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Using Mobile Biometrics and Management Information Systems to Enhance Quality and Accountability of Cash transfer in a Girls' Empowerment Program in Rural and Urban Poor Settings

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Abstract: Information and Communication technology for social protection (ICT4SP) has improved the targeting and identification of beneficiaries, while mitigating benefit fraud within the delivery of safety net and Conditional cash transfer (CCT) programs. However, poor telecommunication and power infrastructure hamper the implementation of ICT tools in low resourced and hard to reach environments. In this paper we describe how we used a mobile biometric fingerprint identification and a management information system within a randomized control trial design program to identify girls in an urban slum environment and remote arid rural area; and discuss contextual strengths and challenges encountered. Use of mobile biometrics and management information system enhanced the quality and accountability of the CCT program. The mobile biometrics system ensured accurate identification of participants, while the MIS enabled increased accountability and efficiency in the disbursement of benefits. The paper also reports challenges experienced that needed multifaceted approaches.

Keywords: ICT4SP, mobile biometrics, Mobiotrics, Conditioned Cash Transfer (CCT), Salesforce, Adolescents, Social Safety Net (SSN)

1. Introduction

The Organization for Economic Cooperation and Development (OECD) has developed a description of social protection as referring to "policies and actions, which enhance the capacity of poor and vulnerable people to escape from poverty and better manage risks and shocks". Social protection measures include social assistance, social insurance and minimum labour standards [1]. Cash transfers are generally seen as one of the main instruments for delivering social assistance. Cash transfer programs in developing countries have expanded dramatically, in part due to the convincing evidence of their effectiveness [2]. They provide cash to poor individuals, households and vulnerable groups. The objectives are to increase the incomes of the poor and to help individuals and households cope with diverse shocks, risks and crises [3]. Conditional Cash Transfer (CCT) programs provide cash transfers to poor families that are contingent upon certain verifiable actions, generally minimum investments in children's human capital such as regular school

attendance or basic preventative health care with the goal of breaking the intergenerational cycle of poverty [4]. Globally, CCTs in education are widely utilized social policy tools aiming to facilitate enrolment and regular attendance to education. In return of their children's regular attendance to school, families receive a payment [5]. In addition to this, it is approximated that attainment of school attendance rates of between 80% and 85% is widely utilized as a condition by many CCT education programs. In the entire globe, CCT programs in education are widely known as schematic programs that employ mechanisms aiming to oversee an increased enrolment and attendance in schools by children from poor households. This is mainly achieved by giving out incentives, embedded on certain criteria, to the families of the targeted beneficiaries [6]. It is argued that indeed CCTs have escalated school attendance among children emanating from poor households [7].

1.1 Need for technology in CCT implementation

The design and implementation of safety net programs present many operational challenges related to the determination and identification of beneficiaries, the maintenance of a database of beneficiaries, the documentation of compliance and the distribution of benefits [8]. CCT programs face even greater operational challenges, as they are more complicated and pose additional participation requirements. At times CCT programs are not only flawed with lack of transparency but are also weak in terms of control and accountability. Effective mechanisms for transparency, accountability and participation help minimize those in need being wrongfully excluded from program rolls, thus enabling programs to more effectively serve their intended beneficiaries [9]. Many social protection programs and in particular CCT programs aim to provide a robust identity in order to deliver services [8]. Inability to correctly identify and authenticate beneficiaries inhibits access to services and may lead to benefit fraud. Preference is currently given to digital biometrics identification technology to distinguish physical features such as fingerprints replacing the traditional paper identity systems [8]. There are scores of emerging Information and Communication Technologies (ICTs) that can be used to improve the delivery of CCT programs as well as increase efficiency and decrease costs. Biometric systems are among new technologies such as mobile computing, satellite communications, simple and smart cards, global positioning systems, radio frequency identification tags, automated teller machines and solar power [10], which are used to improve efficiency, effectiveness and accountability of CCT programs in low income countries.

CCT programs are characterized by large number of target beneficiaries which is accompanied by relatively huge amounts of cash payments and this subsequently begs the question of accountability [11]. The various components of CCTs – such as "targeting", "registration", "conditions", "payments" – all require information to be captured, transferred, stored and analysed. Strong control and accountability mechanisms at all stages of CCT program implementation are critical to minimize and manage risks, and to ensure effective program implementation and sustainability. Paper data collection for such highly complex programs that require collection of information from several sources is possible but might be faced with challenges including huge amounts of time spent on data collection and data entry, restricted real time access to data, delayed generation of reports and monitoring of program indicators, low data security and high risk of document loss or damage.

Management Information Systems (MIS) are considered as indispensable tools in the facilitation of program oversight and accountability. Social safety net (SSN) programs centered on CCTs require the integration of MIS to strengthen its operational accountability and thus divert impending risks. CCT programs are heavily reliant on MIS to alleviate risks involved and enhance accountability, given these programs' challenges involving huge cash

transfers and participant identification. Timeliness, accuracy and relevance of CCTs are based on the major attributes of MIS which are: (1) information management (2) infrastructure of communication and information technology (3) Quality management application, and 4) organizations IT personnel and composition. Looking at some of its measures, MIS employs data quality, data security, records management, database management, master data management and data governance in the processing of beneficiary identification, payment of benefits, monitoring and evaluation, solving of complains [12].

1.2 Need for an Adolescent Girls' Educational CCT program

Many adolescent girls in Kenya face considerable risks and vulnerabilities that affect their education status, health, and general well-being. In addition to low educational attainment and health risks – including early marriage, teenage pregnancy, early and unprotected sexual activity, nonconsensual sex, and HIV/STIs – other factors that impact education and health outcomes include household poverty, lack of economic independence, limited income-earning opportunities, illiteracy, violence, and social isolation. Younger adolescent girls who live in environments laden with these vulnerabilities are at risk of experiencing negative outcomes such as school dropout, early sexual initiation, unintended pregnancy, early marriage, and sexual and gender-based violence.

Increasing education for adolescent girls leads to delays in marriage, childbearing, increased future earnings and better health for future children. Studies from other countries in sub-Saharan Africa have shown positive results of education CCTs on school attendance and enrollment [13].

The Adolescent Girls Initiative Kenya (AGIK) was carried out in two marginalized settings 1) Kibera- one of the biggest urban slums in Africa and 2) Wajir- arid rural setting in the North Eastern part of Kenya. The project delivered multi-sectoral interventions to 6,000 girls and sought to increase enrolment rates and transition to secondary school of girls in these set-ups by employing conditioned cash transfers. The CCT was meant to promote girls' school enrollment and attendance by reducing the cost burden for families taking girls to school. Schooling kits were given as direct incentive to address menstruation, while school incentives were meant to motivate teachers to track school attendance. The education intervention was implemented for 2 years [14]. The AGI-K program design and methods have previously been published in detail. [14, 15]

The AGIK project used different technology platforms to improve efficiency, effectiveness and delivery of the CCT program. Mobiotrics, a smartphone-based biometrics system was used to enrol, identify and verify program beneficiaries and collect school attendance. Additionally, Salesforce – a cloud-based management information system (MIS) was used to collate all participant data from the different program components. It offered real time access to beneficiary data, generation of reports and acted as a platform for monitoring and evaluating program progress. This paper will discuss how mobile biometrics and management information systems were used to enhance timeliness in the delivery of CCT. The paper will also discuss the contextual strengths and challenges encountered in the implementation process.

2. Objectives

This paper is aimed at describing the role of integrating a mobile biometrics and management information system in the delivery of a CCT program in low resourced urban and rural settings of Kenya and discuss the contextual implementing strengths and challenges encountered.

3. Methodology

3.1 Study design

AGIK was a longitudinal randomized control trial testing the impact of different multi-sectoral packages of interventions for adolescent girls aged 11– 15 in two marginalized areas of Kenya: 1) the urban slums of Kibera in Nairobi, and 2) Wajir County in Northeastern Kenya. The interventions included violence prevention, education, health, and wealth creation. Participants were randomized to one of four intervention arms. The program interventions comprised a combination of girl level, household level and community level interventions. The long-term goal of AGIK is to delay childbearing for adolescent girls by improving their well-being. We present here the use of technology to enhance quality and accountability of the CCT component implemented in the AGIK education intervention. The education intervention comprised a CCT based on at least 80% attendance for each school term over the course of the two-year program, with three terms per year. All girls were eligible for enrollment in the AGIK education intervention irrespective of their baseline schooling status. The intervention comprised School enrollment verified via school records, while attendance was monitored using biometric fingerprint readers at the start and end of each school day. The four components of the education program CCT were as follows:

1) Household Cash Transfer (HCT): The designated household head received two cash transfers per term, deposited into a bank account. In Kibera, the total amount transferred per term (over two payments) was 2,250 KES. In Wajir, a total amount of 3,000 KES was transferred per term. These amounts were chosen to reflect 10% of the average household expenditures over a four-month period. For the first term of each new school year, the transfer was conditioned only on enrollment. For all other terms, the first of the two transfers per term was conditioned on attaining at least 80% attendance during the first month; whereas the second transfer per term, which was made after the third month, was conditioned on 80% attendance during the second and third months.

2) School Fees: School fees were paid directly to the school at the start of each term. A maximum of 1,200 KES per term was paid for primary school and 6,000 KES per term for secondary school in Kibera. In Wajir, up to 700 KES and 5,000 KES were provided for primary and secondary school enrollment, respectively. The maximum school fee amounts were determined based on the average fee amounts parents reported paying out of pocket during the need's assessment completed in each project site. Like the HCT, school fee payments were conditioned only on enrollment for the first term covered by the intervention and the first term of the new school year. Payment of the second and third term school fees was conditioned on 80% attendance during the whole of the prior term.

3) Monetary School Incentive: Once each term, schools received an additional 500 KES per girl enrolled in the education program—received at the same time as the school fees.

4) Schooling Kits: At the beginning of each term, girls enrolled in the education intervention received a schooling kit with the following items: four packs of sanitary pads; two pairs of underwear; a small container of petroleum jelly; a bar of soap; and an exercise book and pen. Eligibility for receiving the schooling kit followed the same conditionality as outlined above for the school fees. All transfers were recorded in a cloud- based data management system.

AGIK also conducted a qualitative study aimed at highlighting the strengths and weaknesses of the implementation processes. The qualitative findings provided important information about the perceived effects of the program and the benefits and challenges associated with the program. From these insights, recommendations were made in order to improve upon study implementation processes.

3.2 Implementation of Mobile biometrics

At the start of the intervention, all girls, whether in school or out of school were eligible for the cash transfer upon school enrolment. However, participants were eligible for subsequent cash transfers if they attained 80% school attendance. Daily school attendance was taken using a smartphone-based biometric system with offline support running on Android® mobile phones connected using an on-the-go (OTG) cable to a fingerprint scanner. Program participating girls scanned their fingerprints in the morning when they reported to school and in the evening when schools close for the day. In addition, each term random spot checks were conducted during a two-week period and review of attendance registers done by program staff supported by trained teachers, mentors and field assistants.

3.3 Implementation of Management Information System

Salesforce, a cloud-based relational database, was used to store and manage all program data on each beneficiary. Considerable amounts of information were collected from participants, households and schools. During registration a wide range of information about the participants was collected including their demographic information, schooling status, geographic location information like landmarks, GPS coordinates, contact information, and parent/guardian information. Information related to program interventions was also collated using salesforce and it included participant study arm, daily school attendance, safe spaces and financial education sessions attendance, beneficiary bank account details, status updates on payments received and amounts. The system offered real time data synchronization and access, easy generation of reports, data security, records management, database management, and data governance in the processing of beneficiary identification, payment of benefits, monitoring and evaluation.

4. Technology Description

We describe below 1) Mobiotrics® - the mobile biometric platform developed and customised by authors QA[1] and PM[3] for implementation in the AGIK project and 2) our MIS which was purchased from Salesforce® and customised to the need of the project.

4.1 Mobiotrics

We developed Mobiotrics® to run on the Android® mobile operating system. Fingerprints were captured from the girls using a fingerprint reader plugged into the mobile device using an OTG cable.

The AGIK project was going to be implemented in outdoor and indoor conditions. We also anticipated that battery power would be an important consideration in the specification of the fingerprint reader that we selected. From the various fingerprint reader technologies, we selected the Light Emitting Sensor (LES) technology; devices using this technology are not affected by external light of direct sunlight, which is the case with optical readers. Additionally, LES technology devices require lower power and are more robust to dry or oily fingers or latent fingerprint left behind on its platen surface.

To connect the reader to the mobile device, an OTG cable was necessary to interconnect the USB and micro USB ports of the fingerprint reader and the mobile devices respectively. Importantly, the mobile device models we selected had to enable USB host connectivity, a feature that is ultimately dependent on the device's hardware.

The Mobiotrics® platform was used to either enroll/register girls – this was one off- or to identify them during check in (when they reported to school) or check out (after school). During the enrolment process, demographic information was collected along with the fingerprint images from a finger each from either hand (Figure 1). The enrolment process normally took not more than five minutes and the girl was given an identification card with a unique identification number.

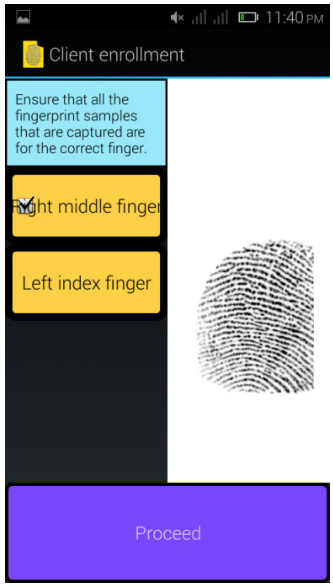

Figure 1: Girl enrolment on Mobiotrics®

During the identification step, the girls placed their fingers on the reader, at which the captured images were used to match against those previous collected to identify the girl; there on the girl would then check in or out (Figure 2). All fingerprint matching to identify the girls was done on the device – no Internet connectivity was required. Devices hence contained a biometric database of all girls likely to be identified on it.

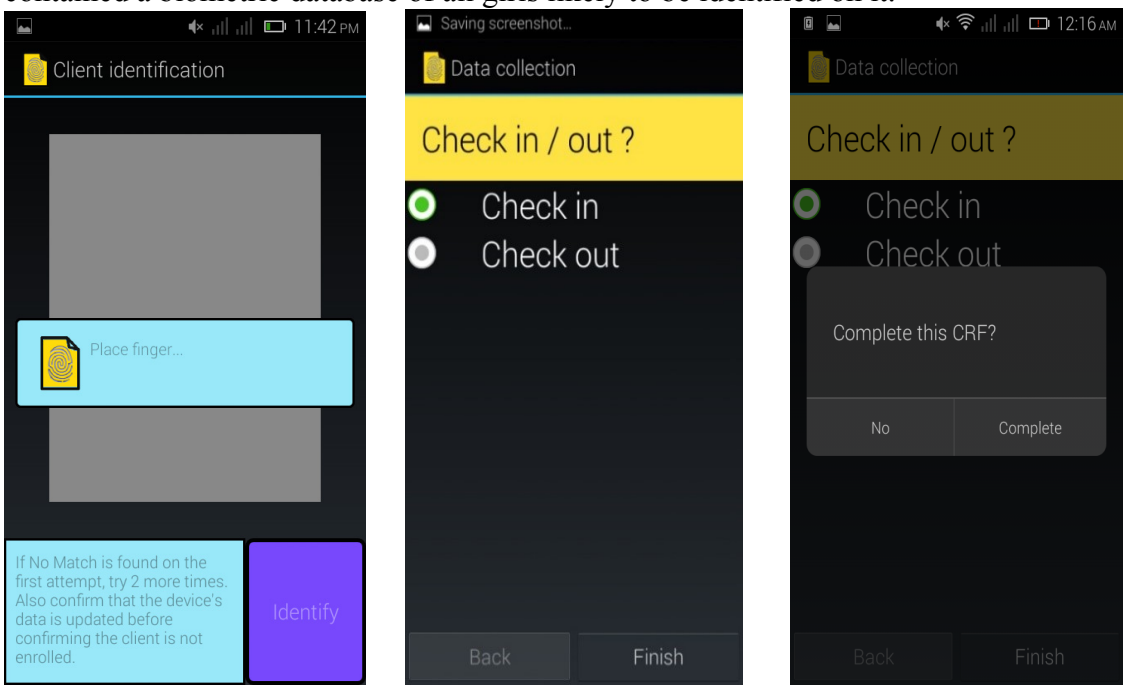

Figure 2 : Identification and school attendance data capture

Real time synchronization and submission of collected data (biometric and school attendance) was possible in Kibera where GSM connectivity was readily available. In some very remote schools where there was limited connectivity especially in the schools in Wajir, we implemented a device-to-device syncing functionality. During routine visits to the school, a program officer would use this feature, which synced (one way) the databases on both devices through Wi-Fi - one of the two phones would act as a hotspot for the other. The newly collected data would eventually reach the cloud server when the program officer

returned to the office headquarters. Another syncing option we developed simply involved dumping the data on a USB storage device and uploading the same to the cloud server.

The cloud server platform was configured to only accept information from pre-registered devices. We used the devices' International Mobile Equipment Identity (IMEI) numbers to identify the devices. This number tagged all information sent from the device to the cloud.

To reduce the power consumption of the devices, the school-based personnel were advised to unplug the fingerprint readers when the app was not in use. In the remote location where grid electricity was not present, solar charging devices were used to charge the mobile devices.

Mobile biometrics kits were installed in 70 and 187 primary and secondary day schools in Wajir and Kibera respectively. The girls in the AGIK education intervention component checked in every morning when they arrived in school and checked out in the evening before they left school. Biometric kits were not installed in boarding primary and secondary schools. Each school received one biometric kit. Schools that had large number of participants received more than one biometrics kit with one kit serving up to a maximum of 50 participants.

Teachers in each of the program participating schools were then trained on use of the biometric kits. The schools designated specific teachers or staff members to assist program participating girls in checking in and out of school every day. A standard operating procedure manual was left at each of the schools. Save the Children program officers in Wajir and Plan International program officers in Kibera offered monitoring support for the biometric systems at the schools.

4.2 Salesforce®

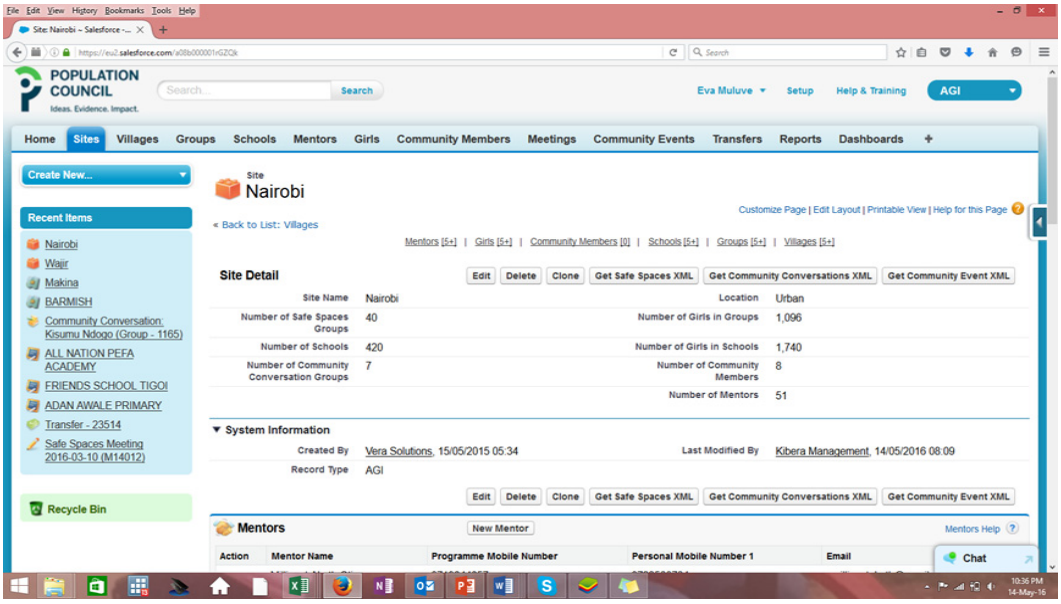

Figure 3: Salesforce relational data management

Salesforce®, a cloud-based relational database was customized and used as the MIS system to store all program data on each beneficiary. The system offered real time access to beneficiary data, data visualization and analytics, report development and a relational data base that offered integration of beneficiary data between different study components. Program data including enrolment and registration, safe spaces attendance, school attendance, benefit distribution, savings and community conversation meetings was managed through Salesforce®. The system enabled data sharing with partners in real time and offered real time generation of reports and monitoring of program. All data was stored

in one "pot" making it easy to make out relationships. Using its SMS capability, it was possible to communicate with participants through sending bulk text messages. This enhanced communication between the program and beneficiaries. In very remote contexts where there was limited infrastructure, other communication methods like mobilizing through school- teachers or community stakeholders were used.

4.3 Information exchange between Mobiotrics and Saleforce

To pass the school attendance information from Mobiotrics to Saleforce, we prepared csv files from the Mobiotrics cloud servers that had the student id., and attendance data. Salesforce was configured to take in this information and update each of the students' records.

5. Results

5.1 Average Cash Transfers and Equipment distribution

The total participants enrolled in the cash transfer program were 1,990 for Kibera and 2,829 for Wajir. Overall, participation in the cash transfer was high with only 5% of eligible households in Kibera and 9% of eligible girls in Wajir never receiving a cash transfer over the two-year intervention period. The mean number of cash transfers received (out of a total possible of 12) was 9.7 and 9 in Kibera and Wajir, respectively (Table 1). The mean number of schooling kits received was 4 in both Kibera and Wajir (out of a total possible of 7). All participating schools had at least one girl in the program. In Kibera the average number of participants by school were 3 with a few public primary schools registering more than 200 participants. In Wajir, the average number of participants by school was 23 with some schools having more than 100 participants.

Total cash transfers received (max 12) by site		
No. of CCT received	Kibera	Wajir
0	100	256
1	1	129
2	64	30
3	33	69
4	32	42
5	20	41
6	35	89
7	53	92
8	85	111
9	132	115
10	205	270
11	335	492
12	895	1,093
Total	**1990**	**2,829**

Table 1: Summary of cash transfers and in- kind benefits by site

5.2. Feedback on the use of technology in the AGIK project

Most program beneficiaries from both study sites reported satisfaction with CCT for the education intervention, which included the schooling kit, school fees payment, and the household cash transfer (HCT). Reported benefits included decreased financial burden for families, improvements in school attendance and enrollment, and increased self-esteem and confidence among enrolled adolescent girls. Parents, teachers and participating program

girls were positive and excited about the use of biometrics to track school attendance. Some of the feedback captured from project beneficiaries in AGIK qualitative study is stated below:

"This gadget captures the girls' fingerprint in the morning and afternoon when they are leaving school, and by doing this the teacher will know if the girl attended school or not. Due to this my daughter never misses her classes." (Wajir parent respondent, female, age 36)

Girls, parents and teachers developed confidence in the system and worked collectively to meet the conditions of transfers. This reduced absenteeism of girls from school and increased progression in school. One beneficiary girl from Kibera reported that:

"When you arrive in the morning you just go there and place your finger and it identifies and brings up your name, then you check in. Also, in the evening before you leave you place your finger to check out and the program will help you by paying school fees if you attend school throughout. That really helps because it will identify that you come to school every day. (Kibera adolescent respondent, age 14)

The strengths of the technology also talk to the relevance of the system in meeting desired needs and conditions of CCT as a means of poverty eradication, improving household livelihoods and supplementing household income. A girl from Wajir reported that:

"The money which we are given when we put our fingers on the fingerprint device helps us to sustain our need, like we buy school uniform with it". (Wajir adolescent respondent, age 12)

5.3 Challenges in the implementation of the mobile biometrics system

We broadly categorize the challenges in the implementation as being technical, contextual or man-made.

Technical problems included the long duration of time taken in recording some attendance disrupting the lessons especially where the number of students was relatively large; malfunctioning devices resulting in failure to enroll/identify girls; and data synchronization failures. Contextual challenges included power failure and poor network connectivity. Man-made challengers included lack of motivation among some teachers to implement the system; and lose of the devices due to theft or misappropriation.

In some cases, as a result of these shortcomings it was not possible to ascertain the necessary 80% school attendance leading to missed CCT to potential eligible households.

Reported below, in a high-volume school where recording attendance data took a considerable amount of time and disrupted the lesson delivery of teachers in the school.

*"For example, the teacher who is in charge, in conducting the biometric has a lesson to attend and the lesson is lost because some girls are still coming for check-in [*and he has to disrupt the lesson and go and record their attendance]. *So that is also another way it has affected the school negatively… Okay, one thing I could have suggested is to change the check-in and check-out into manual register, because it is not easy for a girl to drop out of school which she has been there without incentives…So, I feel they at least ease the work by accepting the school registers or they bring their own register, which the concerned teacher can mark. Because it is easier to confirm a register than to do the check-in and check-out by capturing their fingerprints". (Wajir school head teacher respondent, male, age 29)*

Over the duration of the project, subsequent versions of the mobile application did resolve much of the technical issues. However, the contextual and man-made problems persisted. As reported below for example by a girl from Kibera:

"Every time when I come early the person who is in charge of the fingerprint thing is not there. Now you have to go to class and then they come and call us in the middle of a

lesson. Interrupting, yes, that is what I don't like".(Kibera adolescent respondent, age 15, VE).

Although the challenges were sometimes presenting at different instances, prompt remedial actions were taken to allow progress. One such first step to address some of the challenges included stronger collaboration and ease of communication among stakeholders i.e. households, schools and program staff. In some cases, where use of the mobile biometric system was not reliable, a complement system was developed to record the attendance or ascertain school attendance (where no data from the biometric system was present). A manual backup register was used to resolve issues beyond the scope of the project such as power failure and Internet breakdown, and or where fingerprint reading was a challenge because of disability or bruises on the fingers. However, scenarios where manual registers were used were negligibly small in Kibera than Wajir.

To motivate and facilitate the use of the system, additional school mentors were assigned to different schools to strengthen spot-checks and monitoring performance of the devices and troubleshoot when necessary. Extra devices were also purchased for the backup and replacement of defective ones.

5.4 Lessons learnt

Table 3 below highlights key lessons learnt with respective recommendations.

Component	*Lesson learnt*	*Recommendation*
1. Sensitization and awareness creation	It is critical to create awareness with system users and stakeholders before introducing new technology to increases acceptance and ownership.	Develop a specific awareness and communication plan prior to introducing a new technology.
2. Registration, Identification and verification	The biometric system eliminated cases of double enrolment and double allocation of program benefits while controlling for study arm contamination.	Advocate for use of biometrics systems for CCT related programs
3. Security, storage and management of the equipment	It is important to address how the equipment will be stored in the stations of use.	Evaluate the security and storage of equipment prior to implementation.
4. Infrastructure/Network connectivity	Working in marginalized settings with limited electricity and internet connectivity pose challenges in timely data transmission and synchronization.	Selection of the right system for the context in which you are setting up the biometrics system is critical. The system needs to be robust to connectivity challenges or non-reliant on real time data processing.
5. Time taken in recording attendance	A lot of time was spent in taking attendance in schools with hundreds of enrolled pupils; this disrupted lessons. This was sometimes worse where the devices developed technical issues.	Use a device to participant ratio for the schools to determine number of devices needed per school; optimize the biometric matching algorithms

Table 3: Summary of Lessons Learnt

6. Conclusion and Recommendations

Use of a mobile biometrics and management information system enhanced the quality and accountability of the CCT program. The girls were motivated to use the system as they were able to direct their eligibility for the CCT. The mobile biometrics system ensured accurate identification of participants, while the MIS enable management of high-volume data and increased accountability and efficiency in the disbursement of benefits. Just as important were the challenges experienced that needed multifaceted approaches to address at technical, personnel and community level.

Biometrics-based MIS link every encounter to temper-proof unique identification. Access to programs including CCT are less prone to falsification, fraud or manipulation. Android® devices now have many more features, inbuilt iris or fingerprint scanners, higher processing speed and storage making it feasible to build scalable technology interventions for resource-limited settings. We recommend the integration of biometric-based unique identification in MIS implemented using Android® devices to enhance optimal use of resources thus improving the quality and impact of services provided. Further prototyping of these technologies would also document user-experience needs facilitating adoption and scale-up.

References

[1] OECD, D. (2009). The Role of Employment and Social Protection: Making Economic Growth More Pro-poor. In Policy Statement, DAC High-Level Meeting (pp. 27-28).

[2] FAO (Food and Agriculture Organization) (2016). "From Evidence to Action: The story of cash transfer and Impact Evaluation in Sub-Saharan Africa", Oxford Press University.

[3] Debbie, B (2014). CCTs: Learning from the literature, UNICEF & UN women.

[4] Bénédicte B., Laura B. R. (2006). Examining CCT Programs: A Role for increased social inclusion. World Bank

[5] UNICEF (2003). The CCT education program. https://www.unicef.org/turkey/en/conditional-cash-transfer-education-ccte-programme

[6] Fiszbein, A., & Schady, N. R. (2009). CCTs: reducing present and future poverty. The World Bank.

[7] Bauchet, J., Undurraga, E. A., Reyes-García, V., Behrman, J. R., & Godoy, R. A. (2018). CCTs for primary education: Which children are left out? World development, 105, 1-12.

[8] Alan G. and Julia C. (2013). Identification for Development: The Biometrics Revolution, Centre for Global Development

[9] Eva B. (2005). Increasing accountability models by using technology enabled knowledge systems. The Regents of the University of California

[10] World Bank. (2006). A Technology White Paper on Improving Efficiency of Social Safety Net Program Delivery in Low Income Countries: An Introduction to Available and Emerging Mobile Technologies; Third International Conference on CCTs, Washington, D.C.

[11] Cecchini, S., & Madariaga, A. (2011). CCT programmes: the recent experience in Latin America and the Caribbean. Cuadernos de la CEPAL, (95)

[12] Magdalena C. (2018). Is biometric technology in social protection programs illegal or arbitrary? An analysis on privacy and data protection. International Labour Organization

[13] DFID (2011). DFID Cash Transfers Evidence Paper. Policy Division

[14] Austrian, K., Muthengi, E., Riley, T., Mumah, J., Kabiru, C., and Abuya, B. (2015). "Adolescent Girls Initiative-Kenya Baseline Report." Nairobi: Population Council

[15] Austrian, K., E. Muthengi, J. Mumah, E. Soler-Hampejsek, C.W. Kabiru, B. Abuya, and J.A. Maluccio. 2016." The Adolescent Girls Initiative-Kenya (AGI-K): Study Protocol," BioMed Central Public Health 16(1): 1-14