Another Perspective: Mobile Futures Imagined By and For Emergent Users in India, Kenya and South Africa

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This report was authored by a muilti-disciplinary team from South Africa, Kenya, India and UK:

Matt Jones *(FIT Lab, Swansea University, UK)*
Simon Robinson *(FIT Lab, Swansea University, UK)*
Jennifer Pearson *(FIT Lab, Swansea University, UK)*
Manjiri Joshi *(Industrial Design Centre, IIT Bombay, India)*
Dani Raju *(Industrial Design Centre, IIT Bombay, India)*
Charity Chao Mbogo *(ICT4D Centre, University of Cape Town, South Africa)*
Sharon Wangari *(iHub, Nairobi, Kenya)*
Anirudha Joshi *(Industrial Design Centre, IIT Bombay, India)*
Edward Cutrell *(Microsoft Research, Bangalore, India)*
Richard Harper *(Social Shaping Research Ltd, Cambridge, UK)*

Mobile Futures Imagined By and For Emergent Users

Executive summary

As part of a three-year extended engagement with communities in India, South Africa and Kenya, we carried out five coordinated participatory design workshops over a 14-day period in 2015 with emergent users in Bangalore, Cape Town and Nairobi. The aim was to work with under-served groups to uncover potential novel mobile designs that these users would see as valuable, interesting and exciting with a time horizon of 5–10 years.

This report details the approach, and summarizes the insights from our participants.

Key points

- It is valuable to work with emergent users. Despite their lack of familiarity with advanced technologies and any exposure to design-thinking or activities, our participants created stimulating designs and insights.
- Important design considerations:
  - Wearables and easily-carryable devices have merit.

    - Design for an ecology of devices – more than just the mobile.
    - Consider safety and security.
    - Understand the value of natural user interfaces.
    - Don't just design for the limitations found in developing region contexts.
- Insights from emergent users can inform design for the rest of the world.

Introduction

In the developed world, mobile and ubiquitous computing researchers commonly envisage potential long-term futures. In contrast, for developing regions there has been a focus on more immediate concerns, with a wide range of studies considering how to apply low-end or limited features of more advanced devices and services to support user groups. While this work is incredibly important (and impactful), we argue that without a complementary longer-term perspective, emergent user groups will be destined to always having to adapt to technologies designed from a "first world" perspective. That is, technology will "trickle down" so that as these devices become the developed world's "yesterday", emergent users inherit them as their "tomorrow".

Emerged versus emergent users?

For many people in the *developed* world, ownership of a sophisticated smartphone is a given, and has been for some years. That is, they have relatively easy access to general-purpose programmable phones based on common platforms (Android, iOS, etc.), in which much of the utility depends on data connectivity, and where there are advanced sensors and actuators available to support interaction. Increasingly, these "emerged" users are also creating, accessing, sharing and transacting large amounts of content over very-high-speed data connections via a range of web services.

Hundreds of millions of people in *developing* regions, though, cannot access these devices and services due to a range of

constraints including economic, geographic and educational issues. A smaller but growing group are just beginning to get access to advanced mobile devices and services, these being their first exposure to sophisticated computing technologies. There is, then, a growing constituency of "emergent" users – people for whom such services are just within reach[1]. Our work is focused on serving this constituency, ensuring their voice is included in the design conversation.

This report

In this report, we take envisioning approaches common in developed region contexts, and apply them in developing regions to help move the research and development agenda in different directions. The work surfaces novel forms, materials and frameworks for interaction in these contexts. It should not be assumed that emergent users will simply follow the path of developed world users. They may shape these technologies in different ways, and these technologies may themselves need to be developed to allow this shaping to be more profound and effective.

As part of a three year extended engagement with communities in India, South Africa and Kenya, we carried out five coordinated participatory design workshops over a 14-day period with emergent users in Bangalore, Cape Town and Nairobi. The workshops were developed in conjunction with our local researchers, partners and contacts in each of the regions, and the results have been used to guide prototyping work subsequently, with follow-up fieldwork in each of the areas.

Prior work on mobiles in ICT for development

If you are interested in the field of mobile technology in development contexts, there is a substantial body of work by both the ICTD (ICT for Development) and HCI4D (HCI for

Development) research and practice communities. Some key examples of work in this area include:

- Studies to understand how **low-end mobile devices and simple network services** are appropriated by end-users or built-upon by developers to provide communication infrastructures. Take a look, then, at the work of the Spoken Web team at IBM Research[2] and the Awaaz.De[3] group.

- **Featurephone innovations**. These precursors to smartphones typically have better memory, low-end data network capabilities, cameras and simple web browsers. A number of studies have considered their use in content creation and sharing. The SnapNGrab system developed in South Africa is a good example[4]; and, our team has trialled StoryBank, which provided access to media in rural India, exploring search and browsing to combine mobiles and community displays[5].

- **Smartphones and development contexts**. There are several examples of using basic features of smartphones in emergent contexts (e.g., video and audio for storytelling; see for example our Com-Me toolkit[6]). However, there are only a very limited number of studies reporting on how advanced features of such devices could be deployed (e.g., one example by our team involves use of mobile gestures and pico projection to provide a content creation infrastructure for rural users[7]).

- **Dream phones**. Previous work has used sketching, design prompts and probes to help users design their "dream" or "ideal" phone[8] – a technique which we have used in this work to help explore interaction and interaction styles, rather than simply functions and features.

Context

The work reported here is part of a three-and-a-half year engagement involving researchers from each of the three regions of interest (South Africa, Kenya and India); local researchers from the emergent communities we are working alongside; and, others from outside of these regions.

Each year of the project begins with a Summit in one of the locations (in the year reported here, this was Bangalore) to which a range of stakeholders were invited including an interdisciplinary mix of industry, NGO and academic researchers, developers and designers. Prior to the Summit, the design workshops with emergent users, reported here, were conducted in Bangalore, Cape Town and Nairobi.

The insights and ideas created by these participants were used as input to the Summit. Summit attendees then proposed a series of potential future devices, platforms and services. These responses to the emergent users were taken back to the groups, after the Summit, for discussion and refinement.

All of this activity took place over a two-week period. Following this, given the input from the emergent users, we have been developing working prototypes that have been taken to user groups in South Africa and India, with a third visit—to Kenya—scheduled for mid-2016, to gather further refinements. Later in the year, the prototypes will be deployed over a longer period in these contexts.

Methods

Focusing on the Summit period, five co-ordinated design workshops were convened in three countries. Each session lasted between an hour and an hour-and-a-half, and involved researchers and local partners who could speak the language(s) of the participants.

Participants

We recruited 54 participants in Bangalore, India; eight in Langa, a township in Cape Town, South Africa; and, nine from areas around Nairobi, Kenya. The higher number of participants in India was a function of the Summit location (Bangalore): we wanted to ensure there was a particularly strong voice from Indian emergent users given the majority of Summit participants were from this continent. In future Summits (in South Africa and Kenya) we aim to see a similarly increased number from these regions.

We selected participants who had the following backgrounds: low personal and/or family educational attainment and literacy; no or low personal exposure to advanced digital technologies (such as mobiles with substantial processing power, memory, sensors and actuators; PCs; internet or data connections); and, low incomes. We worked with local contacts in each location to identify participants, asking these partners to recruit people who would be described as emergent users.

The groups we worked with spanned generations (from young school children to 65-year-old domestic workers), and varied in the level of “resource constraint” (e.g., some earning relatively more

than others). It is important to design in terms of such spectrums of constraint and availability. It would be much less fruitful, in contrast, to approach the problem in a discrete way (e.g., "design for illiteracy") as not only will a user's ability vary over time, but they will live in a context of friends, family and co-workers who might well differ from them but who will support their use of new technologies. All of our participants, though, shared the characteristic of not being the target end-users for current mainstream smartphone devices, and for whom a standard smartphone proposition would be less valuable than it might be (e.g., due to the devices' textual and computer-centric interfaces; unaffordable data plans; or, lack of apps or services perceived as of use and value to them).

All participants also had a high degree of mobility in their every-day lives – with the domestic workers moving from house-to-house and within the houses they were cleaning; autorickshaw drivers covering many miles in the city each day; schoolchildren walking extended distances between home, school and an after-school club; and, the Cape Town and Nairobi participants often commuting in shared minibus taxis to and from their work or social locations.

Our co-researchers: participants in Bangalore, Cape Town and Nairobi

- **Bangalore – young people**. We ran a workshop at CLT India's Computer Clubhouse, meeting with around 30 children and young people. We were interested in working with this group because they understand and live the life of an emergent user; and, were motivated and enthusiastic to the possibilities presented by digital innovation.

- **Bangalore – domestic workers' collective**. We met with 16 domestic workers at the office of Stree Jagruti Samiti—a

female domestic worker's collective—and were joined by four NGO employees who have been working with them to find ways of increasing job rights. This group was particularly interesting to us because of the possibilities that mobile and other technologies might provide in supporting them in their highly mobile and flexible employment; and, in helping them collectively organise in what can be a very isolating working environment.

- **Bangalore – autorickshaw drivers**. We met with a group of eight male autorickshaw drivers in a leafy park in Jayanagar, Bangalore – one of the places the drivers socialise at after work. The workshop was facilitated by an employee of Three Wheels United, an NGO focused on providing finance to drivers to purchase their own vehicle. Rickshaw drivers like the ones we worked with were valuable participants, not just because they are members of our core user group, but because they meet and interact with hundreds of passengers each week drawn from many walks of life, from the very poor to the highly affluent; and, they are exposed to all aspects of the bustling city life, picking up and dropping off passengers in places as diverse as slums and luxury hotels.

- **Cape Town – Langa residents**. At the same time as the workshops in India, we also ran a session with eight participants in Langa, a township outside Cape Town, South Africa. We were interested in working with these community members because of their lack of prior hands-on exposure to advanced digital technology. We wanted to explore what they would design without such influences that would also fit with their life skills and financial situations.

- **Nairobi – local residents**. Nine participants from areas within Nairobi (primarily Kibera and Uthiru) took part in

this workshop. All had low incomes, with the majority self-employed or doing casual shift work when available. Nariobi is widely recognised as a technology hub with a growing community of digital innovators and start-ups. Involving participants from this city, then, was seen as highly important to our study, as they are exposed to a vibrant, fast-changing digital landscape.

Workshops

The same workshop method was used in all sites. After introducing the research team and explaining the range of questions and activities we were interested in, participants were asked whether they wished to take part, and gave consent for us to use their input for research purposes. Participants consented orally to taking part and to having their images and work published academically.

We asked participants to take part in two envisioning activities:

1. **Mobiles of the future:** In the first activity participants were placed into small groups of 2–4 people and asked to draw a picture of their ideal mobile device that they might own in the "far off future," defined as five-to-ten years from now. They were told that they were free to design it so it had any shape, size or material they liked.

2. **The "magic thing"[9]:** One of the researchers wore a simple fitness band on their wrist, and explained to the participants that it was a "magic thing" – that is, it could be or do anything the user wanted in terms of how it helped them communicate with others, access content, or provide information and answers to their needs. Participants were then asked to work in teams to specify what they would want the magic thing to be and do if they owned it in the far-off future.

Key Insights

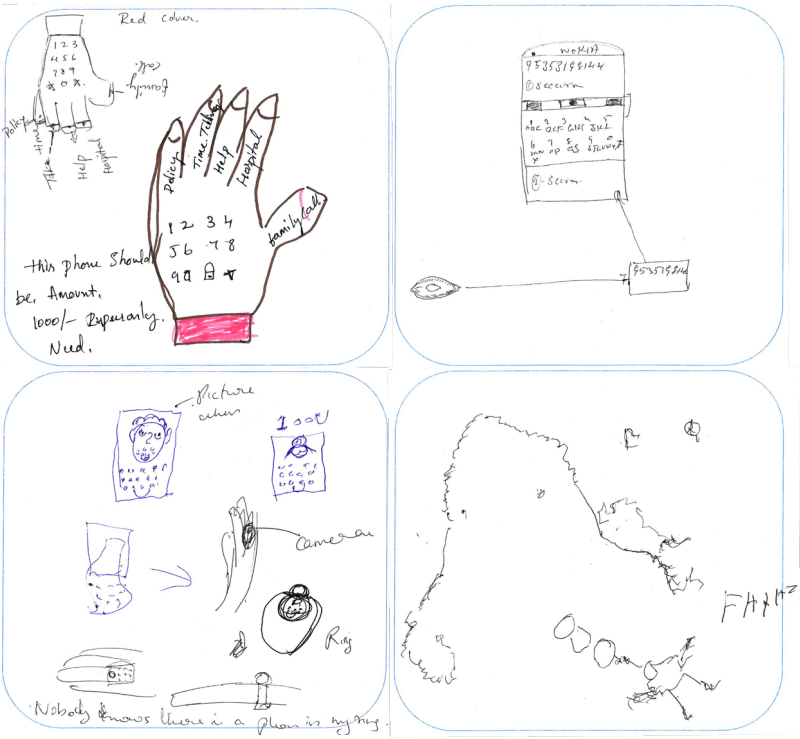
In this section we summarise key findings from both workshop activities with all user groups. In the next section we synthesise these in terms of common themes.

Findings from *mobiles of the future* activities

Bangalore domestic workers' collective

Hidden or hideable: For the domestic workers, a strong desire was for their future mobile to be hidden (or hideable) but accessible. This need was motivated by both safety concerns (they did not want their device to be stolen) and the fact that their employers might become angry if they saw the women using a mobile. The women's suggestions included wearable mobiles in the form of jewellery (e.g., see the lower left image on the following page, with a ring-based mobile; another example—not shown—involved a necklace device that could be subtly hidden in the folds of a sari); and, earpiece devices that automatically answered calls or provided spoken content without others being aware of the interaction. One lady suggested hiding the device in a hairbrush: she explained that as she pretended to brush her hair, she could listen to a call from her husband as well as talk to him.

Wearable: Wearable designs dominated the discussions and drawings. As well as the earpiece, rings and necklaces mentioned above, there were also pendants and bracelets. The ladies in the workshops all wore many items of jewellery, from ankle bracelets and toe rings to necklaces and earrings, as is the norm in India. They saw future mobiles as being an additional adornment—



Mobiles of the Future Sketches from domestic workers (left) and autorickshaw drivers (right) in Bangalore

becoming part of their identity—and mentioned too the need for personalisation (such as colour choices).

Appliance design and simplification: Many of the designs illustrated a desire for simplified interactions. Given the lack of literacy in the group it was perhaps not surprising to see examples where images for notifications and functions were preferred over textual menu items. There were also requests for fewer or larger buttons. It was interesting, too, to see the simplification agenda played out via appliance design thinking in these non-technical, non-design-trained participants. One team, then, requested a ring-type device that took a picture whenever it was pointed at

someone; another, a device that rang and showed the camera picture when a friend was in trouble (this device was motivated by the violence often suffered by workers); and, a third, an earpiece device that could act intelligently by, for example, saving a number mentioned by the caller for future use.

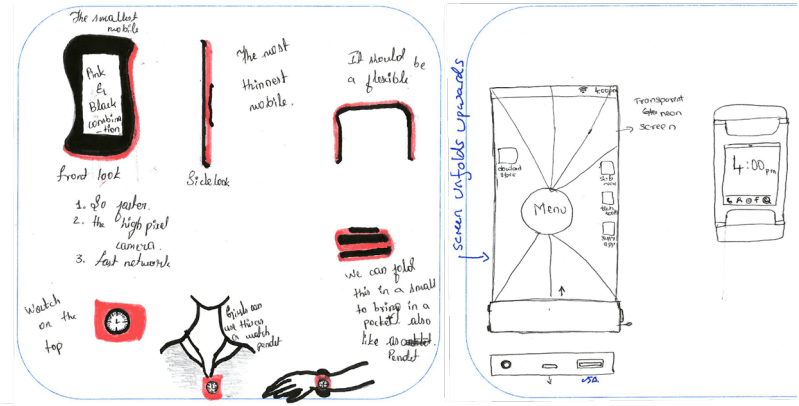
Natural interactions: Gestural and natural style interactions were discussed by many teams, ranging from the previously mentioned hairbrush and ring-pointing designs to a wearable glove-like device (see upper left image, opposite) that combines gestures and elegant simplicity. The lady who designed this mobile explained how she wanted to simply point a finger to call one of five key contacts (such as the police).

Practical considerations: Many of the teams mentioned the need for devices with a long battery life that were not too heavy.

Bangalore autorickshaw drivers

Connecting to the environment: The group focused on thinking about future services. The images opposite illustrate two of these. In the first (upper right), the driver explained that he wanted a device with a split screen, with the bottom display showing content (such as telephone numbers or advertiser offers) that he had looked at while driving through the city. The drawing illustrates the interaction with his "eye" looking at content and this then appearing on the lower screen.

The second sketch (lower right), meanwhile, is a driver's map of difficult roads and junctions he has to traverse. He wanted the phone to be aware of his location and driving conditions so that it would stop working when he needed to be more conscious of his surroundings. This context-aware suggestion should be seen in the light of urban Indian driving conditions (which are normally chaotic and busy compared with many, say, Western cities) and styles (e.g., drivers are often engaged in energetic phone conversations while navigating densely packed roads with no lane discipline).



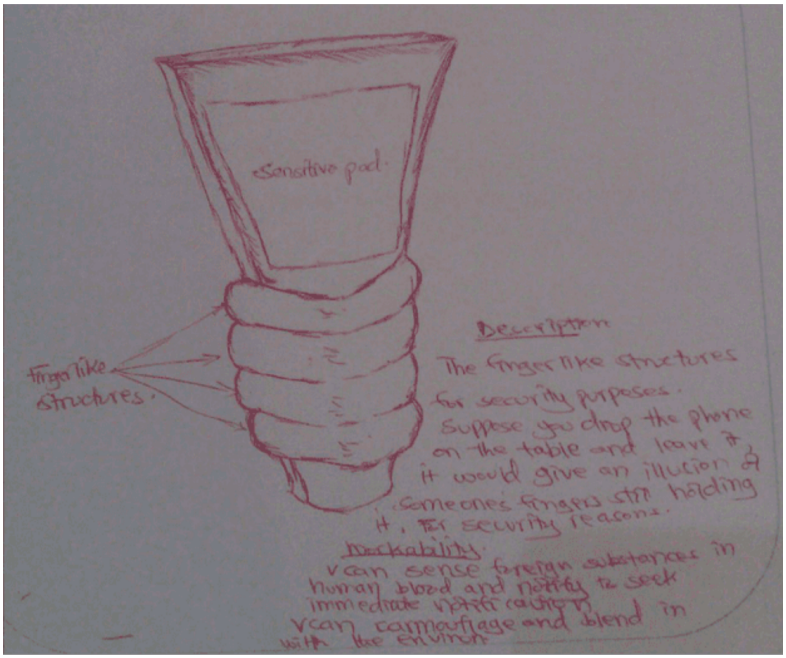
Mobiles of the Future Sketches from after-school club members in Bangalore

Bangalore after-school club

Conventional oblong form-factors were seen in many of the sketches from after-school club participants, though there also several pendant sketches, and one eye-wear based device.

New Materials: The work of two of the groups stood out in terms of their material form. The first (above, left) considered the possibilities of a highly flexible device that could be folded and shaped into different small form factors to be worn or carried more easily and safely, reducing theft. The second group (above, right) had a design that was also motivated by a desire to conceal and increase the portability of the device. In this case, the main body of the mobile was described as a pen-like device from which a flexible screen could be unrolled.

More than the mobile: Several of the other groups wanted their future device to be able to connect to other larger input and output devices (with their sketches showing, for instance, large keyboards attached to some input port; and, output ports for connection to a TV or other output).



Mobiles of the Future A sketch of a camouflaging phone from a participant in Nairobi

Nairobi

Safety and security: Safety and personal well-being features were a key concern as the image above well illustrates. The note for this sketch explains a novel way of tricking an onlooker into thinking the device is being held when placed on a table, makes a further suggestion about the device camouflaging itself, and discusses including a pad that can analyse the blood of a user to provide medical warnings. Another participant wanted their future mobile to be able to alert them about upcoming dangers ("such as riots and fires").

Conversational interfaces: The group had an extended discussion around conversational interfaces – they wanted to be able to talk to the device "as a friend," even to the extent that they suggested

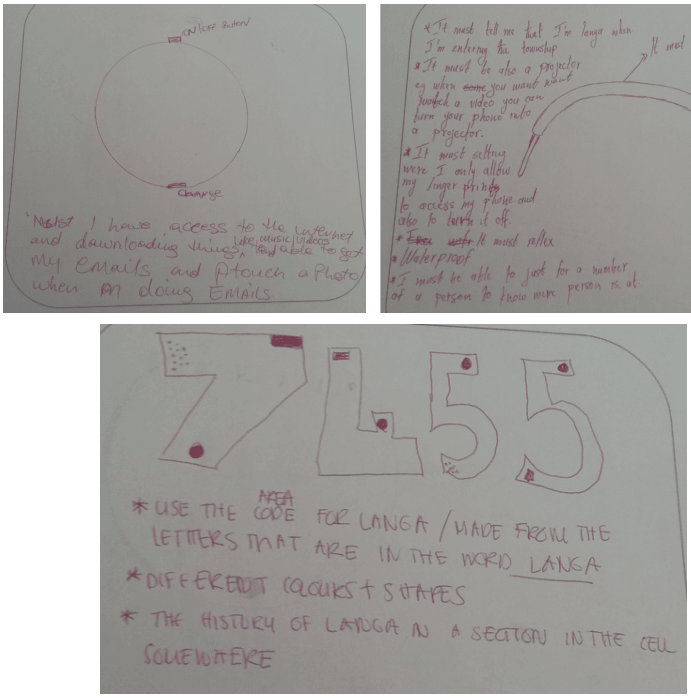
that if the device recognised they were praying, it would "pray along with them". Voice interactions, as in this example, were seen as important. One participant wanted a voice based interface but wanted it to work with their "slang" rather than conventional, accepted language. More prosaically, the group also discussed the problems of recharging their phones during the day, and suggested devices that could incorporate solar or "body heat".

Cape Town

Novel shapes and flexibility: Half of the designs from participants in Cape Town were unconventional (e.g., non-oblong shaped), with some examples shown opposite. There were circular forms, bracelets and small—easily carried—matchbox-sized suggestions. One participant (whose sketch is upper right in the images on the opposite page) spoke of a device that could change form-factor to provide different functions and which was physically flexible.

Global brands vs. local pride: While a number of the participants mentioned brands in their descriptions (mainly "Samsung" and "Nokia," reflecting the domination of these manufacturers in the region currently and historically) there was a desire to see future devices that reflected their pride in where they came from. The most striking example of this was the set of phones shown in the lower sketch on the opposite page. Each device is a number from the postal code for Langa (the notes also suggest phones in the shapes of the letters in 'Langa'). This participant also wanted the phone to have "the history of Langa in a section in the cell somewhere".

Common themes: Like the Nairobi participants, Langa residents live in locations with relatively high rates of theft. Their designs also reflected this, with several suggestions of a device that could be left in a safe place (e.g., at home) but still accessible via a smaller module while away; or, having a form factor (such as being very thin) that would not attract a thief's attention. In a similar way to the autorickshaw drivers in Bangalore, several participants



Mobiles of the Future Sketches from participants in Cape Town

mentioned context-aware services (such as information about their current location or the location of their friends); like the children in the after school club there was a common desire to be able to connect their future mobile to or create larger output displays (such as the upper right sketch above, where the participant wants to be able to "turn your phone into a projector"); and, like the women's collective, there were suggestions for non-textual interactions (such as sending an email by "touch[ing] a photo when doing emails").

Findings from *the magic thing* activities

Bangalore domestic workers' collective

Security and connections to friends and loved ones: One group, for example, explained how when they are abused, the police often dismiss their complaints. They wanted the "magic thing" to automatically record incidents where their employees abused them to use as evidence to the authorities. Another suggested the bracelet would give them a continuous sense of being in touch with their partner or friends.

Bangalore autorickshaw drivers

Connections: The drivers also discussed the way the magic thing could help them connect to their family, with one example being a way of summoning their children home – a tap on the device would guide the kids to the father's location.

An ecology of devices: Picking up on the desire for mobiles to be part of an ecology of devices—as discussed by participants in the first activity—one driver acted out the bracelet's role as a movie selector for display on another screen. He gestured at the bracelet to choose a film and then pointed at an imaginary display to watch.

Bangalore after-school club

Quantified others: While many wearable devices currently deployed in the developed world are about monitoring the status of the wearer (e.g., their activity levels), several of the teams in the after-school club suggested ways the magic thing could give them insights into other people – "point it a person and get a sense of their mood"; "point it at others and get their vital signs"; and, "point it at someone to read their mind".

Nairobi

Health and emotional well-being: The magic thing probe stimulated much discussion in this group focused on wearables to enhance personal emotional wellbeing and health. Several examples included bracelets that could check the individual's health status and provide advice to improve fitness. One group also suggested clothes that could function in this way, with an example being socks that monitored the amount of walking done by the wearer, warning them to take a rest if they had been too active.

Cape Town

Interaction modalities: Participants gave examples of the sorts of wearables they would see as potentially acceptable, including devices like rings, earphones and necklaces that are discreet and non-obvious, and may not attract unwanted attention. While acting out their use of the wrist device, most of the participants interacted with it through tapping on it. Some also indicated that the device should also respond to the user looking at it.

Overall Themes

Pointers Towards Future Mobiles for Emergent Users

Wearables and easily-carryable devices

It is not yet clear whether devices like smartwatches will become all pervasive in regions—such as the UK and USA—where smartphones are dominant. It might be that the more mobile character of lifestyles such as those of our participants, allied to security concerns, will make such devices more attractive in these contexts.

More than mobile

Many designs across the three regions raised the need for peripherals and services that could make their future mobiles more usable and valuable. These ideas remind us, as previous research has shown[10], that while the mobile is an important technology for developing world contexts, users in these regions, as users everywhere, do not want to rely solely on their small screens and restricted input devices all the time.

Safe and secure

Participants wanted devices that were designed with an eye to personal security – that is, they shouldn't put the user at risk, and should reduce the chance of theft. Devices that blended visually with their owner were discussed, from wearables that could be hidden in the folds of a sari to a chameleon-like device that automatically camouflages itself.

Natural user interfaces

In developed regions, the percentage of time users spend using spoken or gestural features of smartphones is very low compared to textual and graphical manipulations. Our emergent participants' designs, in contrast, had many examples of these "natural" user interfaces, driven by both literacy issues but also context of use ones. Consider again, then, the hairbrush interaction of one of the domestic workers; or the hands-free glance-based information gathering of the autorickshaw driver.

Mobiles to fit the context

Developers of future smartphones and mobiles should not simply focus on constraints and limitations found in developing region contexts. Doing so may well provide a rugged, power-efficient and simple-to-use technology but one that will be have limited appeal, being seen as the "poor user's" phone[11]. There is, then, an opportunity to design for the wishes of several groups in our workshops who raised the value of physical and interaction designs reflecting local cultures and personal identities that mattered to them (e.g., the domestic workers seeing wearables as additional adornments; and, the Langa residents wanting designs to remind them of their township in both form-factor and local content).

Word of warning: diversity in design is essential!

While there were commonalities between the ideas coming from India, South Africa and Kenya, it is important to note that there were differences in the specific details and motivations of the designs: for example, in many there was a desire for discreet interactions. In some cases this was motivated by security; in others by privacy; and, the articulations varied from hiding interactions in jewellery to ones that enabled a large

device to be left at home while a more discreet component is carried. Furthermore, there were distinct designs from each region.

Our findings suggest that emergent users are more different from each other than the first-adopters. An engineer or a doctor or a banker might be considered to have similar needs, abilities and outlook everywhere in the world, and thus could use the same apps. In contrast, the preferences of an autorickshaw driver, a domestic worker, or a farmer in one part of the world could be very different from their counterparts elsewhere. These users may often need more differentiated products than “top of the pyramid” consumers, then.

Conclusions

Emergent users have been the focus of many mobile social development and research study projects over the last decade. The emphasis has been, rightly, on exploring the use of a pervasive technology—the mobile phone—in improving health, finance, education and community resilience in contexts where there are normally low socio-economic and education opportunities.

In this report, though, we argue that it is now time to engage with such users so that they can help sketch out a longer-term technology road-map that will lead to devices and services which will be of value 5–10 years from now. The value of such an approach has, we believe, been illustrated through our engagements with the five groups of users in India, South Africa and Kenya that we report on here; engagements and encounters that are part of a multi-year programme of study. Despite their lack of familiarity with advanced technologies and any exposure to design-thinking or activities, our participants created stimulating designs and insights.

Transferring ideas to the rest of the world?

The experience in working with "last-adopters" such as the participants of the studies reported here suggests the approach could be extremely fruitful in innovating for developed regions. So, while wearables and spoken interfaces are just another "feature" for tech-savvy consumers, as we have seen, for

emergent users they could be more integrated in their lives. Talking with people who are highly motivated to see useful devices and services with such features can drive more imaginative innovations for users worldwide. Furthermore, their ideas come fresh, free from first-hand experience of other advanced technologies, and un-encumbered by notions of what is possible. For us, then, the workshops with emergent users stimulated several ideas for rest-of-the-world service innovations.

If you are a designer or developer for the "rest of the world" what have our findings inspired you to think about?

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