Policy</th>
<th>hub / network</th>
<th>Researchers</th>
<th>Funding</th>
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Annex B Resources


Annex C  Addresses and other information

This annex includes contact addresses for organisations that appear in this report. Not included are addresses of UN organisations or addresses that require posting individuals' contact information.

C.1  Bangladesh

BdREN
UGC Bhaban, Room#529, 29/1, Agargaon
Sher-e-Bangla Nagar
Dhaka 1207
Bangladesh

BRAC
BRAC Centre
75 Mohakhali
Dhaka-1212
Bangladesh

880-2-9881265 Ext: 3155, 3107, 3161
info@brac.net

Coders Trust
Hosna Villa
House # 82, Block # E, Road # 19/A, Banani
Dhaka 1213
Bangladesh

+880-4478017838 | +880-1739561919

Save the Children
Bangladesh country office
House No. CWN (A) 35, Road No. 43
Gulshan – 2, Dhaka-1212
Bangladesh

+88-09612555333
info.bangladesh@savethechildren.org

SD ASIA
28, Block – K, Road 20
Banani, Dhaka 1213
Bangladesh

startupdhaka@gmail.com

Start-up Bangladesh
Information and Communication Technology Division
E-14/X, ICT Tower, Agargaon
Dhaka-1207
Bangladesh
C.2 India

Aga Khan Foundation (India office)
Sarojini House, 2nd floor
6, Bhagwan Dass Road
New Delhi, Delhi 110001
India

+92-11-47399700
akfisp.2018india@gmail.com

Central Square Foundation
7 Mercantile House, Kasturba Gandhi Marg
Janpath, Connaught Place
New Delhi, Delhi 110001
India

+91 11 2373 7286

EduGild
9, Vishwashanti Marg
Rambaug Colony, Kothrud
Pune, Maharashtra 411038
India

EdTech Review
A5, 3rd Floor, Shankar Garden
Vikaspuri, Delhi 110018
India

+91 11 4132 1030

EkStep Foundation
Quorum, No. 85, 7th Cross, 4th Block
Koramangala, Bangalore – 560034
Karnataka
India

GoodWorksLabs
Plot No. 72 and 73, 4th Floor, Akshay Tech Park
EPIP Zone
Whitefield
Bengaluru, Karnataka 560066
India

+91 76767 07700
Million Sparks Foundation  
H-35, First Floor  
Sector-63, Noida  
Uttar Pradesh - 201301  
India  

PlanetRead  
Mumbai  
Sea coast CHS, Row House no 5 (First and second floor)  
Phase 3, Sector 15/A, Kille Gauthan  
Opposite NMMC office, Behind NRI Police Station  
CBD Belapur, Navi Mumbai 400614  
India  

Puducherry  
24, St. Francois d'Assise Street  
Kuruchikuppam, Puducherry – 605012  
India  

USA  
26 Manor Drive  
Piedmont, CA 94611  
USA  

info@planetread.org  

Pratham Books  
House No. 621, Second Floor  
5th Main, OMBR Layout, Banaswadi  
Bengaluru - 560043  
Karnataka  
India  

+91-80-42052574, 41159009  

Pratham Education  
Delhi  
B- 4/58, Safdarjung Enclave, 2nd Floor  
New Delhi-110 029  
India  

+91-11-26716083 / 41651638  
info@pratham.org  

Mumbai  
Y.B. Chavan Centre, 4th Floor  
Gen. J. Bhosale Marg, Nariman Point  
Mumbai, Maharashtra – 400021  

+91-22-22819562
SesameWorkshop India Trust
153, 1st Floor, Okhla Phase III
New Delhi, Delhi 110020

+91 11 26323824
contactus_india@sesame.org

C.3 Jordan

ASREN
alal Abu-Ghazaleh University Company building (TAGIUNI) No. 45
Abdel Rahim Al- Waked Street
Shmeisani, near Le Meridien Amman Hotel
PO Box: 921100, Amman 11192 Jordan

+962-(6)-510-0900
info@asrenorg.net

iPark
Royal Scientific Society
Amman
Jordan

IPark Incubator (Amman)
King Hussein Business Park
Grow Building 23, 2nd floor
Amman, Jordan

Little Thinking Minds
PO Box 925132
Amman
Jordan

+962-6-5811958
info@littlethinkingminds.com

MIC Jordan
Royal Scientific Society, Al-Jubaiha
P.O. Box 1438 Al-Jubaiha 11941
Amman
Jordan

+962.6.5334701, ext. 2772

QRF for education and development office
King Abdullah II St., Building Num. 300
PO. Box 140141
Amman
Jordan 11814

+962-6401-6464
Rumie initiative
6th Floor, 10 Dundas St E.
Toronto, ON, M5B 2G9
Canada

info@rumie.org

Ustad mobile
Boutique Villa 7
Dubai Media City
Dubai
UAE

+971 555 997043

Wamda (Jordan office)
P.O. Box: 960913
Amman, Jordan

+96-2648-1448

War Child Holland
Helmholtzstraat 61G, 1098 LE
Amsterdam, Netherlands

+31 20 422 7777

C.4 Kenya

BRCK
2nd Floor, Bishop Magua Centre
George Padmore Lane
Nairobi
Kenya
PO Box 58275-00200
Nairobi
Kenya

+254 718 272 887
info@brck.com

C4D Lab
School of Computing and Informatics
Chiromo Campus, University of Nairobi
P. O. Box 30197 – 00100 GPO
Nairobi
Kenya

+254 790 413 836
hello@c4dlab.ac.ke
DOT Kenya
Museum Hill Centre, Muthithi Rd
Nairobi City
Kenya

+254-705-810200

eLimu
Bishop Magua Centre
(opposite Uchumi Hyper)
Kilimani
Nairobi
Kenya

+254 716 287 946
learn@e-Limu.org

Eneza Education
Silk Wood Office Suites
Ngong Road, Nairobi, Kenya

+254.707.908.308
info@enezaeducation.com

Hewlett Foundation
2121 Sand Hill Rd
Menlo Park, CA 94025
USA

+1-650-234-4500

ICT Authority
Teleposta Towers, 12th Flr
Kenyatta Ave., Nairobi, Kenya
P.O. Box 27150 - 00100
Nairobi
Kenya

+254-20- 2211960
+254-20-2211961
info@ict.go.ke

iHub
6th Floor, Senteu Plaza
Galana/Lenana Road Junction
PO Box 22494 - 00505
Nairobi
Kenya

info@ihub.co.ke
KENET
Jomo Kenyatta Memorial Library, University of Nairobi
PO Box 30244-00100
Nairobi
Kenya

info@kenet.or.ke.

Nailab
4th Floor, Bishop Magua Centre
Nairobi
Kenya

+254 719 308635

Project Kakuma
Help Kakuma
VZW - 0638.928.013
Runksterkiezel 28 – 3500
Hasselt
Belgium

info@projectkakuma.com

Vodafone Foundation
Vodafone House
The Connection
Newbury, Berkshire RG14 2FN
UK

VVOB
Place Julien Dillens 1
1060 Saint-Gilles
Belgium

+32 2 209 07 99

C.5 Lebanon

DOT Lebanon
Pierre Gemayel Street, Next to Al Tamweel Bank
Bldg S.E.A. 3, First Floor
Baouchriye, Beirut
Lebanon

+961-1-255-217

IEA
Lebanese Alternative Learning
Monot Street, Beyrouti Building
Beirut
Lebanon
+961-1-426769

**UK Lebanon Tech Hub**
Berytech Digital Park Beirut Digital District
1294 Bechara El Khoury Road
Beirut
Lebanon

+961-1-669-040

**Wamda (Lebanon office)**
Beirut Digital District, Building 1243, 9th floor
Nassif El Yaziji Street, Bashoura District
Beirut
Lebanon

**C.6 Malawi**

**MAREN**
+265-1-524-282

**mHub**
Corporate Mall, Paul Kagame Road
Lilongwe
Malawi

+265-888-988-046
info@mhumw.com

**MUST**
+265-1-478-000

**Royal Norwegian Embassy**
Arwa House Independence
Private Bag B 323
Lilongwe
Malawi

+265-1-774-211

**Unlocking talent**
Voluntary Service Overseas Malawi Area 10/587
Behind Pacific Mall, P/Bag 8300
Lilongwe
Malawi

info@unlockingtalent.org
C.7 Rwanda

AIMS (Rwanda office)
AIMS Rwanda Centre
Sector Remera, KN 3
Kigali
Rwanda

DOT Rwanda
KG 11 Ave
Kigali, Rwanda
rwanda@dotrust.org

+250-7898388140

GreenTec Capital (Germany)
Carl-von-Noorden-Platz 5, 3FL
Frankfurt am Main
Hessen 60596
Germany

GreenTec Capital (South Africa)
82 Maude Street
Sandton, 2196
South Africa

Impact Hub, Rwanda
Plot 34 KN 41 St
Kiyovu-Kigali, Rwanda

+250-(0)-788-544-203
connect@impacthub.rw

kLab
Telecom House, 8 KG 7 Ave
Kigali
Rwanda

Millicom
(Sponsor of Think)
396 Alhambra Cir, Coral Gables, FL 33134
USA

+1-305-445-4100