



# Read@Home: Embedding Track and Trace in Book Supply Chains Design Document: Sudan



# System Design Background

This system design was compiled following an initial workshop held with the National Consultative Group (NCG) at the Federal Ministry of Education (FMOE) on July 1st, 2021, and subsequent key informant interviews and data collection. Expansive data collection and follow-on design and validation workshops could not be organized due to a coup in October 2021 that led to prolonged political and social unrest in Sudan.

This design sets out the expected functionality of the technology to be used to improve the monitoring of the textbook distribution chain.

Validation by members of the NCG, in particular, FMOE, will be crucial in ensuring the design is fit for purpose and realistic.

## The Main Issues: System Design

These early decisions are the big questions that define what the system should look like: what is the overall purpose of the system, what features should it include, who will use it.

### Decision 1: Who owns the system?

The Federal Ministry of Education (FMOE) will own the system. The system will be managed by the Office of Statistics in the FMOE's Department of Planning. The Office of Statistics is also responsible for managing the data collection and analysis under the Rapid Survey mechanism, using the Kobo Toolbox application.

#### Who are the users?

The users of the system include the Federal Ministry of Education, officials and warehouse workers at the State level, and schools.

### Decision 2: What is the purpose of the system?

The purpose of the system is to provide better visibility into the quantities of books received by schools in good or damaged condition, as well as to provide visibility into the state warehouse level, to enable monitoring and follow-up by the FMOE.

### Decision 3: Which TnT model will Sudan follow?

Sudan will adopt a variation of the First and Last Mile tracking model, which will involve FMOE recording how many books were ordered, then State and school officials recording how many books are received. Including the state level allows the system to confirm the number of books that entered the distribution system and should therefore be expected at schools. This addresses the potential problem that deliveries typically happen in a piecemeal manner throughout the year, meaning that at any given time the number of books that have actually been printed and entered into the supply chain out of the total that have been procured for the

year would not otherwise be known. However, the ability of schools to confirm the books they receive does not depend on the state level having entered their own receipts, and should a change in the structure of the supply chain occur, schools' ability to report would not be affected. The system does not attempt to track individual deliveries or books, but simply the total numbers of books.

This model takes into account the constraints from the varying degrees of technology penetration indicated through the textbook supply chain assessment. It will also allow for greater flexibility if the supply chain structure changes in the future as a result of proposed changes to the political make-up in Sudan.

### **Decision 4a: Will the system include a communication and expectations management system?**

The system will not include a communication and expectations management system, for the following reasons:

- Desire to retain the simplest possible design: the proposed system could be added to the already-existing Kobo Toolbox system being used by the FMOE. However, adding a communication system would necessitate additional software with additional costs.
- The lack of adequate technology penetration: because smartphones and data network coverage are not widely available at the school level, any communication system would have to rely on SMS or IVR technology, which would be relatively expensive.
- Piecemeal delivery: because deliveries happen on a piecemeal basis, any communication system would have to send multiple alerts as each new batch of TLMs arrived at state warehouses, further increasing costs compared to a single delivery cycle.

### **Decision 4b: Will the system collect information on TLM needs at the school level?**

The system will not collect information on TLM needs at the school level. The system will be based on SMS messaging using basic phones and is therefore ill-suited for the amount of data required to collect information on TLM needs at the school level. This system does not intend to change the way TLM needs are collected at the school level or communicated up the supply chain.

### **Decision 4c: Will there be post-distribution monitoring?**

Post-distribution monitoring will be not be included in the system due to the limited information that will be gathered by SMS, and the potential complexity of adding a new user into the system in the form of a Parent Teacher Association or Community member, which add further complexity to the system.

## **The Basics**

The above decisions cover the basics of the system - who will use it and what it should do. The sections below describe the details that define the operation of the system.

## **Where does procurement happen?**

Textbook procurement is currently centralized in Sudan. The FMOE compiles all textbook needs in order to place purchase orders for new books. Currently around 80% of books are purchased through international suppliers, with the balance procured in-country. Internationally procured books are delivered directly to State warehouses. Locally procured books are printed by the FMOE's printing house, which might subcontract to local printers if it is experiencing capacity constraints. Locally printed books are delivered to the FMOE Warehouse, which then separates books for collection by State warehouses. State warehouses separate books for collection by localities. Localities in turn separate books for collection by Administrative Units (in the case of Khartoum State) or by schools. Deliveries generally take place on a piecemeal basis over a period of months as funds allow and/or as they are printed.

FMOE will enter procurement quantities into the system to give the quantities to be tracked. State and school officials will then record receipt of textbooks and note how many were damaged as they receive deliveries.

## **How will the data be collected at each level? (by what technology?)**

The system will involve users from three levels of the Sudan TLM supply chain: FMOE, State, and schools. FMOE officials will create records by entering the total number of books being procured. State and school officials will then receive books and note how many books were damaged, through a standard SMS system using basic phones.

Anywhere in the system where an actor records receipt of books, he/she will have the option to also note the number of damaged books received.

Initial data collection suggests that Sudan could leverage the rapid result assessments carried out using paper forms and, crucially, Kobo Toolbox. This assessment is generally filled out in paper form by schools on an annual basis, and then the data is entered into the Kobo Toolbox database by administrators at the locality level. The rapid results assessment has involved the distribution of around 400 tablets throughout the various tiers in the TLM supply chain. This indicates that there is sufficient training and familiarity with data collection and entry on tablets at the locality level to enable a TLM Track and Trace system to utilize the same technology, personnel and infrastructure. However, at present, the tablets are returned following the assessment. Sudan may wish to consider allowing these tablets to remain with users at the locality level throughout the year, to facilitate a more robust track and trace system, as having access to tablets would allow far more detailed data to be collected at both the state and locality levels.

### **FMOE**

Staff from the Office of Statistics in the FMOE's Department of Planning will enter the total numbers of books being procured. As long as the state level administrators need to rely on SMS to enter this data, FMOE will simply enter the total quantity of books procured, without any

further information about the title, subject, or grade of books procured. Should state administrators be provided with regular access to tablets and therefore gain the ability to enter more detailed information about what they receive, the FMOE could in the future enter more detailed data about what they have procured; however for the time being this level of detail is not required by the system.

## **The State Warehouses**

When a state warehouse receives a delivery from an international supplier or from the FMOE Printing House, the state warehouse will send an SMS to an SMS number set up for the purpose including the warehouse's unique identification number, along with the total number of books received (including damaged books), and then the total number of damaged books received in that delivery. For example, a message of "987654 5000 200" would indicate that the warehouse with identification number 987654 has received 5000 books, out of which 200 were damaged. The system will then send a confirmation text in response, confirming receipt of the data. State warehouses will need to be assigned unique identification numbers (similar to the EMIS numbers used by schools) in order to enable identification when submitting data by SMS.

## **Schools**

When a school receives a delivery, the school director or manager will report the books received in the same manner as the state warehouses, using an SMS with the school's unique Education Management Information System (EMIS) number, along with the total number of books received (including damaged books), and then the total number of damaged books received in that delivery. The system will then send a confirmation text in response, confirming receipt of the data.

## **How will the system software be developed?**

A professional software developer will be contracted to develop the system.

## **Dashboards, indicators, and reports**

### **Who needs administrator access**

The FMOE's Department of Planning will act as the administrator of the system, assuming all maintenance of the system and all its parts.

### **Who needs user access**

Senior officials from the FMOE, GPE and potentially other programs supporting TLM supply in Sudan will have view only user access in order to view and read reports/dashboards.

State warehouse officials and school directors will be able to submit data by SMS, but will not have direct access to the aggregated datasets.

## **How will users access the data?**

## Dashboards and Reports

The system will provide dashboards in order to present aggregated data and indicators in relation to the TLM supply chain, and more in depth reports within the limits of the data available in the system.

### What KPIs will the system calculate?

The system is designed to provide the best possible functionality given the technology constraints throughout the supply chain. Without requesting, barcode/shipment tracking, and allocation tracking, the data available to calculate KPIs will be limited. Additionally, because delivery of TLM materials typically happens in batches as books are printed rather than in one yearly distribution, indicators will need to be tracked over a year, rather than for a discrete distribution cycle.

Nevertheless, the system will enable a much more complete picture of the national TLM supply chain than is available now. Recommended KPIs for monitoring the quality of the distribution process are:

Indicator	Calculation method	Use
Delivery completeness (procurement level)	Total quantity of TLMs confirmed delivered at the state level / total quantity of TLMs procured by FMOE	Allows monitoring of the overall progress of TLM printers in delivering the quantity of TLMs procured
Delivery completeness (state level)	Total quantity of TLMs confirmed delivered at the school level / total quantity of TLMs confirmed delivered at the state level	Allows monitoring of the progress of the supply chain in delivering books from the state level through to the schools
Damage rate	Total quantity of TLMs that were received damaged / total quantity of TLMs that were received, disaggregated for the state and school levels	Allows monitoring of the quality of distribution and whether or not books are being damaged in transport, both before they arrive at the state level and between the state and school levels

## **What detailed reports will be available?**

The system will allow national level and school level reporting within the limits of the data entered into the system. Reports will enable further investigation by FMOE or sub-national officials. Possible reports include:

### **Delivery status, by school**

Users at the national and sub-national levels will be able to confirm whether or not schools have confirmed receiving any TLMs, and also if there were any damages in the shipments. This will enable FMOE and State officials to investigate issues in their areas of responsibility.

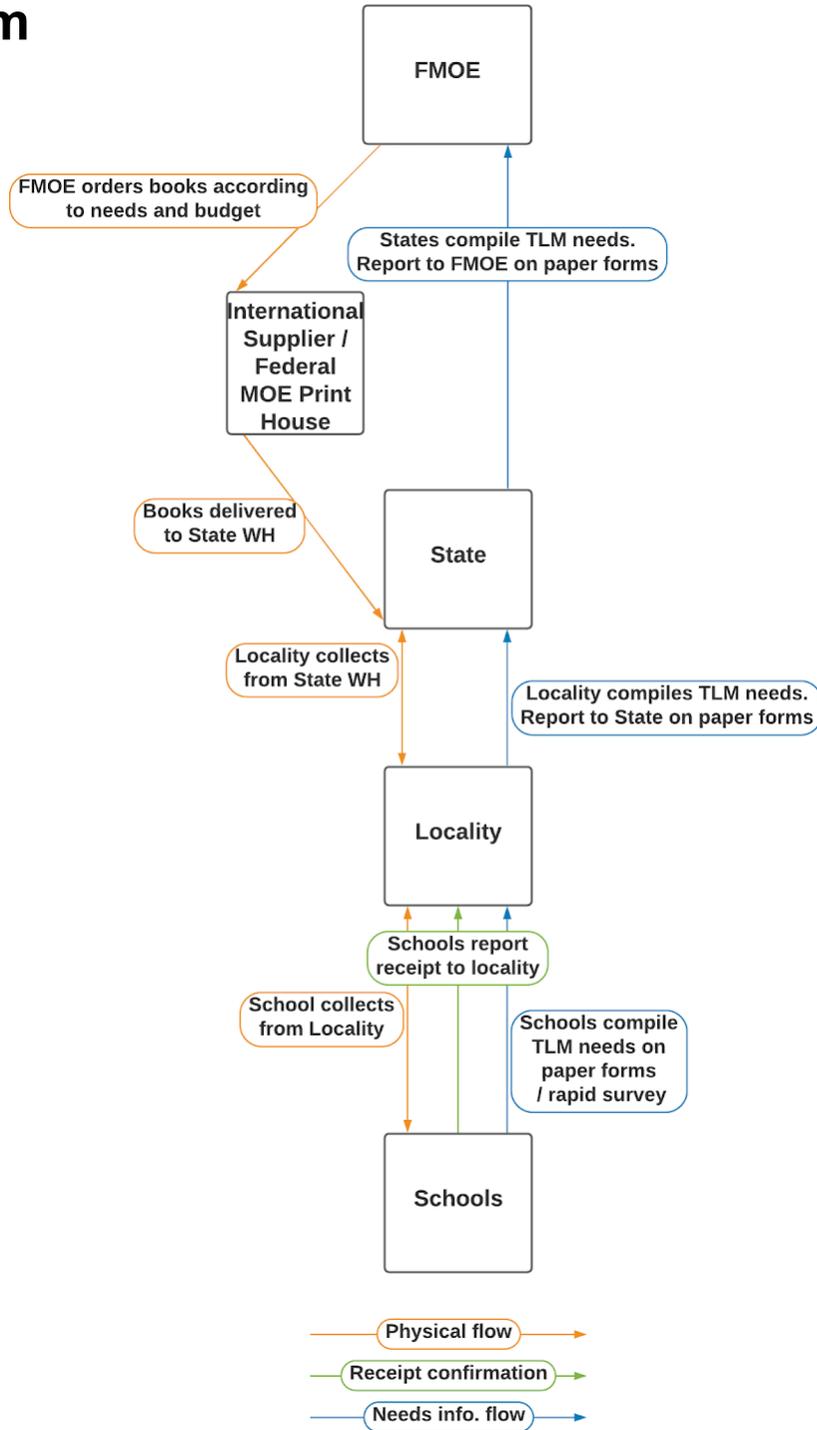
### **TLMs confirmed received, by state and by school**

This report will show the quantity of TLMs confirmed received over the course of the year. It will be able to show the total number of TLMs confirmed received at each state warehouse, as well as the total TLMs confirmed received at each school.

### **Non-reporting schools**

Using the unique EMIS number, it will be possible to flag schools that have not reported receipt of TLMs. Similar to the above reports, this will enable FMOE and State officials to investigate issues in their areas of responsibility.

# Annex 1: System design diagram: Current system



# Annex 2: System design diagram: System designed

