

Electronic System for Building Safety Inspections:

Using Technology to Improve Accountability

Background

The Electronic System for Building Safety Inspections (BSIs) is part of a project implemented by the World Bank Group in collaboration with the Ministry of Housing of Peru. In 2018, the Peruvian Government implemented a reform of the regulatory framework for BSIs, which introduced a risk-based model to classify firms and an expedited process for low-risk businesses to obtain their license. However, the BSI process continues to face important constraints —such as high discretion in the application of the regulation and inadequate capacity of municipalities to monitor compliance and enforce sanctions for noncompliance —which generate inefficiencies and opportunities for rent-seeking.

To address these problems, an impact evaluation is being conducted to assess the impact of increasing accountability on inspectors (through a system of quality checks) and on firms (by varying the frequency of the safety audits that existing firms undergo to ensure they maintain safety standards over time). The study is accompanied by the implementation of an electronic system for BSIs, designed by the research team in collaboration with the five district municipalities and currently in the process of being implemented. The main objectives of this electronic system are to standardize the application of the regulatory checklists (thus reducing discretion) and provide municipalities with a tool to monitor inspections and obtain data and analytics in real time. This note describes how the electronic system works to achieve these objectives and improve inspections.

Advantages

The electronic system for BSIs is made up of two main components:

1. An inspection application for tablets (or phones) to conduct BSIs.
2. A digital platform where inspectors can access inspection reports and generate photographic panels to accompany these reports.

The electronic system does not affect the technical aspects of BSIs. For example, the items inspected and the inspection checklist are exactly the same as on paper, the traditional method for conducting inspections. However, it brings about significant changes in BSIs procedures.

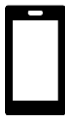
The following are the three most prominent advantages of the system:

1. Digital forms and data generation

The most significant change of the electronic system is that it eliminates paper forms. In the traditional paper system, inspectors not only have to carry multiple forms with them (there are three possible papers forms that must be filled out, some up to 13 pages long), but each has to be filled in duplicate. In the electronic system, BSIs checklists have been programmed into digital forms that can be accessed through an application on tablets; when an inspection is finished, the system determines which PDF reports are generated based on the inspection outcome. As such, inspectors do not have to worry about which specific forms to fill out, which to hand over to the business, and which to keep with them for later updating. The system determines the forms and recipients automatically.

The inspection application allows inspectors to enter administrative data, complete the inspection checklist, take photographs, sign the inspection form and send it to the business representative directly from the tablet. Tablets are equipped with a SIM card that allows businesses to receive PDF copies of the inspection report and other relevant forms in their e-mail within minutes. In addition, administrative data can be preloaded into the tablets, which saves inspectors from having to enter the information manually in multiple forms. Even if municipalities cannot preload the data, inspectors enter the information into the system only once, as it is then pulled into the different forms automatically.

Inspection reports and forms are available in a digital platform where they are available in digital format, and which inspectors and municipality officials can access with a user ID and password. Managers can see inspection data appear in real time, access all inspection forms, and download reports with aggregate inspection data (such as the number of firms that have a specific violation). The system also generates the administrative data that will be used for the impact evaluation.



- ✓ Reduces paper and time spent by inspectors on administrative tasks.
- ✓ Provides access to forms, aggregate reports and inspection data in real time.

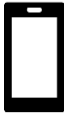
2. Streamlining the inspection procedure

Two key features of the electronic system that help streamline inspection procedures are automatic filtering of questions and the organization of checklist questions by elements.

The paper inspection checklist includes questions for different types of businesses (e.g. hospitals, schools, offices, etc.) and questions that only apply to businesses with specific characteristics (e.g. buildings with more than two floors). Inspectors must manually indicate if these questions —sometimes up to half the checklist— do not apply. The inspection app, on the other hand, uses filters to determine which questions must be answered. Entire sections of the checklist are filtered out based on the type of business entered by the inspector. For example, if the establishment is a school, all questions pertaining to offices, schools, hospitals, etc. are automatically marked as N/A.

The electronic system also streamlines the inspection procedure by organizing questions by inspection item. In the paper checklist, questions pertaining an object are scattered across the checklist. For example, the questions related to electric boxes are dispersed in three different sections —risk of fire, risk of electrocution, and low-risk observations— of the checklist. The inspection app groups questions by item, so that the inspector can answer all questions pertaining to an item at the same time and in the same place.

This mechanism also gives inspectors flexibility to answer questions in whichever order they want, which can contribute to making the inspection more accurate. With paper forms, the fact that questions are scattered in different sections and pages means that inspectors usually go through the establishment to observe various items first, typically writing down observations on a notebook, and enter records in the paper checklist later, using their notes or simply recalling the answers from memory. With the tablets, the fact that inspectors can pull all questions for a specific item at once and in front of the item makes it more practical for inspectors to answer the questions while they conduct the inspection, contributing to accuracy.



- ✓ Automatic filtering saves inspectors time.
- ✓ Organizing questions by item contributes to more accurate and comprehensive inspections.

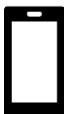
3. Standardizing assessments

Many items of the checklist refer to multiple elements but require the inspector to condense its observation into a single yes/no answer. For example, when an establishment has nine fire extinguishers that are compliant and one that is not, inspectors must mark this checklist item as “does not comply”. In the paper-based system, there is no way to know the specifics of this problem (the rate of violation and the total amount of extinguishers observed). A related problem is that, in practice, overall compliance is left to the inspector’s discretion when inspections are conducted on paper. One inspector might consider that a compliance rate of 90% is close enough to warrant a “comply”, whereas a stricter one might require 100% compliance. One of the most significant procedural changes introduced by the electronic system is the ability to register observations individually when there are multiple elements related to one checklist item. This contributes to more comprehensive inspections and richer data. As such, two establishments with non-compliance rates of 10% vs. 100% receive the same overall rating for that question, as per the regulation, but the underlying data are recorded to be able to analyze the issue.

The inspection app allows this procedure to be standardized. Inspectors can add multiple elements of the same item (e.g. fire extinguishers) and assess the compliance of each individual element. The system then calculates overall compliance, and the data from individual elements is also stored. Municipalities can use this data for different purposes, such as identifying critical safety risks and evaluating the thoroughness of inspectors. The app also allows the introduction of procedural rules, such as the requirement to inspect a certain percentage of elements when multiple elements are found. The research team is considering exploring how the introduction of such rules affect inspection outcomes as part of the larger research objectives of the study.

Another way in which the application standardizes the inspection procedure is by the automatic activation of follow up actions. These follow up actions are specific instructions provided to the business when an item is non-compliant. For example, a non-compliant fire extinguisher can trigger seven different follow up actions (recharge the extinguisher, install more extinguishers, etc.). On paper, inspectors must manually check the relevant actions after they have marked the item as non-compliant (follow up actions are sometimes checked in a form that is separate from the inspection checklist). The electronic inspection checklist has been designed so that the relevant actions are automatically activated. This not only reduces the chances of human error, but also saves inspectors time.

Finally, an indicator of progress in the inspection app ensures a thorough completion of the inspection form. On paper, it is possible and not uncommon to find questions unanswered or skipped. With tablets, the system does not allow the submission of incomplete forms and helps inspectors identify which items are pending evaluation.



- ✓ Option to inspect multiple elements reduces inspector discretion and generates richer data.
- ✓ Automatic activation of follow up actions increases accuracy and saves time.
- ✓ Progress indicator ensures thorough completion of inspection form.

Adoption and Adaptation

The electronic inspection app has been developed in close collaboration with inspectors from participating municipalities, a process that has required constant field testing, consultation and adaptation. Inspectors and municipal officials have provided extensive feedback on the inspection app, and their contributions resulted in important features such as the introduction of filters and the option to include photographs that are unrelated to the checklist (e.g. to demonstrate that a business was closed upon the inspector's arrival).

Prior to the implementation of the system in a municipality, inspectors participate in a classroom training, where they are introduced to the app and its main components, and a field-training, where they conduct a mock inspection on the premises of a business. After these trainings, inspectors can start using the tablets for real inspections on their own or can request support on the field for one day. So far, two municipalities have completed the trainings and adopted the system, while other three will introduce it sequentially in the coming months.

Overall, inspectors have received the electronic inspection system positively, and have specifically commended its time-saving features, such as the automatic generation of photographic panels. Municipalities have also received the system with enthusiasm, highlighting the generation of administrative data and capabilities to monitor inspectors work. Both have highlighted the importance of close collaboration with the research team in the design of the system and feedback mechanisms for continuous improvement.



For information about the electronic system, contact Diego García at dgarciam@worldbank.org