

INNOVATIONS IN MOBILE TECHNOLOGY



BRIDGING THE DIGITAL DIVIDE

Digital Green has been at the forefront of innovation to address the information gap for rural communities through appropriate technologies. The gap between the offline and online worlds was much more pronounced in 2008 when we spun off as an independent entity from a research project in Microsoft Research India's Technology for Emerging Markets laboratory in India. We combined offline solutions such as handheld cameras and pico projectors to produce and screen videos along with an online video library to standardize content and enable access to a wider global audience. Data captured on intuitive paper forms is digitized using an innovative data management system, Connect Online | Connect Offline (COCO) that allows users to seamlessly toggle between offline and online modes on the web browser for uninterrupted usage in regions with intermittent internet connectivity. This data powers a suite of online Analytics Dashboards to help monitor and improve programmatic activities on the ground. The public, private and civil organizations we partner with deploy our offline and online solutions to increase the efficiency of their extension services and help improve the lives of rural communities.

CHANGING MOBILE LANDSCAPE

The technology landscape in resource-constrained regions is changing with the increasing affordability of smartphones and data plans which has positive implications in terms of access to information in the future. At this point, feature phones continue to be prevalent in poor communities and internet usage remains minimal. The challenge of diversity will further be compounded with issues of literacy and novice usage of digital technologies for application developers. However, the potential to use mobile phones to benefit the lives of rural communities is immense. Our robust technology stack, localized content ecosystems, rural penetration and understanding of these communities gives us a unique opportunity to pilot and integrate mobile solutions that will help further close the information gap.

Our suite of mobile solutions currently comprises:

- Responsive web tools
- Mobile applications
- Interactive Voice Response (IVR) systems

RESPONSIVE WEB TOOLS

Responsive web design aims to build sites that provide an optimal viewing and interaction experience on web browsers across devices with varying screen dimensions. Since our software stack is largely web-based, the first step to mobile is usually to make the tools responsive to mobile browsers. The major advantage is the speed of implementation as existing tools are enhanced to work on modern web browsers across mobile devices compliant with prevalent technology standards. Responsive sites are also easier to maintain and provide greater central control owing to a single code base.

RESPONSIVE COCO

COCO, the foundation of our technology stack, records data related to the key processes of the Digital Green approach, namely video production, dissemination and adoption of practices, with the unique ability to accept data, while offline, for areas with intermittent internet connectivity. COCO was initially designed as a web-based solution suited to browsers on traditional desktops. COCO has been made responsive to mobiles and tablets; it can now run off modern browsers like Google Chrome on any device with the ability to tailor itself to the screen size of the device. COCO forms and fields can also be easily customized to suit the data collection requirements of diverse social programs. This open-source web framework can be readily integrated to existing systems. COCO, with its responsive and customizable design coupled with its resilience to data connectivity issues, can serve to solve problems in information-gathering faced by development organizations worldwide.

Extension workers found it handy to add data directly to COCO on mobiles instead of paper forms. Responsive COCO was found to speed up data entry, simplify data management and reduce load on data entry operators.

VIDEOKHETI



RESPONSIVE VIDEO LIBRARY: VIDEOKHETI

VideoKheti (<http://videokheti.digitalgreen.org>) is a responsive web application that provides access to our video library through an easy-to-navigate interface for low-literate farmers and extension workers on any device.

Accessibility is enabled through a multi-modal navigational interface of graphics, audio, and touch interaction, layered over our video library. The application supports the following features:

- **Localized content:** The videos in our online repository demonstrate farming practices relevant for the crops and context of an area, in the dialect of that region, and feature local individuals that farmers can trust and identify with
- **Multi-modal interface:** Use of graphics, audio, local language text and touch interaction enhance user experience and make it accessible for low-literate and novice users
- **Simple navigation:** Farmers find a video by selecting: crop, crop stage, type of farm action and practice
- **Helpful meta-data with videos:** Metrics on past views and farmer adoptions along with multiple thumbnails from each video give users more information on their selection before deciding whether to stream a full video
- **Interactive discussion forum:** Any user with a Facebook or Google account can login to ask questions and give feedback by commenting on the discussion forum
- **YouTube support:** Videos can be played within the browser or on YouTube, allowing users to leverage features such as offline viewing in regions with intermittent connectivity

With VideoKheti, relevant videos can be chosen immediately based on farmer feedback and learning can be reinforced through repeat viewings. VideoKheti provides low-literacy users access to our video library, although it does require adequate internet bandwidth to support video streaming.

MOBILE APPLICATIONS

Smartphone penetration and cellular internet connectivity is rising in rural areas which has given us the opportunity to test, pilot and deploy mobile applications. Native mobile applications tend to be faster than responsive websites as they run locally on the phone and enable deeper integration with the device, allowing access to hardware-features such as camera, GPS data and push notifications. They also have greater access to local phone storage making them more suitable to run asynchronously, offline and online, in low-resource settings. User experience can be richer on a mobile application with added functionality such as left-to-right scrolling. Mobile applications require a separate codebase which is platform dependent (Android, Windows, iOS), but the dominance of Android phones in the lower and mid-market smartphone segments has made Android the de facto choice for mobile application development for rural users.

Mobile COCO

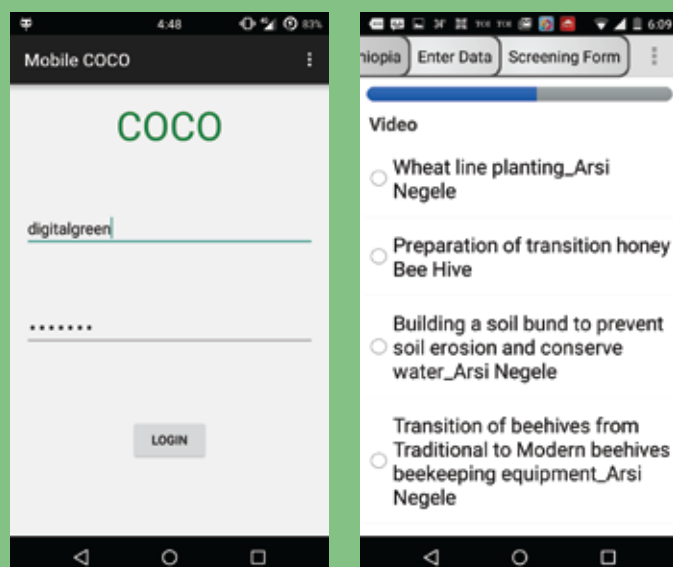
We partnered with Dimagi, a social enterprise, to leverage their CommCare platform to build a mobile application of COCO. CommCare is an open source mobile platform that supports the low-budget feature phones currently prevalent in rural communities. The application enables real-time synchronization of data between CommCare and COCO. Mobile COCO has more than doubled the speed of data entry for screenings and adoptions, making the data more relevant to inform decision-making and improvements in program performance.

Training App

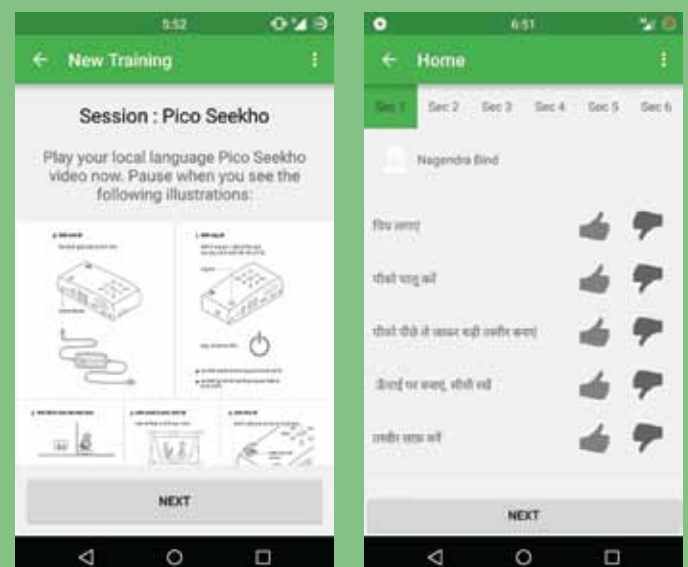
Training rural extension workers to produce and share locally relevant best practices is at the core of Digital Green's operations. We are building an interactive learning and assessment platform

to further strengthen the training programs combining human mediation and online tools. To this aim, we developed an Android application to assist our trainers and evaluate the extension workers being trained. The application was published on Google Play Store with its first training module, Pico-Seekho - a video-based course on how to operate a pico projector to screen videos. The mobile application guides the trainer through step-wise components of the module, while also leaving ample room for the individual's style of training. The instructions are localized, prompting actions at set points to help standardize training across geographies. The trainer also evaluates the extension worker on the concepts learnt in the module using the application. The performance data is then analysed to help improve the training program, monitor the learning progress of the extension workers and inform plans for refresher training.

MOBILE COCO



TRAINING APP



INTERACTIVE VOICE RESPONSE SYSTEMS

Interactive Voice Response (IVR) systems help overcome barriers of literacy and technology penetration through voice-based communication on any type of phone available in rural areas.

SOURCING FARMER FEEDBACK

We piloted a voice-based group messaging service curated by a subject matter expert in Andhra Pradesh using a platform developed by Awaaz.De, a social enterprise. Farmers, who registered their phone numbers with the service, could ask questions and receive scheduled voice messages. A moderator prioritized and grouped the most popular questions, which were answered by domain experts.

FACILITATING IMPROVED COMMUNICATION WITH VILLAGE EXTENSION AGENTS

Also in collaboration with Awaaz.De, we explored the use of an IVR system to enable extension agents who screen videos in each village to better connect with one another. The pilot, implemented in Bihar, allowed field staff to broadcast voice messages to these extension agents that announced meeting timings and videos to be screened. Extension agents were also able ask questions that they received from the community to staff.

ENABLING DATA VERIFICATION

We rely primarily on village-level extension agents to record data on community members that attend screenings, the questions they ask, and the practices that they adopt. To validate this data, we customized an IVR platform, developed by Exotel, to survey farmers directly in Bihar. A sample of farmers received automated calls with prompts and questions in the local dialect in which individuals were asked what videos they had seen and which of the featured practices they had adopted. This system was used to triangulate data reported by extension agents with that self-reported by the community.

BUILDING INTEGRATED ICT-ENABLED EXTENSION SYSTEM FOR INCREASED REACH AND IMPACT

In Ethiopia, we have brought together organizations like Farm Radio International, Dimagi, and Awaaz.De, to see how the use of video, radio and mobile communication channels can support the country's public extension system. Awaaz.De is working with Ethiopia's Agriculture Transformation Agency (ATA) to strengthen an IVR system, which it developed with the Ministry of Agriculture, that has already reached one million farmers. Content is also being shared across mobiles, radio, and video to ensure that it is locally relevant and consistent across channels. The consortium is also working to enable two-way functionality into radio and mobile programming to incorporate the community's voice and feedback.



THE ROAD AHEAD

The variety of mobile and web-based applications developed by us as well as our partners has yielded a rich set of insights, including:

- Solutions need to be integrated with existing extension systems and social organizations for them to be effective
- Broadcast content needs to be localized and succinct
- User contributions need to be actively solicited and valued to garner trust and empower individuals
- Tools should be designed to be resilient to data connectivity issues and optimized for low-bandwidth settings
- User-centered design, that factors in the social setting and audience's limited experience with digital technologies, is crucial to adoption
- Technology innovations must be coupled with appropriate training for novice users
- Mobile solutions can be useful to provide rural beneficiaries with direct and immediate access to information

These learnings inform our mobile developments going forward, which seek to anticipate the changing landscape of devices and connectivity among the partners and communities that we work with globally.