

Smartphones are the PCs of the developing world

THEY were once simple little devices that we used to call our friends from the road to say we were running late. But no longer. As the unfettered drooling over the iPhone has demonstrated, these days we like our cellphones to come customised for our amusement with games, video cameras and internet access.

Smartphones may seem like a frivolous indulgence for rich westerners, but it turns out that their added features can be harnessed to help people in poorer countries do business, educate their children and even hold those in power to account.

"Smartphones are probably much more revolutionary for developing countries," says John Canny, an engineer at the University of California, Berkeley, who is creating educational video games that run on smartphones ([See "Learn English by phone"](#)). "Here smartphones are a bit gimmicky. In the developing regions you have hostile conditions for a PC so phones have a lot of potential to become the computing platform for people," says Canny.

Being able to communicate in real time via speech and text using basic cellphones has already proved invaluable for communities that were never connected by landlines. [Ajedi-ka](#), an organisation that works to promote human rights in the Democratic Republic of the Congo, distributes phones to local teachers, elders and business leaders so that they can report incidents of children being drafted as soldiers. The phones make reporting faster and easier. Meanwhile, health workers across the developing world have started using cellphones to monitor disease outbreaks in real time. In Kenya phones are being turned into mini-ATM machines via Vodafone's M-PESA program, which allows users to load money onto their phones in shops and then send it via a text message to someone else, in their village say. They can also withdraw the money at another location using a password, which in Kenya can be much safer than carrying cash.

For some financial uses, however, it is the phones' ability to take photos and record and send video clips that researchers believe will come in handy.

Micro-lending groups are typically run by women in rural areas who arrange small loans for each other or act as mediators between banks and the local community. They have proved to be a successful strategy in sparking business endeavours and combating poverty. But one problem is that these groups often keep poor accounts, which can make it difficult for banks or other lenders to invest in them with confidence.

"When banks are interested in lending to these people, if they're lucky the groups will have a stack of paper records," says Tapan Parikh, a computer scientist at the University of Washington in Seattle who works with micro-finance groups in India.

Typically, these records would include forms stating the agreed amount, duration of the loan and repayment receipts. Parikh learned that group members prefer the paper forms because many can't read and so fill them out by memorising which

numbers go in which boxes. As a result, he stuck with paper but turned to camera-phones to make the accounting process more secure and transparent.

He created a new version of the paper forms, which look like the old ones except that a barcode has been added next to each box or section where you need to fill in numbers. Instead of filling out these new forms, you take a picture of each barcode with a cellphone. Software on the phone recognises the barcode and a message appears on the screen, prompting you to enter the figures that would have gone in the section that corresponds to that barcode. There is also a spoken version of the message to make things clearer for those who can't read. In this way, the borrower or lender scrolls through the whole form, taking snapshots of the barcodes and entering data via the phone's keypad. The result is an electronic version of the form, which is initially stored on the phone and later uploaded to a central server when the phone is near a mast.

Saving the information on a server makes accounting simpler as data can't easily be lost, and it provides a way for large banks that are considering investing in these small businesses to check how successful they are.

Parikh's system has another advantage, however: additional information, such as photos or videos, can be attached to the electronic form that was saved, and stored on the central server as well. In order to inform a potential lender of what exactly the business does, you might photograph a written description or send a video of the business in action. "You can capture data potentially in the local language or with people who can't read or write," says Parikh.

After running trials of the barcode system in communities in Tamil Nadu, India, Parikh has co-founded a company that will charge banks trying to decide where to invest for the data the system stores.

The forms can also be used by inspectors who certify rural farmers as organic or fair trade. By laminating the forms so that they can survive the rough and muddy conditions the inspectors face, the barcodes are being used to bring up the correct part of the electronic forms, allowing data gathered on site to be entered straight into the phone. Again, photos or videos can be attached.

Farmers can also use photo and video-recording facilities on cellphones to share information about farming practices. In India, the non-profit organisation [Almost All Questions Answered \(aAqua\)](#) already operates a network where farmers can send questions to agricultural experts via text message or the internet, and check crop price information. But it is only accessible to those who can read, says Srinivasan Keshav of the University of Waterloo in Ontario, Canada. "If you're educated, you can send text. If you're not, you need video or audio."

"Farmers can use video recording on phones to share information about farming practices"

Keshav is working on ways to help farmers send videos from their cellphones in place of text and to make these videos searchable by other farmers.

He also sees other uses for video and photo sharing, such as tracking whether development funds assigned to build a dam, say, are being properly used. With videophones, whistle-blowers could publicise footage showing that a dam is not actually being built or that logging regulations are being breached. Keshav's group is trying to work out how to send such videos anonymously.

One problem with relying on video and photos is the expense. While the cost of the hardware will probably come down, sending photos or videos via a standard cellphone network is expensive because the files are large and take a long time to send. Using Wi-Fi to send messages, instead of cellphone networks, would provide more bandwidth and cost less. But although cellphone chips capable of Wi-Fi have been available for years, phone service providers have fought to keep them shut off, because people talking via Wi-Fi instead of the cellular networks would cut into their revenues.

Now that could change. Last month, T-Mobile tried to snag new customers by becoming the first US cellphone provider to allow users to talk via Wi-Fi whenever they were within range of a base station, from anywhere in the world, for a monthly fee of \$10. Keshav hopes that allowing phones to use Wi-Fi networks wherever possible will also speed up the sending of video and pictures in the developing world and make it cheaper.