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New strategic areas for the Economic Commission for Africa and statutory reports

Report on the Development Account project on the use of mobile technology for statistical data collection in Africa

I.   Background

1.   The Economic Commission for Africa (ECA) implemented a project on the use of mobile devices to collect data for effective policy and decision-making. The project was a Development Account project implemented in two phases so that lessons learned from the phase I implementation, as well as concepts, systems and tools, could be transferred during phase II in implementing countries. The project is a capacity development programme of the United Nations Secretariat aimed at enhancing the capacity of developing countries in the priority areas of the United Nations development agenda. The main objective of the project was to improve the capacity of pilot countries in using mobile technology to make statistical data available and accessible to support evidence-based policy formulation. It was implemented through a series of pilot projects involving five countries in phase I and an additional five in phase II.

2.   The pilot projects were designed to be executed by each country's national statistics office, in collaboration with a local training and research institute designated by the office. The institute, in collaboration with the office, was expected to undertake applied research to adapt and develop appropriate concepts, systems and methodologies for the use of mobile technologies in data collection and the integration of the collected data into standard statistical processes. In many parts of the world, innovation is generated by training and research institutes, which is not often the case in Africa. This project was therefore aimed at linking national statistics offices and training and research institutes to work together from the onset of activities to ensure acceptability and sustainability. It allowed ECA member States to deal with the challenge of ensuring that the concepts and systems being introduced could be localized to support the system. The institutes were also expected to develop their own research projects on the basis of the results, thereby ensuring the sustainability of the capacity being built.

3.   The Gambia and Tunisia were selected from West and North Africa, respectively, on the basis of presentations by their national statistics offices during the workshop and meeting. The presentations demonstrated both the suitability of the countries for the project and strong commitments. Cameroon (Central Africa) and Kenya (East Africa) were selected on the recommendation of the consultant in the situation analysis report,

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* E/ECA/STATCOM/6/1.

and confirmation was obtained from the countries regarding their willingness and readiness to participate. Even though the Zimbabwe National Statistics Agency did not participate in the workshop, the country was selected on the basis of presentations by the head of the Zimbabwe non-governmental organization (NGO) Research and Information Services, which made a case for an innovative application that applied the concept of "citizen as data collector". The national statistics office was contacted afterwards, and it agreed to work with the NGO as the training and research institute. That project could not be realized, however, given that the NGO had run into problems with the Government of Zimbabwe pertaining to its registration. Instead, with the approval of ECA, the Zimbabwe National Statistics Agency implemented an alternative project on the collection of consumer price survey data without any institute. Lastly, the Embassy of Ireland in Ethiopia supported the project in Ethiopia, so one more country was added to the five funded by the Development Account project.

II. Project objectives

4.   The main objective of the pilot project was to improve the capabilities of project countries to use mobile technology to make statistical data available and accessible to support their sustainable development agendas. The specific objectives were as follows:

(a)   Strengthen the capacity of countries to collect data with mobile technology;

(b)   Experiment with self–enumeration using mobile devices to collect data and determine the suitability of such data for the production of statistics;

(c)   Strengthen working relationships between national statistics offices and training and research institutes in statistical development.

III. Major activities undertaken through the project

Situation analysis

5.   As part of the situation analysis of target countries to select the pilot countries for the project, a workshop was held in Praia on 18 and 19 March 2014. It was jointly organized by ECA, the Partnership in Statistics for Development in the 21st Century, the African Development Bank (AfDB) and the African Union Commission. In addition, an independent consultant administered a survey of several countries to determine their readiness and recommended five pilot countries. Those countries were selected on the basis of a set of criteria, including level of commitment and readiness to do the project, relevance to their work, mobile penetration, security level/sustainable institutions in the countries, region and language. The consultant's proposal was presented to a joint meeting of the technical and steering committee that was held during the regional workshop.

6.   All pilot projects began with national studies to document the existing status of using mobile technologies for data collection in their countries. The studies were the basis for the selection of areas in which pilot countries would develop appropriate methodologies for data collection using mobile devices. They also served to establish benchmarks and to develop effective partnerships for implementation of the project.

Expert Group Meeting

7.   An ad hoc Expert Group Meeting was organized ahead of a meeting of the Joint ECA-African Union Commission Statistical Commission for Africa and Committee of Directors-General of National Statistics Offices, held in December 2014, to discuss challenges that the pilot countries were expected to encounter in the use of mobile technology for data collection. That meeting also contributed to enhancing an ongoing working document based on the recommendations and lessons learned from African experiences in introducing mobile devices in data collection. Given that no guidelines

existed to assist African countries in the best way to implement this new tool of data collection, the ultimate aim of the meeting was to have a comprehensive document to guide the use of mobile devices in data collection and statistical production in the member States of the region.

Capacity-building

8.   During the Expert Group Meeting, a presentation on CSEntry, which is an Android application, was done, and pilot countries expressed interest in having training on how to customize it to their data-collection applications, given that many of them already had experience using Census and Survey Processing (CSPro). One person from the national statistics office and one from the training and research institutes for each of the six pilot countries came to Addis Ababa for a one-week training session in February 2015.

Country missions

9.   Missions were organized to all pilot countries to agree on project implementation modalities, to clarify the roles and expectations of all actors and to monitor and evaluate the implementation of activities.

Workshops

10.   Pilot countries organized national workshops to bring together all local partners and stakeholders to identify and agree on the implementation modalities and to clarify the roles and expectations. Pilot countries also developed and compiled user manuals and guidelines for the field work. Those manuals and guidelines were used to train enumerators on how to use the device to collect and report field data. Closing workshops involving all stakeholders and some media were also organized at the end of the project to raise awareness on the results of the project.

11.   A regional workshop and conference on the use of mobile technology for statistical processes was held in Addis Ababa in October 2015 to share the experiences gained and lessons learned with practitioners and academics in the field. The conference was preceded by a one-day workshop on the lessons learned from phase I of the pilot project. The national statistics offices and training and research institutes from the six pilot countries were invited to share their experiences relating to implementation of the project. International organizations working on mobile data collection (e.g. the Partnership in Statistics for Development in the 21st Century, the World Bank and Global Pulse Lab) also participated as presenters in plenary sessions. In addition, a call for papers was announced prior to the conference, and authors of selected papers (i.e., regional researchers from academia and national statistics offices from non-participating countries) were invited to present their research on the topic. The conference was an opportunity to share knowledge and experience not only within the national statistics offices and training and research institutes of countries participating in the Development Account project, but also throughout the network of regional stakeholders. Among the papers presented at the conference, five were selected to be published in the African Statistical Journal of AfDB as a special issue on "mobile data collection in Africa", which was expected to reach a wider audience. The rest of the papers were to be published in a subsequent issue.

Upgrading of facilities

12.   All the national statistics offices in pilot countries, except Tunisia, worked closely with the training and research institutes to develop the application. The offices installed and upgraded their computer servers and software to receive the data from the field and integrate them into statistical processes.

Field data collections

13.   Upon development of their in-house application, most pilot countries ran data-collection testing before the actual field data collection. The tests in most cases revealed some dysfunctions of the application. These were corrected before beginning the field data collection. All pilot countries in phase I developed consumer price index (CPI) survey applications for their field data collection.

Mid-term evaluation

14.   An independent mid-term evaluation of phase I was implemented. It was carried out by an international evaluator with national data collectors providing detailed country data for the international evaluator to collate into a comprehensive mid-term evaluation report for phase I of the project.

15.   Five countries participated in phase II. They demonstrated for all pilot countries that collecting data with mobile devices improved the quality of the data collected in the following ways:

        (a)   Reduced data entry errors: Applications developed by pilot countries provided a user-friendly data entry interface with data validation capability, preventing the entering of price data that were out of the expected range;

        (b)   Reduced workload: Unlike paper-based price collection, mobile device applications required the price collector to capture the data just once using the tablet, and data were forwarded to the intended supervisor. No error-prone merging or tedious sorting were required after data collection, given that the system handled all of those;

        (c)   Real-time data collection and transmission: Once price data were captured, they immediately became available to both the supervisor and the users at headquarters;

        (d)   Easy way to detect anomalies: While being verified by a supervisor, out-of-range price data were highlighted by the system for easy detection. The supervisor could either approve or reject price data and even correct mistakes. The system provided an audit trail of the changes;

        (e)   Detailed item specification: A description of the item in detail, a picture of the item and unit of measure made it easier for the price collector to capture data;

        (f)   Improved price collector accountability: The software captured time and the current Global Positioning System coordinates of the device.

16.   Overall, phase II of the Development Account project was successfully carried out by all six countries. They all developed in-house capacity and gained skills and confidence in using mobile technology in data collection. In many pilot countries, however, financial resources remained the main obstacle for sustainability of data collection with mobile devices beyond the project.

Evaluation of the project

17.   The project was evaluated at mid-term by an external consultant. The evaluation contained a set of broad strategic questions, with relevant subquestions, to provide information on the extent of project implementation.

Results from the mid-term evaluation

Relevance

18.   All participating countries had long-term development plans that required timely provision of more statistics of better quality. For example, in the case of the Gambia, the project was particularly relevant because the Government aimed to boost economic development by incorporating information and communication technologies. The project was also found to be very pertinent in Zimbabwe, where in-house staff capacity already existed but needed support in providing training and for purchasing equipment. In Tunisia in particular, respondents felt that the national statistics office chose the Ecole supérieure de la statistique et de l'analyse de l'information as its training and research

institute more to meet the administrative requirement of the agreement with ECA than to develop a real technological partnership. Indeed, the lack of participation of the institute at the design phase of the project, and the absence of a specific budget assigned to the Ecole, weakened its commitment to the project.

Effectiveness

19. In all six countries, in terms of reporting, the ECA coordination team developed a monitoring and evaluation mechanism to guide implementation. As a result, there was evidence to support the rate of implementation. Reporting ranged from essential short-term/mid-term reports (e.g., national situation analyses, national workshop reports and hardware procurement) to ECA focal points reporting to Development Account project headquarters every one to two months on the project status in the countries according to the workplan. In all countries, the national statistics offices were able to develop and pilot geo-enabled mobile data-collection systems for the consumer price survey, successfully enhancing the reliability of the data, given that they could track the authenticity of the data collected. Given that it was a pilot project with a limited budget, however, the national statistics offices were not always able to test the software at the national level. Under the effectiveness criteria, the project was therefore deemed satisfactory because it achieved most of its intended results by the end of its first phase.

Efficiency

20. In general, the project was highly efficient in the six countries. The project was highly valued by the interviewees because it facilitated the processes used by the national statistics office to collect, process and report on price information. The project built the capacity of both the training and research institutes and the national statistics offices, which was a key achievement. The software integrated geo-referencing information and was said to be very user-friendly for collecting and reporting price information.

Impact

21. The impact observed during the evaluation included the reduction in data entry errors and workload and real-time data collection and transmission. Most important, the time needed to generate critical information relating to prices was cut by 20 to 40 per cent, depending on the country. The increased buy-in among a range of stakeholders (e.g., enumerator, national statistics office and among Government organizations) were also notable impacts of the project.

Sustainability

22. Countries secured varying degrees of sustainability. Consumer price index data collection will be done entirely through mobile technology in Tunisia. In other countries, however, the continuation of the project activities is not guaranteed, owing mostly to a lack of funding. Nevertheless, countries that developed their in-house mobile technology capacity, such as Zimbabwe, will likely have less financial burden.

Pilot country projects and outcomes

23. The project had a notable impact in the pilot countries. In general, it was demonstrated that using mobile devices for data collection contributed to an enhancement of the quality of the data collected in the following ways:

(a) Reduced data entry errors: Applications developed in the countries provided user-friendly data entry interfaces with data validation capability, preventing entering data that was out of the expected range;

(b) Reduced workload: Unlike paper-based data collection, the software applications required enumerators to capture data just once for forwarding to the supervisor. No error-prone merging or tedious sorting was required after data collection, given that the systems handled these automatically;

(c) Real-time data transmission: Once data were captured, they were immediately available to both the supervisor and the servers where data were stored;

(d)   Anomalies were easily detected: While being verified by a supervisor, data that were out of range were easily detected. The supervisor could either approve or reject data or was able to correct mistakes;

(e)   Detailed item specification: A description of the item in detail, picture of the items and units of measure make it easier for the data collector to capture data;

(f)   Improved collector accountability: The software was able to capture time and the Global Positioning System coordinates.

24.   In general, phase I of the Development Account project was successfully carried out by all six countries. They all developed in-house capacity and gained skills and confidence to use mobile technology in data collection. In many pilot countries, however, financial resources remained the main obstacle for sustainability of data collection with mobile devices beyond the project.

Country achievements

25.   The five selected pilot countries in phase I were located in the five subregions of Africa: the Gambia from West Africa, Kenya from East Africa, Tunisia from North Africa, Cameroon from Central Africa and Zimbabwe from Southern Africa. Ethiopia was added to phase I with the contribution of the Government of Ireland.

26.   All the national statistics offices in pilot countries worked closely with the training and research institute to develop the application and all countries used CPI for their data collection with mobile devices. All pilot countries had undertaken field data collection. Tunisia has been collecting all its CPI data with mobile devices since January 2016.

Cameroon

27.   The data collection for consumer and producer prices was developed using CSPro software, version 6.1. This most recent version of CSPro can be developed in the Windows environment and be migrated to the Android system to use for electronic collection by tablet or phone. With regard to data transfer, an automatic data transfer module to the central server was implemented and deployed on each tablet. Synchronization was done with file transfer protocol for connecting to the server.

28.   This project helped to build the capacities not only of national statistics office staff, but also staff in the national statistics system with regard to data collection using mobile technologies. It enabled the office to take ownership of the development of data-collection applications using mobile devices and to experiment with the transfer of data directly onto the server. The pilot project set up more efficient complementary modules for real-time time central processing. The project had also made data collected available to the office on a daily basis, which limits the risk of loss of data and also reduces delays in data processing. Furthermore, the project reduced data-collection times and set up a platform for collaboration with the training and research institute for the management and transfer of data. The implementation of the Development Account project allowed the office to raise awareness of some actors of the national statistical information system of the benefits of collecting data with mobile devices.

Ethiopia

29.   In Ethiopia, the central statistical agency partner institution was the Ethiopian Statistical Association. The training and research institute developed the application and carried out the data collection with the support of the Association, which had previous experiences using mobile devices such as personal digital assistants and computer-assisted personal interviewing systems for data collection. An assessment made for the purpose of the pilot also showed that several institutions in Ethiopia had been using mobile devices for data collection and project evaluation purposes (e.g., EPHI, WaterAid Ethiopia, IFPRI-ESSP and the Agricultural Transformation Agency).

30.   The pilot focused on a survey that was on monthly retail and producer price statistics. It used the existing questionnaire developed by the Ethiopian Statistical Association to collect data for both retail and producer prices.

31.   A CSPro software android version, CSEntry, was used to develop the forms to be installed on the mobile devices, and the data-collection activities were done in the field using mobile devices (Samsung Tab3), weighing balance, meter and Garmin GPS.

32.   With regard to data transmission, a server was configured at the Ethiopian Statistical Association. Information technology specialists and programmers were assigned to follow up the progress of data transmission, collation and aggregation.

33.   The pilot project demonstrated significant enhancement of data in terms of quantity, quality and timeliness. The Ethiopian Statistical Association upgraded its existing software to collect data with mobile devices (e.g., improving the software in use in the current Demographic and Health Survey that uses computer-assisted personal interviewing). The Association also began preparations for using mobile technology for its related medium and large industries surveys and, most important, took bold steps towards lobbying and raising the awareness of the Government in using the mobile-based data-collection system for the upcoming major national Population and Housing Census in Ethiopia.

The Gambia

34.   The Gambia Bureau of Statistics and the School of Information, Technology and Communication successfully developed an Android and web interface platform for the consumer price index and the producer price index. The overall achievement of the pilot project in terms of outputs and outcomes was satisfactory, given that all its activities were successfully implemented. The execution and implementation arrangements between the national statistics office and training and research institute were in accordance with the agreements made under the initial project design, making the project implementable within scope, cost and time. The sustainability of the achievements needs to be closely monitored, however, in view of the fact that the project was a pilot that needs to be replicated. The use of mobile data collection ensured that data were readily available on collection and upload. There were no problems with data entry errors, and access to content by staff of the Bureau's Price Statistics Unit also went well. The analytical tool used was very much appreciated by the Bureau's research analysts for being able to generate the index with the click of a button. The Bureau's price statisticians thoroughly observed the process and were satisfied with the results.

Kenya

35.   The Kenya National Bureau of Statistics partnered with the School of Mathematics at the University of Nairobi. As with all pilot countries in the project, the pilot survey was done on consumer price indices. In Kenya, the indices and corresponding inflation statistics were compiled and disseminated every month in 25 data-collection zones located in 13 urban centres. The implementing partners in Kenya undertook a comparison of various software platforms available for data collection, especially CSpro, ODK and e-Survey. The partners decided to adopt an integration of CSpro and e-Survey software applications for the consumer price indices data collection. The reason for adopting the integrated application was to cater effectively for geo-coding, time-stamping and possible inclusion of price item pictures on the questionnaires for data collection.

36.   Unlike the traditional way of collecting data, the project allowed for the integration of specification aspects in the data-collection software (e.g., photos) and geo-referencing, thus minimizing biases and providing a true picture of the on-the-ground situation. Integration of the conversion of measurements into standard units also minimized errors in calculations.

37.   The main success has been the project's contribution to raising awareness in Kenya about the use of mobile devices for data collection. To the School of Mathematics, the development of the software and data collection was beneficial to students. Through an agreement with the Kenya National Bureau of Statistics, data collected for the

consumer price indices and other surveys will be used as training materials by the university.

Tunisia

38.   Tunisia had been experimenting with mobile devices data collection since 2014. The initial survey to test the system was with the consumer price index. At the end of 2014, the information technology team had begun to test different development tools for mobile applications. The task was very tedious, given the multitude of solutions and the time required for the various tests in order to make the proper choice. The chosen solution was to develop the application under Cordova, using HTML5 technology, CCS3, JavaScript, JQuery and mobile-based Websql.

39.   The partnership between the national statistics office and the training and research institute was important to ensure that the spread of mobile technologies would reach the largest possible number of organizations conducting field surveys in the country. It was therefore essential to develop a true and long-term partnership for the benefit of not only the office but also the country as a whole.

40.   Following the implementation of the project, the national statistics office developed an application for data collection with mobile devices that had been tested in real conditions. Since the beginning of January 2016, all data collected for the consumer price index have been undertaken using mobile technologies.

41.   The quality of data collected has greatly improved. This improvement was due to features on the application that caught the attention of the enumerator whenever there was a significant price difference, compared with the previous month. There was also a reduction in missing data, given that the platform manager could track near-real time data collection and could identify points of sale that had not yet been visited and thus needed the personalized follow-up with each enumerator. There was also the possibility of identifying products by photo.

Zimbabwe

42.   Research and Information Services was identified as the training and research institute partner of the Zimbabwe National Statistics Agency. Initially, the project was supposed to collect data on village registers with the secretaries of village heads as unpaid self-enumerators. That could not be realized, however, given that Research and Information Services registration was not renewed. As a result, the Agency implemented an alternative project for its consumer price survey.

43.   The Zimbabwe National Statistics Agency had previous experience in collecting data using the mobile data-collection method and had been developing the software since 2010 for the Zimbabwe Demographic and Health Survey using personal digital assistants and tablets using CSPro as the data entry software. The Agency therefore developed software for the project in-house, and it was deployed on 200 Android tablets.

44.   The time taken for transporting data from the provinces to the head office was reduced from a period of one week to just one day by using mobile devices. The cost of sending the data from the provinces to the head office would be reduced if paper questionnaires were carried by Zimbabwe National Statistics Agency vehicles because there would be no additional fuel and vehicle maintenance costs. In addition, it would be cheaper to transport the consumer price survey questionnaires by Swift courier service than by sending them through the server, given that air time for each enumerator and the total cost of air time per province was higher than the cost of sending it by the courier service. In addition, the consumer price survey budget would also be reduced in the future because there would be no cost for printing the paper questionnaires and no transport cost in moving the questionnaires to and from the provinces. Furthermore, collecting data using the tablets would save on office space and there would be no need to stock volumes of questionnaires. There was no cost for data entry, and the time taken for data entry was eliminated, thereby increasing efficiency in the production of timely statistics. Moreover, quality checks could be performed on the gadgets. That is to say, both the team leaders

and the provincial supervisors were able to check and make some corrections on the gadgets before the data were sent.

45.   The project contributed to the capacity-building of national statistics office staff and enhanced the ability of the Zimbabwe National Statistics Agency to support statistical data within the Government of Zimbabwe. As a result of the project, many government departments are seeking support from the Agency. For example, the Ministry of Lands and Rural Resettlement and the Ministry of Health and Child Care began to rely on the expertise of the Agency in collecting data using mobile devices after the success of the pilot project. Through the pilot project, the Agency was able to develop and pilot a geo-enabled mobile data-collection system for the consumer price survey, successfully enhancing the reliability of the data, given that they could track the authenticity of the data collected.

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