Connections
Transport & ICT

Advancing Development with Mobile Phone Locational Data

Improving the Effectiveness of Assistance

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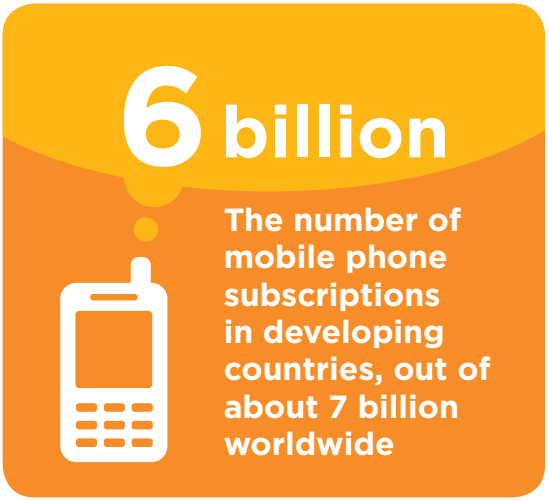
Mobile phones, and especially smartphones, are opening new ways to assess and improve assistance and the delivery of basic services in the developing world. Each year, developing countries see an annual gain of about 500 million new smartphones, virtually all of which generate not only call data records but also, with their GPS and Wi-Fi capabilities, a rich set of more precise data on location and movement. The rapid diffusion of the phones and the locational data they generate are helping fuel the "science of delivery"—the evidence-based, experimental approach to project assessment and improvement.

The technology is finding an expanding variety of uses. Recent examples involving transport and logistics include:

- **Transit route mapping in Abidjan;**
- **Supply chain management for community health workers in Malawi;**
- **Transport planning in Côte d'Ivoire; and**
- **Malaria tracking in Kenya**

A notable and more impromptu use arose after a tsunami hit Japan in March 2011. Health care authorities used call data records (CDRs) generated by mobile phones to track the evacuation from the vicinity of the damaged Fukushima nuclear power plant. They then meshed the CDRs with health records to optimize the delivery of needed emergency health treatment.



Phone Data and the Science of Delivery

Commenting on the concept of "delivery science," a 2013 World Bank blog post noted that during the several years it takes to prepare, implement, and evaluate a project "the world has moved on, problems mutate and practitioners need real-time data to learn as they do and respond to shifting client priorities. There is value … in real-time learning and adaptive iteration."

Mobile phones, and applications that run on them, have shown a remarkable capacity to provide project learning and adaption. The technology embedded in smartphones, including global positioning system (GPS) sensors, Wi-Fi capabilities, and cameras, allows users to generate information in the field—such as when gathering survey data or monitoring project activities—that is automatically tagged with locational data.

The locational capabilities are speeding a trend toward quantification and measurement that underlies the emerging science of service delivery. They also advance the ability to predict outcomes and

thus support rapid adaption of programs, which is particularly important for responding to epidemics.

Mobile Survey Applications

Typically, data collected in the field are updated and edited offline before they are uploaded into central databases. But computerized data collection and editing was often prohibitively expensive for developing countries before the advent of mobile phones, particularly smartphones with their touchscreens and extensive user options.

However, in Manila, where no mass transit routes had been previously mapped, a World Bank project in cooperation with the Philippines government developed a mobile phone application to automatically collect route data from the field while avoiding the costs of offline editing. Employing an open-data, open-source software system, the app allowed transit staff members simply to ride the routes and allow the GPS capability of the phone to generate route coordinates that were simultaneously transmitted to the database (see *Connections* Note #2).

Another software system, CommTrack, provides inventory and logistics management and is widely used to improve the distribution of medications and medical equipment. In Malawi, Health Surveillance Assistants (HSAs) carry and prescribe a predefined list of medicines, which they receive from health centers. Using cStock, a CommTrack app, the HSAs report their prescriptions and stock levels to the health centers via their mobile phones, which reduces wasted trips by HSAs to health centers that do not have the supplies they need.

Call Data Records

Locational data can also be collected passively in the form of CDRs, which are very large, complex sets of data. The records include the time and duration of each call and the approximate location of the user, which can be derived by triangulation between the cell towers with which the caller was communicating.

The potential value of passively collected CDRs is often much higher than actively collected survey data, if only because the sample sizes are so much larger and unit costs lower.

For example, to help deal with the overburdened road and transit networks in Abidjan, Côte d'Ivoire, IBM's AllAboard project analyzed 500,000 CDRs generated over a period of five months. Locational data indicated the origins and destinations of much of the travel flow in the city, and an optimization model suggested how to reduce waiting and travel times on mass transit routes. The result was four new bus routes and the extension of an existing bus route, collectively expected to cut travel time by 10 percent.

In Kenya, researchers mapped every call or text message made from more than 14 million mobile phones and combined the information with knowledge of the regional incidence of malaria in the country. The results, published in 2012, represented the largest study to date of the interaction of human travel patterns and the spread of malaria.

The researchers found that they could estimate the probability that a particular person was carrying malaria parasites and could map the movements of carriers to identify source areas. Thus, besides mapping and predicting malaria movement, the data identified locations to be targeted for malaria control and elimination. The potential applications of the technique to other diseases, notably Ebola, are promising.

Outlook for Use of Phones and Locational Data

As smartphones and mobile broadband service become more affordable in lower-income countries, as they already are in the advanced economies, they will become increasingly useful in the drive to improve public service delivery.

Moreover, satellite-based positioning capabilities are improving as other countries and regions—including China, the European Union, and Russia—begin to build systems to complement the existing U.S. system. Access to multiple systems can improve connectivity, overcome bottlenecks in data traffic, and make the locational data generated by smartphones more precise.

▶ **For more information on this topic:**
https://openknowledge.worldbank.org/handle/10986/19316

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