

Project factsheet information

Project title	Link TB with Technology
Grant recipient	Operation ASHA (OpASHA) No. 27B4, Sangkat Boeung Kak II, Khan Toul Kork, Phnom Penh, Cambodia 12152 www.opasha.org
Dates covered by this report	1 – 04 – 2014 / 31 – 05 – 2015
Report submission date	31 – 05 – 2015
Country where project was implemented	Cambodia
Project leader name	Jacqueline Chen (email: Jacqueline.chen@opasha.org)
Team members (list)	Mr Sam Hing, Program Coordinator Ms Pheng Sedavotey, Team Lead Implementing Team Ms Lay Sinoth, Team Supervisor (Prey Kabas Operational District) Ms Ratha, Mr Sitho, Mr Sam Ath, Mr Sopheap, Mr Kosarl and Mr Chenda, Field Supervisors (Prey Kabas Operational District)
Partner organizations	Operation ASHA (India)
Total budget approved	AUD 30,000
Project summary	<p>Operation ASHA is an NGO that provides Tuberculosis (TB) care to the most disadvantaged populations. We have presence in India, Cambodia and our model is replicated in parts of Africa. In Cambodia, we work closely with the Government to implement the TB program in 8 provinces, reaching out to about 15% of the population.</p> <p>Cambodia and South Africa has the highest TB prevalence in the world according to World Health Organization (WHO, 2014). TB spreads very quickly through breath exhaled by patients with active mycobacterium TB in their lungs. Each undiagnosed/ untreated patient infects 12 others, on an average, leading to a geometric progression.</p> <p>Our eDetection App serves to stem TB spread using low cost communications network (3G and tablets) and systematic screening to reach the 80% of the population living in rural Cambodia. The App's geo mapping function allows our mobile field supervisors to identify and react quickly to community hot spots with high TB prevalence to prevent outbreaks. The App also prompts users of the follow-ups required for each TB patient especially useful so that patients don't fall through the cracks due to human error. With the App, we have successfully prevented 4,872 cases of TB and recorded an increase in accuracy of identifying patients with TB by 12%.</p>

Table of Contents

Project factsheet information	1
Table of Contents	2
Project Summary	3
Background and Justification	3
Project objectives	4
Users and uses	4
Indicators	7
Project implementation: understanding the chain that leads to results	8
Narrative - project implementation	9
Project outputs, communication and dissemination activities	16
Project outcomes	18
Project management and sustainability	22
Impact	23
Overall Assessment	25
Recommendations	27
Bibliography	27

Project Summary

Tips: It is recommended to **complete this section once you have finalized the text of the report**. It will be easier to go back through to build the summary based on the highlights of the report the project team just put together.

The Project Summary can be up to **one page long**.

It should include a brief justification; an outline of the project objectives to be achieved; the project real timeline and the main activities conducted.

The abstract of the project written when ISIF Asia initially approved the project and the objectives listed in the Grants Agreement signed by APNIC and your organization should be useful inputs when preparing this section of the report.

Game Changer in TB Detection CAMBODIA

WHAT?

- 17,373 People Screened
- 953 People sent for diagnostics
- 406 registered on TB Geomap

HOW?

- 1: Screening
- 2: Diagnosis
- 3: Contact
- 4: Treatment

IMPACT?

- 4,872 TB cases prevented
- 8% Sputum Positive Rate

User Experience

- App in local language with pictures
- Easy to use
- Increase accuracy of identifying TB by 12%
- Helps me follow-up with my patients better

Visit Demo Booth 1 and contact: Jacqueline Chen, Country Director
jacqueline.chen@opasha.org

isif asia | Operation ASHA
Fighting Tuberculosis Worldwide

Cambodia and South Africa has the highest TB prevalence in the world according to World Health Organization (WHO, 2014). TB spreads very quickly through breath exhaled by patients with active mycobacterium TB in their lungs. Each undiagnosed/untreated patient infects 12 others, on an average, leading to a geometric progression.

Our eDetection App serves to stem TB spread using low cost communications network (3G and tablets) and systematic screening to reach the 80% of the population living in rural Cambodia.

The App's geo mapping function allows our mobile field supervisors to identify and react quickly to community hot spots with high TB prevalence to prevent outbreaks.

The App also prompts users of the follow-ups required for each TB patient especially useful so that patients don't fall through the cracks due to human error.

Impact: With the App, we have successfully prevented 4,872 cases of TB and recorded an increase in accuracy of identifying patients with TB by 12%.

Background and Justification

Tips: The reader should be reminded of the **context** your organization is working, and where the project has been developed in.

This section provides a window to **understand the challenges** faced by the community you are working with.

Include a detailed description about the situation **before the project start**, describing any relevant aspects that make the project relevant in such a particular scenario.

The reader should be provided with a clear description about the problem(s) to be addressed through this project and the motivation from your organization and team members to get involved and offer a solution.

Context: Cambodia continues to shoulder a disproportionate percentage of the world's tuberculosis victims, with a higher prevalence rate of the extremely contagious respiratory disease than anywhere outside of South Africa. In 2014, about 35% of active TB infections in Cambodia are "missed" – either not found or treated. (Phnom Penh Post, 2014). There is an urgent need to scale up detection of these hidden patients to limit potential outbreaks in the community.

Motivation: Operation ASHA has developed an App to bridge the gap between Government's TB programme and undiagnosed TB patients. Using the App, our field supervisors visit families of existing patients, factories where patients work and also go door-to-door in areas they serve. They use the App to educate the community on symptoms of TB, ask them to answer a basic questionnaire, and subsequently facilitate sputum testing and diagnosis of suspects. The App serves to connect patients and form a wireless link with the microscopy centres so that no patient is lost to follow up. By filling the existing gaps, we plan to terminate the chain reaction and not allow any person suffering to fall through the net.



Project objectives

Tips: Please include here the **original objectives** as listed on the Grant Agreement.

If any objectives were modified, added or removed during the reported period this should be explained/justified.

Objective: The key objectives of the project is to

- Increase TB case detection in Cambodia; and
- Improve treatment outcomes for TB patients through early detection

No objectives were modified, added or removed during the reported period of the project.

Users and uses

Tips: Discuss with your project team who would be the future users and how they would use the findings throughout the project lifecycle. The uses identified should relate to the theory of change that you have discussed with your project team. The discussion about theory of change, users and uses, will be a very important input to your communication strategy: depending on who the user is and of what use will be the findings, a communication strategy can be developed. For example, if the users of the findings are policy makers and the use is to influence a change in the regulatory framework, which communication approach will work the best?

Who will be the user of these findings?

What are the more relevant things the project team wants to learn about or evaluate through the lifecycle of this project?

Operation ASHA was one of the three 2014 grant recipients selected to receive additional mentoring in Utilization Focused Evaluation (UFE) and Research Communication under a collaborative project between information Society Innovation Fund and DECI-2.



Under the scheme, mentoring was provided throughout the lifecycle of our project, using a combination of online tools, coaching, and face-to-face interactions by a team of regional experts from the Asia Pacific region namely Dr. Sonal Zaveri, leading the UFE mentoring; and Dr. Vira Ramelan, leading the Research Communication mentoring. In addition, Dr. Ricardo Ramirez and Dal Broadhead, provided backend oversight and support at a regional level.

The evaluation questions below were designed in consultation with the mentors under the mentoring program (see picture below).



Proposed evaluation questions using the Utilization Focused Evaluation (UFE) and Research Communication (Res Comm) Approaches:

UFE

- 1) How has the App contributed to TB care in terms of screening, case notification compared to conventional methods?
- 2) What are the Field Supervisors' challenges and benefits in using the App for TB care and service delivery? What are the lessons learnt for scaling up?

Res Comm

- 3) How to convince the Government (i.e. CENAT) that

OpASHA's eDetection App is a viable alternative to existing solution case finding in the community?

Uses

The objective of the evaluation is to act as a feedback mechanism to enhance the scale up of an upcoming pilot project, which integrates the eDetection App funded by ISIF grant with two other Apps for roll out in Daunkeo Operational District (~200,000 people), Takeo Province as well as to disseminate findings to donors, government and potential adopters to increase funding or uptake of the use of our technology to deliver TB care.

Opportunities for Dissemination

ICT4D 2015 Conference in May: Present App and findings during demo session. This seeks to introduce the App and benefits to an international audience and potential adopters or funders. Sub-Technical Working Group for Tuberculosis Control in Sept 2015: Present to the Government on the results of the technology pilot and propose for part of the technology solution to be adapted for the National Tuberculosis Program.

Users

- Jacqueline Chen, Country Director, Operation ASHA

- Dr Vin Samnang, Program Director, Operation ASHA

Approach to Utilization Focused Evaluation

To evaluate question 1, we need to examine the contribution of the App in two ways, a) comparing the same intervention area, before and after implementation of the App and b) comparing an intervention area (i.e. with the App) and a control area (i.e. without the app), which possesses the similar characteristics. Comparison will be measured using the following indicators:

- No of people screened
- No. of TB suspects sent for diagnostics
- No. of TB suspects testing positive for TB
- Case detection rate = Total positive TB suspects / total screened
- Sputum positive rate (after three months or six months) = Total positive TB suspects (of patients tested negative) / total diagnosed
- TB cases prevented = No. of patients diagnosed x 12 (On average every active TB patient passes TB virus to 12 patients in their lifetime)

To evaluate question 2, we conducted a self-administered questionnaire followed by a focus group discussion with the field supervisors who are using the App in the field.

The written questionnaire was focused on understanding the user experience of the App. Field Supervisors who used the App on a daily basis were asked to rate their experience in different scenarios. For example

- Rating the ease of use based on different functions on the App
- Identifying the type of issues faced with various functions
- Experiences when comparing paper monitoring with App
- Types of issues faced at the onset and now

Questions for focused group discussion with 6 Field Supervisors

- Would you recommend using the App? If yes, why. If no, why
- What would you recommend about capacity building? What should we keep from the earlier training? What should we add? Any other suggestions regarding delivery of training?
- How do you feel about using the tablet now? Earlier? Explain.
- What do you think about using technology for TB detection? Or in any health issue?
- What are your views about the App?
- How has the community responded when you use the tablet and app? Initially and now? If you had to do it again, what would you change?
- How has the public health providers (at health center) responded when you use the tablet and app? Initially and now? If you had to do it again, what would you change?
- What is the impact of this App for the community? For the patients? For you?

Approach to Research Communications

After the conclusion of the evaluation above, we prepared a poster presentation (i.e. infographics) for dissemination at 2015 ICT4D Conference from 15–18 May in Singapore (<http://ictd2015.org/>). We will also be presenting parts of the findings at a Sub - Technical Working Group with the Government in September 2015.

Indicators

Tips: Indicators help to measure project's progress.

Indicators help the objectives that were set by the project team to be affordable, tangible, and measurable.

They help to verify the success and rewrite the course in case we are not achieving it.

An indicator could be quantitative (percentage, amount) or qualitative (perception, opinion).

The ISIF Asia secretariat suggests the SMART approach to indicators:

S Specific
M Measurable
A Achievable (acceptable, applicable, appropriate, attainable or agreed upon)
R Relevant (reliable, realistic)
T Time-bound

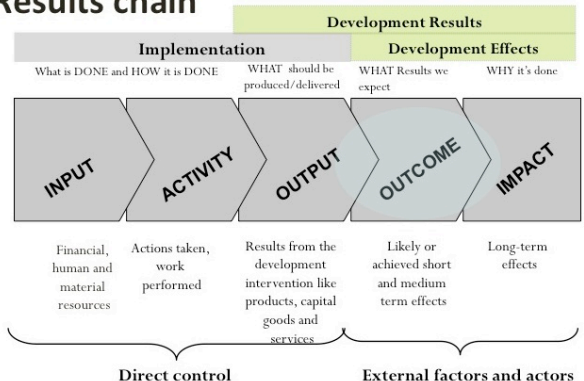
Baseline	Indicators	Progress	Assessment	Course of action
There is no TB App available in Cambodia that systematically screens the community for TB.	There is thus a need to create an App from scratch. The steps to develop an App are: a) Conceptualize design of App b) Program App in English with Khmer language feature c) Set up user testing of App (trial testing in one tablet) d) Installation of App in all tablets	March to May 2014	100% completed We found that setting up an informal feedback loop where the users could provide inputs anytime while using the App was really useful. Based on anecdotal feedback from the field, they shared that it was comforting to know that they were not doing it alone and they had consistent backend support from the Head Office.	Before designing the App, we consulted with the Government (Centre for Tuberculosis and Leprosy control) and World Health Organization to decide on the screening questions and algorithm. This ensured that the premise of the design is technically sound. In designing the App, we also consulted with the field team to map the detection process for a patient. As with all Apps, there is a regular need to review and update the features in the App. Throughout the course of the pilot, we updated the App about 2 times. Before each update, we conducted a feedback session with the field team (i.e. users). After each feedback session, we assessed and categorized the issues based on functions and made tweaks to the interface of the App so that it was more user centric.
None of the members of the field team knew how to use a tablet or an App	These are the milestones for training. a) Drafted training manual b) Translated manual from English to Khmer c) Drafted training curriculum and prepared training materials d) Set up Trained the trainer approach e) Trained the field team	May 2014 to July 2014	100% completed During the project, we started implementing a pre and post test after each training session. This enabled us to immediately assess the level of understanding of the field team at each training session and enabled us to review areas which were	We had to start from the fundamentals for training. This included teaching the team how to use the tablet, how to take care of the tablet and the concept that data from the tablet can be transmitted and stored by a server. When we started training, we found that retention rate was limited because they were learning something completely new. Based on our experience, we found that it was most effective when training for a new topic was followed up with refresher training in the subsequent

			perceived as more challenging. This helped improve the field team's learning experience.	two weeks. This enabled us to better assess the knowledge retention rate of the team and supervise them more closely.
There are no existing care delivery models where the field team uses a tablet in the field in Cambodia	These are the milestones for implementation. a) Select area of intervention b) Select field supervisors for pilot c) Inform key stakeholders of pilot (e.g. health centres, village chiefs, Operational District Chief etc) d) Identify start date e) Conduct field supervision for monitoring f) Set up onsite support	May 2014	100% completed We found that it was important to conduct regular monitoring in on the use of the App in the field. We found that it took time for the field supervisors to get used to using the App instead of the traditional monitoring using pen and paper. Through supervision, we were able to facilitate the correct use of the App more effectively.	For the onsite support, we set up a whatsapp chat group so that issues in the field could be flagged out quickly. Instead of typing the issues, the team used the voice recording function to communicate.
There is no online database available. Excel sheets are used for program monitoring.	These are the milestones for the creation of the database a) Design database b) Program database c) User testing of database d) Syncing database to traditional data reporting.	Jul 2014 to present	100% completed We have set up the database for project monitoring and the database can be accessed in the field by anyone with a username and PW using the internet, though the interface could be improved to make it more user-friendly.	For a team used to paper and pen monitoring in the field, using spreadsheets for program monitoring and owns analogue phone for communications; leveraging on technology (i.e. smart phones, tablets, web-based program monitoring platforms) didn't come intuitively for the Cambodians. We had to train and gradually influence the mindsets of the team to adopt the technology. We had to identify technology champions and worked with them to build up their capacity and set up a train-the-trainer approach so that the knowledge can be transferred and later monitored in the field.

Project implementation: understanding the chain that leads to results

Tips: This is the most important section of the report. Here, the reader will **understand the processes and operational issues** of your project and how they contribute to the achievement of the objectives and the theory of change behind the project implementation. Is possible that the project team's understanding of the development problems to be addressed with this project will have evolved or **changed** from those described when the project was originally submitted and approved. If that is the case, please share what motivated the change and what course of action has the project team identified.

Results chain

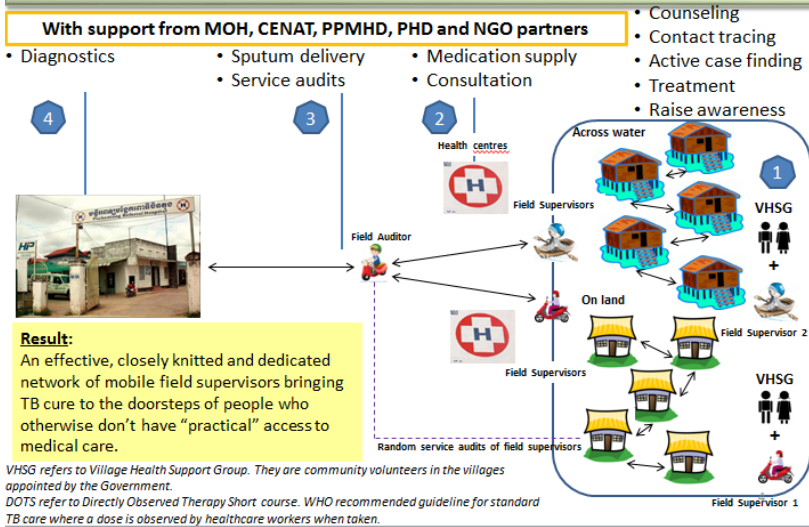


Results chain diagram provided by In Develop

Narrative - project implementation

Problem Statement: Cambodia has the highest TB prevalence in the world (tied with South Africa). Most cases of TB remain latent after infection by the *Mycobacterium tuberculosis* (Source: Global Health 101). An estimated 64% of Cambodians are infected with the TB bacteria, this makes them at high risk of contracting active TB (Source: WHO). As the fourth leading cause of death in Cambodia, TB is responsible for an estimated 66 deaths per 100,000 people. However, in 2014, about one third of TB cases in Cambodia remain undetected. There is an urgent need to scale up detection of these hidden patients to limit potential outbreaks in the community.

Mobile DOTS model: avoids duplication, optimizes use of existing Government infrastructure



Operation ASHA's traditional model: Operation ASHA provides TB care at our patients' doorstep (see diagram above). We do this by training and hiring a mobile field team or village health support groups (VHSG) from the local community. The size of the mobile field team (i.e. comprising of field supervisors and field auditors reporting to a team supervisor) is dependent on the population in each Operational District. Every day, our field supervisors travel from village to village on their scooter. They do door to door TB screening, collect sputum from people with signs and symptoms of Tuberculosis and work with the field auditor to collect and send sputum to the nearest laboratory for diagnostics. When the diagnostics are done, Field supervisors inform the villagers of

the results. Villagers with Tuberculosis are enrolled for treatment. During TB treatment, the field supervisor meets the patient to provide Directly Observed Treatment (Short Course), as per guidelines by World Health Organization and National Tuberculosis Program in Cambodia.

Operation ASHA's model with technology: Operation ASHA's field supervisors carry tablets when they go door to door to do screening in the community. Rather than using pen and paper to note down the details of the patients whom they have screened, they key in the details on the App, which enables easy retrieval next time.

The App is loaded with screening questions and an in-built algorithm. Depending on responses to the screening questions, the App may suggest different follow-ups for each patient. Mobile field supervisors use the App to systematically screen for TB in the community and follow the instructions on the App to facilitate diagnosis. This ensures accuracy and consistency.

The App, with the geo mapping technology helps our field supervisors locate TB suspects more easily. As there is no structured address system in Cambodia and our field supervisors navigate the local terrain based on memory. It will also help our field supervisors map out TB clusters so that they can calibrate their efforts to tackle areas with high TB concentration. This ensures faster response time by our field supervisors.

The real time data entry from the App will facilitate better patient management and follow-ups on detection and diagnosis. It serves to remind our field supervisors on the key follow-ups such as diagnostic tests to carry out based on the in-built TB algorithm. This improves efficiency of care delivered.

With the features above, the likelihood of human error in screening will be reduced. As the App also prompts the field supervisor on next steps required, it ensures that each patient is followed up diligently.

Partnership: We worked closely with the National Tuberculosis Program, Provincial Health Department, Operational District and Health centre public health care team as well as the community on the project. The relevant parties were consulted prior to implementation. The Government also provides free TB treatment and diagnosis for our patients.

Gender Influence: OpASHA offers equal opportunities in jobs and promotion regardless of gender. In OpASHA, 33% of the field team and 80% of the team supervisors are female. Of the 9 people involved in this project team, 45% were female. We also provide accessible, quality and affordable TB care in a sustainable way equally to both genders. Under OpASHA's grassroots, high impact TB care model, the mobile field supervisors will go door-to-door to share about TB and to identify persons who may display TB symptoms, targeting both male and female dominated households.

Technical Aspect

Lessons from Deployment: One of the challenges we faced during deployment was the syncing process between the tablets in the field and the server. The 3G coverage in Cambodia has been improving, but there are still many areas in the province where 3G access remains unreliable and limited. This means that data from the tablets are not always sync completely and sent to the central database. Initially, we made a switch to another telecommunications company but the improvements were minimal. Thereafter, we identified areas in the Operational Districts where the 3G network was strong and advised the field team to gather at these locations to sync their tablets daily. This improved the syncing process.

Another issue we faced was that our field supervisors started using the tablets for their personal use after working hours. We had no issues with this in the beginning. However, we observed that the multiple apps that the field team downloaded for their leisure started to slow down the speed of the tablets considerably, affecting the performance of the eDetection App. The management thereafter decided to clean up the tablets and locked

the tablets so that only required Apps can be downloaded into the tablet. The performance of the App and tablet improved considerably thereafter. The field team though disappointed, understood the management's decision. Design Process of the App: There were three main stages to the designing process. Stage 1 was to map out the screening questions and the functions that we require on the App. Stage 2 was to decide on the algorithm and the flow process of the App and Stage 3 was to program the App.

During stage 1, we researched on the list of screening questions that were recommended by World Health Organization (WHO), and then consulted with the Medical Officer at WHO (Cambodia) to shortlist the questions that were more relevant to the epidemiology of Cambodia's population. The order of the screening questions was ranked based on the guidelines from Centre for Tuberculosis and Leprosy Control (CENAT).

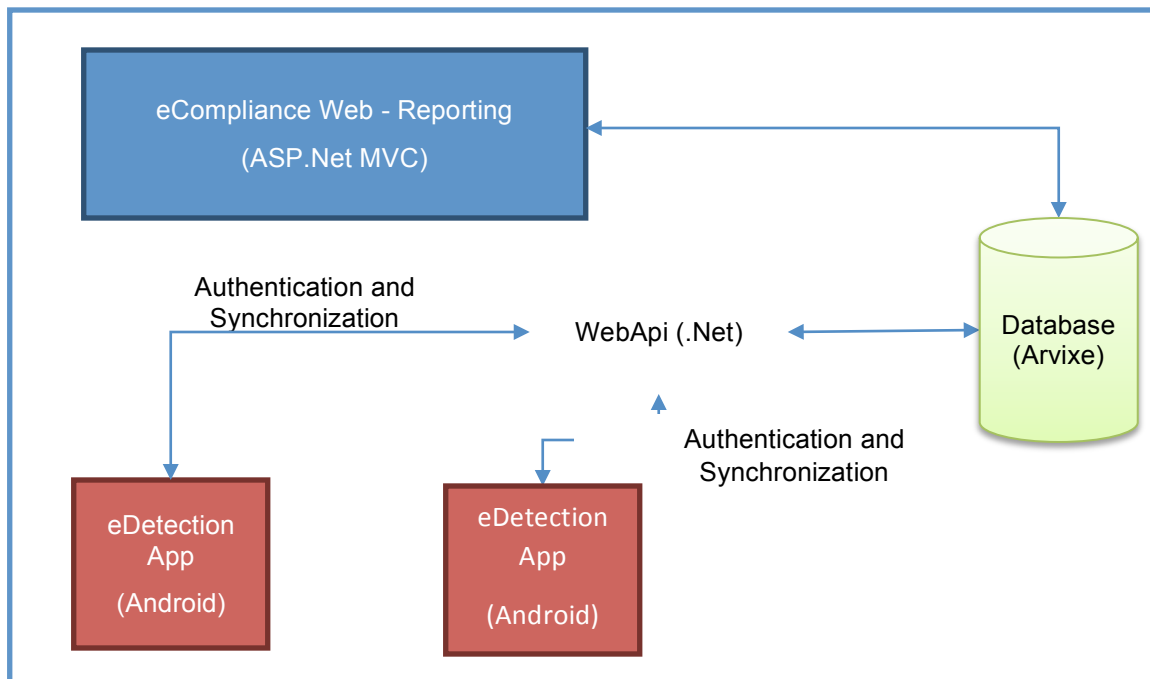
To decide on the functions required in the App, we started by mapping the workflow process of the field supervisors. We decided that there should be a contact details section before proceeding to the screening questions. We then listed down the different status a patient could have by mapping it into the TB care pathway. We found that these were the main stages – sputum result pending, antibiotics medication, repeat sputum result pending, X-ray pending and outcome of diagnostics (i.e. positive, negative archived or archived).

At stage 2, we referred to CENAT's diagnostic guidelines for Tuberculosis on the standard screening workflow. We adopted it for the App and added in an additional screener based on the risk groups of the patient. The new screening methodology for high risk groups was a recent addition by the WHO and was slowly gaining traction hence we decided to stay ahead of the curve and added that screening feature into the App. With high risk group, the screening algorithm was slightly different from the standard scenario. Lesser symptoms needed to be checked before symptomatics were flagged out for diagnostics because of their higher susceptibility to TB.

During the initial stages of design, the active case finding and contact tracing interfaces were running in parallel. This meant that a patient who was screened for TB in the community needed to be added again into the App under contact tracing. Contact tracing is a requirement for close contacts of a patient with a positive TB diagnosis. In the updated versions of the App, we enhanced it such that the patients from active case finding could be ported over to the contact tracing without the field supervisors re-entering the data. Another feature that was added was the re-screening function. As per guidelines for Cambodia, TB patients needed to be screened on a regular basis during their course of TB treatment. At the onset, there was no re-screening option. This was subsequently added based on feedback from the field supervisors. We added a search feature so that Field Supervisor could search through their past patient entries and retrieve their records in the tablet instead of adding a new entry. In future upgrades of the App, we also intend to add in an automatic SMS feature that reminds the field supervisor of re-screening schedule to ensure that re-screenings are done on time in the field.

For stage 3, the programming of the App was done by the technology team in India.

Specifications of the App: The App works on a client server paradigm and has two components – Server (Reporting System and Central Database) and the Android based App.



The server is a web based .Net Application (**ASP.Net MVC 5, WebApi**) and is connected to **SQL Server**. The reporting and database is hosted on a 3rd party web server, which is also connected to the local server based in India, which creates a daily backup of the data and reporting.

The reporting system is hosted online and is available from any part of the world. In order to access the system, one will need a user Id and Password. Each user is associated with a profile that controls what reports are available to the user, what locations are available, etc. The reports in the system are available for export in PDF and XLS (Excel) format.

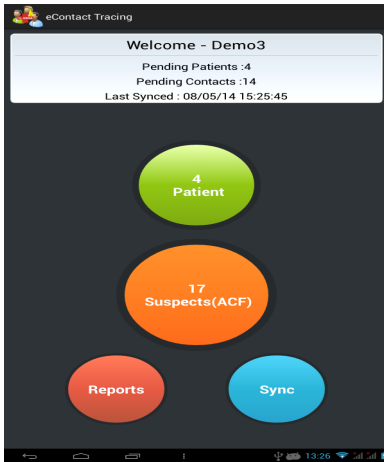
The client app is built on Android SKD 16 and is available for 7" tablets with Android 4.0+. The system is password protected, which requires a user id and password and is authenticated from the server. The system creates a local PIN in cases when the machine is offline and cannot work on online mode. On successful authentication, the system can register new suspect and track the detection process. Once a suspect is found positive, the system sends the data of the suspect to Database using the WebApi Interface. The reporting system uses these data to show reports for analytics.

Hardware and Software Requirements:

- eDetection Application
 - a. Android Tablet – 7"
 - b. Android 4.0+
 - c. SIM Card with 3G
 - d. 512 MB RAM, 2 GB HDD

Interface of eDetection app for Case Finding in the Community (English Version)

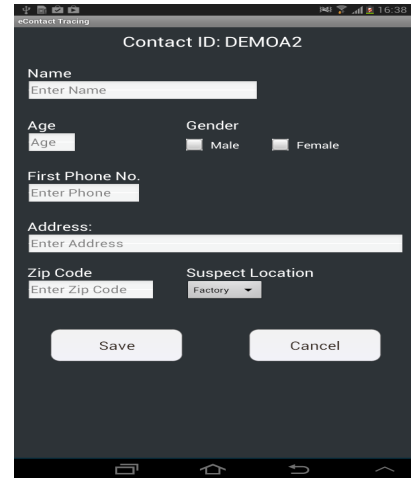
Step 1: Login to Status Page



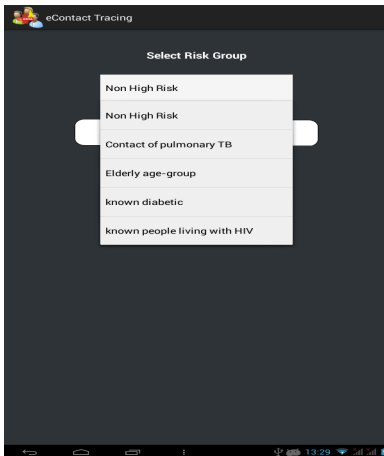
Step 2: Add Patient



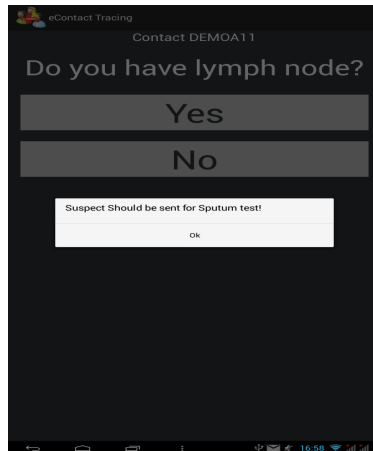
Step 3: Key in Details



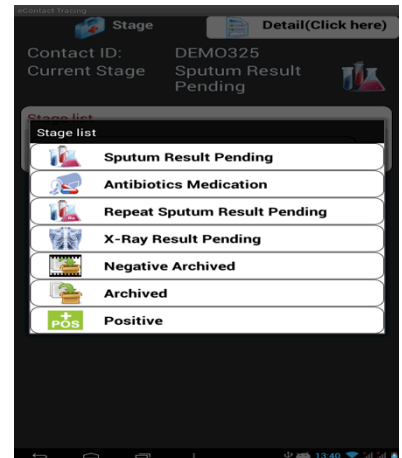
Step 4: Start Screening



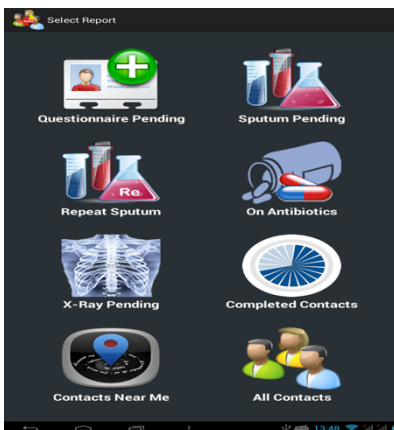
Step 5: Prompt for follow-ups



Step 6: Update status based on stages of care



Step 7: Check reports based on patient status



Interface of eDetection App for Case Finding in the Community (Khmer Version)

Step 1: Login to Status Page



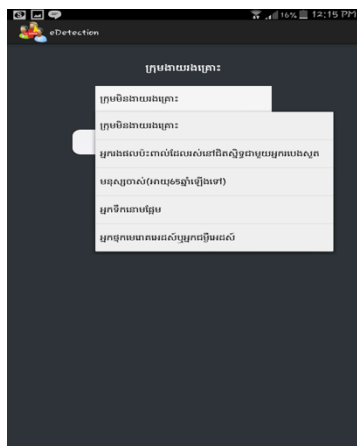
Step 2: Add Patient



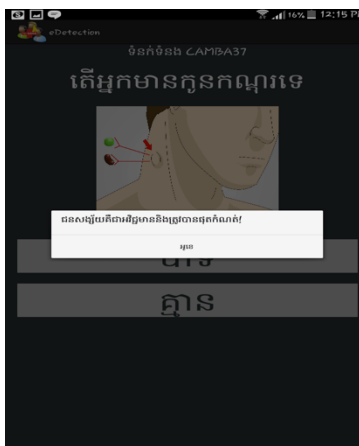
Step 3: Key in Details



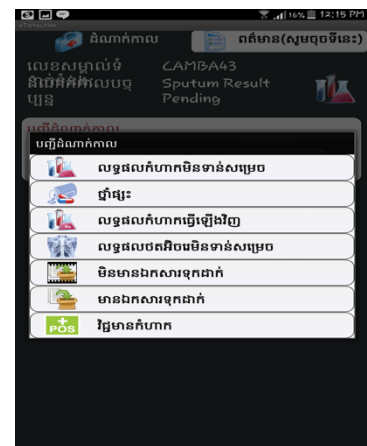
Step 4: Start Screening



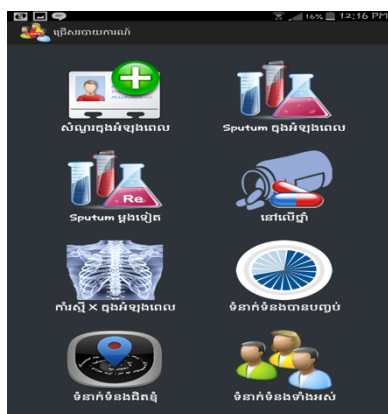
Step 5: Prompt for follow-ups



Step 6: Update status based on stages of care



Step 7: Check reports based on patient status



Input	Project activities	Outputs	Outcomes	Timeline	Status	Assessment
Worked with Technology team to create eDetection App	<ul style="list-style-type: none"> a) Conceptualize design of App b) Program App in English with Khmer language feature c) Set up user testing of App (trial testing in one tablet) d) Installation of App in all tablets 	<ul style="list-style-type: none"> a) Produced draft design of App b) Identified data field for translation and program the app c) Version 1 of App is produced d) Version 2 and 3 were produced subsequently with fixes for existing features 	Completed the development of eDetection App	Mar to May 2014	Completed	Screening is more systematic and consistent as Field Supervisors have to go through all screening question at each seating.
Trained project and field team	<ul style="list-style-type: none"> a) Drafted training manual b) Translated manual from English to Khmer c) Drafted training curriculum and prepared training materials d) Set up Trained the trainer approach e) Trained the field team 	<ul style="list-style-type: none"> a) Developed 1 x App user manual b) Developed 1 x set of training materials for field team c) Developed 1 x set of competency test for field team 	Completed training of 3 project staff and 6 field staff in using the App	May to Jul 2014	Completed	We found that we were getting similar questions and queries from different field supervisors. Hence, we compiled a list of frequently asked questions and translated it into Khmer. We added the FAQs to the appendix of the training manual.
Worked with field team to Pilot App	<ul style="list-style-type: none"> a) Select area of intervention b) Select field supervisors for pilot c) Inform key stakeholders of pilot (e.g. health centres, village chiefs, Operational District Chief etc) d) Identify start date e) Conduct field supervision for monitoring f) Set up onsite support 	<ul style="list-style-type: none"> a) Identified Prey Kabas Operational District (OD) as target area for the pilot b) Identified areas for intervention and control group c) Notified stakeholders and community leaders of the pilot at monthly meetings d) Deployment started in May 2014 e) Developed supervision checklist and schedule for monitoring f) Created mechanism for onsite support and feedback loop for assistance 	Successfully deployed eDetection in the field	May 2014	Completed	In the first three months of deployment, we found that there were multiple issues with the App which we fixed on the go. For example transfer of the TB positive patient from case finding to contact tracing interface. The initial version required typing the patient data twice which would appear as a duplicate in the system. We were subsequently able to address the issue by allowing patient data to be ported from one interface to another. With the strong feedback mechanism between the field and the HO, we were able to address these issues quickly.

Worked with Technology team to create database	a) Design database b) Program database c) User testing of database d) Syncing database to traditional data reporting.	a) Developed database to monitor and extract data from the field	Successfully deployed web-based platform	Jul 2014 to present	100% completed	Have set up the database for project monitoring and the database can be accessed in the field by anyone with a username and PW using the internet. For future versions of the web platform, we will need to improve the design so that it is more user-friendly. Although the web platform captures the data, it remains difficult to extract data in the users' preferred format for analysis.
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Project outputs, communication and dissemination activities

Tips: Take into account that the reader of your report has not been involved in project implementation, so readers do not have any further knowledge besides the information you are providing here.

This section of the report will allow you to document the communication and dissemination efforts that the project team has conducted, which might be part of a specific communication strategy design as part of the project, or in place for the organization as a whole. When possible, please provide information about strategies in place and the rationale behind them.

Lessons can be learned from many aspects of project implementation, covering a wide variety of aspects such as technical, social, cultural and economical. Taking the rationale behind the project and its objectives can serve as a framework to draw your conclusions. Lessons can be identified by project partners, beneficiaries and general staff from the organization. A project diary and other activity records can serve as a tool to reflect during project team meetings and immediately after project activities are conducted.

Outputs are immediate, visible, concrete developmental change that is the tangible consequence of project activities, under direct control of the project team.

Example of possible outputs to report are:

- New products and Services (software, online platforms, applications);
- Information sharing and dissemination (publications, conferences, multimedia, social media);
- Knowledge creation (new knowledge embodied in forms other than publications or reports, such as new technologies, new methodologies, new curricula, new policies);
- Training (short-term training, internships or fellowships, training seminars and workshops) and
- Research Capacity (research skills; research management capacity and capacity to link research to utilization of research results).

Project outputs	Status	Assessment	Dissemination efforts
Successfully developed the eDetection App	Completed	The technical issues raised earlier in the report have been addressed through subsequent App updates. A total of 3 versions were created. The	1) Technology demonstration at ICTD2015 in Singapore (as detailed earlier). The team was given a platform to showcase our eDetection App to conference participants.

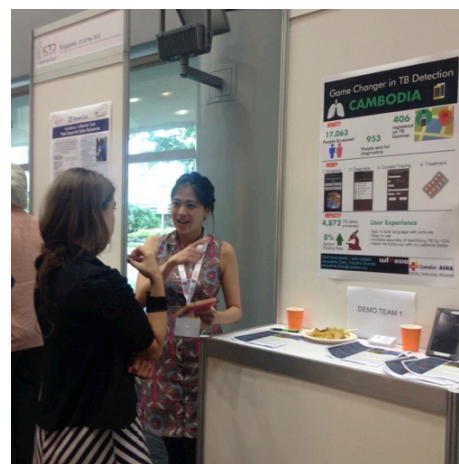
		original and 2 updates which featured fixes in several features.	<p>2) Joined a networking session at <u>Joyful Frog Digital Incubator</u> in Singapore. Networked with industry players and made a one minute pitch on eDetection App</p> <p>3) Secured a presentation session at the quarterly sub technical working group meeting on Tuberculosis with the Government. We are proposing that parts of the technology can be adopted for the National Tuberculosis Program in Cambodia (i.e. <u>Centre for Tuberculosis and Leprosy Control</u>). eDetection will be one of the Apps that we will be presenting on in Sept 2015.</p>
Successfully developed user manual and training materials for App	Completed	<p>The manual details all functions in the App and serves as good reference for new and existing users</p> <p>Training materials are slides that are designed in a modular fashion and provide step-by-step guide on using the App</p>	The manual and training materials will be reused to train new users when we expand the pilot under another grant funding.
Successfully developed online database through the web	Completed	<p>The online database is fully functional. To improve usability, there is a need to improve the layout of the webpage design and ease in extracting data in the format that the user requires.</p> <p>For the dashboard, users should also be able to customise the indicators for display so that it is useful for project monitoring.</p>	The weblink can be found here .

Technology Demonstration in Singapore

The Operation ASHA team from Cambodia attended the International Conference on Information and Communications Technologies and Development (ICTD 2015) in Singapore from 14th to 18th September 2015. We were selected to do a demonstration of our eDetection App.

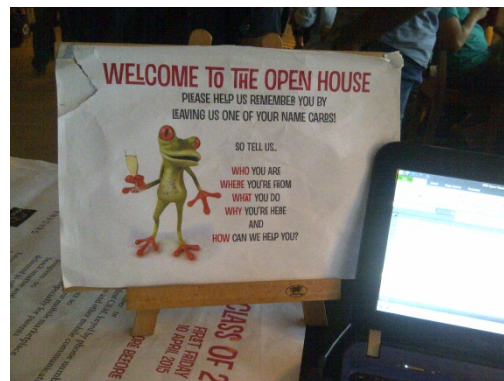
During the conference, we were given many opportunities to share about our App and our experience in implementing the project. More details below:

- Seed alliance session on 15th May 2015: Round table to showcase regional programs organized by seed alliance. Recipients from regional funds under the Seed Alliance were also provided with an opportunity to share about their projects and challenges in bringing positive change to their communities through ICT. As one of the recipients of ISIF Asia funding, we were also invited to provide a brief introduction of our work.
- Demo Madness on 16th May 2015: During Demo Madness, each demo presenter was allocated 30 second to introduce their demo idea/artifact. Thereafter conference participants were encouraged to visit all demo booths during the 3 hour demo session. This was particularly useful as there was strong interest in our App and we were able to network with many people at the session.



Joyful Frog Digital Incubator (JFDI) Open House

As part of the conference, ISIF also arranged for a special networking session at JFDI. JFDI Open House is a weekly Friday gathering where innovators, students, budding entrepreneurs and potential investors gathered to network and talk about their latest creation. The venue was a café co-located with a startup accelerator firm at Ayer Rajah Crescent (Singapore). During the open mic session, ISIF grant recipients (such as Operation ASHA), was given the opportunity to share about their work. It was a very fruitful session as we met like-minded people who were working on really innovative projects and the positive feedback/vibe was very encouraging.



Project outcomes

Tips: This section should be completed **ONLY** for the final report.

ISIF Asia expects you to report about the **outcomes** of the project as defined in the table below, based on the project implementation section of this report. Project team is encouraged to discuss the questions provided below to guide the reflection:

Can you identify and describe the relationships between the activities implemented and the social, economical, cultural and/or political benefits of your project implementation?

Outcomes can be defined as:

- Medium-term effects
- Effect of a series of achieved outputs
- Should capture the changes for the beneficiaries
- Take place during the life of project/strategy
- Influence but not direct control

This project contributed to creating positive change in the following ways:

- 1) **Increased TB detections:** Using the App (in 11 months), we screened 17,373 people for TB and sent 953 people for diagnosis. 406 people were tested positive for TB and enrolled into the TB treatment program. To find out the additionally due to the App, we compared the results of the pilot with a control group. The intervention group comprised of 6 randomly selected field supervisors and the control group comprised of 4 randomly selected field supervisors. All field supervisors were working in the same Prey Kabas Operational District, Takeo Province and assigned to a health centre. The only difference was the use of technology.

With the App with found that

- **10% more people were screened under the intervention group compared to the control group.** However, there was a 23% drop in number of people screened when we compared results before and after the pilot. We found that this was due to the longer time taken to register the patient on the tablet. Previously the field supervisors did not need to note down the details of the people screened, just the number of people screened. The longer time taken for screening led to a drop in numbers screened.

- **16% more people were sent for diagnostics under the intervention group compared to the control group.** This means that the App made it more systematic in selecting people that the field supervisors should follow-up on. The result was also consistent when we compared the results before and after the pilot.
- **44% more TB symptomatics were tested positive for TB under the intervention group compared to the control group.** While there could be a possibility that the group of field supervisors under the intervention group was more effective in detecting TB from the onset, we also found a **similar trend when comparing results of the intervention group before or after the pilot with a smaller increment of 12%. This could mean that the App helped increase the accuracy of detecting TB patients by minimally 12%.**
- **There is a marginal increase in case detection rates of 0.55% under the intervention group compared to control group.** This is consistent with 0.72% increase when comparing results of intervention group before and after the pilot. The marginal increase in case detection rates could be due to a more sensitive algorithm applied to people who fell into the high risk group.
- We also tested the sputum positive rate, after three months and six months after first screening, through random sampling, **we found 5% displayed signs and symptoms of TB.** This was consistent with the findings of the overall program.
- Based on the number of TB cases found, we also estimated that 4,872¹ cases of TB were prevented in the community. This was estimated based on the likelihood that one TB person on average infects 10-15 other close contact over the course of the year.

Key findings are summarized in the table below.

S/N	Description	Pilot – Non Pilot	Pilot (after) – Pilot (before)	Findings
1	No. of people screened	10%	-23%	Our field supervisors found that they had to spend more time introducing themselves and app before they could start screening in the community. Hence the decrease in number of people screened.
2	No. of suspects sent for diagnosis	16%	19%	With more systematic screening using the App, more people were sent for diagnosis.
3	No. of TB symptomatics testing positive for TB	44%	12%	Of the pool that were tested, 12% more were found to have TB.
4	Case detection rates	0.55%	0.72%	Case detection rates increased marginally.

- 2) **Field Supervisors found the App useful:** Through a self-administered questionnaire followed by a focus group discussion with the field supervisors using the App, we found that the top three most useful functions on the App were medical record keeping, in-built prompts for patient follow up and the geo-mapping function. We found that while, contact tracing and detection were also useful, the issues faced with these two

¹ Calculated based on 406 x 12 (average of 10 and 15) = 4872. When a person develops active TB (disease), the symptoms (cough, fever, night sweats, weight loss etc.) may be mild for many months. This can lead to delays in seeking care, and results in transmission of the bacteria to others. People ill with TB can infect up to 10-15 other people through close contact over the course of a year. Without proper treatment up to two thirds of people ill with TB will die. (Link: <http://www.who.int/mediacentre/factsheets/fs104/en/>)

functions in the initial phase, had an impact on users' perspective on its effectiveness. The most challenging aspect of using the tablet appears to be the syncing, as pointed out earlier due to the limited connectivity of telecommunications in the province. This is an area which we hope would improve as Cambodia continues to develop its telecommunications sector. More details of the aggregated findings can be found below.

S/N	Description	Functions	Findings
1	Rating use based on different functions in the App	Detections Medical Record Keeping Contact Tracing	Top three most useful functions were Medical record keeping, follow-up with patients and geo mapping.
2	Identifying the type of issues faced with various functions	Follow-up with Patients Geo Mapping Productivity	Faced some challenges when using these functions Contact tracing and detection.
3	Experiences when comparing paper monitoring with App		App is much better than conventional for Medical record keeping, follow-up with patients and geo mapping.
4	Type of issues faced at the onset	Network connectivity Switching on 3G Syncing with server Tablet hangs Tablet is slow	At the onset, our field supervisors faced issues with the network and tablet. The network was spotty and the tablet kept hanging. This affected detection in the community as it took a long while for the tablet to recover and respond. We solved the issue by switching telecommunications network and locked the tablet. We found that the tablet was not performing optimally because there were too many other Apps downloaded in the tablet by the Field Supervisors.
5	Type of issues faced now	App not responding Forgot how to use App	With daily practice, we found that our field supervisors became more confident and seasoned in using the Apps, though some still cited syncing with server as an issue.

Responses from focused group discussion with 6 Field Supervisors

- Would you recommend using the App? If yes, why. If no, why

All field supervisors said they would recommend using eDetection App for TB detection and contact tracing. Most of them cited that using the App increases authenticity of data collected in the field, compared to paper monitoring and reporting.

- What would you recommend about capacity building? What should we keep from the earlier training? What should we add? Any other suggestions regarding delivery of training?

The theory, practical and quiz components for capacity building were useful. On site supervision and field audits on the use of the tablets by the Team Lead also helped them improve, as they were being observed and mentored one-on-one. The Field supervisors agreed that to use the App well, daily practice is needed.

- How do you feel about using the tablet now? Earlier? Explain.

The general sentiments were that when the pilot started, using the tablet was hard. They were happy to receive the tablet, but everyone had to learn how to use the tablet and thereafter the App from scratch. Most of the field supervisors were using analogue phones before the tablet. The tablet brought prestige when they went into the

community to do detections, but it also was a boon when the villagers were initially skeptical and asked many questions about the tablet.

- What are your views about the App?

Field supervisors commented that the App is useful because it reduces paper recording, increases authenticity of data collected in the field and helps identify people with the correct signs and symptoms for TB. The downside to the App is that it takes up more time typing in the information of people screened into the App, this reduces the number of people the field supervisors can screen in one day. With lesser people screened, this impacts the number of people detected with TB.

- How has the community responded when you use the tablet and app? Initially and now? If you had to do it again, what would you change?

Initially, field supervisors said that the communities screened were not very open to giving personal details to register for screening. They had to explain us over and over again. With time their efforts paid off, the communities became more aware about the project and they appreciated the field team's efforts to do more systematic screening and hence were willing to provide their details to register for screening.

- How has the public health providers (at health center) responded when you use the tablet and app? Initially and now? If you had to do it again, what would you change?

No difference. Field supervisors all said that they have built a good working relationship with the Health Centres since the start of OpASHA's TB program in the area and the public health care staff are supportive of our work and intervention in the community.

- What is the impact of this App for the community? For the patients? For you?

The App made me busier because I have to spend more time keying data into the tablet for each person screened. In the past, I could just ask verbally and move on quickly but not anymore. I understand that it helps with record keeping but it makes me busier. I like using technology in my work in general but sometimes it is frustrating when the tablet or App doesn't work the way it is supposed to. I have to call my Team Lead and head Office to help me when this happens.



Project management and sustainability

Tips: Please comment on the general project **administration, staffing, procurement, etc.** specially those aspects contributing to the fulfilment of the project objectives as well as those that have delay project implementation.

Indicate **how the project team has strengthened its capacity** and work towards sustainability with the support provided by ISIF Asia? (new equipment, training, improved administrative skills, lessons learned from the project). Has the organization increased its research or administrative skills of the team involved? Has the project allowed for a particular contribution to capacity building of women or marginalized social groups? Special attention should be paid to the expected or unexpected impact on marginalized social groups.

Have you done **anything different** to provide administrative support for this project **besides your “business as usual”** processes and procedures? Has the project inspired change inside your organization?

Sustainability is to be examined not only in terms of staff retention and financial stability of the organization supporting the project but about the communities’ appropriation of benefits perceived from project implementation.

The ISIF Asia Secretariat is very interest to learn if this project has generated opportunities for future development (new funding from partnerships, sponsorships, investment or other funding mechanisms), please provide details.

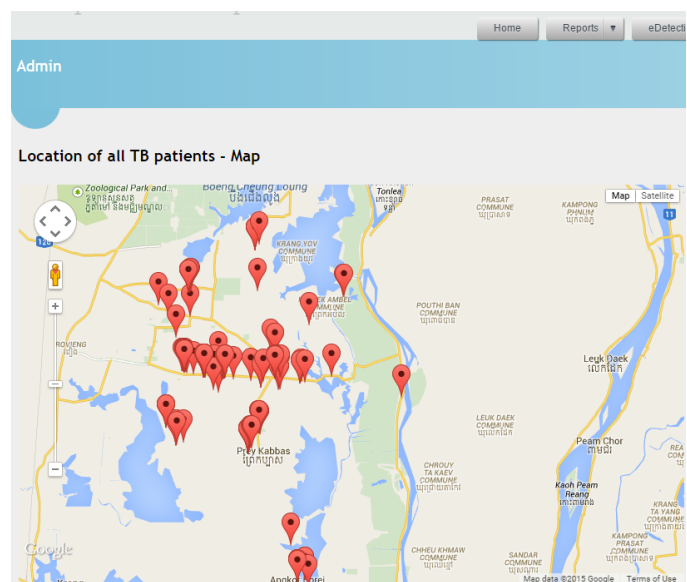
Please explain if the ISIF Asia grant has helped to consolidate your organization and how. If any of the project activities will continue after the end of the ISIF Asia grant, please describe how your organization is planning to support future developments.

Procurement: We purchased 7 tablets with funds from ISIF to kick-start this pilot. The tablets are used by mobile field supervisors to do door to door TB screening in the community. The investment from ISIF has enabled us to pilot the App across six health centres in Prey Kabas Operational District and reach out to 84 villages (approx. 93,500 people)

Technology: With the seed funding from ISIF, the Cambodia Country Office was able to set aside time and resources to innovate. The Cambodian Country Office, with support from our technology team, designed and created eDetection App to strengthen case finding and contact tracing by collecting patient details (i.e. high risk group), posing a standard questionnaire to screen for signs and symptoms of TB and based on an in-built algorithm, prompt the field supervisor on follow-ups.

Advantages of using the App include:

- Geomapping of TB hotspots in the community using global positioning system
- Real time data from the tablets are synced to a central server and can be extracted for program monitoring
- Patient details from the Tablets form part of an electronic medical record
- Ensure patients are followed-up according to protocols



Capacity development: With ISIF's support, we were able to build up the capacity of project team and field team to use technology in their work. Our local project team and field team started with no knowledge of using an android tablet or an App. Through the pilot, funded by ISIF, the local teams were trained and supervised to use their tablets effectively at work, leverage on the App to increase their ability to find TB cases in the community, thus benefitting the larger Cambodian community.



Opportunities: The initial funding from ISIF has enabled us to secure more funding from other donors (such as CLSA Chairman Trust, USD 100,000 for one year) to expand our pilot. We have received additional funding to integrate

eDetection App with 2 other Apps that track the diagnostics results and treatment adherence and to scale up the TB management solution in Daunkeo Operational District (i.e. another operational district) in Takeo province. We have also secured the buy-in from the Government for the aforementioned expansion.

Sustainability: We plan to expand our eDetection pilots to other Operational Districts in Cambodia.

Impact

Tips: This section of the report does not refer to the project activities, but about the “bigger picture”. It will be desirable if the project team can reflect on the **impact that the project has contributed to as part of other actions implemented by your organization and/or your partners.**

Impact refers to the influence the project may had on the way people does things through the use or adoption of the project outputs; changes in the context the project was implemented; changes in the community the project has been working with; and/or changes inside the organizations that have participated in the implementation or the relationships established through the project's implementation.

Impact is often impossible to measure in the short term and is rarely attributable to a single activity. Impact can be linked to a vision or long-term development goal that your organization might be working towards.

It can be identified as a logical consequence of achieving a combination of outputs and outcomes.

Impact is usually measurable after the project life and is outside the direct control of the project team and the organization.

Our Transition to Electronic Data

One of the key impacts from the pilot funded by ISIF is the team's gradual transition to using electronic data and extracting data from online platforms for program monitoring. With the eDetection App, we were able to send the encrypted data to a central database and have it presented in the above format, where we are able to track at a glance - the patient details, signs and symptoms and stage of care.

eCompliance Web - Operation Asha Hello, jacqueline.chen@opasha.org! Log off

Home Reports Contact Tracing Lab Alert Diabetes

Reports

ACF Report

FILTER CRITERIA

Start Date: End Date:

ACF REPORT BETWEEN 1-1-2014 AND 25-8-2014

CONTACT ID	CONTACT NAME	AGE	GENDER	HIGH RISK GROUP	LOCATION	PROLONGED FEVER	LOSING WEIGHT	LONG TERM COUGH	NIGHT SWEATS	LYMPH NODE GREATER THAN 2CM	LYMPH NODE	STAGE	STAGE DATE
CAMBB7	Oun Phorn	46	M	NONHIGHRISK		NO	YES	NO	YES	NO	NO	Sputum Result Pending	5/12/2014 11:09:59 AM
CAMBB8	Chea Khom	73	M	1		NO	YES	YES	YES	NO	NO	Sputum Result Pending	5/12/2014 11:19:53 AM
CAMBC22	Sung Yeang	56	F	NONHIGHRISK		YES	YES	YES	YES	NO	NO	Sputum Result Pending	5/16/2014 2:13:27 PM
												Sputum	5/19/2014

eCompliance Web - Operation Asha Hello, jacqueline.chen@opasha.org! Log off

Home Reports eDetection Lab Alert

History for Contact: CAMBB2600

STAGE NAME	STAGE DATE
Questionnaire Pending	4/6/2015 3:35:43 PM
Sputum Result Pending	4/6/2015 3:36:01 PM
Antibiotics Medication	4/7/2015 8:35:54 AM
X-Ray Result Pending	4/7/2015 8:39:08 AM
Positive	4/7/2015 8:40:07 AM

Total Days - 0

Past Data

STAGE NAME	STAGE DATE
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When we click on the patients' ID, we are able to track the history of the diagnostic process for the patient and whether they were followed up in a timely manner according to care protocols. This is important for program monitoring and enables the Head Office to do random audits to verify that our patients have early access to diagnostics and treatment after they are screened to reduce the risk of the spread of TB.

ISIF grant funding has facilitated Operation ASHA (Cambodia)'s first step towards using mobile technology to enhance TB care delivery and build up a cost effective and user centric TB electronic database for monitoring. This pilot has enabled a mindset change in the local team's view of using technology and build up a positive response to upgrading their skills, albeit at different pace for each individual.

Overall Assessment

Tips: This section of the report is extremely valuable for the ISIF Asia secretariat as it provides evidence about the role and relevance of ISIF Asia contributions in the Asia Pacific region.

Tips: Briefly provide your own views on the value and importance of the project relative to the proposed innovation, investment of time, effort and funding involved. Include the strengths and weaknesses of the project and the steps taken to strengthen the credibility and reliability.

This is your opportunity to conduct a team reflection about the value of the project for the organization. The following questions might help you to prepare a substantive overall assessment.

- To what extent the project meet its objectives?
- What were the most important findings and outputs of the project? What will be done with them?
- What contribution to development did the project make?
- Were certain aspects of project design, management and implementation particularly important to the degree of success of the project?
- To what extent the project help build up the research capacity of your institution or of the individuals involved?
- What lessons can be derived that would be useful in improving future performance?

To what extent the project meet its objectives:

The key objectives of the project were

- Increase TB case detection in Cambodia; and
- Improve treatment outcomes for TB patients through early detection

The project met its objectives because

- We were able to increase accuracy of TB case detection by 12% using the App
- Treatment outcomes for OpASHA is 94%, slightly higher than the national TB program in Cambodia

What were the most important findings and what will be done with it?

Key finding

- Using technology to aid systematic screening and mapping to TB in rural Cambodia can be effective

To do

- Use the findings and learning from the pilot to improve the implementation of our next technology pilot project in the pipeline

What contribution to development did the project make?

- 17,373 people screened for TB
- 953 people sent for diagnosis
- 406 people registered on TB map

Were certain aspects of project design, management and implementation particularly important to the degree of success of the project?

The following factors contributed to the success of the project:

Project Design:



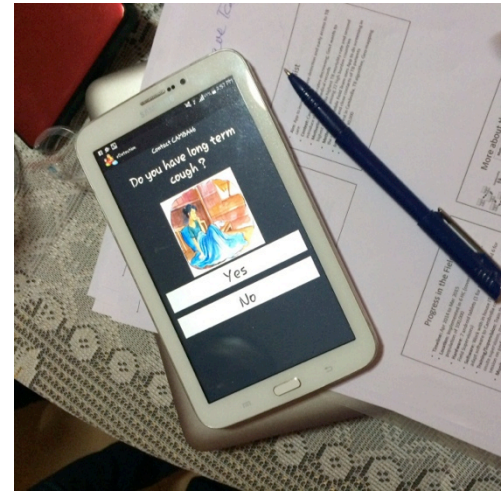
- Consultation with key stakeholders before starting design
- Translation of App into Khmer language
- Use of pictures to supplement screening questions
- Regularly take in feedback from field to enhance usability of App and update the App

Project Management

- Clear timeline, schedule and accountability
- Central coordination between Technology team in India and Implementation team in Cambodia
- Hands on approach by management

Project Implementation

- Train the trainer approach
- Modular training with onsite field supervision
- 24/7 technical support for tablets in the field by implementation team
- Clear line of communication between Head Office and Team



What lessons can be derived that will be useful in improving future performance?

The key lessons are

Project Design:

- Under utilisation of geomapping function in eDetection App: Needs to be able to reflect both present and past patients in the tablet to be useful for Field Supervisors to monitor outbreaks.

Project Management

- Useful to build up a Technology team in Cambodia, if suitable manpower can be found to support the programming and troubleshooting of the Apps locally

Project Implementation

Assign one full head count for project lead for future projects so that the workload is more manageable. Currently the Team Lead for the project is double hatting as a Team Supervisor for an Operational District in Phnom Penh.

Recommendations

Tips: Include any recommendations in this section that you and your project team, the organizations supporting the project and the community you worked with, would like to make to other practitioners or researchers on the field facing similar problems or implementing similar solutions.

Please take a minute to share recommendations with the ISIF Asia secretariat that might help to improve the support provided.

Recommendation 1: Technology can sometimes be a disruptive innovation, so it is important to manage attitudes, perceptions and buy-in from the start. We found that we were able to implement the project successfully because we had done consultations and secured the buy-in from different stakeholders. For the next project, we would also consider doing small awareness campaigns with the villages that we will be intervening in before starting the project so that our field supervisors have an easier time using the technology to register people for screening etc.

Recommendation 2: Designing Apps to deliver care is a constant work in progress. There has to be a good feedback loop between the users and designers of the App to optimize maximum usability. For our App, we had several rounds of enhancements and in some cases we had to convince the technology team to make the changes. For the next pilot, we will be setting the pace and expectations that refining of design is part of the project implementation process and more importantly that is it a re-iterative process.

Recommendation 3: For new grantees, do apply for the UFE and Research Communications mentoring program as we found it really useful. It is worth the additional effort and resources required. Our experience has separately been captured in a case study written by our two mentors (Sonal and Vira).

Bibliography

Tips: Include complete bibliographic references to all sources (printed, on-line, quotes, etc) used to prepare the different sections of this report. The APA style guide offers examples about how to reference a variety of sources. <http://www.apastyle.org/learn/quick-guide-on-references.aspx> (as accessed on 3/7/2013).

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5. Cambodia. (2013). *WHO*. Retrieved from https://extranet.who.int/sree/Reports?op=Replet&name=WHO_HQ_Reports/G2/PROD/EXT/TBCountryProfile&ISO2=kh&outtype=pdf. (accessed on 21st September 2015)