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The Use of Mobile Geotag Technology in Driving Project Performance at Scale

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Abstract

The monitoring of any project at scale becomes challenging issue and most of the monitoring systems are not strong enough to effectively monitor the project across difficult geographies. Monitoring at scale is a daunting task with hard to reach population and places in any given project implementation. However, projects suffer at large because of weaker monitoring system in difficult areas. Thus, Project management becomes challenging and project fails to deliver results especially when implemented at scale. The fact we all know if any project is not monitored through robust systems, project performance gets compromised. Nonetheless, where no one watching the activities it is highly likely the quality of project implementation and project management gets questioned. What could be done to build a system of project monitoring on the real-time basis and with virtual access, where one can remotely observe and track activities in the ground and on real time basis, with 100%, reach using the technology. The simple use of mobile technology built on Global Positioning System (GPS) can use Geotagging to find and link with variety of location-specific information from a device, can find images taken near a given location by entering latitude and longitude and photos can be linked to location specific information with the time stamp when and where the activity was precisely done. For monitoring of the Bihar Handwashing Programme at scale the Geotag applications has been developed along with web portal with an Android based application which serves the interface for the on-field teams to capture activity data. The application has been built with various control features to ensure that only the desired users have access to the relevant data. This is being done by way of mapping individual mobile phones via IMEI codes to Unique User IDs (Team IDs). This mapping ensures that no duplication of work is observed on the field, and one user may only access and operate upon the data pertaining to related user. The data captured on real time basis can be viewed in web portal and help program to interpret data in meaningful manner. It also ensures the quality of the programme is consistently maintained with robust monitoring system. As a result, so far over 0.4 million contacts have been rejected against the 2.7 million reached. The data collected gets audited and reviewed with external auditors and the auditors follow the operational procEducres where each photo gets validated to match with activities and sessions, and contacts get rejected if it is not matching in defined procEducres so this makes ongoing monitoring very powerful, and controls the quality of program implementation. The data automatically is synced to a web portal and is used at all levels to track program performance and also reward programme staff accordingly. Geotag system design helps in rEduccing fraud while it is cost effective. Through the inbuilt online live dash board in web portal, it helps the project to take data driven decisions for improving project performance at scale. The external evaluations conducted so far indicates that this system have substantially provided data points to improve project performance.

Keywords: Geotagging; Global positioning system (GPS); India; Handwashing behaviour

Introduction and Rationale

Definition

Geotagging also known as geographical tagging may be defined as the process, where geographical data such as pictures and video can be tagged with latitude and longitude of that place. The tagging helps us to know location-specific information latitude and longitude using Global Positioning System (GPS) to link with unique time stamp embedded in photos specifics such as the hour, minute and seconds on photo with latitudes and longitudes. Geotagging therefore capture location specific information and the simple mobile with camera and inbuilt GPS can be used for geotagging. Geographical tagging (Geotagging) is capable of tagging photographs, video, websites, SMS messages, QR Codes or RSS feeds [1]. This data can also include altitude, distance, and place names The World Bank (WB) has recognized the Philippines as the leading nation in utilizing geotagging as a vital tool in promoting transparency of government-implemented projects. Geotagging is being used with ability to capture the location stamp, with precise latitude and longitudes helps the user or end user to have a better control on to monitor and also some projects they use to collect some evidence for the activities.

Geographical tagging and its applications: Case study on Bihar Handwashing Programme: The Geotag technology is simple and effective to track and monitor activities at scale and across locations with low resource settings, without electricity and poor internet settings. Therefore, we took up this challenge and IT team came with well-designed process based on the requirement at field. The applications of this technology therefore were modulated to monitoring key performance indicators to drive the programme at scale. Bihar Handwashing programme (BHP) with commitment to Handwashing Behavior Change has never been attempted in history of any public health programme. The programme aims to reach out to 9 million

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children, 45 million people covering 50,000 schools in more than 30 districts of Bihar in India with population of over 100 million and spread over 10,000 square kilometers [2]. However, when we implement a programme at such scale, ensuring quality is one of the biggest issue/challenge among several challenges. The programme focuses on training of highest quality for more than 1000 field work force who takes the message of handwashing to schools as well as communities. There are both qualitative as well as quantitative parameters which are monitored and evaluated at different levels. All components of programme are monitored through a geo tagging technology by using a mobile phone to capture activity images, outreach numbers and locations to ensure that the programme is reaching out to desired population. While, geo tagging is used to capture the data, the information is cross checked by checklists used by project coordinators, who would in person present on field. Once the data is captured into geotag, it is synced to a central server which generates an analysis of progress on field through a live dashboard like a live cricket score. All analysis that is available on a central dashboard is audited by an independent external evaluator.

Geotag applications process for robust project management: To implement the behavior change program at scale using geo tag technology process need to be made user friendly; major aspects on-field operations, which need to be covered and monitored effectively. The application is crafted on Android OS based application, which enables the field teams to capture data on real time basis through a mobile phone which gets synced to web portal. This application has been built with various control features which ensures that only the desired users would have access the data relevant for the users. This is being done by way of mapping individual mobile phones with unique IMEI codes linked to Unique User IDs (Team IDs). This mapping ensures that no duplication of work is observed on the field and only unique user would have access to data related to them. Each team is then allocated a specific route plan, a route plan simply being a set of geo tag location of schools that are allocated for a team based on geography, accessibility and attendance. The Route plans would have combination of 'Planned' and 'Buffer' schools. Further, for each school the application allows for 3 to 4 Visits to be registered, a Visit being a dedicated day of intervention at a school. These Visits operate under the control structure such that a school only accepts the next visit after a gap for 6 days. For instance, if a team visits a school on day 1, the next visit can only happen on day 7. This control ensures that the intervention spreads across 21 days which complies with the behavior change model inherent to the programme design. Unique sessions are then generated by the Users (teams) corresponding to a specific school in their Route plan for a specific Visit. These sessions constitute capturing of geo-tagged photographs that are captured portraying specific action steps that signify the delivery of the intervention. Each session has 4 activity photographs accompanied by start and end images that help capture the length of the intervention, a key quality metric, and the count images that identifies the count of the contacts reached. Various guidelines to ensure that only trained manpower is conducting these sessions have been laid out for auditors to check and report. Apart from sessions other data points like Mother Meetings, Mid-Day Meal intervention, the Hand Wash Station Status and toilet functionality are also captured and geotagged. The data on Hand wash station and toilet functionality is shared with Government counterparts [3].

To further support the operations on field, Geotag is also used to capture Review sessions that are held every month for teams to exchange learning's, identify gaps and revaluate targets. Project Coordinators supervise these meetings and captures the same through their unique Project Coordinator User ID which is linked to the 8 User IDs (teams) allocated to him. For review sessions, the application has a framework that captures data points which denote the vicinity of teams from each other, which helps identify whether the teams are meeting at one place or not, the duration of the session, that helps identify if the teams have spent sufficient time for knowledge exchange and the photographs, to ensure that the right people are present at the session. Based on all these data points, for School interventions and review sessions, various quantitative metrics are drawn to determine the performance of teams on field and accordingly team based reward in place.

Dashboard in web portal with live scores facilitating the data driven management: In this large scale programme a lot of data points are captured that help in keeping the pulse of the project in check. An important addition to the web portal, which has been recently made, is the development of the Live Dashboard. The importance of the Dashboard lies in the fact that till its development the various cyclic reports, viz., Weekly, Monthly and KPI (A report that captures the Key Performance Indicators of the programme in a cycle), were generated manually that required hours of cumbersome data crunching and validation (Figure 1). This in turn resulted in a time gap between a Report Request, a Report Generation and a Report Review. To rEducce the time gap between a Report Request and a Report Generation, an automated report generation tool was added to the portal which can provide a meaningful summary of the activity, which is the Dashboard. The Dashboard pulls up data from the various pages available on the portal and with a predefined logic arranges and presents a comparison between the planned and actual achievement of the various indicators related to the programme. This comparison can be made for a time period specified with a date filter, which is a part of the Dashboard. The Dashboard consists of two additional pages on the portal, viz., Weekly/Monthly Report, and Key performance indicators (KPI) report. In a nutshell, the 9 million target reach for the programme will be captured and validated by geo tag which can be universally accessed to verify that the programme has delivered upon the numbers. GPS data compiled in the system assigns a unique identification tag for each activities and project, avoiding duplication and overlapping and control on false reporting of data.

Reward and recognitions using this data in the portal: With Geo tag data authenticating the quality and reach of the programme, quantitative performance evaluation has been made possible, wherein identification of strong and weak performers can be done in a well-defined robust framework. In BHP, currently incentive evaluation is being done at two levels, i.e., Team (Supervisor and Promoter)

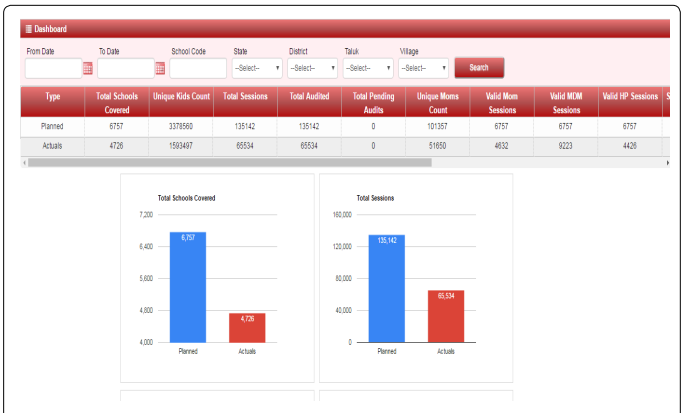

Figure 1: Dashboard generating KPI based reports realtime.

and Project Coordinator. To ensure that relative evaluation is done the teams are evaluated Project Coordinator wise, i.e., a set of teams working under the same PCs compete to win the monthly, quarterly and half yearly and annual reward. This is done to ensure that external variances do not create bias in the evaluation, as mostly teams working under the same Project Coordinators have similar working ecosystems. Currently the evaluation framework comprises of two major sets viz., Qualification metrics and Qualitative metrics.

Quantitative parameters

Attendance of teams - a 100% session attendance is required, i.e., both the promoters and the supervisor status shall be 'Y' (denotes Yes) as per the auditor in all the approved sessions conducted by the teams. Key Performance Indicators (KPI) completed – 100% compliance towards completing the major KPIs, MDM sessions, Hand Wash Station Status and Mother Sessions. With the current framework, the immediate result that has been observed is that a positive wave of competition has emerged within the Project Coordinators and the teams. This has also induced in them an urge to better understand the programme in detail as all the parameters reflect crucial aspects that will contribute to the achievement of the programme objectives.

External evaluation of behavior handwashing programme: Building on qualitative aspects of the programme, the project team has focused on external evaluations while ensuring that the internal checks are stringent enough to reflect consistency of programme delivery (Figure 2). The project comprises of three external evaluation mechanisms viz., 1) Teacher led Programme Delivery, 2) Dipsticks documenting the trends in awareness and behavior change and 3) Behavior change impact on health indicators i.e., Diarrhoea and Pneumonia.

Teacher led model evaluation BHP

The teacher led model study documented substantial increase in behaviour change in the intervention group as compared to control group in pre and post evaluation. Among the intervention group, handwashing in a day increased by 3.14 times and hand washing with soap increased by 1.42 times in a day. Hand washing before meal increased by 20% and handwashing with soap overall increased by 16%. Handwashing post defecation showed the overall increase by 15% while rEduccing the use of proxies like mud and ash by 24%.

Dipstick study

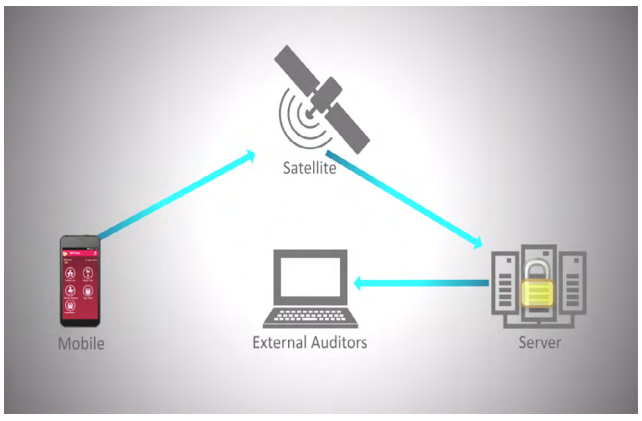

Figure 2: Geotagging mechanism and data flow

A regular dipstick study is part of overall programme design which tracks the progress in terms of handwashing behavior change at key occasions. The study is conducted at regular intervals to monitor the outcome of the activity conducted in selected geography.

Methodology

This study was conducted by an independent research agency in 8 intervention districts of Bihar from December to 1 March 2016 cycle and data was collected in April which includes robust 6400 randomized samples. The random sample were in proportion to size/coverage at block level while ensuring that all block and districts are covered. A total of 800 samples (400 kids+400 mothers) covered from each district giving the estimates at 95% confidence level. This is maximum sample needed to know for proportion which is not known or at 50%. The total no. of samples included 8 districts, 74 blocks, and 182 schools.

The dipstick study provided the results which are summarized below

Both mothers and children show a promising growth in handwashing behavior change post defecation with more than 82% population practicing the behavior. The behavior change at lunch also has substantially reached to more than 70% for children. This confirms the success of Group Handwashing before mid-day meal which has been a strong component of this programme. The mothers also have shown a success even though they are contacted only once during the programme. More than 60% of handwashing with soap among mothers as well children is good starting point. They have definitely recognized the importance of handwashing with soap and the habit needs to be further reinforced and improved. The idea of washing hands with soap is difficult to correlate since both mothers and children confirmed that they already take bath with soap. This is one of the reasons why they don't see this as a different activity. Handwashing with soap before breakfast is yet to be recognized as one of the key occasions for mothers as well as children. Since, many households don't take a complete meal during the breakfast like in Lunch and Dinner; it is one of the potential reasons that they don't consider breakfast as key occasion to wash hands with soap (Figure 3).

External evaluation by a global academic institution

The overall evaluation is being dealt by a Global Academic Institution assessing the overall effectiveness of the programme in two phases. The first phase captures the programme effectiveness with respect to activities leading to behavior change at critical occasions and second phase documenting the overall impact of the programme by document health impact thereby rEduccing the incidence of Diarrhea and Pneumonia among target population.

Conclusion

Geotagging technology allows projects to monitor in remote and difficult to reach locations and can be easily and accurately managed, and validated. The world bank program in Philippines used geo-tagging for improved transparency and effectiveness in procurement and project management [4] Geotagging provides the user with the ability to capture the location on the mobile device it also allows users to read this location for varied purposes. It is cost efficient and safe and this technology enables the project team to validate, monitor and evaluate actual progress on the ground without having to travel to hard-to-access locations and areas with high security risk, saving them precious manpower resources, time and effort [4]. The technology provides donors, implementing agencies, contractors and

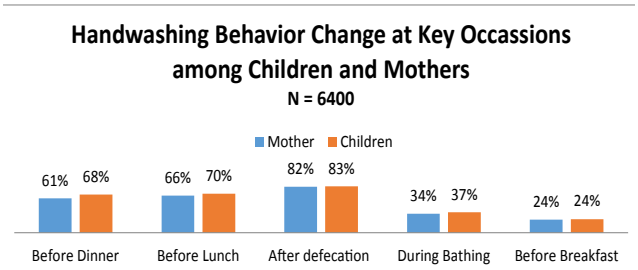

Figure 3: Handwashing behavior change at key occasions among children and mothers.

other partners with useful information about its sub-projects such as exact locations, dates of operation, land areas, distance covered and where they are situated in relation to other landmarks in the area [4]. Various organizations are currently using the geotag technique to have a better control on field operations especially on non-static projects that are spread across geographies with limited access to electricity [1]. Through the BHP program geotag application is providing dynamic support to the team however, it has some limitations. The primary reasons for this are the absence of accurate latitude longitude database and the poor network connectivity in the interior regions of the state. The control features, though built in a robust framework, are dependent on the BHP server data and gets synced offline as well. This data is often archived to maintain the smoothness of the data flow, but leads interference with control features like the locking period between two visits. The data generated through one of the largest handwashing behavior change programme is also huge. While, the robust data capturing and monitoring system allows the programme to collect and substantiate information at all levels, it is equally important to analyse this data for driving programmatic decision making. The entire process has helped in refining the programme at all levels. The initial results had shown that the programme is working well in school settings however, the community outreach required a change in strategy. The programme model thus been revised ensuring equal focus is given on community outreach as well through a hamlet and cluster based outreach strategy. As soon as the community received equal focus as the schools, the behavior change indicators improved manifold contributing to overall programme quality. The focus has increased towards enhanced community engagement, and it has shown the results by improvement in mother engagement drastically. The average engagement for every school covered has increased from 8 mother to 28 mothers per session. A targeted approach helped us to reach out to mothers in the community covering two specific groups a) Mothers of children studying in schools and b) Pregnant and Lactating Mothers at Aanganwadi Centers (Government sponsored child-care and mother-care center) to address Under 5 mortality among children. The programme had started as Handwashing Programme however, based on learning from implementation, the components of clean water and clean toilet are also included. Though, the programme doesn't provide the infrastructure support on Water and Toilets, it does collects data on availability and functionality of both these components and advocate with government to ensure both availability and functionality. The data which initially was used only to capture the programme outreach is now the foundation of programme related decisions. The programme team analyses data for aspects of implementation, quality, identifying gaps, revision in strategy, and programme performance of all stakeholders. The Geotag and Dashboard helps programme team with required inputs and data points to reward and recognize the performers – be it health promoter, agency providing manpower, the field levels implementation team or the management team [5]. The entire geo tagging mechanism provides real time updates improved the implementation process and helped the project staff to enhance data driven project performance and external evaluation and results validates the same where project performance is improved at scale.

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