

Read@Home: Embedding Track and Trace in Book Supply Chains

Design Document: El Salvador

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Glossary

MINED	Ministry of Education
WB	World Bank
TLM	Teaching and learning materials
PASE	Programa de Alimentación y Salud Escolar (Directorate of Social Programs)
TOR	Terms of Reference
TnT	Track and Trace (Seguimiento y Rastreo)
WB	World Bank

System Design Background

The second and third working meetings with the NCG took place on June 18 and 22 respectively, and we were able to compile a more detailed description of each of the components of the TLM supply chain. The meetings resulted in a draft design document finalized and refined by the JSI/WEI team for the following and final working meeting and presentation. To effectively compile all project learning into a comprehensive Track and Trace Design, the session included the following topics:

- Active discussion with the NCG to work through the decisions listed in the Master Global Best Practices Guide. JSI/WEI used the Guide to help the NCG think through the decisions below:
 - Decision 1: Who will own the system (and what do they need from Track and Trace, and what range of budget do they have)
 - Decision 2: What is the goal of the system?
 - Decision 3: What TnT model? - Full Tracking, or First and Last Mile?
 - Decision 4: What additional components are desired in the system; communications and expectation management functions (messages, alerts, notifications, 1 way, 2 way etc.); ordering/requesting components; post distribution monitoring; etc.
- Collaborative design of a draft Track and Trace design based on these decisions detailing the users, Track and Trace workflow, data to be collected, technology to be used, etc. JSI/WEI used sections of the Global Best Practices Guide to help NCG think through and decide upon technology choices, dashboards/reports, approaches to user training, etc. Precise details of exact software, applications, etc., intentionally did not get decided at this point. Only basic decisions about technologies to be used include whether SMS, instant messages, an app for each different TnT function. Special software, platforms, apps, etc. may be investigated and determined later by the firm contracted to develop the Track and Trace system.

JSI/WEI used the information gathered from the working sessions to develop a comprehensive Track and Trace Design Document (see below) and presented it to the MINED before the final closing project meeting on December 9, 2021.

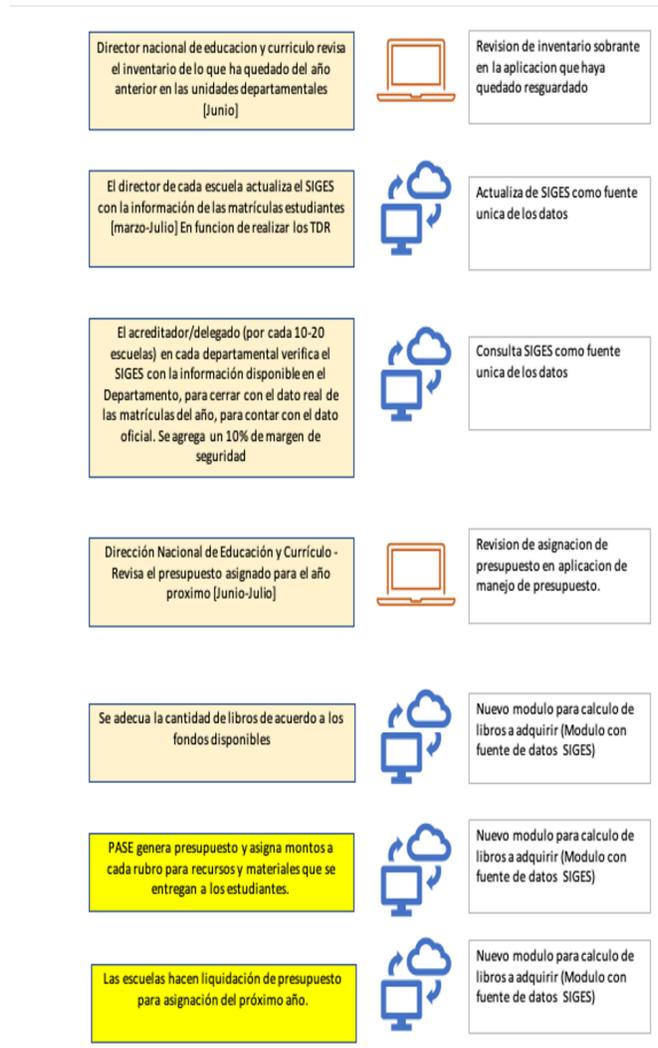
Identification of processes to digitize for each stage of the supply chain

The proposed system includes interfaces and reports within the Information System for Salvadoran Educational Management (SIGES). The proposed automation will use the data sources from SIGES and will not create a parallel system for MINED, and will instead be integrated into SIGES.

The designed TLM system should have the following modules:

- Forecasting
- Procurement
- Distribution

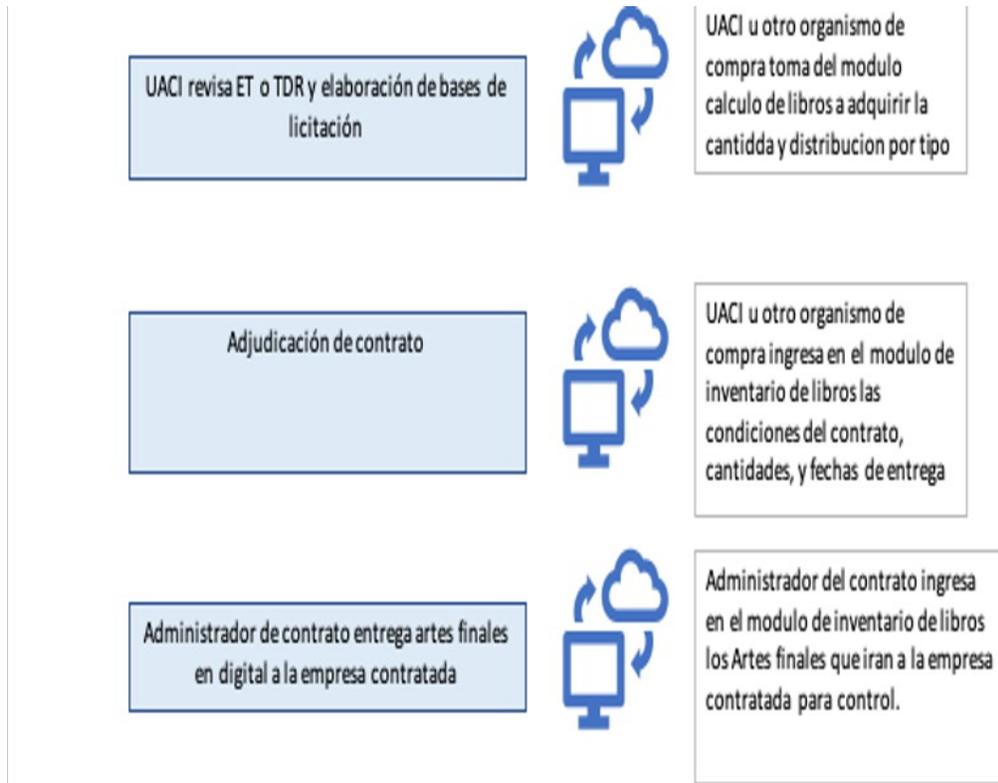
Forecasting module



A forecasting module will enable managers to track the following processes:

1. Perform the forecasting of textbooks and learning materials based on statistical and prediction models.
2. Be able to balance the real needs and the available budget.
3. Keep track of the returns and leftovers of TLM from the previous year
4. Account for existing inventory in forecasts

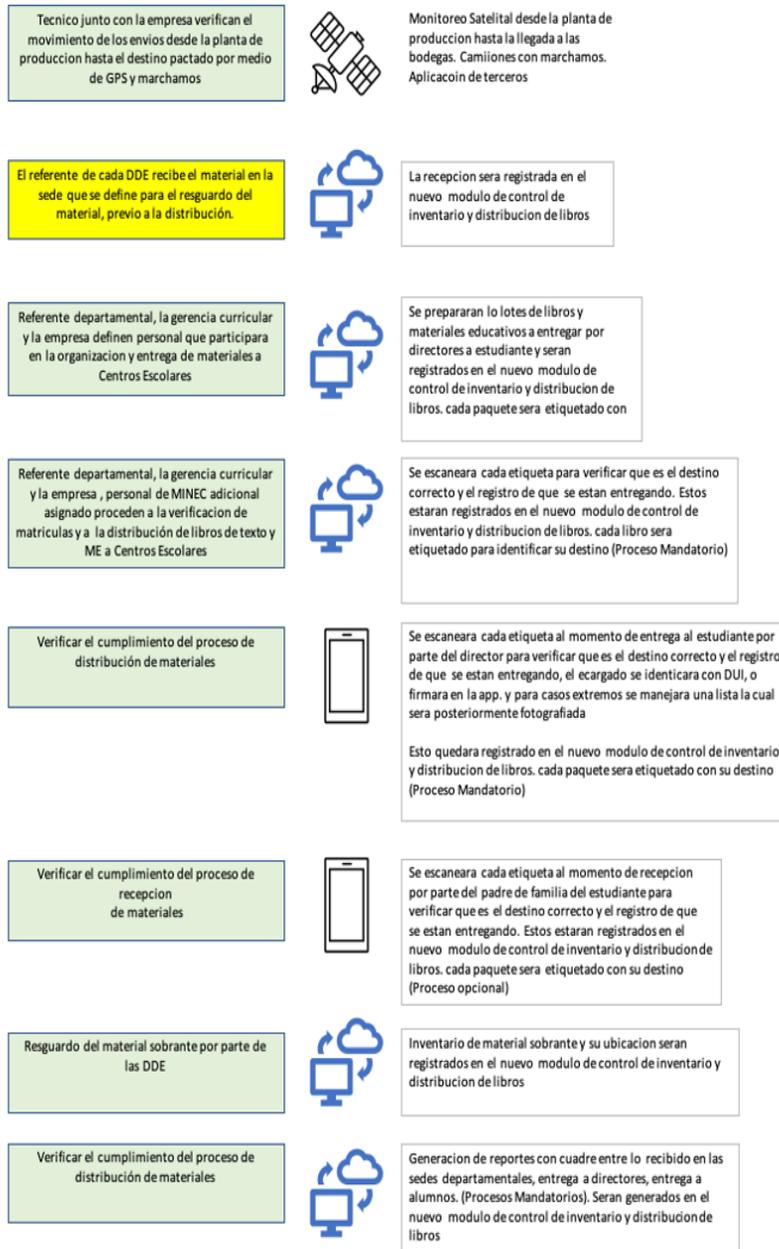
Procurement module



A procurement module will enable managers to track the following processes:

1. Establish an interface with either the Procurement and Contracts Unit of the MINED or with procurement agents to manage the procurement and delivery of textbooks and learning materials as stipulated in the contract with the supplier(s)
2. Follow up on the production of the textbooks and learning materials to ensure compliance with the specifications established in the contract.
3. Determine and authorize electronically the quantity and detail of books to be printed.

Distribution module

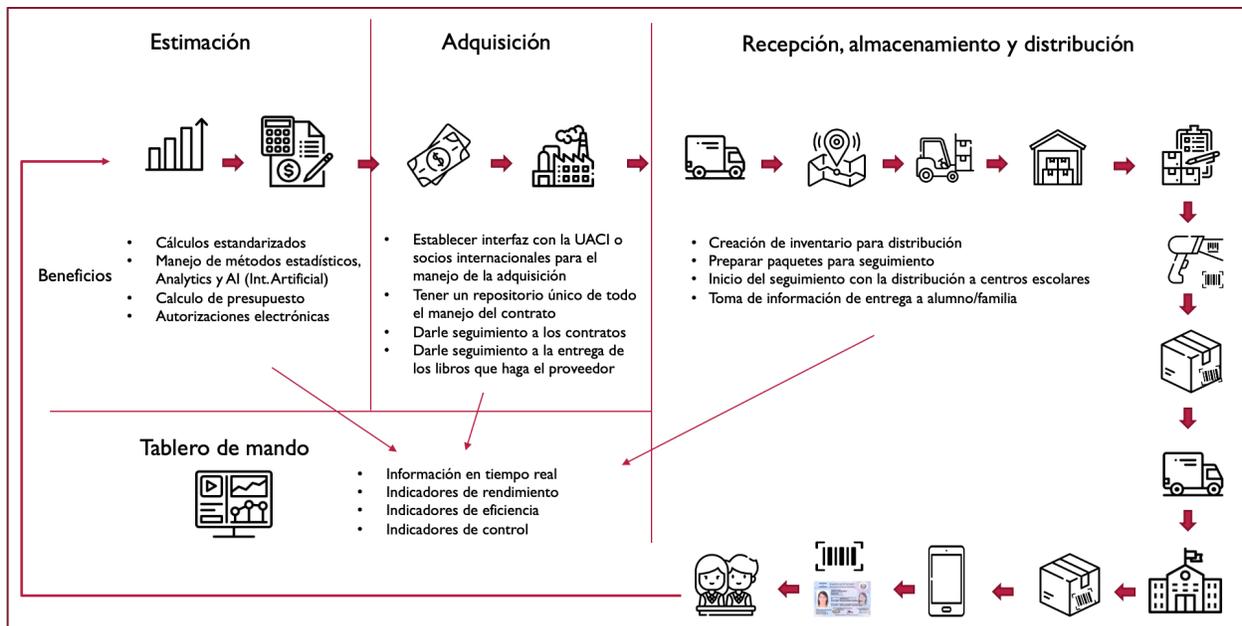


A distribution module will enable managers to track the following processes:

- Manage the inventory delivered by suppliers.
- Generate inventory reports.
- Calculate the distribution lists for schools according to the needs entered in the SIGES, and generate the delivery notes.

- Provide the information to generate the packages for distribution to schools, e.g. Barcode printing (2-dimensional code 128 is proposed), calculation of packages by school and potentially by student, etc.
- Manage a delivery and control module with their respective reports and the ability to generate the delivery certificate so that they are signed by the recipients of the books, both in schools and at the student level.
- Develop a mobile application to track the delivery of TLM from school directors to the students and certify that the TLM was indeed delivered to families/students, capturing the information of who receives the TLM, the barcode of the package or the book, and the location of the delivery.
- Generate delivery reports and delivery certificates to students.
- The module must be able to capture the information and keep it offline to update later in case there is no internet coverage at the time of delivery to students or their attendees.
- The security of this mobile application must be integrated with the SIGES system so as not to generate more users or passwords, only modifications to the profile.
- The inventory module must be able to handle stock imbalances, if any, and returns or shortages.
- Develop dashboards to monitor the progress of the distribution and provide information for timely decision-making.

Once the three stages of the supply chain are automated and the TnT is up and running, the monitoring and tracking system will work as a cycle, providing critical information at all levels:



Full track and trace model

The full tracking model will track textbooks and learning materials in the first mile and last mile of the supply chain and track what happens during intermediate levels. This model will allow MINED to track supplies throughout the supply chain, providing traceability and helping identify issues such as delays, damage, and system leaks if any.

This type of model can allow schools to receive updates on the status of their incoming shipments as they move through the supply chain, improving their planning ability and raising the alarm when deliveries are not progressing as expected. Similarly, it allows the central level to check the status of the distribution and can provide actionable information that will help them to move things around when needed.

This level of visibility comes at a cost. While the proposed design may provide more robust data management and more end-to-end management of the TLM distribution and delivery, full tracking models require strong supply chain and HR capacity at intermediate levels, as textbooks and educational materials must be tracked at these locations.

These models are inherently more expensive to design and operate, as they involve additional training and more person-hours to track the movement of TLM, as well as additional costs for tracking technologies, equipment such as barcode/smartphone readers, and internet connectivity at each of the intermediate levels of the supply chain.

The use of barcodes for tracking textbooks can occur either by labeling each book with a different serial number, which would make the project a little more complex and more expensive, or with the labeling of the boxes that go to each school, taking as proof of delivery the tracking of the serial number and linking it to the recipient's ID.

Roles and responsibilities

The proposed roles in managing the TnT are as follows:

1. Administrator: he/she will be responsible for accessing the configuration variables, managing user rights, role changes, etc.
2. Forecasting manager: he/she will have access to all the forecasting features.
3. Procurement manager: he/she will manage the interface with the procurement unit and any external procurement agent.
4. Reception and Distribution manager: he/she will manage the processes for the reception and distribution of the supplies at the reception and distribution centers and prepare the packages and monitor their delivery to schools.
5. Delivery: The delivery role is the one that will be used at the level of directors, teachers, collaborators, etc., who will deliver the books to the students and will use the mobile app to capture the delivery data.
6. User of information: the user can only view reports, dashboards, and other options, but he/she won't edit/modify any data.

In total, six roles are proposed within the application (modules embedded in SIGES) and the mobile application; the type of training will differ both in content and methodology.

The administrator (role 1) requires special one-on-one training with the application developers. Managers for roles 5 and 6 can be trained through virtual sessions and videos; roles 2 to 4 will require more in-depth training as it will include activities carried out by roles 5 to 6. These training activities should be in-person and complemented with videos for remote learning.

Key Performance Indicators (KPIs)

Logistics management indicators are performance measures that can be quantified and are always related to the performance of the supply chain. Their objective is clear: to evaluate the performance and the outcomes in each of the stages of the supply chain

Key Performance Indicators (KPIs) in the supply chain need to be:

- Relevant: that provides meaningful, helpful, and precise data.
- Realistic: it is possible to conduct the measurements in conditions of coherence of time, resources, and budget.
- Quantifiable: they must be able to be expressed in numbers or percentages.
- Periodic: an isolated measurement in time does not provide the necessary information, so the data collection must have a specific frequency.
- Attributable: each KPI must have one or more people responsible for the measurements, who must report to one or more people in charge of recording and analyzing those metrics.
- They are associated with temporary or permanent variables: depending on their validity and need for revision.
- Consistent: always using the same formula to make it possible to compare the results they provide over time.

Proposed KPIs for the TnT system

- % of procured books that have been printed (number of books printed / number of books procured)
- % of books delivered (number of books delivered / number of books procured)
- % of books or educational material damaged or defective in relation to the total to be delivered (number of books received damaged or defective / number of books delivered)
- % of schools that have updated their original request data (number of schools that made modifications to original delivery calculations / total number of schools)
- % of books delivered within agreed delivery window (number of books delivered within agreed timeframe / total number of books to be delivered)
- % of Children who received books (number of children who have confirmed receiving books on time / total children in the system to receive books)
- Indicator of books delivered vs. deadlines
- Heat map of books delivered
- Drill Down of deliveries by Country/Department/Municipality/School/Grade