

# Calling Kenya

## Forum Nokia Developer Vibe Series

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Imagine a typical mobile-phone user. Most likely, the first image that comes to mind is not that of an African day laborer who subsists on less than \$1 a day.

Yet the so-called developing nations are home to nearly 60 percent of the world's mobile users. In African countries alone, according to the Communications Commission of Kenya, mobile phone usage has grown an average of 65 percent a year for the past five years — twice the rate of growth in Asian countries. In Kenya, the growth rate is even higher: The Commission says the country had nearly 6.5 million mobile subscribers as of mid-2006, up from only 15,000 in 1999.

This remarkable rate of technology adoption has led Nathan Eagle, a U.S. research scientist from the Massachusetts Institute of Technology, to launch a mobile-technology education, research, and entrepreneurship program in Kenya. The program, called EPROM (for Entrepreneurial Programming and Research on Mobiles), is sponsored by the MIT Design Laboratory, the University of Nairobi, and Nokia. “If you're interested in mobile phones, now is a fantastic time to be in Kenya,” says Eagle, who recently was awarded membership in the Forum Nokia Champion program.

The EPROM program comprises three projects: development of new applications for mobile users worldwide; academic research using mobile devices; and creation of a widely applicable mobile-programming curriculum. “An entrepreneurial approach is interesting,” says Peter Waiganjo Wagacha, a computer science lecturer at the University of Nairobi who is working with Eagle on the EPROM project. “The students can learn skills and use them to set up projects that could end up as money-making ventures — and, for some people, maybe self-employment.”

EPROM is based in part on work from Reality Mining, a research project that Eagle conducted in the U.S. Focusing on the activity of 100 mobile phones supplied by Nokia, Reality Mining collected data related to all voice calls and text messages from the phones, the phone users' locations, and — thanks to Bluetooth

scanning — data on other mobile users who were physically near the test phones. “My thesis was that by building separate probabilistic models, you can start predicting human behavior,” Eagle explains. “Given that the phone has been watching you for the last two months, can it predict when you’re going to work, when you’re going to lunch, and who you’re going to have lunch with?”

To get answers, Eagle and his colleagues collected Reality Mining data over the nine months of the 2004–05 academic term. The result: roughly 500,000 hours of data on continuous human behavior, thought to be the largest data set of its kind. Eagle will use the Reality Mining data as the basis for an academic paper that, he says, will show how the team’s models identified friendships with 95 percent accuracy.

Eagle then became interested in doing mobile phone research in Africa. He made his first trip to Kenya in early 2006. In June, he set up residence in Kilifi, a Kenyan town southeast of Nairobi on the coast of the Indian Ocean. “The usage for mobiles that I’m seeing here is pretty surprising,” he says. “In Kilifi, I can pay for a taxi, buy milk, and transfer funds using the mobile phone. People are checking marketplace prices and sending money to relatives. The phone is basically a surrogate for computers and credit cards.”

## In the Field

EPRM’s research component will examine various demographics to learn more about how Kenyans — be they day laborers, taxi drivers, or business professionals — use their mobile devices. Eagle and his colleagues have recruited students from the University of Nairobi School of Computing and Informatics. The students will conduct a new round of field research, using approximately 70 late-model S60 phones supplied by Nokia.

In a related project, Eagle and his colleagues are looking into potential mobile applications for medical field-workers. Eagle is collaborating with the Kenya Medical Research Institute (KEMRI), an organization that studies such diseases as malaria. Kilifi, where Eagle is living, has one of the world’s highest rates of endemic malaria, making it, he says, “an interesting place to study malaria, what is conducive to malaria, and how malaria changes.”

Field-workers from the institute currently collect data on paper. “Basically, they go out to the field, visit various homesteads, and ask people questions about who’s born, who’s dead, and relevant health problems — that sort of thing,” Eagle explains. “It’s called demographic surveillance.”

But the researchers’ paper-based system is far from perfect. For one, it requires the services of nearly a dozen data-entry people. For another, errors are common. The data-entry clerks have to read the field researchers’ handwriting, which can be blotted, smeared, or otherwise illegible. To resolve these issues, Eagle’s students are working to develop a system that will run on mobile phones. With such a system, the data would be automatically digitized in the field; the field-workers would have greater accountability (“You’ll know where they really are when they’re capturing the data,” Eagle says); and the data could be sent directly to the database, via general packet radio service (GPRS). Also, because the field-workers would no longer need to hand-deliver their data to the main station, they could spend much more of their time in the field.

PDA’s have been deployed in similar projects, but mobile phones are better-suited to this type of application, Eagle says. “Phones are typically cheaper than PDA’s, and you can have connectivity issues with PDA’s,” he says. “You know where the phone is — at least, via a cell tower — and you can actually start sending data. So you don’t need to do the synchronization that you’re constrained to with PDA’s.”

## Off the Desktop

EPROM's educational component involves mobile programming courses at the University of Nairobi. Eagle and his colleagues believe that the current curriculum, which focuses almost exclusively on programming for PCs, is inappropriate for Africa. PCs are still rare in countries such as Kenya. By contrast, mobile phones are virtually ubiquitous. As a result, according to the EPROM Web site, "African computer science graduates are not qualified to address the computing needs of African people. At such a critical point in the evolution of computing technology, there is a need to equip these computer science students with the skills to develop mobile phone applications specifically for African users."

To that end, Eagle and his colleagues are preparing a series of mobile technology courses. The proposed curriculum has been approved by a college principal and the university's deputy vice chancellor of academics.

For students with little programming experience, EPROM will offer a class titled "Python for Rapid Mobile Application Development," which is based on a one-week pilot course that was offered to university faculty and students in July 2006. The new course will provide an overview of how to develop mobile applications with minimal amounts of coding.

The EPROM educators are also preparing a joint MIT–University of Nairobi project-based course titled "Mobile Phone Programming for Entrepreneurs." This class will team MIT and University of Nairobi students, who will develop, market, and launch their own mobile applications in Nairobi and Boston. In general, those applications will be short message service (SMS) server-based offerings, but client-side applications will also be encouraged. Nokia has pledged seed funding to turn the best class projects into commercial ventures.

For those students who have already studied object-oriented programming (preferably with Java™ technology), EPROM is offering "Introduction to Mobile Phone Application Development in Java." This course will use existing MIT and Nokia course material.

## On the Money

On the entrepreneurial front, students who take these EPROM courses will have opportunities to help create a community of African mobile-application developers, Eagle says. EPROM aims to provide a foundation for the development of mobile applications tailored to the needs of Kenyans as well as people in other developing countries in Africa and elsewhere.

Because the most-popular mobile applications in Kenya rely on SMS, the EPROM program will also offer "SMS Boot Camp" at the University of Nairobi. This project-based course will enable teams of students to launch and market their own SMS services. A small amount of seed funding for commercialization will be available to the teams with the best projects.

"Basically, if the students come up with an application, we're able to host it on our back end," Eagle explains. "We've got the SMS server systems all set up. This empowers [the students] to do whatever they want to do. From the student's perspective, there are really no startup costs associated with launching the product. If it works, then hopefully we can find some seed money to get it off the ground."

The goal is to get mobile technology companies in Kenya to work with the EPROM students, evaluating their projects and giving feedback. So far, two Kenyan mobile operators have been approached. "We hope to get them on board," says Wagacha of the University of Nairobi. "We hope they could also support the initiative, because we know that these companies are also trying to expand their value-added services."

Learn more about the EPROM program

<http://web.mit.edu/eprom/>

Learn more about the Reality Mining project

<http://reality.media.mit.edu/>

Learn more about the Forum Nokia Champion program

[http://forum.nokia.com/main/forum\\_nokia\\_champion/index.html](http://forum.nokia.com/main/forum_nokia_champion/index.html)

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