

WORKING PAPER

Navigating the 'Data Revolution'

A Case Study on the One Tablet Per School Programme in Sierra Leone

Date February 2021

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Recommended citation

McBurnie, C. (2021). *Navigating the 'Data Revolution': A Case Study on the One Tablet Per School Programme in Sierra Leone*. [Working Paper]. EdTech Hub. DOI: <https://doi.org/10.5281/zenodo.4430545>. Available at <https://docs.edtechhub.org/lib/FEXGB4IJ>. Available under Creative Commons Attribution 4.0 International.

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Notes

EdTech Hub is supported by UK aid and the World Bank. Please note that the views expressed in this report do not necessarily reflect the views of the British government or the World Bank.

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Reviewer

[Björn Haßler](#)

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Abbreviations and acronyms

DSTI	Directorate of Science, Technology and Innovation
EMIS	Education Management Information System
MBSSE	Ministry of Basic and Senior Secondary Education
TSC	Teaching Service Commission

1. Introduction

In September 2020, Sierra Leone’s Ministry of Basic and Senior Secondary Education (MBSSE) approached EdTech Hub to seek technical support with the design of the One Tablet Per School programme. A core component of the programme focuses on collecting dynamic school-level data — teacher registration, student enrolment, teacher and student attendance, Covid-19 cases — to inform programming and policy decisions. In this context, EdTech Hub embedded a team member within the MBSSE’s Delivery Unit to support the development of this data system. The MBSSE established the Delivery Unit in August 2020 to strengthen the government’s implementation capacity and to monitor progress toward education policy priorities.

This report provides an initial self-assessment of the impact of our technical support after three months. EdTech Hub conducts these assessments to see how we can better support our partners and improve our overall approach to technical support. When preparing the report, we used outcome harvesting to identify observable and significant contributions that EdTech Hub has made to the development of the One Tablet Per School programme.

The report begins with background information on education data systems and the One Tablet Per School programme. The following sections provide an overview of our methodological approach, outline key findings from the assessment and discuss the impact of EdTech Hub’s technical support. The report concludes with practical considerations for the implementation of education data systems.

2. Background

2.1. A 'data revolution' in low- and middle-income countries?

The international development community has advocated for a 'data revolution' to eradicate poverty and catalyse sustainable development ([↑High-Level Panel of Eminent Persons on & the Post-2015 Development Agenda, 2013](#)). In Sierra Leone, proposed open data reforms focus on increasing public sector accountability, government transparency, and civic participation ([↑Field, 2020](#)). In the education sector, robust data systems have been linked with improved service delivery and resource allocation ([↑Abdul-Hamid, 2017](#); [↑Education Commission, 2019](#)). When developing these systems, technology can play an important role in the collection, analysis, and dissemination of data ([↑Save Our Future, 2020](#)).

Yet, the development of a robust data system can demand significant infrastructural and human resources that low- and middle-income countries may lack. For example, a shift toward automated data collection often requires high levels of device penetration and internet connectivity ([↑Abdul-Hamid, 2017](#)). Outside of physical infrastructure, a government's technical capacity to process and understand data can strongly influence how decision-makers apply evidence ([↑Custer, et al., 2018](#)). Notably, technical illiteracy has previously been identified as an impediment to the success of open data systems in Sierra Leone ([↑Joswiak, 2017](#)).

Moreover, the provision of data — and the creation of a data system — does not automatically translate into better decision-making. In practice, a significant gap exists between the supply of education data and its use, as organisations tend to focus on hardware rather than the needs of users ([↑Custer, et al., 2018](#); [↑Crouch, 2019](#)). This technology-first approach does not account for the challenge of ensuring that decision-makers act upon data to support system strengthening ([↑Bernbaum & Moses, 2011](#); [↑Mackintosh, et al., 2020](#)).

In this context, developers need to consider what — and how — data is presented to decision-makers ([↑Read & Atinc, 2017b](#)). Data should be readily available, digestible and tailored to user priorities to support meaningful action ([↑Abdul- Hamid, 2017](#)). For many countries, however, data is inaccessible as governments lack well-maintained dashboards ([↑Read & Atinc, 2017a](#)). Elsewhere, decision-makers face a different challenge of navigating multiple unintegrated dashboards to find information ([↑Crouch, 2019](#)). In the past, this issue has been particularly problematic in Sierra Leone ([↑World Bank, 2015](#)).

The use of data in the decision-making process also depends on the value that policymakers ascribe to different types of evidence as well as broader socio-political factors such as the level of civic engagement ([↑Crouch, 2019](#)).

Decision-makers may hold different conceptions of what valid and usable data looks like ([↑Custer, et al., 2018](#)). In turn, this conception may impact the perceived benefit of analysing and applying data to shape education interventions ([↑ibid.](#)).

As such, system developers should adopt an iterative delivery approach. In 2007, for instance, the Government of Afghanistan piloted a basic education survey that grew into a functioning Education Management Information System (EMIS) after a period of extensive review and user feedback ([↑Abdul-Hamid, 2017](#)). A gradual process of adaptation and expansion can allow governments to avoid the risk of making large-scale investments in systems that decision-makers may not need or use.

2.2. The Sierra Leonean vision for data in education

In June 2020, the MBSSE established the vision for the One Tablet Per School programme: to provide every government and government-assisted school with a tablet to improve school management and administration. Initially, the MBSSE worked with a team of international consultants to develop the programme before EdTech Hub started to provide technical support. EdTech Hub's technical support has entailed a series of co-working sessions including

activities such as stakeholder analyses, problem scoping and user journey mapping.

Importantly, the One Tablet Per School programme was designed to build on the following components of the World Bank's Free Education project:

- rationalising existing data collection processes;
- collecting weekly or daily data on teacher and student attendance;
- developing an integrated Teacher Management Information System to support workforce planning and management.

As such, the programme will focus on collecting dynamic school-level data including:

- registration details of individual teachers such as qualifications, subject specialism, payroll status and years of service;
- classroom-level student enrolment data disaggregated by gender, educational need and pregnancy status;
- daily attendance records for teachers and students;
- daily reports on the presence of Covid-19 symptoms.

Notably, all of this data will feed into a consolidated set of dashboards.

3. Methodology

In this study, we assessed if and how EdTech Hub’s technical support has plausibly shaped the MBSSE’s approach — in terms of technological, delivery, coordination — to the One Tablet Per School programme. In particular, we focused on the following questions:

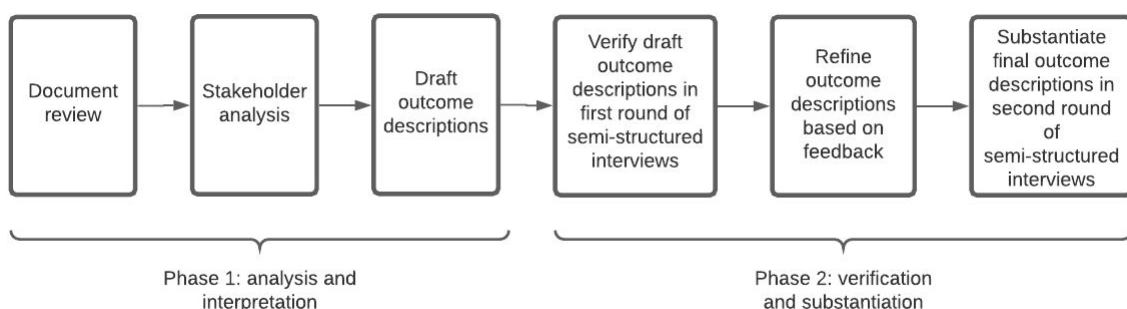
RQ1. How has the MBSSE observably changed its approach to the One Tablet Per School programme since EdTech Hub started to provide technical support?

RQ2. How do these changes contribute to the MBSSE and Sierra Leonean government’s goal of expanding the availability and use of data to support systems strengthening?

Our research design is influenced by the notion of systemic mixed-methods research, which focuses on societally relevant research outcomes ([↑Haßler, et al., 2019](#)). In the first stage of the research, we conducted a systemic analysis of the production and use of education data in Sierra Leone. In doing so, we aimed to foreground our findings within the context and political economy of Sierra Leone’s education sector.

In the second stage, we used outcome harvesting to collect — or harvest — evidence of what has changed (the observable outcomes) since EdTech Hub started to provide technical support to the MBSSE ([↑Wilson-Grau, 2018](#)). The overall outcome harvesting process is shown in Figure 1.

Figure 1. *An overview of the outcome harvesting framework.*



3.1. Outcome harvesting: analysis and interpretation

For the purpose of outcome harvesting, we sequentially applied the following two methods to collect data (see Figure 1):

1. **Document review.** We reviewed programme documents — concept notes, project proposals, working notes, budgets, correspondence with programme stakeholders — to see how the design of the initiative has evolved over time.
2. **Stakeholder analysis.** We drew and compared pre- and post-technical-support stakeholder maps to identify shifts in the relationships between the MBSSE and other actors over time ([↑GIZ, 2015](#)).

Based on the above analysis, we drafted a set of outcome descriptions to outline observable changes in the One Tablet Per School programme (RQ1). The descriptions considered the significance of each outcome (RQ2) and the extent to which EdTech Hub’s technical support demonstrably contributed to these changes. An outcome was deemed significant if it met both of the following criteria:

1. It represented a new practice that supported the government’s long-term policy objectives.
2. Members of the Delivery Unit confirmed that the change contributed to the MBSSE’s future goals.

3.2. Outcome harvesting: verification and substantiation

Following Phase 1, we conducted semi-structured interviews with two of the Delivery Unit’s three staff members to verify the outcome descriptions. The participants were chosen as a result of their close engagement with the One Tablet Per School programme. Participants required a strong understanding of the programme’s development — and EdTech Hub’s involvement — to provide concrete feedback on the descriptions.

Following these interviews, we refined the outcome descriptions according to the feedback of participants. In the absence of an independent actor with knowledge of the One Tablet Per School programme, we validated the updated outcome descriptions in a second round of semi-structured interviews with the original participants.

4. Findings

4.1. Systemic analysis: education data in Sierra Leone

This section provides a systemic analysis of the production and use of education data in Sierra Leone. This analysis focuses on policy priorities, infrastructural provisions, existing products, people and stakeholders, and current data practices ([↑Haßler, et al., 2019](#)).

4.1.1. Policies

Sierra Leone's National Innovation and Digital Strategy promotes the use of data to increase government accountability and raise the impact of policy on society ([↑Directorate of Science, Technology and Innovation, 2019](#)). In particular, the strategy points to the need to use data to 'inform [the] prioritisation of education interventions at all levels' ([↑ibid.: 13](#)).

In this context, the Education Sector Plan supports systems strengthening to improve service delivery. ([↑Ministry of Education, Science and Technology, 2018](#)). A key component of this objective involves the provision of 'timely, reliable and accurate data' on the performance of the education sector ([↑ibid.: V](#)). The plan outlines the government's intention to replace paper-based data collection processes with an automated system ([↑ibid.](#)).

Moreover, the Education Sector Plan specifies the need to develop tools to strengthen teacher management. In particular, the plan suggests that the government should use technology to create a harmonised database on the education workforce and to monitor the supply and demand of teachers ([↑ibid.](#)). Importantly, the Teaching Service Commission (TSC) continues to struggle with the challenge of managing the education workforce — and especially the supply and demand of teachers outside of urban centres — today ([↑Education Workforce Initiative, 2020](#)). Many schools in remote areas have hired underqualified teachers locally in response to a significant increase in student numbers ([↑Mackintosh, et al., 2020](#)). As such, the TSC has prioritised

the development of a national database of registered and licensed teaching staff ([↑Teaching Service Commission, 2020a](#)).

4.1.2 Provisions

Infrastructural conditions present a key challenge to the development of an automated data-collection system in Sierra Leone.

In 2019, only 22% of schools in Sierra Leone had access to electricity ([↑Ministry of Basic and Senior Secondary Education, 2019](#)). Notably, this number drops to 13% for primary schools, which represent 64% of all education institutions in the country ([↑ibid.](#))

Meanwhile, only 4% of schools have access to a computer ([↑ibid.](#)). Similar to the proportion of institutions with access to electricity, this amount falls to 2% for primary schools ([↑ibid.](#)). In addition, schools often lack suitable storage facilities for technological hardware. For example, a national education programme in Sierra Leone estimated that around 10% of mobile devices used in school-based initiatives break or malfunction each term.

At the same time, over 85% of schools have access to mobile network coverage and internet connectivity ([↑ibid.](#)). This number varies across districts, ranging from 38% of schools in Falaba to 98% of schools in Western Urban ([↑ibid.](#)).

4.1.3. Products

Despite these infrastructural challenges, the government has made significant progress toward developing systems that provide reliable education data.

In particular, the MBSSE successfully digitised the Annual School Census which the Education Sector Plan highlighted as a national priority ([↑Ministry of Education, Science and Technology, 2018](#)). Currently, the government equips enumerators with tablets to collect school-level data on students, teachers, infrastructure, and finances from all schools in Sierra Leone ([↑Namit & Mai, 2019](#)). The MBSSE recently distributed tablets to all senior secondary schools, where principals will submit their own data from next year ([↑Sengeh, 2020](#)).

Data from the Annual School Census feeds into the Education Data Hub which the MBSSE and the Directorate of Science, Technology and Innovation (DSTI) launched in 2019 to share information with the public.¹

Separately, the TSC piloted the Sierra Leone Education Attendance Monitoring System in 43 schools across five districts between July and August 2020.²

Under this programme, school leaders were given a tablet to submit data on the background and attendance of teachers. District-level officials visited participating schools on a termly basis to verify the data that school leaders submitted. This data fed into a private dashboard with analysis for decision-makers and a public-facing dashboard with non-sensitive information for civil society.

Meanwhile, the British Foreign Commonwealth and Development Office's flagship *Leh Wi Lan* ('Let's learn') programme has collected data to support its goal of improving learning outcomes in English and mathematics in all Sierra Leonean secondary schools. Recently, *Leh Wi Lan* launched the pilot of a tablet-based data collection programme in 250 secondary schools in five regions (↑[Leh Wi Lan, 2020](#)). At these schools, principals are expected to collect dynamic data on a range of indicators such as student and teacher attendance, instructional time, learning resources and continuous professional development. This data feeds into a series of three private dashboards for ministry officials, district-level staff, and school principals. Notably, *Leh Wi Lan* intends to scale this programme to all government and government-assisted secondary schools in Sierra Leone.

While these initiatives could support the government's vision of data-driven systems strengthening, the overlap between programmes poses a risk of duplication in the absence of strong coordination. At a time when different providers are distributing hardware to principals, schools may receive multiple tablets that perform broadly similar functions. This potential duplication of

¹ For more information on the Education Data Hub, see <https://educationdatahub.dsti.gov.sl/>

² For more information on the Sierra Leone Education Attendance Monitoring System, see sleams.org

effort could reduce value for money and result in incoherent data if schools submit information on different applications. Moreover, the development of several distinct dashboards may lead to a fragmented rather than harmonised data system.

4.1.4. People

The use of data to inform decision-making occurs in different ways and for different purposes across the education sector. The following table outlines the ways in which education stakeholders in Sierra Leone may use data to support their day-to-day work.³

Table 1. *How education stakeholders in Sierra Leone may use data.*

Primary actor	Uses of data in day-to-day work
Ministry-level staff at the MBSSE	<ul style="list-style-type: none"> ■ Developing targeted, evidence-based plans for education sector development ■ Informing decisions on spending, programme design and policy development ■ Prioritising schools and districts for support ■ Increasing the efficiency and equity of resource allocation in the education sector
Central staff at the TSC	<ul style="list-style-type: none"> ■ Informing human resource planning, including leave management, payroll calculation, contracting, sanctions for unauthorised absenteeism, and incentives ■ Tracking the supply and demand of teachers to promote a more efficient and equitable distribution of staff ■ Reducing the total spent on teacher wages by removing ‘ghost’ teachers from the payroll
Central staff at the Ministry of Finance	<ul style="list-style-type: none"> ■ Calculating what the state can afford to invest in the national education system ■ Collaborating with the MBSSE and TSC to allocate funding to priority areas

³ The information in this table is based on an analysis of the current Education Sector Plan, the TSC’s Harmonised Policy on Teacher Management, the Sierra Leone Education Attendance and Monitoring System’s end-of-pilot report, *Leh Wi Lan’s* end-of-pilot report and the Education Data Hub’s mission statement.

<p>Central staff at the Tertiary Education Commission and the Ministry of Tertiary and Higher Education</p>	<ul style="list-style-type: none"> ■ Working with the TSC to support human resource management, including payroll calculation and sanctions
<p>District-level officials and officers</p>	<ul style="list-style-type: none"> ■ Coordinating the administration and operation of Teacher Training Colleges to ensure pre-service training courses prepare teachers with the requisite skills ■ Designing incentives to attract students — and especially female students — to take courses on priority subjects such as science and mathematics
<p>School leaders</p>	<ul style="list-style-type: none"> ■ Identifying school and classroom needs across the district based on information such as the qualified teacher–student ratio ■ Tracking the implementation of government policies and programmes, including the sanctions framework on attendance and absenteeism ■ Monitoring issues relating to the performance and attendance of schools, teachers and / or students
<p>Parents and caregivers</p>	<ul style="list-style-type: none"> ■ Reviewing school performance indicators to identify and prioritise appropriate actions for improvement ■ Managing teachers, including attendance, timetabling, registration issues, and professional development
<p>Parents and caregivers</p>	<ul style="list-style-type: none"> ■ Monitoring data on schools in their proximity and on education in their district ■ Holding national-, district-, and school-level decision- makers to account for poor performance and a lack of improvement

4.1.5. Practices

The Education Sector Plan presents data-driven decision-making as central to overall systems strengthening. Yet, the realisation of this vision depends in part on a data-driven culture that permeates the education sector ([↑Abdul-Hamid, 2014](#)).

To this end, the MBSSE commissioned Education Partnerships Group to conduct a system-level analysis of education service delivery as the basis for evidence-informed policy design ([↑Sengeh & May-Wilson, 2020](#)). A key output of this partnership is a new framework to support ministry-level officials to

develop coherent, evidence-based policies ([↑Ministry of Basic and Senior Secondary Education, 2020](#)).

Separately, the MBSSE has trained ministry staff, enumerators and school principals on data collection and analysis ([↑Nमित & Mai, 2019](#); [↑Sengeh, 2020](#)). These sessions focused on how to use tablets to submit data for the Annual School Census ([↑ibid.](#)). Moreover, the TSC provided workshops to prepare school leaders and district-level officials to collect and verify data for the pilot of the Sierra Leone Education Attendance Monitoring System. Importantly, this training aimed to enable district-level officials to act as a technical focal point for school leaders. Similarly, *Leh Wi Lan* delivered a two-day training programme to principals on the importance of data for school improvement and the use of tablets for data collection ([↑Leh Wi Lan, 2020](#)).

Despite these efforts, a data-driven culture does not appear to have uniformly materialised across the education sector as of yet. The Education Data Hub, for example, has a relatively limited user base in Sierra Leone with 90% of demand coming from outside of the country ([↑Freiermuth, et al., 2020](#)). Meanwhile, the frequency of school reporting varied significantly across districts in the pilot of the Sierra Leone Education Attendance Monitoring System. This variance seemed to reflect the level of training, external support and input that schools received from district-level officials.

4.2. Outcome harvesting: EdTech Hub's impact on the One Tablet Per School programme



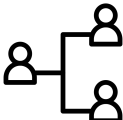
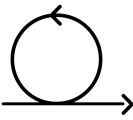
The following table summarises the findings from the outcome harvesting process. In particular, the table maps out:

- the problems that the programme aims to address;
- examples of how EdTech Hub has contributed to programme design;
- the principal change agents that EdTech Hub has collaborated with to shape programme design;
- the observable and significant outcomes of EdTech Hub's technical support.

Table 2. A summary of EdTech Hub's technical support.

Problems				
	Lack of real-time data for decision making	Managing the education workforce	Duplication of data collection efforts	
EdTech Hub contribution				
	Co-working sessions	Needs analysis	Data collection systems mapping	Stakeholder analysis
	User journey mapping	Constraints mapping	Evidence review	Stakeholder coordination
Change agents				
	Delivery Unit (MBSSE)	TSC	The World Bank	Leh Wi Lan
		Planning and Policy Unit (MBSSE)		DSTI

Table 2 (continued). *A summary of EdTech Hub's technical support.*

Outcomes		4		1
<p>Programme focused on school-level data collection</p>	<p>Categories of data aligned to government priorities</p>	<p>Building on an existing data collection tool</p>	<p>Consolidated dashboard on education across all levels</p>	
5		2,000		
<p>New or strengthened project-related partnerships</p>	<p>Building on institutional structures</p>	<p>Fewer tablets required as a result of project-related partnerships</p>	<p>An iterative delivery model</p>	

This study found that EdTech Hub’s technical support plausibly contributed to six observable and significant changes in the MBSSE’s approach to the One Tablet Per School programme. The table below outlines:

- observable changes that materialised after EdTech Hub started to provide technical support to the MBSSE (RQ1);
- the significance of these changes (RQ2).

Table 3. *A summary of observable and significant changes.*

In October 2020, the Delivery Unit decided to focus on using tablets to collect school-level data such as teacher registration details (for example, payroll status, qualifications, specialism) and daily attendance records. Previously, the MBSSE intended to distribute tablets that hosted a range of applications with the general aim of digitising education service delivery.

This change shifted the programme's emphasis from distributing devices to addressing the concrete needs of the education sector. This shift responded to two problems: the MBSSE's lack of real-time education data and the challenge of managing the teaching workforce. In the long term, this data can support evidence-based decisions in priority policy areas such as school financing and planning, payroll management, the focus of pre-service training, and the recruitment and deployment of staff.

In October 2020, the Delivery Unit opted to ask principals to initially collect data on teacher registration, student enrolment, daily attendance and the presence of Covid-19 symptoms. Beforehand, the MBSSE planned to ask principals to relay a wider range of data points including disciplinary records, individual test scores, learning goals, student and teacher schedules and curriculum plans.

This change was significant as requiring school leaders to drastically alter their practices — or to start monitoring behaviour, recording exam results, setting individual targets and planning lessons all at once — could limit adoption rates among users and especially those with low levels of digital literacy. The smaller set of data points reflects:

- what the TSC and *Leh Wi Lan's* pilot programmes found school leaders could feasibly collect on a daily basis;
- what the MBSSE and TSC view as the most critical information for improving education service delivery and management of the teaching workforce.

As such, this shift will moderate the demand on school leaders and lower barriers to engaging with the system while providing the government with data on priority issues.

In October 2020, the Delivery Unit decided to trial the data collection application through an initial phase of content-focused user testing in 10 schools and a pilot programme in 60 schools. Up until this point, the MBSSE considered immediately distributing devices with multiple applications to 900 schools.

This shift toward starting small and iterating reduces the risk of investing in devices and software that do not meet the needs of users. The user testing and pilot phases will provide an opportunity to adapt the application based on how school leaders, district-level officials and ministry staff view and apply data prior to scaling. In doing so, the programme could generate higher levels of engagement — and volumes of information — to provide better quality data for decision-making.

In October 2020, the Delivery Unit chose to mobilise district-level officials from the MBSSE and TSC to provide technical support to principals and to conduct random spot checks to verify reported data. Earlier, the MBSSE planned to recruit interns at DSTI to fulfil these duties.

The decision to build on existing institutional structures — instead of hiring additional staff — was significant as it will reduce the administrative complexity of the system as well as the cost of human resources. Meanwhile, this change supports system strengthening as district-level officials will receive new training, regularly visit schools under their jurisdiction, access data to make better-informed decisions and buttress their authority as education focal points.

Between October and December, the Delivery Unit increasingly coordinated decisions with the World Bank, formed a new project-related partnership with *Leh Wi Lan*, aligned data points with the Annual School Census, and established informal working relations with DSTI and the payroll team at the Ministry of Finance.

The foundation of new partnerships and the strengthening of existing relationships is significant as:

- the programme closely aligns with the funding requirements of the Free Education project, reducing the risk that the World Bank will not finance the initiative as planned;
-

- project-related partnerships enabled the government to build on existing resources and avoid having to procure tablets for over 2,000 secondary schools;
 - the coordination of data collection has created concrete linkages with pre-existing systems such as the Annual School Census and the payroll system, supporting the development of complementary rather than duplicative processes.
-

In December 2020, the Delivery Unit decided to build on an existing data collection tool that programme stakeholders have already received training on and used. The Unit also outlined plans to roll the programme out on existing hardware: the TSC's stock of 60 tablets during the pilot and the tablets that *Leh Wi Lan* distributed to secondary schools during the scale-up. The tool will populate a set of dashboards where users can view data from multiple sources and download information in machine-readable formats. Previously, the MBSSE planned to collect data using an application from another country that lacked offline functionality.

This decision to use existing tools and devices will significantly lower programme costs for software development, survey design, licensing, and procurement, and consequently increase value for money. Building on existing infrastructure is important given Sierra Leone's resource constraints.

Meanwhile, this change will increase the usability of the system as the programme will:

- take advantage of systems that organisations have adapted to the Sierra Leonean context and the needs of school leaders in remote areas with low connectivity;
 - build on pre-existing technical expertise, training and experience of using tablet-based data collection tools to support decision-making;
 - present consolidated data on a single dashboard to limit the need to navigate between a series of portals with incomplete data;
 - enable users to manipulate and analyse downloaded data as needed to support the design and delivery of education interventions.
-

5. Discussion

The outcome statements indicate that EdTech Hub's technical support has contributed to a shift from a technology-first delivery approach to a problem-centred delivery approach. At present, the programme explicitly and directly addresses needs that the government has identified as policy priorities (see Sections 4.1.1. and 4.1.4). The use of tablets to relay real-time, school-level data supports the government's aims of increasing the availability of dynamic data to inform programming decisions and building a database to manage the education workforce.

Moreover, EdTech Hub has supported the MBSSE to coordinate with government and non-government actors. The One Tablet Per School programme has convened organisations collecting data in Sierra Leone with the intention of building a single, coherent data set on education at all levels (see Section 4.1.3.). Outside of the education sector, the proposed application will feed information into other ministerial databases to support government-wide systems strengthening. For instance, real-time teacher registration data will increase the Ministry of Finance's capacity to manage the pay of public sector employees.

In supporting programme coordination, EdTech Hub has significantly contributed to the identification of existing systems to build on. The use and deployment of current resources and provisions — and especially *Leh Wi Lan's* hardware — is imperative given the infrastructural constraints in Sierra Leone (see Section 4.1.2.). Resource sharing also reduces the risk of duplication and the possibility of schools receiving multiple devices that perform the same function (see Section 4.1.3.).

Similarly, EdTech Hub has supported the MBSSE to mobilise current human and institutional capacity (see Sections 4.1.4. and 4.1.5.). The planned delivery approach reinforces — rather than distributes — the authority of district-level officials who currently have the remit of managing service delivery in Sierra

Leone's decentralised education system. The decision to build on existing human infrastructure is particularly important in a country with high levels of digital and technical illiteracy (see Section 2.1.).

Meanwhile, EdTech Hub contributed to the adoption of a human-centred approach to programme design to account for the day-to-day experiences of school leaders. For example, the decision to collect a smaller set of data was intended to shape how school leaders analyse the benefits of reporting dynamic data against the costs of altering their daily routines. This focus on the incentives behind programme engagement responds to the uneven culture of data use in Sierra Leone's education sector (see Section 4.1.5.).

Yet, the current absence of a uniform culture of data-driven decision-making does not mean that the government cannot collect a wider range of information in the long term. As such, EdTech Hub supported the MBSSE and TSC to develop an iterative implementation plan (see Section 2.1.). This approach will enable the government to refine the system based on how users engage with technology, perceive different types of evidence and act on data prior to investing at a national level. At the same time, school leaders will have the time to gain experience with tablet-based data collection prior to reporting more granular data points.

6. What did we learn?

The findings of this study highlight a number of practical considerations that decision-makers should make when designing a national data system.

Why do you need a national data system and what will users do with this information?

Advocates of a ‘data revolution’ often assume that all users require any and every type of data to inform each of their decisions (↑Custer, et al., 2018). Yet, governments need to examine the purpose of data collection and the value that decision-makers place on different data points. For example, government officials may only need school-level data — as opposed to data on individual students — to decide how to allocate scarce resources. Similarly, school leaders may prefer a termly summary of the main reasons for teacher absenteeism to a daily report with precise percentages.

What actors have an interest in and an influence over the development of a national data system?

The development of a national data system will involve multiple actors with different levels of interest and influence. These actors may require data for their day-to-day work, and may either support or oppose the inclusion of specific data points and either practically facilitate or hinder the data collection process. For instance, enumerators will have a significant impact on the collection of high-quality data.

What existing infrastructure and programmes can support a national data system?

The implementation of a national data system can entail a significant investment in physical infrastructure and software. Moreover, governments need to make financial allowances to support the long-term maintenance of this investment.

At the same time, many governments have already developed education data systems that can be refined and expanded. Prior to implementing a new system, programme designers should map and assess the current data collection landscape to understand what data is available, what data collection models exist and what value the new data system will bring. Governments should look to build on — rather than duplicate — existing processes to create a coherent national data system and avoid the costs of developing a new product from scratch.

What human capacity does the proposed data system require?

The design of a national data system should reflect a country's available human and technical capacity. For example, governments may not have access to an abundant supply of skilled labour to support the collection, verification, analysis and application of data. In this scenario, governments need to explore what — and how — data can be viably collected while investing in long-term capacity building across all levels of the education sector.

How does the proposed data collection model reflect the day-to-day routines of users?

Where data collection relies on school leaders and staff, governments need to consider what information enumerators can feasibly and willingly collect. A sudden and significant change in routine — using an unfamiliar device, introducing new classroom practices, allocating more time to administrative tasks — may make school leaders reluctant to support data collection. This issue is likely to be more problematic where the education workforce is under-supported and underpaid. Programme designers should adjust their model and expectations to the experiences of users.

What assumptions do you need to validate to ensure programme success?

The answers to the above questions — and others that influence programme success — may be unclear when designing a national data system. For

example, programme designers may lack reliable information on the routines of teachers or struggle to accurately pinpoint how different actors may influence the data collection process. Governments should trial their model at a small scale to test and validate their assumptions before iterating and expanding the system. In doing so, the government can identify and mitigate risks before making a national-level investment.

7. What steps will we take next?

In the following months, EdTech Hub will support the MBSSE and TSC to test the One Tablet Per School programme with users. In particular, we will work with our government partners to design and evaluate the user-testing process. During this period, we will explore if and how school leaders engage with the proposed data collection forms and the tablet-based data collection model. In doing so, we aim to validate our assumptions related to the previously outlined considerations. What data do schools leaders need and value? What factors encourage or discourage data collection? What level of training and ongoing support do school leaders require? What data can school leaders feasibly collect daily? In finding indicative answers to these questions, we can support the MBSSE and TSC to refine and iterate the design of the One Tablet Per School programme before piloting the initiative.

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