

SYNERGIES BETWEEN THE PRINCIPLES FOR DIGITAL DEVELOPMENT AND FOUR CASE STUDIES



GLOBAL EDUCATION & SKILLS FORUM (GESF) ALLIANCE ON ASSESSMENT AND IMPACT FOR LEARNING

ABOUT THIS REPORT

This report was prepared by Björn Haßler for the Research for Equitable Access and Learning (REAL) Centre, University of Cambridge, UK, with support from the Global Education & Skills Forum (GESF) Alliance on Assessment and Impact for Learning. This Alliance was co-chaired by Pauline Rose (REAL Centre, University of Cambridge, United Kingdom) and Baela Raza Jamil (Idara-e-Taleem-o-Agahi, Pakistan) and included the following members: Emma Broadbent (The Varkey Foundation, United Kingdom), Andrew Cunningham (Aga Khan Foundation, Switzerland), Joseph Chimombo (Ministry of Education, Malawi), Rashmi Kauthria (Global Teacher Prize Finalist 2017, India), Lucy Lake (Camfed, United Kingdom), Shajia Sarfraz (Independent Researcher, Pakistan) and Miguel Szekely (Center for Education and Social Studies, Mexico) Saba Saeed (Idara-e-Taleem-o-Agahi) also contributed to this report.

GESF ALLIANCES

GESF Alliances are groups of experts brought together by The Varkey Foundation to think about how education can change the world. Alliances's members are drawn from across the world and include leaders from academia, government, business, civil society and teaching. Each alliance works on some of the key issues of our time: conflict, climate change, global citizenship and the status of girls' education. They also work on the future of education itself: teachers, universities, public-private partnerships and the use of assessment.



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For further information, contact: Research for Equitable Access and Learning (REAL) Centre, Faculty of Education, University of Cambridge, 184 Hills Road, Cambridge, CB2 8PQ, UK. Email: realcentre@educ.cam.ac.uk

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INTRODUCTION

Education interventions are increasingly turning to technology for support in a variety of ways. One important aspect of technology use is the collection and dissemination of data on enrolment, attendance and attainment in schools. Such data have the potential to inform national education strategies, by providing an indication of the status of the system. Used appropriately, they can also inform teachers, parents and communities on shortcomings in children's education, and ways that this can be improved within schools. With the increased use of technology for these purposes, it is timely to consider:

The approach taken in this report is to draw on the experience of four organisations (the Aga Khan Foundation, Camfed, the Punjab Information and Technology Board and The Varkey Foundation), all of which have used technology platforms for collecting education data to inform their programmes. Considering these experiences, we have these objectives:

- By comparing these organisations' experiences to the Principles – and using the principles as a guide for structured reflection – we may help to avoid unintended adverse consequences which may arise from the adoption and use of digital technology, as well as to help save costs.



- The appropriateness and effectiveness of those digital tools in collecting the data; as well as
 - The way such digital tools are developed and deployed
- These considerations fall into the domain of the Principles for Digital Development,¹ which were initially formulated through work led by UNICEF² in order to help development projects that utilized digital technology avoid common pitfalls. The principles are not specific to the education sector, but concern the whole ICT-for-development sector.
- As a “second-loop learning” objective, we examine whether this mapping exercise does indeed provide important lessons regarding the case studies, to examine whether systematic use of the Principles could be helpful in the future.
 - A further objective is to identify whether there are Principles which are particularly relevant to the case studies, and whether the Principles require important additions or clarification.

THE PRINCIPLES FOR DIGITAL DEVELOPMENT

The Principles For Digital Development (the Principles) were initially formulated through work led by UNICEF in order to help projects to identify and avoid common

pitfalls. The Principles have been adopted by a large number of organisations for all of their programmes, including the UK's Department for International Development (DFID).³ Endorsement is open to organisations of various types.⁴ The Principles are:

THE PRINCIPLES FOR DIGITAL DEVELOPMENT

PRINCIPLE 1 - DESIGN WITH THE USER

User-centered design starts with getting to know the people you are designing for through conversation, observation and co-creation.

PRINCIPLE 2 - UNDERSTAND THE EXISTING ECOSYSTEM

Well-designed initiatives and digital tools consider the particular structures and needs that exist in each country, region and community.

PRINCIPLE 3 - DESIGN FOR SCALE

Achieving scale requires adoption beyond an initiative's pilot population and often necessitates securing funding or partners that take the initiative to new communities or regions.

PRINCIPLE 4 - BUILD FOR SUSTAINABILITY

Building sustainable programmes, platforms and digital tools is essential to maintain user and stakeholder support, as well as to maximize long-term impact.

PRINCIPLE 5 - BE DATA DRIVEN

When an initiative is data driven, quality information is available to the right people when they need it, and they are using those data to take action.

PRINCIPLE 6 - USE OPEN STANDARDS, OPEN DATA, OPEN SOURCE, AND OPEN INNOVATION

An open approach to digital development can help to increase collaboration in the digital development community and avoid duplicating work that has already been done.

PRINCIPLE 7 - REUSE AND IMPROVE

Reusing and improving is about taking the work of the global development community further than any organization or programme can do alone.

PRINCIPLE 8 - ADDRESS PRIVACY AND SECURITY

Addressing privacy and security in digital development involves careful consideration of which data are collected and how data are acquired, used, stored and shared.

PRINCIPLE 9 - BE COLLABORATIVE

Being collaborative means sharing information, insights, strategies and resources across projects, organizations and sectors, leading to increased efficiency and impact.

The Principles are also connected to a number of other existing frameworks, such as research ethics⁵ and open access publishing.⁶

These Principles may not speak immediately to the day-to-day concerns of programmatic work. However, detailed guidelines are also available for each Principle that demonstrate how to apply them in practice.⁷ This guidance is broken down into four stages:

- Stage 1: "Analyse and Plan";
- Stage 2: "Design and Develop";
- Stage 3: "Deploy and Implement"; and
- Stage 4: "Cross-Cutting: Monitoring and Evaluation" ("M&E").

While the Principles and their guidance are most obviously relevant to the development of new digital products, it is also important for organizations to consider the four stages when tailoring and adapting their existing products. For example, the Principles' guidance for analysing and planning a product also applies to product selection, while the guidance for designing and developing a product is also relevant to product adaption (even if this is commissioned adaptation by a software company).

programme stages, leading to designs that use digital technology more effectively. A common use of the Principles is to map project documents (such as proposals or reports) against the Principles, to see how they can inform the processes described. Finally we note that the current steward of the Principles is the Digital Impact Alliance, an organisation based at the United Nations Foundation, with multi-lateral support. The Digital Impact Alliance also runs the Open Source Center,⁸ focussing on technology for development and offering grants.

MAPPING THE PRINCIPLES AGAINST FOUR STUDIES FROM THE GESF ALLIANCE ON ASSESSMENT AND IMPACT FOR LEARNING

In this section we review four case studies informed by each one of the nine principles:⁹

- Aga Khan Foundation (AKF): Developing and prototyping PROMISE³ (a new online/offline, mobile/tablet-based Programme Management Information System for Education by Everyone, Everywhere).
- Camfed (CFD): Use of mobile technology in monitoring education in Ghana, Tanzania and Zambia.
- Punjab Information and Technology Board (PITB): Improving student learning outcomes through real-time student assessment, and monitoring of public schools in Punjab, Pakistan.
- The Varkey Foundation (VF): Delivering a comprehensive monitoring and evaluation system in Ghana using Salesforce and TaroWorks.

PRINCIPLE 1. DESIGN WITH THE USER

INTRODUCTION

Successful digital initiatives are rooted in an understanding of user characteristics, needs and challenges. User-centered design – also referred to as design thinking or human-centered design – starts with getting to know the people you are designing for through conversation, observation and co-creation. Information gathered through this engagement leads to building, testing and redesigning tools until they effectively meet user needs. By designing with the users, and not for them, you can build digital tools to better address the specific context, culture, behaviors and expectations of the people who will directly interact with the technology. Designing together means partnering with users throughout the project lifecycle, co-creating solutions, and continuously gathering and incorporating users' feedback.

“
USER-CENTERED DESIGN
STARTS WITH GETTING
TO KNOW THE PEOPLE
YOU ARE DESIGNING FOR
THROUGH CONVERSATION,
OBSERVATION AND
CO-CREATION.

Stage 4 ("M&E") refers to the monitoring and evaluation of the product itself. For example, if the product is a job-searching app, then the M&E would seek to answer how many people (within the intended audience) are using the app, and whether the app actually makes finding jobs easier (for that audience). Stage 4 of the Principles also applies to products which are themselves "M&E/research" tools – i.e. the stage recommends "double-loop learning". For example, if your M&E app monitors children's achievement, then Stage 4 of the Principles does not only refer to children's achievement (monitored once the product is deployed, to inform the education sector as a whole), but also to the evaluation of the M&E app itself (informing e.g. the M&E department within a ministry, during all stages of product development).

Importantly, the Principles are considered guidelines, rather than hard and fast rules. The value of the Principles is that they initiate dialogue at various

⁵For example, for Principle 8 see Ethical guidelines for educational research, British Educational Research Association, September 2011: <https://www.bera.ac.uk/researchers-resources/resources-for-researchers/>; and Draft standards available for review, ICT4D, November 2017: <https://ict4dethics.wordpress.com/>

⁶For example, for Principles 6 and 9 see DFID Research Open and Enhanced Access Policy, Department For International Development, 3 April 2013: <https://www.gov.uk/government/publications/dfid-research-open-and-enhanced-access-policy>

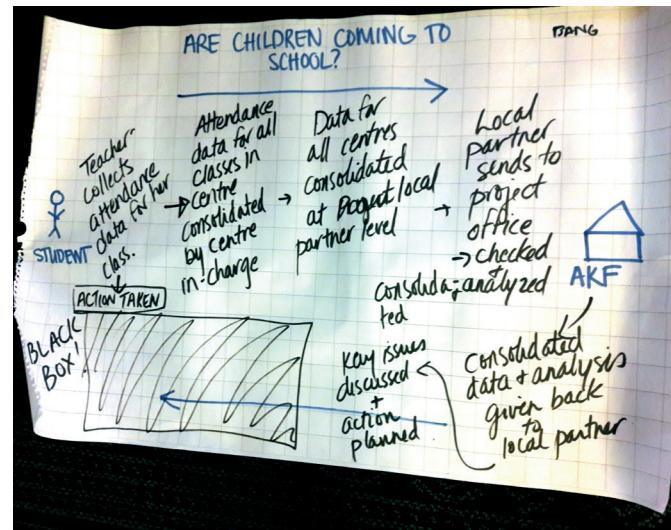
⁷See e.g. "Design with the user", Principles for Digital Development: <https://digitalprinciples.org/principle/design-with-the-user/>

THE CASE STUDIES

The AKF case study indicates that the “Human-centred Design” methodology¹⁰ was used in the development of the platform (i.e. at project initiation), in line with Principle 1.

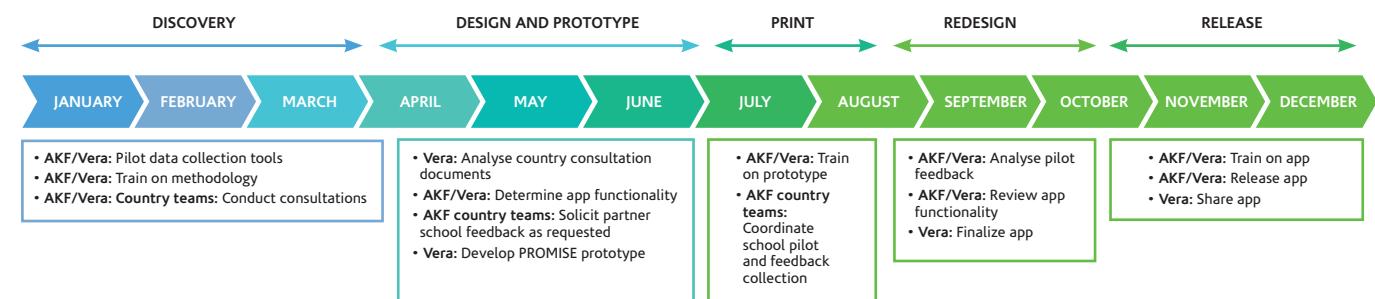
The AKF case study is very clear about their insights and how they arose, quite possibly a consequence of explicitly being designed with the users, including students and parents:

“After receiving the Force for Change Grant in December 2016, AKF employed the human-centred design approach at scale, spending the first six months in ‘discovery’ and ‘design/prototype’ phases, collaborating with local education stakeholders (students, parents, teachers, school leaders, government officials, and education donors/NGOs) across 24 government schools in six countries (Afghanistan, Tajikistan, India, Uganda, Tanzania, and Kenya).”



|| Human-centered design in action showing data flows
© Aga Khan Foundation 2017.

AKF's case study further illustrates the process:



|| The human-centered design approach employed by the Aga Khan Foundation

Data in the form of user stories was collected, and informed the prototype:

“The discovery phase generated 550 user stories, thereby informing the design of the prototype for roll-out. Budgeting for this phase of technology emphasized the need to understand existing data flows and data ‘pain points’ within offline systems at classroom, school, and district education levels. Without this initial analysis, the development of PROMISE³ would have missed key functionalities.”

This was followed by a trial of the prototype over six weeks per school:

“The prototype was then piloted across the same 24 schools from July to October, using one locally sourced tablet per school. The size of the screen was a key factor for initial testing of the app’s functionalities. Each school was given an initial training and then asked to use the app independently for six weeks. This pilot has

generated key insights into additional needs by users, challenges in data governance and storage, and costs for scaled roll-out.”

Among the insights regarding product features were: Operate offline; enable teachers to assess what they care about; offer schools globally informed and locally rooted learning assessment tools; and enable teachers to design their own learning assessments.

While the PITB study did not use formal user-centred design approach, the case study make it clear that the app was developed with the users:

“As Pakistan is a developing country, a large area of concern during the development phase of the LND [Learning and Development] program was the responses of both students and MEAs [Monitoring and Evaluation Assistants] to technology. Technology penetration in Pakistan’s government schools is behind that which is seen in developed countries, thus the familiarity

³Open Source Center, Digital Impact Alliance: <http://www.osc.dial.community/>

¹⁰The Digital Principles for Digital Development are available under Creative Commons Attribution Share-Alike 4.0. This footnote is included to satisfy the attribution requirement of the licence for citations of the principles throughout the text of this document. For more information see: <https://digitalprinciples.org>

³Human-centred design is a form of participatory action research: https://en.wikipedia.org/wiki/Human-centered_design

of students and evaluators with using a tablet-based application posed potential issues. Anticipating this challenge, PITB worked extensively with MEAs during the development of its Android application, consistently incorporating their feedback on the design of interface: from the size of the buttons to the order of display. This allowed MEAs to own the product and familiarize themselves with it while allowing PITB to create a more user-friendly product. Since MEAs were the primary persons to be using the application, they could then pass on their understanding to the students."

The examples from CFD also demonstrate the need for piloting, and in particular working with a representative group of stakeholders:

"Piloting in a small area first is a good idea, and also allows staff to provide extensive support to phone users. A vertical pilot (all stakeholders in a small geographical area) seemed to be more successful than a horizontal pilot (all of a stakeholder type throughout a country). For example, in Malawi, two districts piloted the phones to begin with. District officials who had

“ THE GROUNDWORK IS ESSENTIAL BEFORE INVESTING IN MOBILE TECHNOLOGY: THINKING CAREFULLY ABOUT WHAT DATA IS NEEDED, WHERE THE DATA WILL SIT, WHO WILL COLLECT IT, WHO MIGHT FEEL ‘BYPASSED’ IF THE DATA IS BEING SENT DIRECTLY WITHOUT BEING FIRST REVIEWED.”

It is also interesting to note that PITB operates a school information system and also offers a hotline, which may help to spot usability problems:

"PITB's other major programmes are the School Information System (SIS) and their complaints hotline 111-11-2020 which the attendant then directs to the district CEO of Education..."

The CFD case study shows that the design was prepared with an understanding of user characteristics, and notes the emerging issue that "mobile technology is a tool – the human interactions and processes are key". Examples from CFD that relevant to Principle 1 demonstrate the need for groundwork:

"The groundwork is essential before investing in mobile technology: thinking carefully about what data is needed, where the data will sit, who will collect it, who might feel 'bypassed' if the data is being sent directly without being first reviewed."

received training on using phones were then able to support teachers in their district."

The CFD case study also contains a number of insights about the need for appropriate training:

"When training volunteers, it's important to train in small groups, so support can be given to those who are struggling. In Tanzania we decided to train phone users using a cascade training method which worked well and meant we could keep the groups small. It's also important to pay attention to the needs, skills and experience of individuals during the training as (particularly in more rural contexts) many have not used mobile phones before leading to some struggling to read the small screens or to press the buttons and type. Setting in place a peer support system among volunteers in a particular area has helped address this."



|| © The Aga Khan Foundation, 2017

The CFD case study described the effectiveness of a gradual roll-out of the programme, suggesting the value of piloting with paper-based data collection:

"Rolling out mobile phones gradually meant that in the initial phase we were collecting data using mobile technology and paper simultaneously. How well paper forms were used was a good predictor of how well mobile technology was eventually used. This suggests that piloting paper-based data collection is a useful exercise before investing in mobile technology. It allows the opportunity to test the soft skills involved: the human relationships and interactions, the commitments of volunteers (if those collecting data are volunteers), and related to this latter, the integration of data collection within existing workloads and work streams (e.g. of teachers, district officials). It also means that, when mobile technology is introduced, the mobile technology is the only novel element (while the monitoring data to be collected should be fairly similar)."

The CFD study also notes the importance of user feedback, describing "...an automated SMS system to acknowledge the receipt of data..." , however the VF case study described buy-in from some staff, including teachers, to the adoption of new technology as "fragile" – which also points to the value of Principle 1.

PRINCIPLE 1 IN ACTION: DESIGN WITH THE USER

The above examples illustrate the importance for user consultation very clearly. For example, multiple user types and stakeholders were consulted, context-appropriate tools were designed that improved users' current processes and saved time, using fewer resources and improving quality. The process was iterative and incorporated feedback, with adaptation of the tool after the initial testing and launch.

Overall the processes aligned well with Principle 1. It may have been useful to have Principle 1 in mind during these developments, as it may have helped generate clarity and stakeholder support for the processes, particularly at the beginning. In the language of Leadership for Learning, this may have helped to "make practice explicit and discussable".

The Alliance would welcome the opportunity to publish all four case studies as a single case study on Principle 1 (and Principle 2, see below) on the Digital Principles website in order to share learning more widely (Principle 9).

Further guidance and case studies for impact are available at: <https://digitalprinciples.org/principle/design-with-the-user/>

PRINCIPLE 2. UNDERSTAND THE EXISTING ECOSYSTEM

INTRODUCTION

Well-designed initiatives and digital tools consider the particular structures and needs that exist in each country, region and community. Dedicating time and resources to analyze the ecosystem, or context where you work, helps to ensure that selected technology tools will be relevant and sustainable and will not duplicate existing efforts. Ecosystems are defined by the culture, gender norms, political environment, economy, technology infrastructure and other factors that can affect an individual's ability to access and use a technology or to participate in an initiative. Initiatives that do not account for ecosystem challenges are less likely to achieve their objectives or scale. This may also lead to unintended consequences. The ecosystem is fluid, multifaceted and ever-changing, requiring that digital development practitioners regularly analyze the context to check their assumptions.

THE CASE STUDIES

All case studies reviewed by the Alliance demonstrate the importance of understanding the existing social context in a country, including considerations around language. For example, CFD has noted:

"Because most volunteers in Tanzania who collect data speak only Swahili, we added a new specially designed functionality, which allows questions (and answer options) to be viewed in Kiswahili, but translated into English when entering Camfed's database..."

"One of the most powerful tools within mobile technology is the ability to overcome language barriers, with questions and answer options translated, and the possibility of choosing your preferred language. For example, in Tanzania, the questions and answer options are viewed by field users in Swahili, but imported into our database in English."

CFD's case study also demonstrates the importance of understanding and respecting political sensitivities:

“ WELL-DESIGNED INITIATIVES AND DIGITAL TOOLS CONSIDER THE PARTICULAR STRUCTURES AND NEEDS THAT EXIST IN EACH COUNTRY, REGION AND COMMUNITY.



"In 2013 mobile phones for monitoring were rolled out in Malawi (initially in two districts only) and in 2014 in Zimbabwe, where, due to political sensitivities, mobile phone monitoring was first introduced with District education officials prior to rolling out with teachers."

CFD has also emphasised the importance of stakeholder willingness to collect data and how smartphones can incentivise stakeholders to do so:

"Mobile technology is only a tool, and not a solution; if the commitment and willingness to collect data is not there when using paper, being given a phone is not going to change this. That having been said, mobile phones do serve as an incentive (and in some contexts a status symbol) – especially smart phones – though conversely they can also pose a potential security risk for users."

The case studies have noted the utility of different apps in communication and data collection. CFD's study, in particular, recognizes of the importance of WhatsApp as a tool for communication:

"Communication with volunteer data collectors is important – especially when it comes to monitoring deadlines. In Camfed, volunteers have used the phones for making calls to Camfed on programme issues as well as for sending data, so it is enhancing responsiveness of the system more widely. It has also enabled use of WhatsApp to facilitate peer networking which has proved a valuable incentive."

AK's case study draws explicit attention to local realities:

"Overall, we remain extremely excited about the future of PROMISE³. We are thrilled that the design process has been rooted in local realities and informed by global innovations and technologies."

Principle 2 In Action: Understand The Existing Ecosystem
The above examples illustrate the importance for understanding the existing "ecosystem" (i.e. the social and political context). The programmes engaged with their target users and referred to their own understanding.

Overall the processes aligned well with Principle 2. As for Principle 1, it may have been useful to have Principle 2 in mind during these developments as a formal principle, as it may have helped generate clarity and stakeholder support for the processes, to "make practice explicit and discussable". There is clearly scope for collaboration between the four projects, and it would be interesting to know whether the four projects interacted, to avoid duplicating efforts. It would also be interesting to know whether the ecosystem was monitored for changes throughout the project lifecycle. More broadly coordination with other implementing organizations, civil society and the government could be advantageous.

Further guidance and case studies for impact are available at: <https://digitalprinciples.org/principle/understand-the-existing-ecosystem/>

PRINCIPLE 3. DESIGN FOR SCALE

INTRODUCTION

Achieving scale requires adoption beyond an initiative's pilot population and often necessitates securing funding or partners that take the initiative to new communities or regions.

Achieving scale is a goal that has been elusive for many digital development practitioners. The mHealth field, for example, has identified the problem of pilotitis, or the inability to move initiatives beyond pilot stage. Achieving scale can mean different things in different contexts, but it requires adoption beyond

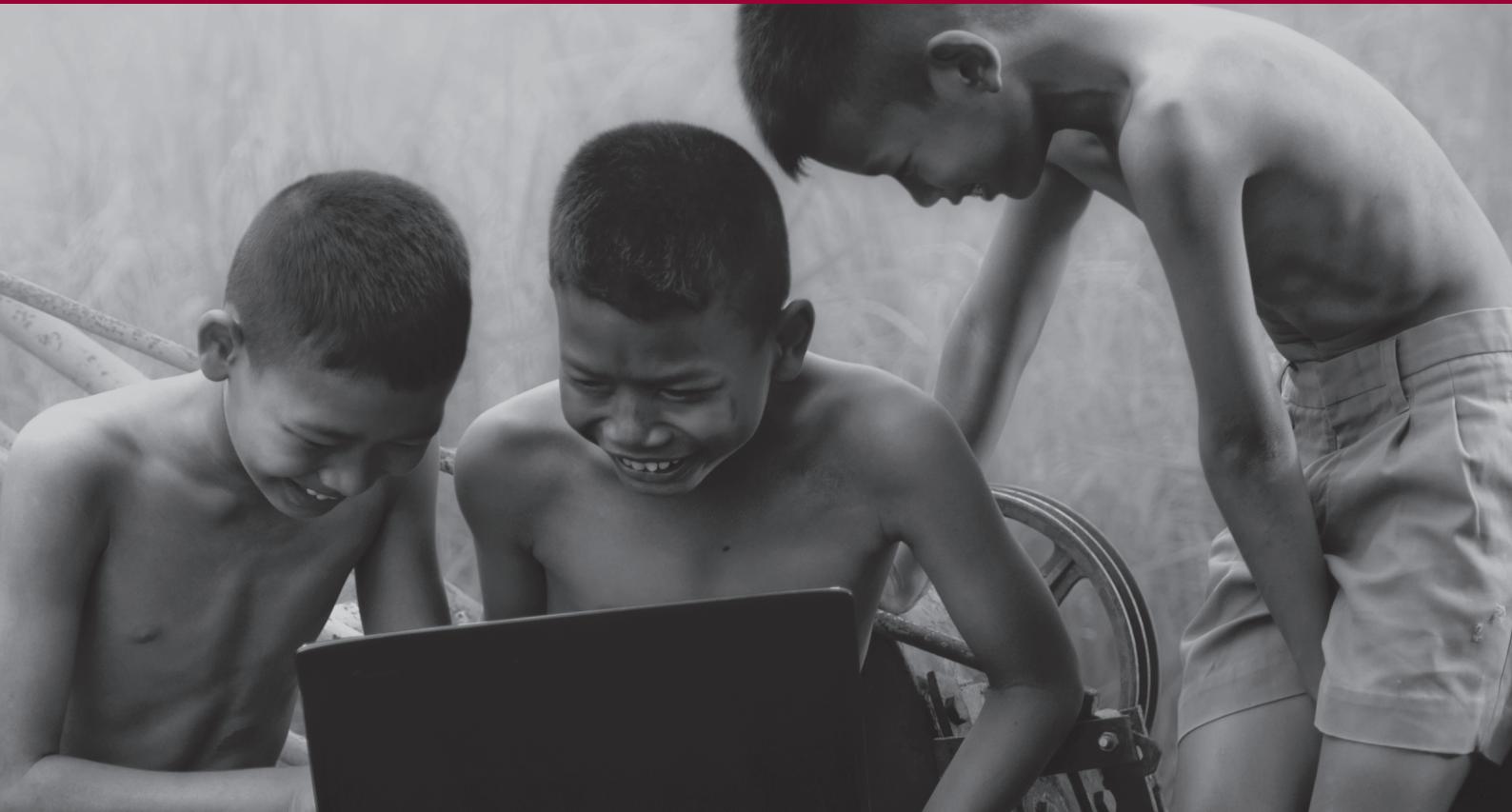
pilots that require more time and planning but lay the foundation for scaling by reducing future work and investment. By designing for scale from the beginning, your initiative can be expanded more easily to new users, markets, regions or countries if the initiative meets user needs and has local impact.

THE CASE STUDIES

The third Principle poses that "as you make technology choices [i.e. typically early in the project], think about whether they will make it easier or harder to scale".

The PITB case study has already reached a reasonable scale, with some 48,000 schools participating:

"Their tablet-PC and smart-phone based systems enable thousands of government officers across the Province to capture and reliably share M&E information every day...



an initiative's pilot population and often necessitates securing funding or partners that take the initiative to new communities or regions. Different implementers may define scale as reaching a certain percentage of a population or a certain number of users. Designing for scale means thinking beyond the pilot and making choices that will enable widespread adoption later, as well as determining what will be affordable and usable by a whole country or region, rather than by a few pilot communities. You may need to evaluate the trade-offs among processes that would lead to rapid start-up and implementation of a short-term pilot versus those

"Rolled out in 2017, the SIS is a self-reporting system for schools with more than 48,000 schools participating. It allows for the real-time tracking of school information, enrolled student information, teacher and support staff information, and daily attendance records, which are publicly made available on an online dashboard for everyone from school principals to policymakers to learn from and use for the improvement of education services. ... This revolutionizes the way in which schools are monitored and held accountable at all levels."

Moreover, there is explicit attention to costs and scale: "PITB's smart-monitoring initiatives[' ...] value proposition is: simplicity, cost-effectiveness, and prove-at-scale."

The AKF case study provides insightful notes on "product sustainability", sharing realisations that occurred some way into the project, including affordability of hardware and platform licences:

"5. Product Sustainability: Ensuring the Affordability of Learning Data Management for All. The sustainability of PROMISE³ will depend on three key factors: a.) the **affordability of the hardware** (locally sourced tablets and/or smart phones) b.) the **affordability of platform licenses** (Salesforce user licenses) and c.) the flexibility of the app to meet the diverse needs of multiple schools across a variety of contexts. PROMISE³ has sourced locally available hardware to try to address issues of maintenance, affordability, and accessibility for government and other local partners to roll-out the app in non-AKF supported schools. AKF and Vera Solutions are in negotiations with Salesforce.org for a global roll-out of the app through the University of Oxford and AKF's Schools2030 longitudinal research programme. These questions of **long-term pricing and maintenance are critical for the sustainability of any and all uses of technology** for data collection, analysis and utilization moving forward in the public sector of education."

In the CFD and VF case studies, scaling at the design stage is not explicitly discussed. However, AKF notes that CFD also uses Salesforce, and similar issues thus apply.

PRINCIPLE 3 IN ACTION: DESIGN FOR SCALE

This Principle focuses on issues such as to design for scale from the start. It suggests that creators should keep their design simple, flexible and modular to make it easy to change content and adapt to other contexts, and "as you make technology choices, think about whether they will make it easier or harder to scale".

It also suggests to "identify partners early who can help to scale your tool or approach", which could include sectoral cooperation.

The Principle suggests that creators should "consider your funding model, including revenue-generation options, social business models, the cost per user and financial paths to sustaining the initiative". This last issue is one of the core issues in digital technology: the scaling of costs, as noted by AKF, the "affordability of platform licenses". It is worth noting that commercial software licensing models often scale "per user" which works well for companies that grow (alongside growing income; "growth with the market"). However, in many low and lower-middle income settings, this model does not work, and alternative cost models need to be found. PITB utilised open source software and thus avoided the issue of licensing costs (see also Principle 6).

There are many open source M&E tools available,

such Open Data Kit or the tools developed for PITB. Unfortunately project-by-project thinking can make commercial solutions look equally attractive, especially for short-term or one-off projects. However, the four organisations who provided case studies are significant actors in the education sector, and all have very long term interest in scalable and sustainable development. It would be interesting to see whether the common interest in scale could also build cooperation around open source, lowering the costs and drawing in smaller organisations. See also Principle 9, "Be Collaborative".

Further guidance and case studies for impact are available at: <https://digitalprinciples.org/principle/design-for-scale/>

PRINCIPLE 4. BUILD FOR SUSTAINABILITY

INTRODUCTION

Building sustainable programs, platforms and digital tools is essential to maintain user and stakeholder support, as well as to maximize long-term impact.

Sustainability ensures that user and stakeholder contributions are not minimized due to interruptions, such as a loss of funding. A program built for sustainability is more likely to be embedded into policies, daily practices and user workflow. For many digital initiatives, institutionalization by a nongovernmental organization, private company or local government is the ultimate goal in achieving long-term, positive impact. For others, institutionalization is achieved by developing a business model that has sustainable revenue generation.

THE CASE STUDIES

The case studies make several references to sustainability. PITB, for example, notes that equipment lifetime may be increased through incentives to the user:

"The second major challenge foreseen by PITB was ensuring that the tablets provided to MEAs were appropriately cared for, as repair or replacement costs could potentially become significant and hinder the success of this project. In reality, however, damage to tablets has been close to negligible as quoted by PITB. PITB believes that the primary reason for MEAs taking good care of their devices was due to its SIM-enabled nature; the SIMs accompanying the tablets contain a data package and 300 free voice-calling minutes, thus allowing MEAs to use their devices for personal use as a bonus and incentivizing them to care for their tablets."

However, CFD notes that high turnover of staff is a common issue:

"In Zambia in particular, systemic issues presented a challenge to the sustainable implementation of mobile technology, including: high turnover of teachers in rural schools; cost of replacement of broken phones; geographic isolation of rural schools; and poor mobile coverage."

CFD also notes that capacity building so that staff can create their own tailored forms might mean the system stays useful for longer: "capacity training for programme teams to create and upload their own monitoring forms."

Sustainability also means a steady supply of the required professional development, with events also providing an opportunity to further design with the user. As CFD note:

"Refresher trainings need to be built in to the budget of a mobile technology roll-out. In countries where we had annual refresher trainings built in for teachers (i.e. Tanzania and Ghana), the system was far more effective. In Zambia, where refresher trainings were not budgeted for (exacerbating the issues cited above), and the use of mobile technology to send data declined among secondary school teachers. As well as reinforcing with volunteers how and what to monitor, refresher trainings are an important opportunity to listen to volunteers (e.g. is the demand on their time for filling in monitoring forms too onerous? Is there an answer option missing for a particular question?) and enable peer to peer sharing/learning."

Technology has high upfront costs including hardware, staff development and support. The quote recognises that the so-called "total cost of ownership" is more than just the hardware costs. For the initial investment to pay off, the initiative needs to be viable in the medium or long term. CFD notes:

"Switching to mobile technology needs to be seen as an investment – with high up-front costs, both in terms of mobile phones and training and as well as in terms of staff time to provide follow-up support in the early phase of roll-out; even though mobile technology may enable more efficiency in the long run, for the full returns of initial investment to be realised, there needs to be an understanding that the costs in terms of volunteer interaction and support will be far higher to begin with. In Malawi, where the pilot was a vertical one, covering only two districts, the initial investment led to a strong ongoing peer support network among stakeholders."

The following quote from AKF recognises that sustainability (and indeed other issues such as scalability and security), albeit promised by commercial providers, often remains elusive:

"We are all aware of the many organizations and companies worldwide continuously claiming to provide the winning solutions for transforming governmental and organizational education information management systems (EMIS). However, we have found through experience that a number of these service providers often lack a.) the appropriate deep-bench of advanced technical leadership (i.e. only the founder knows how to trouble-shoot issues) b.) robust security and protection measures (i.e. hackers can easily attack open-sourced data tools) c.) adequate data storage (i.e. systems crash when more than 1,000 schools are registered) and/or d.) Transparency in what their systems can offer (i.e. providers consistently hide behind a metaphorical curtain that is raised only when we pay additional fees for further customization of end-user data needs). As a result, governments, organizations, and even individual schools are systematically falling victim to what we refer to as the 'education technology data bandits'."

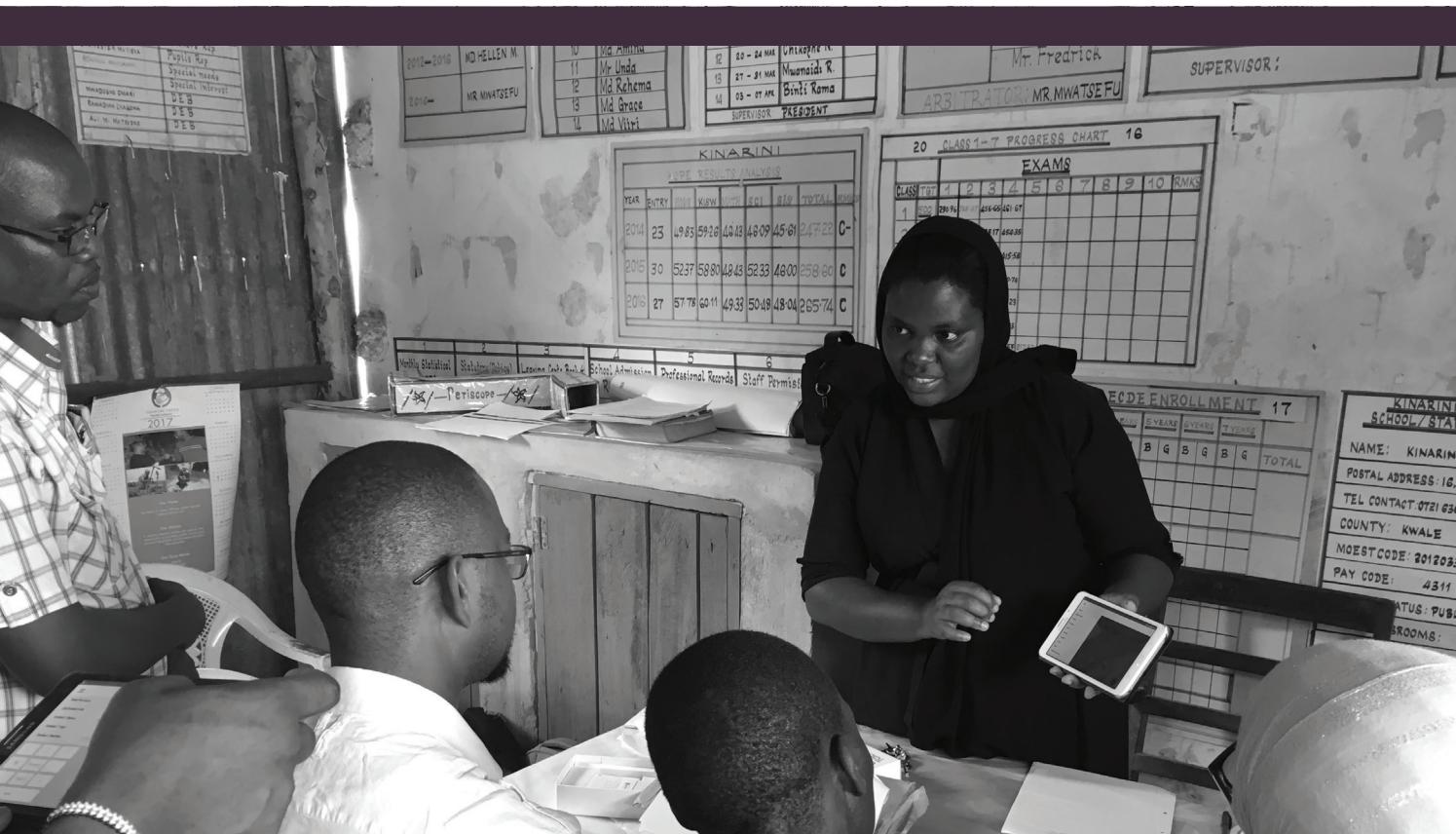
BUILDING SUSTAINABLE PROGRAMS, PLATFORMS AND DIGITAL TOOLS IS ESSENTIAL TO MAINTAIN USER AND STAKEHOLDER SUPPORT, AS WELL AS TO MAXIMIZE LONG-TERM IMPACT.

Moreover, it offers an opportunity for equipment maintenance (and thereby understanding equipment failure modes):

"During refresher trainings, we have found that it is helpful to have someone experienced in IT available to run a phone 'clinic' for the duration of the training – checking phones, updating software, replacing SIM cards and batteries. In Tanzania, teachers involved in mobile data collection have also met together independently to provide each other with support, and have created WhatsApp groups to keep in touch with each other."

PRINCIPLE 4 IN ACTION: BUILD FOR SUSTAINABILITY

Clearly for programme outcomes and impact to be sustainable/scalable, programme processes need to be sustainable/scalable. Similarly to Principle 3, technology platforms need to be designed from the outset with sustainability in mind. Principle 4 also includes consideration of "the long-term cost of the initiative" and the need to "identify options to sustain it financially", determining "which investments will be needed, including people, money, technology and institutional capacity." An important insight from the CFD case study is the need for "capacity training for programme teams", with recognition of a need for "refresher trainings need to be built in to the budget of a mobile technology roll-out", as part of the total cost of ownership.



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Technology needs maintenance (also part of the total cost of ownership); a fact which is clearly realised by CFD. The organization notes that it is advantageous to have “someone experienced in IT available to run a phone ‘clinic’ for the duration of the training – checking phones, updating software, replacing SIM cards and batteries...”

A sustainable and scalable approach includes an explicit focus on designing professional development for users, that “makes professional development practice explicit and discussable”. In other words, professional development also needs to be the subject of evaluation, a process that must also include the development of materials and trialling.

For example, smartphones (used for monitoring and evaluation) can also serve to support professional development; they can contain materials that allow participants to refresh their memory following the workshop (such as screen recordings of how to do data submission). Workshops then divide their time between “practising data submission” and “learning how to access the supporting materials” as well as practising how access remote support (such as WhatsApp). Overall, this has proven potential for making the professional development more effective and learning outcomes more sustainable.

Further guidance and case studies for impact are available at: <https://digitalprinciples.org/principle/build-for-sustainability/>

PRINCIPLE 5. BE DATA DRIVEN

INTRODUCTION

No amount of data will lead to accelerated impact if it is not used to inform decision making. When an initiative is data driven, quality information is available to the right people when they need it, and they are using those data to take action.

The data produced by a digital initiative should be used for more than just outputs, such as published work or donor reporting. Examples of the types of data that can be collected to inform decision making include surveillance, research, operations, project management and data from secondary sources collected outside of the program.

THE CASE STUDIES

PITB’s case study emphasises the importance of real-time data acquisition and data use:

“This steady stream of [M&E] data is automatically consolidated in real-time, and made available to decision-makers as actionable information in the form of SMS-alerts and online dashboards...

"The speed and quality of data collection has improved immensely, making it near real time. The system works for those operating in remote parts of the Province as well."

The case study notes that near real-time feedback loops have had a positive impact on teacher absenteeism:

"Teachers and school administrators have become conscious of the fact that a consistent low score on monthly student assessments will inevitably lead to more queries and administrative action. Hence, teacher presence and in-class learning are being positively impacted."

AKF's case study also notes the value of real-time data:

"In particular, PROMISE³ will enable school-level teachers, directors, district-level government officials, and global education development agencies to generate real-time data about educational quality, equity, and equality for the most marginalized children, worldwide. For the first time, the PROMISE³ app will equip education stakeholders to generate classroom-level, school-level and district level, rather than just country-level progress

"Automatic location-tagging (of tablet-based form submission) has helped quell the debate on whether the monitoring officer visited the school or not – hence, making the data capture process more credible for quality and access dimensions."

Although not mentioned in the report, this is likely also used by PITB to complete and maintain a school database with geographical coordinates, which is an important element of infrastructure planning. CFD's case study also comments on the speed of data collection:

"The main difference between data collected by paper and by mobile technology at Camfed is the speed with which it is received."

It raises the point that the speed of data collection is only useful if it is indeed processed and used for decision making:

"For this speed to be taken advantage of, the data needs to be managed within the organisation's database: it needs to be acknowledged, reviewed, and followed up on in a timely manner."

“ WHEN AN INITIATIVE IS DATA DRIVEN, QUALITY INFORMATION IS AVAILABLE TO THE RIGHT PEOPLE WHEN THEY NEED IT, AND THEY ARE USING THOSE DATA TO TAKE ACTION.

reports against the indicators of SDG 4. In short, the PROMISE³ app will enable education leaders to 'go the last mile' in better collecting, managing, analysing, and acting on individual data about student and classroom levels of quality education."

As PITB notes, all appropriate affordances of the device are used, such as geodata to validate the visit of the officer to the school:

An important issue about user feedback is raised: Users submitting data need to be sure that they are making a valuable contribution. Automated SMS feedback can help with this. As CFD further notes:

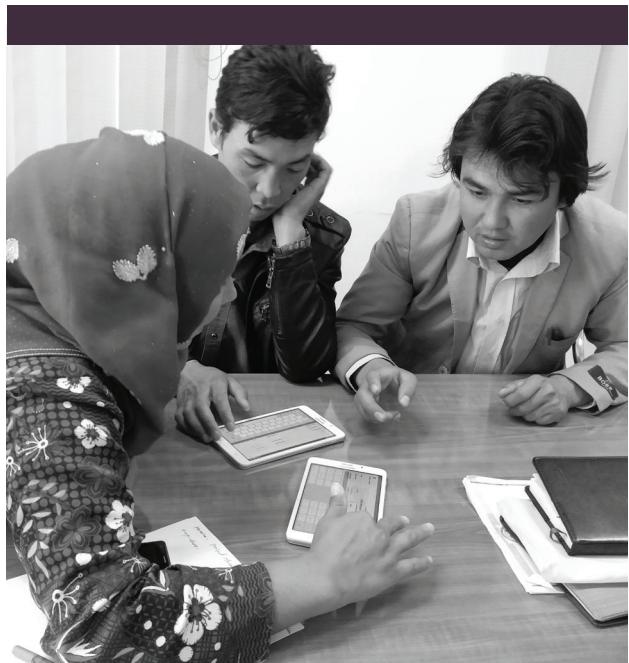
"At times this management of the data has not been done as timely/efficiently as it should be, and this has sometimes resulted in volunteers losing interest as there is no evidence that what they are sending is being read. Both the automated SMS response we set up (which provides an immediate reassurance that the data

submitted has gone into the database) and the review system within Salesforce that helps Impact Officers to check data and highlight issues have gone some way towards strengthening the feedback loops to resolve this.”

The use of a “dashboard” offers quick insights into data, routinely performing analysis. In their case study, PITB note:

“A centralized dashboard enables key stakeholders to track MEA visits and carry out timely data analysis... Education management officials at the district as well as the center, now refer to the data provided by the central monitoring system on a regular basis, for informed decision making.”

Importantly, the focus is not only on education outcomes, but also on improvement of the monitoring system itself (“double-loop learning”). PITB conclude:



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“The tablet-platform has allowed the Government to rapidly tweak and improve its school monitoring plan – and to roll-out it out to a thousand-strong field force at a press of a button.”

PRINCIPLE 5 IN ACTION: BE DATA DRIVEN

The aim of all four programmes is to collect education data, and to make this data available for real-time decision making. It comes across very clearly that education decision making is data driven.

There is a second level to be considered, which is the operation of the M&E systems themselves; at this level we may ask whether the M&E system itself is being developed, adapted and scaled in a data-driven way. For example, what do we know about the usability of

the system? What do we know about the performance of the system under conditions of intermittent bandwidth?

For AKF, the process of developing the system is clearly data driven. This is evidenced by their formal use of the HCD methodology, focussing on data collection and data about their M&E process, which in turn informs how the system is further developed. The other case studies raise related issues (c.f. Principle 4), suggesting perhaps that formal evaluation of professional development fed back into the development; the development of professional development can be “data driven”, in that the professional development needs are assessed, appropriate professional development is implemented, with outcomes being evaluated over time, which feeds back into the next round of professional development.

Further guidance and case studies for impact are available at: <https://digitalprinciples.org/principle/be-data-driven/>

PRINCIPLE 6. BUILD FOR SUSTAINABILITY

INTRODUCTION

Too often, scarce public and international development resources are spent investing in new software code, tools, data collection, content and innovations for sector-specific solutions that are locked away behind licensing fees, with data only used by and available to specific initiatives. An open approach to digital development can help to increase collaboration in the digital development community and avoid duplicating work that has already been done. Programs can maximize their resources — and ultimately their impact — through open standards, open data, open source technologies and open innovation. By taking advantage of existing investments when you are able, you can apply finite digital development resources toward creating global goods. What being “open” means for your initiative will depend on practical and technical constraints, security and privacy concerns, and the dynamics of the people and networks in your space. For example, to what extent your initiative uses open source software will depend on the needs identified for your context and an assessment of which of the available options best meets those needs, factoring in their total cost of ownership.

THE CASE STUDIES

PITB’s case study clearly states that open source technology is being used:

“As a core strategy, PITB leverages mobile technologies and open-source platforms to design terrain-viable solutions for real-time monitoring, on-spot assessment, and citizen feedback.”



While CFD and AKF use a proprietary (non-open source) system (Salesforce), AKF does reflect that open source may be beneficial:

"In response, what we believe is lacking within the education sector is an open, third-party hosted 'education data tool and tech platform exchange' that provides local and global education stakeholders with a one-stop-shop for verified teaching and learning assessment tools and a set of viable technology companies/platforms/apps on which they can work at scale."

AKF also notes issues similar to "vendor lock-in" (discussed below):

"However, we have found through experience that a number of these [commercial M&E] service providers often lack the appropriate deep-bench of advanced technical leadership (i.e. only the founder knows how to trouble-shoot issues)."

PITB's case study is the only case study that refers to open data, and the transparency generated by this: "As a step towards openness and transparency (and as a deterrent for the MEA to misreport information), some of the real-time datasets have been made public. The civil society can hence view and challenge the information being logged by the MEA for each school."

PRINCIPLE 6 IN ACTION: USE OPEN STANDARDS, OPEN DATA, OPEN SOURCE, AND OPEN INNOVATION

AKF's case study noted that a number of commercial M&E "service providers often lack ... the appropriate ... advanced technical leadership" and that "only the founder knows how to trouble-shoot issues" (c.f. full quote above). This issue is comparable to "vendor lock-in", in which a customer becomes dependent upon a vendor for products and services and is effectively unable to use another vendor without significant cost. The practical consequences of this are as follow. In the section "Principle 3 in Action: Design for Scale", we noted the issues of commercial software licensing models often scale "per user":

- For a commercial M&E system trial, used by an NGO with approximately 100 users, the total licensing cost is low. Significant staff costs (c.f. discussion of Principle 4) are invested by the NGO, e.g. to design the form, trial the system and provide professional development. The NGO then has a smooth running system for 100 users.
- As the NGO scales to 1,000 users the licensing costs increase. However, the effort expended in making the system operational and conducting professional development was greater than this, so at this stage – on balance – it is cheaper to move to 1,000 than to redevelop. Moreover, there may well be pressure for the NGO to move to scale, and there is not time to redevelop. Thus, vendor lock-in is created.

¹¹We do note that commercial proprietary systems can also offer data export, but it may not be a feature that is routinely highlighted. This also raises important questions about not just the legal ownership of the data, but also the "technological ownership of the data". For example, an NGO may legally own some data stored by a company, but if this data is hard for the NGO to export in bulk, the legal ownership cannot be enacted.

The issue here is not that the software is provided by a commercial vendor. Rather, the issue is that the commercial vendor offers a proprietary system, for which they are the only vendor.

Principle 6 suggests the use of “existing open platforms where possible to help to automate data sharing, connect your tool or system with others and add flexibility to adapt to future needs” as well as “invest in software as a public good”. There are global commercial vendors that offer such services around open source systems, which use open standards for data storage.

This means that the client (at a later stage) can either:

- Employ a different commercial vendor of the same open source system; or
- Extract their data, and move to a different system.¹¹

The barrier to open source can be that the systems are not marketed as well as commercial solutions. Moreover, they are typically offered by smaller consultancies, who are less able to offer “deals” to entice users to the system. Similar to the remarks in CFD’s case study about technology as a whole being

an up-front investment, it can also be the case that a scalable open source tool constitutes an up-front investment; a proprietary off-the-shelf tool may indeed be cheaper for 100 users, and therefore appear favourable at first sight.

Similar to the technological vendor lock-in, there can be a “methods/resources lock-in”. The case studies do not mention open content licenses; such licences now used by several funders (e.g. by DFID for research outputs, c.f. above). It can be the case that certain instruments or methodologies are considered proprietary by an NGO, despite being developed with public funding. In analogy with “software as a public good”, one might also consider “investment in content as a public good”, whereby instruments, methodologies, professional development resources are shared publicly open licences,¹² so that they enable other organisations improving learning outcomes (see also P9, “be collaborative”).

Further guidance and case studies for impact are available at: <https://digitalprinciples.org/principle/use-open-standards-open-data-open-source-and-open-innovation/>.

“ AN OPEN APPROACH TO DIGITAL DEVELOPMENT CAN HELP TO INCREASE COLLABORATION IN THE DIGITAL DEVELOPMENT COMMUNITY AND AVOID DUPLICATING WORK THAT HAS ALREADY BEEN DONE.

PRINCIPLE 7. REUSE AND IMPROVE

INTRODUCTION

Instead of starting from scratch, programs that “reuse and improve” look for ways to adapt and enhance existing products, resources and approaches. Reuse means assessing what resources are currently available and using them as they are to meet program goals. Improve means modifying existing tools, products and resources to improve their overall quality, applicability and impact. Start by identifying relevant methods, standards, software platforms, technology tools and digital content that have already been tried and tested. You can learn about digital development tools that have been piloted or scaled through conferences, blogs, program evaluations and the digital development community. While an existing tool or approach may not exactly fit all your needs for reuse, consider improving and building on it, rather than creating something

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entirely new. The result is a tool that is now better and more reusable by all because of your improvements. Reusing and improving is not about designing shiny new objects or limiting a technology to internal use; it is about taking the work of the global development community further than any organization or program can do alone. Reusing and improving can also dramatically reduce the time needed for development and testing, and reduce your costs.

THE CASE STUDIES

CFD’s case study mentioned that “Open Data Kit” was used, perhaps at an earlier point in the process. The organization described: “moving from Episurveyor software to Open Data Kit (ODK)”

Case study AKF suggests that it would be useful to have something that could be reused:

“In response, what we believe is lacking within the education sector is an open, third-party hosted ‘education data tool and tech platform exchange’ that

provides local and global education stakeholders with a one-stop-shop for verified teaching and learning assessment tools and a set of viable technology companies/platforms/apps on which they can work at scale.”

PRINCIPLE 7 IN ACTION: REUSE AND IMPROVE

Principle 7 suggests the identification “of existing technology tools (local and global), data and frameworks being used by your target population, in your geography or in your sector”. In the M&E sector, there are open source tools available that could be reused and improved, but as discussed for Principle 6 (and indicated in several case studies) making sense of the available solutions can be difficult for individual organisations.

The question of geography is less applicable here, as all case studies indicated good knowledge of the local ecosystem (Principle 2). Generally speaking there may be local companies that have experience that already do have local experience. Moreover, in the case of local NGOs, they may also be able to provide better continuity (Principle 4) than a global company that does not have a local branch. In many countries such NGOs exist, but they are easily overlooked as they may not be as stable as larger international corporations – an issue for how aid funding is allocated.

Further guidance and case studies for impact are available at: <https://digitalprinciples.org/principle/reuse-and-improve/>

PRINCIPLE 8. ADDRESS PRIVACY AND SECURITY

As this area is a significant concern to the four organisations, we discuss this more extensively than some of the other principles, drawing on the guidance available. This also illustrate how the Principles’ support materials can be utilised to reflect on project details.

INTRODUCTION

Addressing privacy and security in digital development involves careful consideration of which data are collected and how data are acquired, used, stored and shared.

Addressing privacy and security in digital development involves careful consideration of which data are collected and how data are acquired, used, stored and shared. Organizations must take measures to minimize collection and to protect confidential information and identities of individuals represented in data sets from unauthorized access and manipulation by third parties. Responsible practices for organizations collecting and using individual data include considering the

sensitivities around the data they have collected, being transparent about how data will be collected and used, minimizing the amount of personal identifiable and sensitive information collected, creating and implementing security policies that protect data and uphold individuals' privacy and dignity, and creating an end-of-life policy for post-project data management.

ADDRESS PRIVACY AND SECURITY – CORE TENETS

8.1. Define data ownership, sovereignty and access before any data are collected or captured. Determine what local data protection laws and regulations need to be followed, who gets to decide what to do with the data, who is allowed to access or use the data and where data can (or must) be stored.

8.2. Keep the best interests of end users and individuals whose data are collected at the forefront of your planning for upholding user privacy and ensuring data security and ethical implementation. This is especially important when implementers work with vulnerable or marginalized communities who may not have had a say in how their data have been collected, used or shared.

8.3. Perform a risk-benefit analysis of the data being processed that identifies who benefits and who is at risk. This process may need to be repeated throughout the period of performance as new data are needed, new risks are identified or emerge, or new data-sharing partners are considered.

8.4. Assess the risks of unauthorized access or leakage of any stored data. Consider the impact this data could have on the individuals if accessed or published maliciously and the risks if data were combined with other data sets.

8.5. Understand that risks are highly contextualized, not just to countries but also to communities, populations and periods of time. If working with vulnerable or marginalized communities, what groups might have motivation to acquire your data, how capable are they, and are the information and access controls around the data sufficient?

8.6. Minimize the collection of personal identifiable information. Consider how critical personal information is to the project's success and what the consequences would be if those data are exposed to third parties — especially when partnering with users from vulnerable populations, such as minority groups, the disabled, and women and children. Include a risk assessment for collecting personal information.

8.7. Catalog and track any personal or sensitive information captured throughout the project: Create a plan for mid-and post-project destruction or secure offline storage of sensitive data, including the review of hard drives, Cloud file storage, flash drives, email

inboxes and other common sources of data leakages.

8.8. Be transparent with individuals whose data are collected by explaining how your initiative will use and protect their data.

8.9. Obtain informed consent prior to data collection.

It is crucial to ensure that participants understand why their data are being collected, how data are used and shared, and how the participants can access or change the data collected — and that they be given the option to refuse to participate. Participants should be informed of and fully understand the risks related to sharing their data. Consent forms should be written in the local language and easily understood by the individuals whose data are being collected.

8.10. Protect data by adopting best practices for securing and restricting access to data.

Examples of best practices include encrypting files, using two-factor authentication, restricting access permissions, storing data on secure servers or secure Cloud storage services, and implementing organizational security policies and procedures, including data-sharing agreements with all data-sharing partners.

The Case Studies

Regarding Tenet Principle 8.1, CFD's case study states the important issue of developing and adopting a data governance model:

"Related to the above is the importance of mapping out the 'governance' over data – who is entitled to gather/view data, where do the reviews need to take place in order for the data to be validated as well as authorised? Getting this wrong can create significant vulnerabilities – both for the individuals involved, as well as in relation to how the data is used in terms of who it is shared with (and for what purpose). As an example – with the current enthusiasm for young people to get involved in data collection relating to the SDGs, it's important that they are not in effect seen as 'policing' systems (as there's often significant mistrust of mobile phones as tools for data gathering because of the perceived loss of control over how the data is viewed/used) which can create very problematic dynamics in young people's relationship with local authorities, for example."

This also includes who has access to which data. CFD further note:

"Some data gathering platforms allow mobile technology users to view the data housed on the database. While this means users have far greater access to data, which they have helped to collect, this raises important issues of data security and child protection, especially when individual students and schools are recognisable. It is thus critical to design levels of database access ascribed to particular user groups to ensure that principles of data protection are enshrined. Additionally, it is important to continue to

innovate and explore opportunities for better sharing back of data and data analysis through the functionality of smartphones.”

Likewise, AKF’s case study states the importance of understanding regulations and security on Tenet 8.1, noting the importance of understanding existing and non-existing national and global data governance regulations for collecting data on education and storing it online. AKF’s study further highlights the importance of anonymity and data protection.

The importance of anonymity is also emphasised by Principle 8.6. The emphasis here is not on anonymising non-anonymised data, but rather is on limiting non-anonymous data in the first place. Data security, including the protection of non-anonymous data, is expressed by Tenet 8.10, while failure to secure data relates to Tenet 8.4.

The importance of privacy and security is clearly stated in CFD’s case study: “getting this wrong can create significant vulnerabilities – both for the individuals involved, as well as in relation to how the data is used in terms of who it is shared with”.

Moreover, as CFD further note, privacy and security is not just to do with technology:

“Mobile technology is a tool – the human interactions and processes are key. As well as the willingness and commitment of volunteers, it’s important to find out if they will have the authority to collect the data in the contexts (e.g. schools) in which they will be operating.”

These statements also resonated with Tenet 8.6 on “personal identifiable information … [especially] when implementers work with vulnerable or marginalized communities”.

Tenet 8.5 also relates to case study CFD, raising the issue of data collection processes being vulnerable to vested interest:

“Incentive alignment is an important aspect of mapping out the data gathering to ensure that data gatherers have a clear stake in the process without this being vulnerable to vested interest.”

PRINCIPLE 8 IN ACTION: ADDRESS PRIVACY AND SECURITY

The above correlation of the detailed tenets with the case studies illustrate how certain tenets are already reflected in the case studies, while there is less evidence of others. This includes suggestions regarding “risk-benefit analysis” (8.3.), “catalog and track any personal or sensitive information captured throughout the project” (8.7.), “be transparent [about which data is being collected]” (8.8.) and “informed consent prior to data collection” (8.9.).

Clearly some of these areas would have been addressed by the implementing organisations, and using Principle 8 as a guide would have helped to make these more visible in the case studies.

Further guidance and case studies for impact are available at: <https://digitalprinciples.org/principle/address-privacy-security/>

More generally all nine Principles have tenets (and detailed further guidance) associated with them, that may be helpful in shedding further light on the other areas too.

PRINCIPLE 9. BE COLLABORATIVE

INTRODUCTION

Being collaborative means sharing information, insights, strategies and resources across projects, organizations and sectors, leading to increased efficiency and impact. This Principle brings all the others together in practice. People working in digital development have a shared vision to create a better world, and collaboration is essential to making this vision a reality. No single initiative or organization can make it happen alone. We have the most impact when we work together across geographies, focus areas and organizations and in partnership with local communities and governments. By collaborating, those working in digital development and beyond can pool their resources and expertise not only to benefit each initiative but also to strengthen the global community. Collaborating does not just happen accidentally; it requires time, planning and dedicating resources to look for and develop opportunities.

THE CASE STUDIES

AKF’s case study suggests that greater collaboration could be helpful, particularly in terms of making sense of the existing data collection technologies:

“The Global Learning Lab’s online repository of learning assessment tools provides a small example of what could be possible in a repository, though their resources are mainly limited to the US audience at this time. And beyond EdSurge, Brookings, and Results for Development’s Centre for Education Innovations, Navitas EdTech Landscape 3.0, it remains very difficult to sift through the many EdTech actors to identify the technology platforms available for enhancing the education data flows within and beyond classroom and school systems. AKF is currently partnering with UNICEF Innovations to conduct a horizon scanning about what works in digital learning in Eastern, Southern, Western and Central Africa; but this is just the beginning.”



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Similarly AFK's final reflections suggest an "education data tool and tech platform exchange", as a way to improve collaboration and sharing of information: "In response, what we believe is lacking within the education sector is an open, third-party hosted 'education data tool and tech platform exchange' that provides local and global education stakeholders with a one-stop-shop for verified teaching and learning assessment tools and a set of viable technology companies/platforms/apps on which they can work at scale."

The humanitarian sector (in comparison to the development sector) has established a number of such platforms, for example for data sharing (e.g. the Humanitarian Data Exchange, <https://data.humdata.org/>) as well as collaborations and tools to collect such data (e.g. the Humanitarian OpenStreetMap team, <https://www.hotosm.org/partnerships>). In the development sector, such collaboration and sharing of tools and data appears to be less extant.

The breaking down of silos (e.g. across humanitarian and development assistance) is an important part of this Principle. This also means thinking across health, education and economic development, as illustrated in AFK's case study:

"AKF will integrate and replicate the functionalities of PROMISE3 into a global portfolio of monitoring and evaluation programmes that will create new stories of impact across inter-related sectors of health, education and economic development. In partnership with the University of Oxford's Centre for Comparative and International Education, PROMISE3 will also serve as the

global tool for a new longitudinal research programme called Schools2030 that will track how children navigate multiple pathways of uncertainty over twelve years of schooling across 2,030 schools, worldwide.

"As a result, AKF and its peer organizations using PROMISE3 will be better positioned to advocate for a more holistic, cross-sector approach to improving and advancing the quality of international education research, policy, and practice by the end of the SDGs in 2030. PROMISE3 will break down traditional data silos throughout the international education sector, and begin to uncover a more nuanced set of insights into 'what works best' for supporting the learning needs of some of the most marginalized and at-risk children, worldwide."

Regarding the sharing of concrete further information, AKF's case study also lists public documents and a video presentation.

CFD's case study further notes that: "it is important to continue to innovate and explore opportunities for better sharing back of data and data analysis through the functionality of smartphones."

PITB's case study indicates that at the provincial level, there are the beginnings of collaboration and sharing of tools:

"The federal as well as provincial governments of Pakistan actively seek PITB's assistance in replicating systems for them. PITB also continues to explore credible international collaborators to offer their solutions globally – particularly in Education and

“ BEING COLLABORATIVE MEANS SHARING INFORMATION, INSIGHTS, STRATEGIES AND RESOURCES ACROSS PROJECTS, ORGANIZATIONS AND SECTORS, LEADING TO INCREASED EFFICIENCY AND IMPACT.

Health. PITB's education solutions portfolio consists of a practical set of modular components that collectively span most core functions of public-sector education departments in developing countries.”

PRINCIPLE 9 IN ACTION: BE COLLABORATIVE

As for Principle 8, it may be helpful to look at some of the core tenets. The tenets include:

Understand how your work fits into the global development landscape. Identify others working on the same problem in other geographies, and determine if there is a community of practice. Find the technical leaders in global and regional organizations (such as the World Bank, the World Health Organization, etc.) who can help you disseminate your work to other teams, regions and countries.

This aspiration is well articulated in AKF's case study, which seeks to operate across different domains. All projects could be strengthened by planning “to collaborate from the beginning”.

Plan to collaborate from the beginning. Build collaborative activities into proposals, work plans, budgets and job descriptions. Identify indicators for measuring collaboration in your monitoring and evaluation plan.

The production of these case studies clearly represents a positive example of such growing collaboration. As the collaboration strengthens, it will be important to “document work, results, processes and best practices”.

Document work, results, processes and best practices. Share your code with the open source community, publish documents under a Creative Commons license, and participate in digital development conferences and other forums to share lessons you have learned and to learn from other practitioners.

Importantly, the tenet suggests the use of Creative Commons licensing, which provides a clear framework for how documents can be shared. This is further elaborated:¹³

Plan to publish materials under a Creative Commons license and share code by default. Creative Commons license¹⁴ allows the creator to retain copyright while allowing others to copy, distribute and make use of their work for non-commercial purposes. Ensure that you have a strong rationale if another approach is taken, and share your reasoning with the community to be as transparent about the decision as possible.

A clear sharing framework like Creative Commons licensing may also be advantageous when applying for funding.

Further guidance and case studies for impact are available at: <https://digitalprinciples.org/principle/be-collaborative/>

CONCLUSIONS

In conclusion, we note that each of the case studies raise issues and offers valid approaches in relation to the Principles. In some areas the Principles are more strongly articulated. For example, in AKF's case study a strong human-centred design approach was used at the outset that align with the Principles.

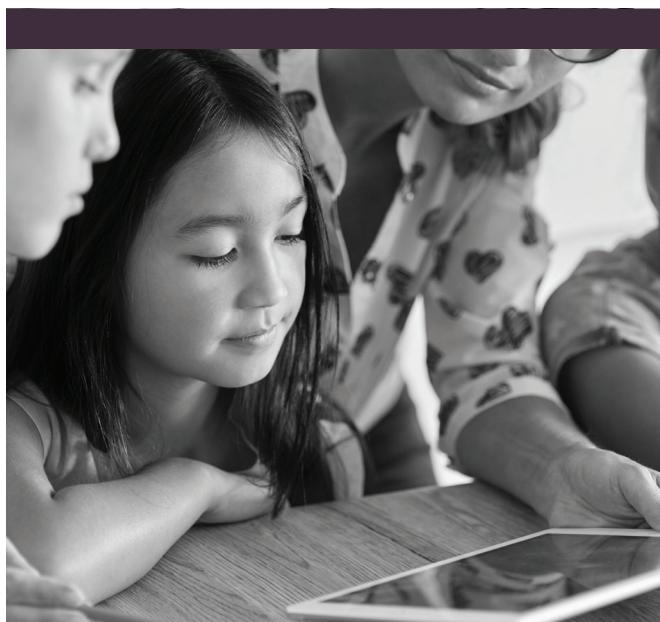
In other areas the Principles were less strongly articulated. For example Principle 8, “use open source”, offers scope for future developments. Principle 8 suggests the use of “existing open platforms where possible to help to automate data sharing, connect your tool or system with others and add flexibility to adapt to future needs” as well as “invest in software as a public good”, to which we can add “invest in content as a public good”, as well an increased collaboration, a shared sense making of the available options (Principle 9, “be collaborative”), and a shared “reusing and improving” (Principle 7).

On the whole, it does seem that the Principles could add value to the kind of projects described in the case studies. From this analysis, an important question arises of where the responsibility for adherence to the Principles lies, in particular the respective roles of the technology provider and the organisation for whom data are being collected. Responses to these questions

are likely to become even more critical as national governments adopt the use of technology for similar purposes. The Principles are construed as guidelines, and are meant as formative tools. At the same time, public endorsement of the Principles¹⁵ is an indication of commitment.

Regarding future developments of the systems:

- Education programmes using technology to collect, store and disseminate should consider the Principles, and, if appropriate, endorse them.
- When procuring suppliers, it may be helpful to consider a supplier that has formally endorsed the Principles, who is willing to foreground the Principles



in future work, and who can – ideally – provide solid evidence for successful use of the Principles in previous work. If they have not yet endorsed them, it would be worthwhile identifying their willingness to endorse them at the stage of procurement.

- The interface between the major technology companies and education stakeholders is likely to continue to be an issue for consideration. It would be beneficial for the Principles to incorporate reference to this interface, with recommendations for how best to ensure a balanced relationship.
- The Digital Impact Alliance is preparing resources for donor organisations (and recipients of funding), which will include practical suggestions, and which education stakeholders might benefit from.
- The Open Source Centre (<http://osc.dial.community>), may also be able to offer further advice, or even contribute funding towards developing shared tools.

The case studies also raise some very valid overarching points. The AKF's case study notes that, despite high investments, we still lack critical information:

"Despite the billions of dollars spent annually by the international community to strengthen education systems, we still lack critical information to answer three important questions for achieving SDG 4 Education by 2030: (i) Are our children going to school? (ii) Are our children staying in school? and (iii) Are our children learning the skills and knowledge needed to become contributing members of a pluralistic society in the 21st century? School leaders, national education ministers, and international development practitioners still lack the tools to effectively collect, analyse, and act on real-time, contextualized education data, which is needed to design and scale more evidence-based, community-driven, inclusive solutions to education disparities, worldwide."

Some of this may be attributable to the lack of appropriate, scalable, cost-effective systems.

"Do we, as an education sector, truly have the appropriate internal capacities and competencies to really understand how to engage with technology companies to help strengthen educational data bottlenecks? What opportunities are we missing? What pitfalls are on the horizon? Do we have a robust community of practice of education-related organizations and institutions using technology companies for educational data collection, analysis and utilization moving forward?"

The role of the Global Alliance for Learning Impact in addressing these questions, and indeed for the way forward, is also raised:

"Hopefully, the **Global Alliance for Learning Impact** can deliberate about creating a set of meaningful guidelines and/or foundational insights that could help inform and inspire a new global resource about what works in using technology to measure quality education at scale. We look forward to learning from you all in the coming months. Thank you for inviting our thoughts to be shared."

Clearly frameworks such as the Sustainable Development Goals seek to initiate joint action, and clearly there is progress towards this. However, in the field of teacher professional development, systemic "at global scale" thinking can remain elusive for Sustainable Development Goals 4, particularly regarding the practical tools of our trade: Tools for data collection, professional development materials for enumerators, professional development for researchers, early and open publishing.¹⁶ This is particularly problematic as many of those tools are readily available. We hope that this report can serve as a stepping stone towards greater open collaboration around Sustainable Development Goals 4, enriching learning outcomes by 2030.

¹⁵"Endorsers", Principles for Digital Development: <https://digitalprinciples.org/endorse/endorsers/>

¹⁶Häfler, B., Hennessy, S., & Hofmann, R., (2018, accepted for publication). Sustaining and Scaling Up Pedagogic Innovation in Sub-Saharan Africa: Grounded Insights For Teacher Professional Development: <http://bjohas.de/Publications/HHH3B>

CASE STUDY: AGA KHAN FOUNDATION



AGA KHAN FOUNDATION
An agency of the Aga Khan Development Network

Developing and prototyping PROMISE3 (a new online/offline, mobile/tablet-based Programme Management Information System for Education by Everyone, Everywhere)

PROBLEM

Despite the billions of dollars spent annually by the international community to strengthen education systems, we still lack critical information to answer three important questions for achieving SDG 4 on Education by 2030: (i) Are our children going to school? (ii) Are our children staying in school? and (iii) Are our children learning the skills and knowledge needed to become contributing members of a pluralistic society in the 21st century? School leaders, national education ministers, and international development practitioners still lack the tools to effectively collect, analyse, and act on real-time, contextualized education data, which is needed to design and scale more evidence-based, community-driven, inclusive solutions to education disparities, worldwide.

SOLUTION

The Aga Khan Foundation was awarded one of seven 2016 Force for Change grants from Salesforce.org to develop, build and take-to-market a community-driven, replicable new application that provides a customized interface on Salesforce's Force.com® platform called PROMISE³ – a new Programme Management Information System in Education for Everyone, Everywhere – offering the global education and development community a new robust, online, mobile-friendly one-stop-shop for tracking selected SDG 4 indicators of educational access, quality, equity, and equality across multiple geographies, especially in hard-to-reach and conflict-affected areas.

Contact: Avenue de la Paix 1-3, 1202 Geneva, Switzerland
Mail: P.O. Box 2369, 1211 Geneva 2, Switzerland
Telephone: +41 22 909 7200 Facsimile: +41 22 909 7291
Website: www.akdn.org Email: andrew.cunningham@akdn.org

GOALS

The intended results of PROMISE³ are two-fold:

Goal 1: Create a best-in-class automated school-level education data tracking system app that generates dynamic data dashboards to better monitor and act on progress of two inter-related targets and associated indicators from SDG 4 (Education) by sex, age, and geography utilizing Salesforce's Force.com® platform:

- **4.1** By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes.
- **4.2** By 2030, ensure that all girls and boys have access to quality early childhood development, care, and pre-primary education so that they are ready for primary education.

stakeholders to generate classroom-level, school-level and district level, rather than just country-level progress reports against the indicators of SDG 4. In short, the PROMISE³ app will enable education leaders to “go the last mile” in better collecting, managing, analysing, and acting on individual data about student and classroom levels of quality education.

Goal 2: Generate new evidence about the international ‘educational dividend’ by assessing progress of SDG 4 in relation to other inter-related SDG targets in health, public-private partnerships, climate change, and sustainable economic development. AKF will integrate and replicate the functionalities of PROMISE³ into a global portfolio of monitoring and evaluation programmes that will create new stories of impact across inter-related sectors of health, education and economic development. In partnership with the University of Oxford’s Centre for Comparative and International Education, PROMISE³ will also serve as the global tool for a new longitudinal research programme called Schools2030 that will track



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In particular, PROMISE³ will enable school-level teachers, directors, district-level government officials, and global education development agencies to generate real-time data about educational quality, equity, and equality for the most marginalized children, worldwide. For the first time, the PROMISE³ app will equip education

how children navigate multiple pathways of uncertainty over twelve years of schooling across 2,030 schools, worldwide.

As a result, AKF and its peer organizations using PROMISE³ will be better positioned to advocate for a more holistic, cross-sector approach to improving and advancing the quality of international education research, policy, and practice by the end of the SDGs

in 2030. For the first time, PROMISE³ will break down traditional data silos throughout the international education sector, and begin to uncover a more nuanced set of insights into “what works best” for supporting the learning needs of some of the most marginalized and at-risk children, worldwide.

PARTNERSHIP

AKF works with Vera Solutions (Vera) as its technical partner. Vera Solutions specializes in developing online and mobile programme management and monitoring and evaluation (M&E) systems, providing consulting services centred on the Salesforce.com platform. A Salesforce International Impact Partner and Silver-Tier Consulting Partner, Vera has delivered Cloud and mobile solutions for more than 175 organizations in more than 45 countries. Vera has nearly 50 staff on four continents – between Boston, Cape Town, Geneva, Mumbai, Nairobi, and New York City.

PROGRESS

After receiving the Force for Change Grant in December 2016, AKF employed the human-centred design approach at scale, spending the first six months in “discovery” and “design/prototype” phases,

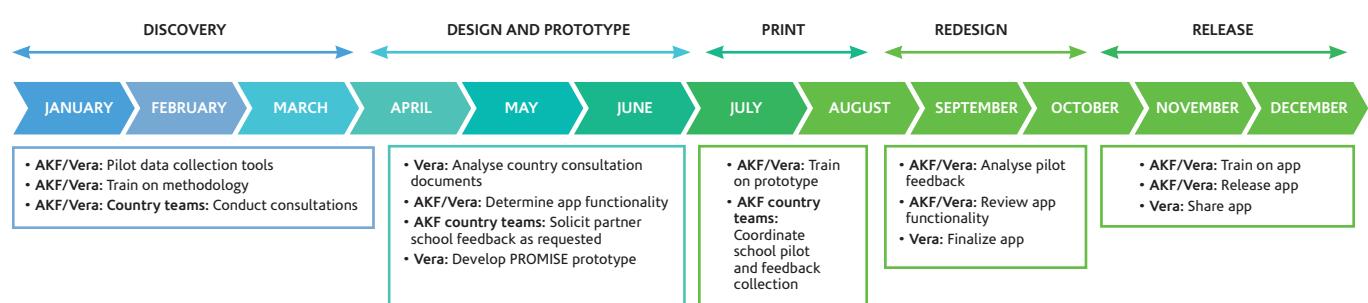
use the app independently for six weeks. This pilot has generated key insights into additional needs by users, challenges in data governance and storage, and costs for scaled roll-out. These are outlined in the next section.

KEY INSIGHTS

Over the last 11 months of implementing the Force for Change grant in the development of PROMISE³, AKF and Vera Solutions have generated a number of key insights that could inform the work of the GESF Global Learning Alliance for Learning Impact, especially around key questions regarding the ways we collect, analyse, and use educational data through new technologies. We have narrowed these down to five, as outlined below:

1. Product Process: Develop Tech-Enabled Data Solutions Rooted in Local Realities

Over 550 user stories about existing school-level data flows and pain points were generated from the discovery consultation period for PROMISE³. What made the difference was actually using these stories in the design of the prototype. In order to do so, AKF and Vera categorized the user stories into 12 core functions that PROMISE³ needed to address, based on bottom-up local realities:



collaborating with local education stakeholders (students, parents, teachers, school leaders, government officials, and education donors/NGOs) across 24 government schools in six countries (Afghanistan, Tajikistan, India, Uganda, Tanzania, and Kenya).

The discovery phase generated 550 user stories, thereby informing the design of the prototype for roll-out. Budgeting for this phase of technology emphasized the need to understand **existing data flows and data pain points** within offline systems at classroom, school, and district levels. Without this initial analysis, the development of PROMISE³ would have missed key functionalities.

The prototype was then piloted across the same 24 schools from July to October, using one locally sourced tablet per school. The size of the screen was a key factor for initial testing of the app’s functionalities. Each school was given an initial training and then asked to

- 1. Student Attendance** (e.g. reasons for absence, distinction between late arrival and absence)
- 2. Student Biographical Data** (e.g. parents’ contact information, preferred name)
- 3. Student Enrolment** (e.g. reason for drop-out, destination of transfer)
- 4. Student Performance** (e.g. quantitative and qualitative assessment scoring function)
- 5. Teacher Quality** (e.g. teacher attendance, classroom observation, biographical information)
- 6. Curriculum Delivery** (e.g. subjects taught, curriculum coverage)
- 7. School Infrastructure** (e.g. number of toilet facilities, textbooks)

8. **App Interaction** (e.g. offline capability, multi-language support, non-project specific)
9. **Data Analysis** (e.g. student test score comparison, student absence trends)
10. **Information Sharing Horizontal** (e.g. within and across schools, parents, and community)
11. **Information Sharing Vertical** (e.g. to and from AKF and government)
12. **Process Efficiency** (e.g. duration of attendance input, automated calculations of scoring)

These twelve categories represent local realities that can inform global principles in **what really matters** at the school-level in educational data collection, analysis and utilization through the use of a new technology. These inputs represent 24 day-long sets of semi-structured interviews and focus groups at schools with students, parents, teachers, school leaders, and district education officials.

2. Product Features: Operate Offline, Enable Teachers to Assess What They Care About, and Offer Schools Globally Informed and Locally Rooted Learning Assessment Tools

Based on the user stories from six diverse country contexts, the PROMISE³ app prioritized three key functions that reflect local priorities perceived as necessary for a successful roll-out in the future:

- **Operate fully offline.** PROMISE³ enables schools with limited or no connectivity to be able to enter, analyze and use data about their students and teachers offline. Without this feature, the majority of targeted schools would not be able to use the functionalities of the app, nor meet the core needs of the 12 categories outlined above.
- **Enable teachers to design their own learning assessments.** PROMISE³ enables teachers and head teachers to design their own learning assessments (qualitative and/or quantitative) to measure what they wish to track in students' levels of progress – whether that be related to classwork, extra-curricular activities, or other dimensions of quality learning. This flexibility positions PROMISE³ well beyond a project or an initiative, and instead enables an opportunity to develop teachers' professional competencies in employing and deploying relevant formative and summative assessment tools at classroom and school levels.

“ PROMISE³ HAS SOURCED LOCALLY AVAILABLE HARDWARE TO TRY TO ADDRESS ISSUES OF MAINTENANCE, AFFORDABILITY, AND ACCESSIBILITY FOR GOVERNMENT AND OTHER LOCAL PARTNERS TO ROLL-OUT THE APP IN NON-AKF SUPPORTED SCHOOLS.

- **Provide a ‘toolbox’ of globally comparable assessment tools.** PROMISE³ provides a library of locally rooted, and globally informed learning assessment modules (i.e. classroom observation tools and student learning assessment tools) that teachers and head teachers can employ at the classroom and school levels to be able to compare their students against local, national and global quality educational constructs that may not be in their national curriculum yet (i.e. social emotional learning, growth mindsets, 21st century skills, pluralistic dispositions, etc.). This toolbox can be upgraded easily when the app is connected to the network, enabling multiple organizations and government officials to upload newly developed measurement tools for assessing learning within the classroom and school.



3. Product Regulations: Understand Existing (And Non-existing) National And Global Data Governance Regulations For Education Data Collection And Storage Via ‘The Cloud’

Throughout the development phase of the app, the team has experienced a large variance about education-related data regulations across the six target countries. For example, what are the rules and regulations that governments have (or lack) regarding the process by which data about education is collected, stored, and utilized ‘in the Cloud’? Whose ‘Cloud’ is it? Where is the data allowed to be stored? Who should have permission to access the data? There is no global or accessible

national guiding resource available for practitioners. The project team has identified a number of restrictions on the access, residency, and sharing of education data, particularly personally identifiable information about children and/or marginalized populations. But we desperately need more sound legal, political, and technological guidance to ensure the app development follows national and global regulations in data residency and ownership for all.

4. Product Security: Ensure Education Data Is Anonymized, Protected and Secure

As PROMISE³ is being developed for school-level stakeholders, host governments and partner educational organizations such as AKF, levels of data anonymization, protection and security are essential for ensuring that the right people have the right levels of access to the right information. However, this requires a significant level of technological expertise that often falls well beyond the capacity of the intended users. As a result, we rely heavily on the expertise of Vera Solutions and Salesforce.org’s digital architects and staff. However, is this adequate? With over 8,000 non-profits registered and using Salesforce as their digital data platform “trusted platform”, one of the main reasons they remain a common partner of choice is their demonstrated first-in-class level of data security and protection measures, alongside their sophisticated modeling of anonymizing data at the appropriate user levels. However, what, if any guidelines are informing how Salesforce.org and other data technology companies collect, store, and distribute data per user; particularly related to student learning information? How do these relate to government regulations, if any exist? Who is ultimately responsible for when a breach in data occurs? These are questions currently being wrestled by our project team moving forward as we consider scaled roll-out and expanded partnerships with government and non-government actors.

5. Product Sustainability: Ensuring The Affordability Of Learning Data Management For All

The sustainability of PROMISE³ will depend on three key factors: a.) the affordability of the hardware (locally sourced tablets and/or smart phones) b.) the affordability of platform licenses (Salesforce user licenses) and c.) the flexibility of the app to meet the diverse needs of multiple schools across a variety of contexts. PROMISE³ has sourced locally available hardware to try to address issues of maintenance, affordability, and accessibility for government and other local partners to roll-out the app in non-AKF supported schools. AKF and Vera Solutions are in negotiations with Salesforce.org for a global roll-out of the app through the University of Oxford and AKF’s Schools2030 longitudinal research programme, but still remain unclear about how non-AKF affiliated users will be able to access the app moving forward. These questions of long-term pricing and maintenance are critical for the sustainability of any and all uses of technology for data collection, analysis and utilization moving forward in the public sector of education.

FINAL REFLECTIONS

Overall, we remain extremely excited about the future of PROMISE³. We are thrilled that the design process has been rooted in local realities and informed by global innovations and technologies. Do we, as an education sector, have the appropriate internal capacities and competencies to really understand how to engage with a technology companies for helping strengthen the education sector? What opportunities are we missing? What pitfalls are on the horizon? Do we have a robust community of practice of education-related organizations and institutions engaging technology companies for improved data collection, analysis and utilization moving forward?

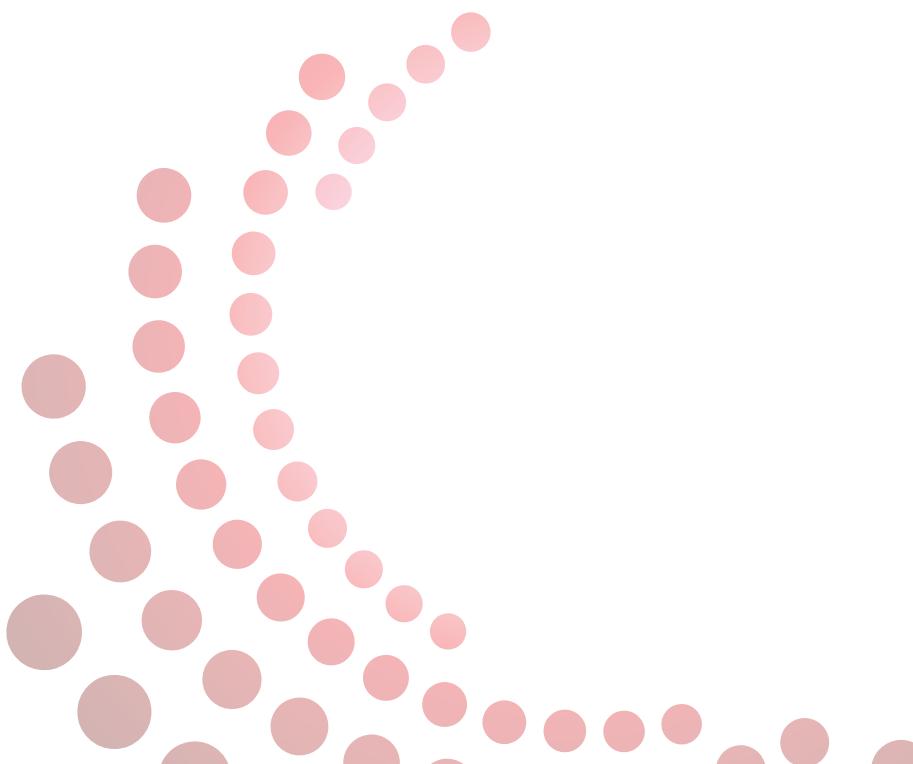
We are all aware of the many organizations and companies worldwide continuously claiming to provide the winning solutions for transforming governmental and organizational education information management systems (EMIS). However, we have found through experience that a number of these service providers often lack a.) the appropriate deep-bench of advanced technical leadership (i.e. only the founder knows how to troubleshoot issues) b.) robust security and protection measures (i.e. hackers can easily attack open-sourced data tools) c.) Adequate data storage (i.e. systems crash when more than 1,000 schools are registered) and/or d.) Transparency in what their systems can offer (i.e. providers consistently hide behind a metaphorical curtain that is raised only when we pay additional fees for further customization of end-user data needs). As a result, governments, organizations, and even individual schools are systematically falling victim to what we refer to as the “education technology data bandits”. In response, what we believe is lacking within the education sector is an open, third-party hosted ‘**education data tool and tech platform exchange**’ that provides local and global education stakeholders with a **one-stop-shop for verified teaching and learning**

assessment tools and a set of viable technology companies/platforms/apps on which they can work at scale. The Global Learning Lab’s online repository of learning assessment tools provides a small example of what could be possible in a repository, though their resources are mainly limited to the US audience at this time. And beyond EdSurge, Brookings, and Results for Development’s Centre for Education Innovations, it remains very difficult to sift through the many EdTech actors to identify the technology platforms available for enhancing the education data flows within and beyond classroom and school systems. AKF is currently partnering with UNICEF Innovations to conduct a horizon scanning about what works in digital learning in Eastern and Western Africa; but this is just the beginning.

Hopefully, the Global Alliance for Learning Impact can deliberate about creating a set of meaningful guidelines and/or foundational insights that could help inform and inspire a new global resource about what works in using technology to measure quality education at scale. We look forward to learning from you all in the coming months. Thank you for inviting our thoughts to be shared.

ADDITIONAL RESOURCES

- PowerPoint Presentation (CCIC, September 2017): PROMIS(E)³ – Programme Management Information System for Education by Everyone, Everywhere
- PowerPoint Presentation (Global Partnership in Education, 2017): Our PROMIS(E)³ for Schools2030: Data, Education, and Impact
- Video Presentation (Dreamforce, November 2017): (Relevant six-minute piece – 20:07-26:36) Keeping our PROMISE³ for Schools2030 – K-12 Revolution in Education



CASE STUDY: CAMFED



This case study briefly describes the learning from Camfed's use of mobile technology for routine monitoring data collection.

Use of mobile technology in monitoring education in Ghana, Tanzania, Zambia

BACKGROUND

There is a popular maxim in business, “what gets measured gets done.” With better, more powerful and more accessible technology, gathering and evaluation development data is fast becoming a necessary tool to ensure that the sustainable development goals are met.

Schools in many parts of the world face major challenges in gathering and accessing meaningful data to monitor important educational indicators such as student and teacher attendance and learning outcomes. Camfed, through its mobile data collection tools, is leading the way in tackling these challenges in rural school systems in Ghana, Malawi, Tanzania, Zambia and Zimbabwe. By using effective data collection tools, Camfed is encouraging young people to attend and do well in schools, helping build capacity within school communities, and also continually improving its own organizational effectiveness.

THE DATA COLLECTION MODEL/DESCRIPTION

Mobile technology has been used by Camfed for routine monitoring data collection since 2011.

The groundwork for the introduction of mobile technology included: migrating to Salesforce, a Cloud-based database which would allow for data collected using mobile technology to automatically enter the database; a process of “streamlining” existing data collection on paper forms, to ensure the “right” data was being collected; and, examining data flows to make sure the data was being collected by the “right” people.

The use of mobile phones for monitoring was first piloted in Ghana and Zambia, with stakeholders trained to collect data from partner schools including from girls benefiting from support. In Zambia, the pilot was in a geographical region, and in Ghana the pilot was with one stakeholder group (school graduates). In 2012 the phone roll-out was extended to cover all of Zambia and Ghana, and was also introduced to Tanzania. Because most volunteers in Tanzania who collect data speak only Swahili, we added a new specially designed functionality, which allows questions (and answer options) to be viewed in Kiswahili, but translated into English when entering Camfed’s database. Later innovations included:

- Management systems within Salesforce to make sure that data was reviewed and actioned promptly;
- An automated SMS system to acknowledge the receipt of data;
- Transitioning to the use of smartphones as these became more affordable and readily available;
- Moving from Episurveyor software to Open Data Kit (ODK);
- Capacity training for programme teams to create and upload their own monitoring forms;
- In 2013 mobile phones for monitoring were rolled out in Malawi (initially in two districts only) and in 2014 in Zimbabwe, where, due to political sensitivities, mobile phone monitoring was first introduced with District education officials prior to rolling out with teachers.

CHALLENGES

Several issues were identified in the use of mobile technology. Before investing in mobile technology, it is essential to do the groundwork: thinking carefully about what data is needed, where the data will sit, who will collect it, who might feel “bypassed” if the data is being sent directly without being first reviewed.

The main difference between data collected by paper and by mobile technology at Camfed is the speed with which it is received. For this speed to be taken advantage of, the data needs to be managed within the organisation's database: it needs to be acknowledged, reviewed, and followed up on in a timely manner. At times this management of the data has not been done as timely/efficiently as it should be, and this has sometimes resulted in volunteers losing interest as there is no evidence that what they are sending is being read. Both the automated SMS response we set up (which provides an immediate reassurance that the data

submitted has gone into the database) and the review system within Salesforce that helps Impact Officers to check data and highlight issues have gone some way towards strengthening the feedback loops to resolve this.

One of the most powerful tools within mobile technology is the ability to overcome language barriers, with questions and answer options translated, and the possibility of choosing your preferred language. For example, in Tanzania, the questions and answer options are viewed by field users in Swahili, but imported into our database in English.

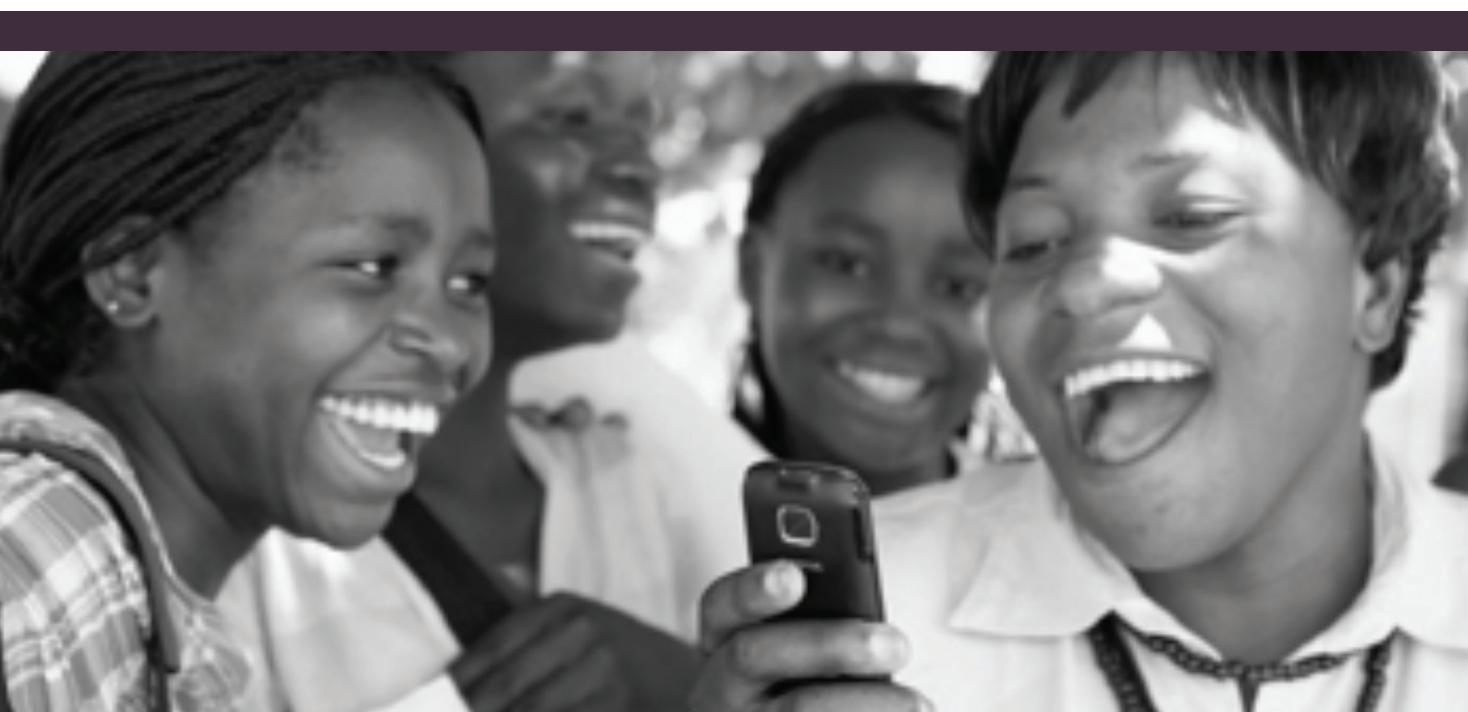
In Zambia in particular, systemic issues presented a challenge to the sustainable implementation of mobile technology, including: high turnover of teachers in rural schools; cost of replacement of broken phones; geographic isolation of rural schools; and poor mobile coverage.



Refresher trainings need to be built in to the budget of a mobile technology roll-out. In countries where we had annual refresher trainings built in for teachers (i.e. Tanzania and Ghana), the system was far more effective. In Zambia, where refresher trainings were not budgeted for (exacerbating the issues cited above), and the use of mobile technology to send data declined among secondary school teachers. As well as reinforcing with volunteers how and what to monitor, refresher trainings are an important opportunity to listen to volunteers (e.g. is the demand on their time for filling in monitoring forms too onerous? Is there an answer option missing for a particular question?) and enable peer-to-peer sharing/learning. During refresher trainings, we have found that it is helpful to have someone experienced in IT available to run a phone "clinic" for the duration

a horizontal pilot (all of a stakeholder type throughout a country). For example, in Malawi, two districts piloted the phones to begin with. District officials who had received training on using phones were then able to support teachers in their district.

When training volunteers, it's important to train in small groups, so support can be given to those who are struggling. In Tanzania we decided to train phone users using a cascade training method which worked well and meant we could keep the groups small. It's also important to pay attention to the needs, skills and experience of individuals during the training as (particularly in more rural contexts) many have not used mobile phones before, leading to some struggling to read the small screens or to press the buttons and type.



II © Camfed International, 2017

of the training – checking phones, updating software, replacing SIM cards and batteries. In Tanzania, teachers involved in mobile data collection have also met together independently to provide each other with support, and have created WhatsApp groups to keep in touch with each other.

Mobile technology is only a tool and not a solution; if the commitment and willingness to collect data is not there when using paper, being given a phone is not going to change this. That having been said, mobile phones do serve as an incentive (and in some contexts a status symbol) – especially smart phones – though conversely they can also pose a potential security risk for users.

Piloting in a small area first is a good idea, and also allows staff to provide extensive support to phone users. A vertical pilot (all stakeholders in a small geographical area) seemed to be more successful than

Setting in place a peer support system among volunteers in a particular area has helped address this.

Communication with volunteer data collectors is important – especially when it comes to monitoring deadlines. In Camfed, volunteers have used the phones for making calls to Camfed on programme issues as well as for sending data, so it is enhancing responsiveness of the system more widely. It has also enabled use of WhatsApp to facilitate peer networking which has proved a valuable incentive.

EMERGING ISSUES FOR CONSIDERATION

1. Piloting Paper-based Data Collection Is A Useful Exercise Before Investing In Mobile Technology

Rolling out mobile phones gradually meant that in the initial phase we were collecting data using mobile

technology and paper simultaneously. How well paper forms were used was a good predictor of how well mobile technology was eventually used. This suggests that piloting paper-based data collection is a useful exercise before investing in mobile technology. It allows

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MOBILE TECHNOLOGY IS ONLY A TOOL AND NOT A SOLUTION; IF THE COMMITMENT AND WILLINGNESS TO COLLECT DATA IS NOT THERE WHEN USING PAPER, BEING GIVEN A PHONE IS NOT GOING TO CHANGE THIS.

the opportunity to test the soft skills involved: the human relationships and interactions, the commitments of volunteers (if those collecting data are volunteers), and related to this latter, the integration of data collection within existing workloads and work streams (e.g. of teachers, district officials). It also means that, when mobile technology is introduced, the mobile technology is the only novel element (while the monitoring data to be collected should be fairly similar).

2. Mobile Technology Is A Tool – The Human Interactions and Processes Are Key

As well as the willingness and commitment of volunteers, it's important to find out if they will have the authority to collect the data in the contexts (e.g. schools) in which they will be operating.

It's also critical to map out the “governance” of data – who is entitled to gather/view data, where do the reviews need to take place in order for the data to be validated as well as authorised. Getting this wrong can create significant vulnerabilities – both for the individuals involved, as well as in relation to how the data is used in terms of who it is shared with (and for what purpose). As an example – with the current enthusiasm for young people to get involved in data collection relating to the SDGs, it's important that they are not in effect seen as “policing” systems (as there's often significant mistrust of mobile phones as tools for data gathering because of the perceived loss of control over how the data is viewed/used) which can create very problematic dynamics in young people's relationship with local authorities, for example. Incentive alignment is an important aspect of mapping out the data gathering to ensure that data gatherers have a clear stake in the process without this being vulnerable to vested interest.

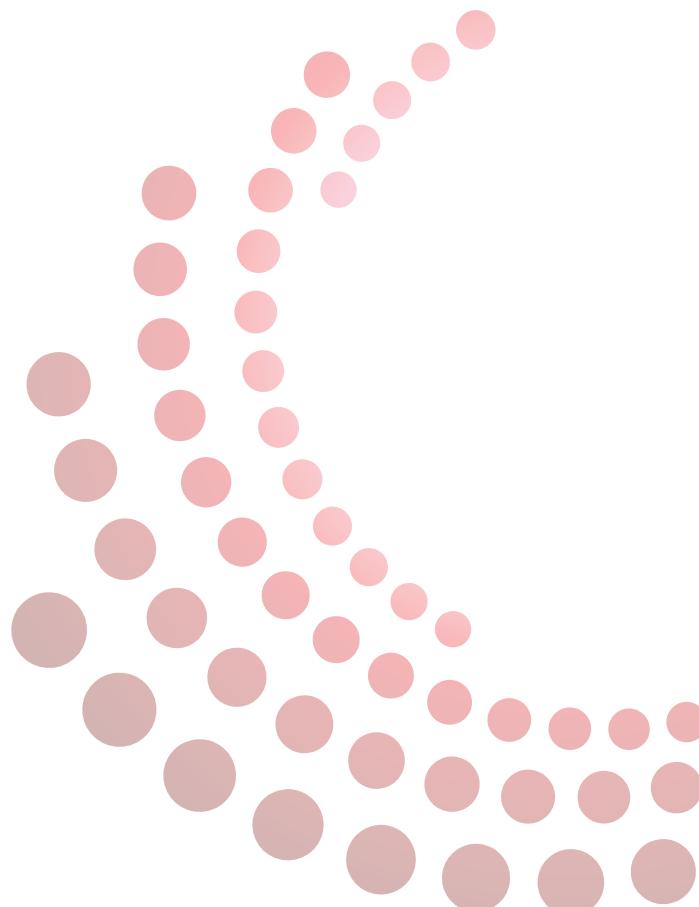
3. Switching to Mobile Technology Needs to Be Seen as an Investment

With high up-front costs, both in terms of mobile phones and training and as well as in terms of staff time to provide follow-up support in the early phase of roll-out, mobile technology while expensive at first, may enable more efficiency in the long run. For the full returns of initial investment to be realised, there needs to be an understanding that the costs in terms of volunteer interaction and support will be far higher to begin with. In Malawi, where the pilot was a vertical one, covering only two districts, the initial investment led to a strong ongoing peer support network among stakeholders.

4. There Are Important Issues of Data Security And Child Protection Which Must Be Considered In The Use of Mobile Technology

Some data gathering platforms allow mobile technology users to view the data housed on the database. While this means users have far greater access to data, which they have helped to collect, this raises important issues of data security and child protection, especially when individual students and schools are recognisable.

It is thus critical to design levels of database access ascribed to particular user groups to ensure that principles of data protection are enshrined. Additionally, it is important to continue to innovate and explore opportunities for better sharing back of data and data analysis through the functionality of smartphones.





CASE STUDY: PUNJAB INFORMATION AND TECHNOLOGY BOARD

Improving student learning outcomes through real-time student assessment, and monitoring of public schools in Punjab, Pakistan

ABOUT PUNJAB INFORMATION AND TECHNOLOGY BOARD

Punjab Information Technology Board (PITB) is the IT-arm of the Government of Punjab, Pakistan. PITB currently manages over 250 Information Communication Technology projects in key sectors in the province, including Agriculture and Livestock, Education, Health, Law and Order, Transport, and Security. With a population of 110 million the province has many information, services and governance challenges.

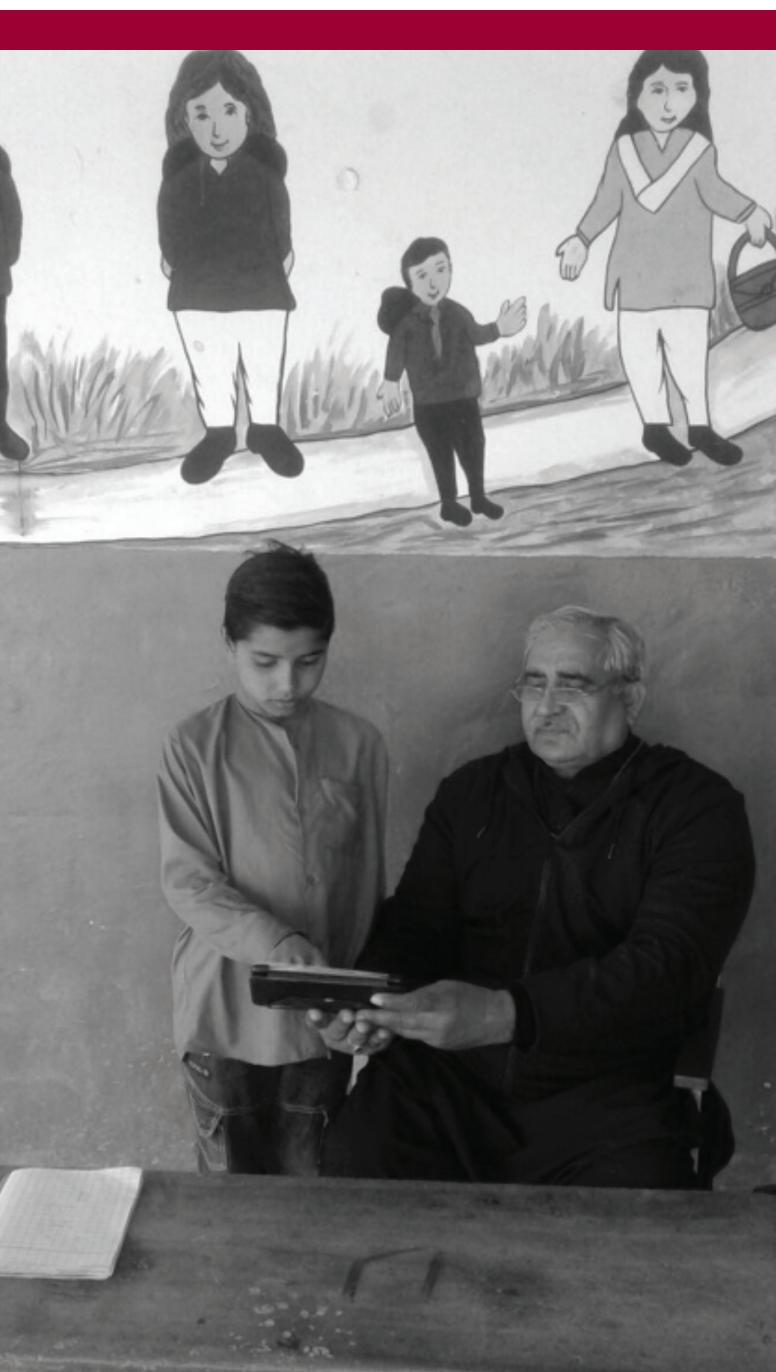
As a core strategy, PITB leverages mobile technologies and open-source platforms to design terrain-viable solutions for real-time monitoring, on-spot assessment, and citizen feedback. Their tablet-PC and smart-phone based systems enable thousands of government officers across the Province to capture and reliably share Monitoring and Evaluation information every day. This steady stream of data is automatically consolidated in real-time, and made available to decision-makers as actionable information in the form of SMS-alerts and online dashboards.

The Learning and Numeracy Drive (LND) initiative of the School Education Department (SED) Government of Punjab aims to capture learning improvements at the foundational or lower primary level (Grade 3). These mechanisms incentivize the education system in Pakistan to be better, and hold the providers of education responsible in case of any issues, which hasn't been done thus far. The LND programme works in a similar light and is detailed below.

PITB's smart-monitoring initiatives continue to be recognized in international media, including coverage in the Economist, Time Magazine, The Washington Post, Wall Street Journal, and the Guardian. Their value proposition is: simplicity, cost-effectiveness, and prove-at-scale.

BACKGROUND

The public school system in Punjab, Pakistan, caters to over 10 million students through its 52,695 schools dotted across the Province. The School Education Department employs a workforce of almost 350,000 teachers and staff to run these schools. The government also employs a field-force of 950 officers called Monitoring and Evaluation Assistants (MEAs), tasked with visiting each public school across Punjab, every month. These officers act as an independent school monitoring layer for the government. They carry out spot-assessments of students, and report key stats including student enrollment, teacher presence, and availability of important school facilities (water, electricity, toilets etc).



MEAs traditionally used paper forms to fill out visit reports, and would submit them to district administrative staff – who would subsequently summarize the data into Excel sheets. A central office would then collect these Excel sheets from all 36 districts, and further summarize the information at provincial level. While the paper-based reporting approach served as a means of collecting and storing lots of paper, the traditional data-tabulation process was inherently delay-prone and open to several layers of operator errors and potential data manipulation.

The Chief Minister's Office as well as decision-makers at the education department required timely and reliable information from the field, in order to take meaningful corrective measures. Thus in 2014, PITB introduced an innovative ICT-based solution for school monitoring and student assessment. All 950 MEAs were equipped with low-cost tablet-PCs, and purpose-built Android-apps for real-time data capture. Hence, these solutions have been rolled out at mass-scale.

Since August 2014, over 1 Million school-visit and 2.2 million student assessments have been logged into a central online reporting system – with real-time access and SMS-alerts for stakeholder. The School Education Department carried out comprehensive field tests of these applications, and switched over entirely to the tablet-based solution after completing a parallel run exercise spanning six months. These tablet-based systems have become an integral component of Punjab's multiyear School Reforms Roadmap. These systems now fuel the Education Stock-take presentations on quality, access and equity made to the Chief Minister and Chief Secretary every eight weeks. The data informs policy actions.

HOW IT WORKS

Each monitoring official (MEA) has been provided a tablet-PC with purpose-built Android-apps for student assessment and on-site reporting. These tablets are SIM-enabled, and therefore, capable of sending data back to the central server in real-time. In case the monitoring officer is in an area with no cellphone coverage, the Android-app is intelligent enough to locally store the data, geo-location, and date/time information of the assessment on the tablet. This information is relayed to the central server as soon as the monitoring officer gets to an area with cellphone coverage.

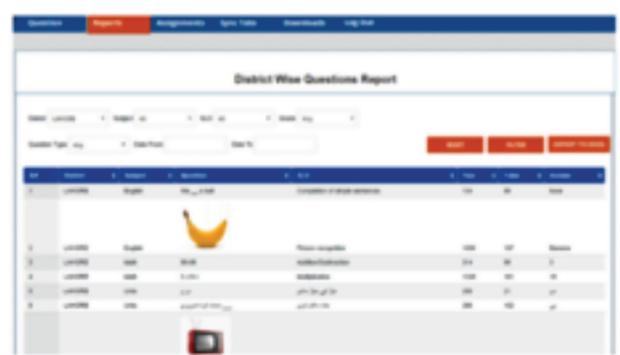
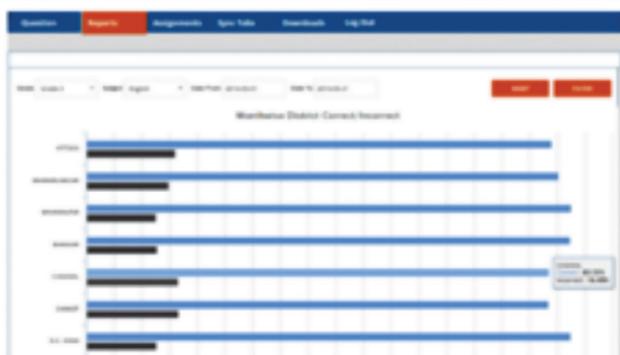
Each month, district education officials assign visit schedules for each MEA. Upon arriving at the school, the MEA opens the Android-app on the tablet-PC, and selects the school being visited. The app automatically loads the school profile and registers the date, time, and location of the visit.

The MEAs have been instructed to randomly select seven students in a section in Grade 3, and to give



them the spot-test on their tablets. Based on a central question-bank, the Android-app on the MEA's tablet randomly selects assessment questions for the particular grade, subject, and key SLOs.

These multiple choice questions are presented to the student who is being assessed. A total of seven questions are asked in each assessment test. The process typically takes less than five minutes to complete per student.



Currently student learning outcomes are measured for English, Mathematics, and Urdu, for primary grades. However, the system can easily be configured for any subject, without the need for changes in software code.

This low-cost onsite-assessment approach is also helping baseline and benchmark learning levels between and across public and low-cost private schools in Punjab. This has enabled education officials to take an

evidence-based approach for planning public-private partnerships in education. To maintain fairness and to discourage collusion, district officials regularly re-assign and shuffle schools to be visited by each MEA during a month – through the central online system.

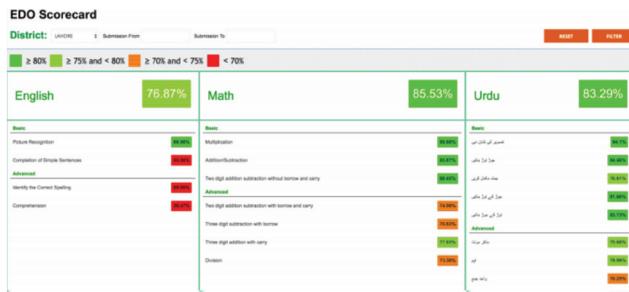
BENEFITS

The benefits of the tablet-PC approach have been enormous and are synthesized below.

1. Automatic location-tagging (of tablet-based form submission) has helped quell the debate on whether the monitoring officer visited the school or not – hence, making the data capture process more credible for quality and access dimensions.
2. The speed and quality of data collection has improved immensely, making it near real time. The system works for those operating in remote parts of the Province as well.
3. Responsibility of data entry is fixed with the MEA, rather than shared between MEAs, the district staff, as well as IT staff at the central location.
4. The government now has an effective mechanism in place for frequent, timely, and low-cost student assessment – in addition to its traditional paper-based annual assessments carried out for selected grade-levels, which tend to be costly, time consuming, and error-prone.
5. A centralized dashboard enables key stakeholders to track MEA visits and carry out timely data analysis.
6. The tablet-platform has allowed the government to rapidly tweak and improve its school monitoring plan – and to roll-out it out to a thousand-strong field force at a press of a button.
7. Teachers and school administrators have become conscious of the fact that a consistent low score on monthly student assessments will inevitably lead to more queries and administrative action. Hence, teacher presence and in-class learning are being positively impacted.
8. Education management officials at the district as well as the center, now refer to the data provided by the central monitoring system on a regular basis, for informed decision making.
9. As a step towards openness and transparency (and as a deterrent for the MEA to misreport information), some of the real-time datasets have been made public. Civil society can hence view and challenge the information being logged by the MEA for each school.
10. Most importantly, data analysis indicates that student learning outcomes at the primary level (for basic numeracy and literacy skills) have started improving.

CHALLENGES

Encouragingly, the challenges faced during the roll-out and implementation of the LND program were minimal when compared to the benefits. One of the largest anticipated challenge was data anonymity, however this was fortunately not an issue in reality as the platform was created by PITB and used by government departments, both of which are highly trained at each level with the use of data (the images on the right show the data dashboards used by these departments). The challenges that were faced during this project fall under three overarching themes: technology adoption, technology care and availability of MEAs.



Each challenge is further detailed in the paragraphs that follow.

As Pakistan is a developing country, a large area of concern during the development phase of the LND programme was the responses of both students and MEAs to technology. Technology penetration in Pakistan's government schools is behind that which is seen in developed countries, thus the familiarity of students and evaluators with using a tablet-based application posed potential issues. Anticipating this challenge, PITB worked extensively with MEAs during the development of its Android application, consistently

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incorporating their feedback on the design of interface: from the size of the buttons to the order of display. This allowed MEAs to own the product and familiarize themselves with it while allowing PITB to create a more user-friendly product. Since MEAs were the primary persons to be using the application, they could then pass on their understanding to the students.

The second major challenge foreseen by PITB was ensuring that the tablets provided to MEAs were appropriately cared for, as repair or replacement costs could potentially become significant and hinder the success of this project. In reality, however, damage to tablets has been close to negligible as quoted by PITB. PITB believes that the primary reason for MEAs taking good care of their devices was due to its SIM-enabled nature; the SIMs accompanying the tablets contain a data package and 300 free voice-calling minutes, thus allowing MEAs to use their devices for personal use as a bonus and incentivizing them to care for their tablets.

The third challenge faced by PITB when launching this project was the availability of MEAs. MEAs are staff of Punjab's Programme Monitoring and Implementation Unit (PMIU), thus not specific staff for the LND project. Fortunately for PITB, once the project took off and its success was proven, PMIU was happy to delegate MEAs for the LND project.

“ SINCE AUGUST 2014, OVER 1 MILLION SCHOOL-VISIT AND 2.2 MILLION STUDENT ASSESSMENTS HAVE BEEN LOGGED INTO A CENTRAL ONLINE REPORTING SYSTEM – WITH REAL-TIME ACCESS AND SMS-ALERTS FOR STAKEHOLDER.

CASE STUDY: THE VARKEY FOUNDATION

Delivering a comprehensive monitoring and evaluation system in Ghana using Salesforce and TaroWorks

This case study describes The Varkey Foundation's introduction and use of Salesforce and TaroWorks to collect country-wide data from its projects.

OVERVIEW

The Salesforce platform has been used by The Varkey Foundation Ghana for routine monitoring data collection and internal evaluation since 2014, when it was introduced as part of the DFID-funded Girls' Education Challenge (GEC) project, Making Ghanaian Girls Great! (MG Cubed).¹⁷ Over the last three years the platform has been developed to incorporate three other projects in Ghana, with plans to expand the instance to cover operations in Uganda.¹⁸ The Cloud-based platform allows the Varkey Foundation to track progress on outputs, respond to issues with satellite technology, and conduct regular internal evaluations.

The impetus for the use of Salesforce included:

- **The nature of the project:** The GEC grant was awarded through the “innovation” window – a DFID initiative which offered funding for the most innovative, effective and well-evaluated pilot projects that support marginalised girls to succeed in their education. MG Cubed was introduced as a pilot, in which the feasibility of implementing a satellite-enabled, solar-powered interactive distance learning system was tested. Major focus was placed on the efficacy of the technology: Salesforce was introduced to integrate with the system in order to track “log ins” from schools; technical issues and remote troubleshooting; and online broadcasting time. Secondly, the project entailed close tracking of a cohort of nearly 4,000 girls.
- **Shift from paper-based approaches:** The Varkey Foundation Ghana knew that the amount of data being collected (for instance, termly pupil attendance) could not be reliably stored and effectively analysed solely through traditional databases (such as Access).
- **The need for mobile data collection:** The Varkey Foundation Ghana has a large team of field based coordinators who are responsible for routine data collection, for instance undertaking classroom observations. In order to save time, tablets with TaroWorks (an Open Data Kit application), which allows for offline data collection. TaroWorks' mobile Customer relationship management (CRM) allows teams to collect information, analyse metrics and manage fieldwork in real-time. Field officers simply “sync” data when internet is available, and this is integrated with Salesforce.

TaroWorks is now used in 11 districts by 33 staff members. Salesforce is operated by a System Administrator in London and a Programme Administrator in Accra. Thirty-five staff members can access Salesforce for their customised data needs, depending on their role. All data is entered into tablets using English at present.

Benefits Of The System

The benefits inherent in the system include:

- Field officers are able to save time by collecting data on tablets and sharing it in real time. This has sped up the monitoring process (for instance, the team in Accra does not have to wait for unwieldy Excel files) and ensured streamlined data flow between the various actors in the system (Image 1).



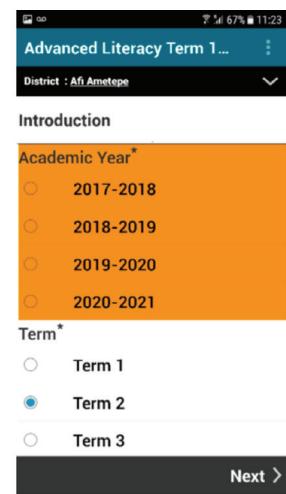
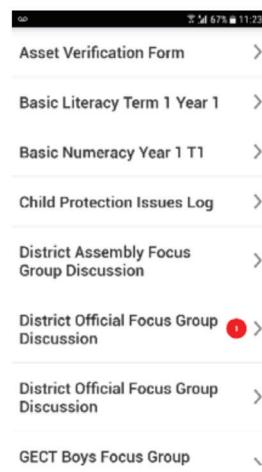
- The team's project activities are carefully tracked in Salesforce and readily analysed, shared, and securely stored. Data loss is never an issue, and even when problems are encountered with data syncing between TaroWorks and Salesforce, the Cloud stores backup data which can be decrypted by the remote TaroWorks support team.
- The Varkey Foundation obtains its technical support for both Salesforce and TaroWorks from the TaroWorks team, who offer one hour per month of gratis support. The TaroWorks user community is engaged and communicative: most questions are resolved in community forums which are managed by TaroWorks staff. The result is that the community

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THE CLOUD-BASED PLATFORM ALLOWS THE VARKEY FOUNDATION TO TRACK PROGRESS ON OUTPUTS, RESPOND TO ISSUES WITH SATELLITE TECHNOLOGY, AND CONDUCT REGULAR INTERNAL EVALUATIONS.

collaborates in identifying system “ tweaks ” which TaroWorks addresses in regular software updates.

- At the front end, the system is simple to use. Field officers are given access to “ Jobs ” (Image 2) and are able to navigate the interface to select which Job they require. Field officers can be provided time-bound targets for completion of Jobs, which can be monitored through Salesforce.
- Data is collected through a variety of question types, including free text. All data is “ mapped ” to relevant projects, districts, and data type according to how monitoring data is reported on.



ISSUES AND CONSIDERATIONS

The Varkey Foundation’s experience of developing, using, and managing the Salesforce (and TaroWorks) platform has led to key learnings about the use of technology in managing data.

1. **A great deal of planning and data flow mapping needs to occur early on in the process.** This includes who has access to what, and what they can do (Profiles and Permissions) and what reports (i.e. data summaries answering specific questions, such as “How many hours of training were broadcast this week?”) need to be set up. The Varkey Foundation Ghana sets up project dashboards for key M&E indicators, and runs daily tech reports providing information on broadcasts, log ins, and tech issues.
2. **There are issues of data ownership, in the sense that field officers send data and this is received instantaneously by staff in Accra and London.** There is a risk that field officers then get cut out of the process. In the second phase of the GEC project, field officers were involved in a workshop designed to develop their understanding of the project logframe and theory of change.



3. A responsive support resource is essential.

In Ghana, The Varkey Foundation uses WhatsApp for TaroWorks discussion, instruction, and error sharing. This has enabled the Impact Manager to respond quickly to issues (both user error and system error) and reduced frustration with the system.

4. Mobile data collection requires an internet connection to sync.

There is a risk of data overload, particularly when data is being “pulled” from the system (i.e. to pre-populate questions) as well as being “pushed”. The Varkey Foundation has experienced frequent system data overload issues due to network capacity.

5. Back-end capacity is easily concentrated in one or two staff members.

Continual investment should be made in ensuring that staff members graduate from using TaroWorks to using Salesforce. This is something The Varkey Foundation is addressing by introducing key programme staff to some back end functions.

6. Buy-in from some staff, such as teachers, to the adoption of new technology is fragile.

Trust in the system is easily shaken, and therefore care must be taken to provide both training to staff on the use of TaroWorks and Salesforce, and follow up on reported issues. This can be time intensive, as The Varkey Foundation has found.





The pictures throughout this report were chosen to represent children and teachers all around the world.