Itinerative Design: A User-Centred Method for Inclusion and Engagement in Digital Innovation

Reshaping the Future Report No. 2

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This booklet is based on research articles that include extended discussion of the framework and full citations to the related literature. Further details can be found at the end of this report.

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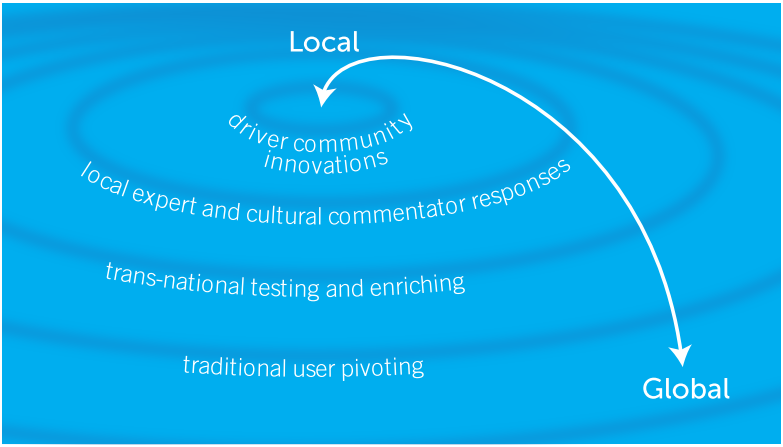
Itinerative Design

Executive summary

"Designed in California" is a brand statement used by high-tech manufacturers to denote provenance and cachet of digital innovation and modernity. In this booklet we explore philosophically alternate design perspectives to those this statement embodies, reporting and reflecting on a long-term multi-sited project that seeks to diversify future-making by engaging communities of "emergent" users in "developing" regions. We discuss and argue for inclusive technology design methods, present our approach, and detail case studies as examples of the potential of these perspectives in uncovering radical innovations.

Key points

- Highlights benefits of having new, diverse perspectives on innovation.
- Reports on working with township communities in South Africa.
- Method engages people in far out future thinking.
- Community ideas drive the design and development process.
- As ideas develop further inputs are integrated from a wide range of stakeholders nationally and internationally.
- Resulting prototypes can disrupt conventional designs, impacting on mainstream users, globally.



Flows of innovation The itinerative design flow of information – local innovation rippling across regions, circling between stakeholders to inform designs.

Introduction

"Designed by Apple in California." This statement is boldly etched into the back of the iPhone, a computational device that over the past decade has brought about a sea-change in how many of us live our everyday lives. The statement emphasises how computer engineers, information architects, business strategists, interface designers and a myriad of specialists have come together, in Silicon Valley, to shape some of our most common everyday experiences.

The future being "designed in California" is one for and by "traditional users", people who have long benefited from a plethora of digital innovations. In contrast, "emergent users" are those who are now getting their hands on digital technology for the first time in places such as townships in South Africa and the informal settlements of India and Kenya. Typically, relative to traditional users, these communities have lower educational attainment, limited access to resources (including disposable income and in some cases technological infrastructures such as wireless networks) and face additional lifestyle challenges (e.g., high crime levels). Our work has focused on methods to include emergent users in the design of future technologies, creating opportunities to co-create, shape, and refine devices and services based on their own needs and desires, just as more traditional technology end-users have done for many years.

Itinerative design methodology

The illustration on the page opposite shows the broad vision of the itinerative design methodology. The process begins locally with driver emergent community members not as users or

appropriators, but as technological innovators and future-makers. These local driver community innovations are then rippled out and reflected back, first to local experts, cultural commentators and other stakeholders, and then travel further to emergent and "expert" user groups in other regions, taking the ideas and suggestions made by initial innovators to other future-makers for further testing, situating, and enriching.

Each cycle—or segment—of itinerative design, then, begins when the core interaction team visits a driver region community of emergent users to conduct intensive innovation workshops with future-makers, which aim to identify a series of interaction challenges and potential technology interventions. Rapid, in-situ ideation, scenario generation and low-fidelity prototyping are documented before feeding back to local technology experts, NGOs, cultural commentators and other stakeholders for response and refinement.

Next in the process is a series of prototypes of techniques and devices to address the opportunities identified during the initial future-making workshops. These prototypes are iteratively developed and piloted in controlled studies across several different emergent user communities, refining and adapting between each iteration. Longitudinal deployments are then undertaken within multiple driver regions; again, interpreting, refining, adapting and situating throughout. Finally, at the end of the process, we look to the global by pivoting to explore how the resultant technologies could be beneficial beyond those communities involved in the design process – to "traditional" users.

Itinerative Design with South African Driver Communities

Method

This instantiation of an itinerative design cycle took just over one calendar year, and was driven by future makers from townships located along the outskirts of Cape Town, South Africa. It began with a six-week period aimed at tailoring and conducting a series of innovation workshops (see *Innovation sprint* diagram, page 8) which is the focus of the majority of this report. We do this to emphasise the importance of exploring methodological tools—such as itinerative design—that can be used by and with future-makers to generate the starting point—the pebbles, as it were—that are key to the rippling out and reflecting back, across design's pool, as the itinerative process unfolds (shown in the *Flows of innovation* diagram, page 4, as driver community innovations). We also report on the ideas and insights co-created with participants during this particular iteration of the process as examples of the richness such future-making activities can afford.

Following this intense ideation process was an eleven-month period of development, refinement and deployments of the ideas generated within the workshops, which we report on later in this booklet.

Innovation sprint The innovation sprint segment of the Itinerative Design process that we focus on in th conducted a technology audit of existing work to identify key demonstrator technologies. We then underte

Innovation workshops

Our goal was to work with residents in Langa, Khayelitsha, and Delft to co-create and innovate new forms of technologies and possibilities for the future through a series of workshops.

The diagram above shows a basic timeline of the innovation workshops portion of this itinerative design cycle, which comprised of five phases, each of which drew in emergent users, local experts and the itinerant team to reflect on a range of potential future technologies. These conversational openers were carefully curated in Phase 1 and ranged from new-to-market commercial products to highly-regarded research prototypes. During the remaining four Phases, these materials were used to inspire participants, arouse discussion, and generate ideas for future designs that are more suited to the contexts in which emergent users live and work.

The five Phases were:

Phase 1: Preparatory work to select and filter the technology concepts to be used as demonstrators in ideation workshops

Phase 2: Future-making workshops, which were structured to probe participants' current use of mobile devices, and their daily

his report was split into five phases, and took place over a focused six-week period. To begin, we ook a two-week period of intense co-creation with emergent users.

routines and activities, followed by exercises to evaluate how the technologies we demonstrated might fit.

Phase 3: Analysis of the data, ideas and insights gathered from the future-making workshop sessions, using these to create concept designs and potential scenarios of use

Phase 4: A summit event with local technology experts, NGOs and other stakeholders to test and challenge the designs.

Phase 5: A video showcase with the original workshop participants, and others transnationally, presenting the ideas and scenarios generated (in the form of video sketches) in order to evaluate their suitability and use.

Phase 1: Preparatory work – technology audit

While the technological landscape in Langa, Khayelitsha and Delft is rich with creative appropriations of established technologies (such as the mobile phone), there are fewer examples to-hand in these contexts of cutting-edge technology developments, both commercial or as research prototypes. Such exemplars would form an important basis of discussion. The core team, therefore, conducted a technology audit where we selected three categories

of technology to be demonstrated to and discussed with future-makers: commercial products, state-of-the-art research projects, and our own group's research, borne out of our previous work with emergent users.

In each category, we selected four representative technologies:

Commercial technology: We surveyed popular, 'in vogue' technologies from news articles, press releases, videos, adverts and social media, and selected future-focused, but commercially available technologies. These were: smartwatches; virtual reality headsets; IoT beacons; and, quantified-self trackers (such as fitness watches).

State-of-the-art research: We retrieved the top 20 most cited and all of the award-winning papers from each of the past five years of Google Scholar's top-ranked human computer interaction conferences and journals, filtering to select those that were mobile, or related to mobile devices, giving a total of 74 publications. The core research team then individually rated the systems in each paper in terms of how valuable they would be during the future-making workshops (in terms of relevance, connection to emergent user contexts and ability to demonstrate the technology in situ). We then categorised the top-rated papers, giving four overall themes: interaction through phone gestures; interaction through on-body touches; interaction through object manipulations; and, interactions with multi-screen devices.

Emergent user research: The itinerative design process is an annual cycle, of which this was the second year. In this category we included four technologies designed and prototyped by future-makers in previous years. Introducing these technologies during design workshops illustrates one aspect of what we mean by trans-national testing and enriching (see *Flows of innovation*, page 4). Engaging with previous work also showcases how previous prototypes or design experiences are better seen as continuations in itineration rather than new beginnings in iteration. The examples in this category were: a multi-device tool to split

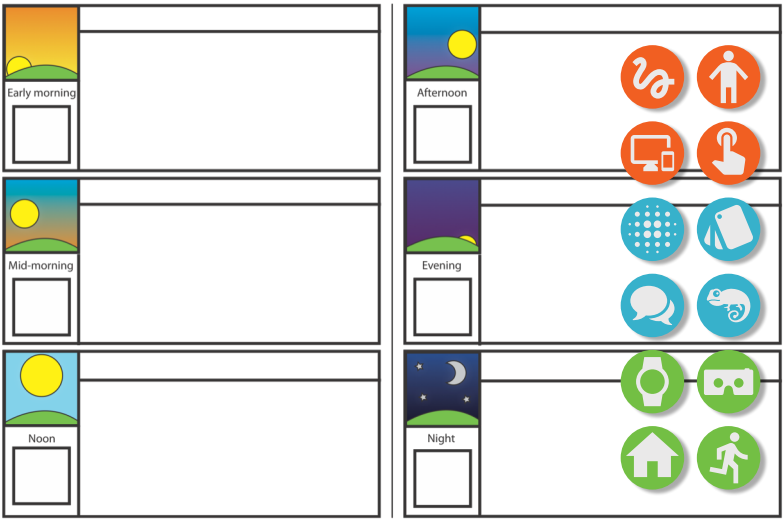
components of complex services across a group of phones; a phone that is able to camouflage itself; a shape-changing mobile device; and, a speech recognition service.

Phase 2: Future-making workshops

The aim of the workshops was to get future-makers to think about how the example technologies we demonstrated could fit into their lives, using these as a catalyst to imagine potential devices and interactions that could later be prototyped and refined. 24 future-makers took part in a full day workshop in Langa library (12 participants each day, spanning over two days, with participants compensated for their time). Participants were English speaking, and had a mix of technology experience and literacy levels, but all lived in lower social-economic areas. After welcoming participants over breakfast and explaining the project outline and goals, we undertook an IRB-approved informed consent process, then moved on to scene-setting activities, followed by a dive into the potential future technologies selected during Phase 1.

Setting the scene: As an icebreaker exercise, and to help participants reflect on the activities, places and technologies involved in their daily lives, we handed out workbooks to be completed over the course of the day. The start of these booklets collected basic demographic and technology-usage and ownership information, after which followed a group-based discussion probing device desires by asking what participants would like to be able to do with their devices in the future.

Next, each participant sketched out a typical weekday in their lives, drawing or describing the activities they would normally be doing over the course of the day (see *Workbooks*, page 12). This was followed by sketches of three distinct locations that they visited often. Finally, participants annotated their sketches to show how often they currently used their mobile phone at each time or place (from ‘all the time’ to ‘never’). Local videographers filmed and documented personal accounts of both the participants and researchers during each workshop.



Workbooks Sample pages from the workbooks in which participants sketched and narrated their daily activities. Inset: the stickers used to highlight opportunities.

Thinking about the future technologies: The remainder of each workshop day was spent walking through and discussing with participants the technologies identified in Phase 1. Each technology category was demonstrated in a different part of the room, and participants moved in groups of four people between each area, spending about an hour discussing each theme. This process began with demonstrations by the researchers of each technology, followed by a group-based feedback session around the potential suitability, usage, and any immediate advantages or disadvantages that they foresaw. We also wanted to determine when, where and during what activities the future-makers felt each technology would be most beneficial to them. To do this, we referred back to the sketches created in the set-up activity, and provided participants with coloured icon stickers for each technology (see inset in *Workbooks*, above). For each separate technology, participants were given one sticker to place at a time of day, and one to place in a location that they thought this

technology would work best. Towards the end of the workshop, we asked participants to rank each technology in order of how useful it might be to them, then summarised the day, reiterating how the results would be used, and that the video showcase the following week would give an opportunity to critique the ideas generated.

Phase 3: Analysis and scenario generation

Following the future-making workshops, the core team of four researchers undertook an intense period of in-situ data analysis (including all participant workbooks and feedback notes), to identify themes, issues and potential avenues for exploration and prototyping. As part of this investigation, we extracted and clustered the technologies participants saw as most useful into themes, and determined the most popular times, activities and locations in which they could be used. These analysis sessions involved a series of iterations of design concepts that encapsulated as much of the workshop data as possible.

This process ultimately led to four separate design concepts. At this stage, we recorded verbal narratives of how, why, where and when each design might be used, and sent these to a remote sketch artist who created a draft storyboard for each idea. These storyboards were then used to create short videos highlighting the purpose and interaction of each scenario. Each video consisted of a series of hand-drawn sketches enhanced with an audio script of the scenario of use. These basic videos were designed to be as simple as possible to understand, and focused entirely on the user interaction and functionality of each idea, rather than the technical requirements or workings. These scenarios, in both sketch and video form, were used in illustrating the ideas to local stakeholders (during the summit event, Phase 4) and, after further refinement, to return to future-makers for feedback (during the video showcase, Phase 5).

Phase 4: Summit event

The insights and ideas created by participants in the future-making workshops were used as input to a summit event to which a range of local stakeholders were invited, including an interdisciplinary mix of industry, NGO and academic researchers, developers and designers, all of whom had experience of working with and for emergent users. The broad aim of the event was to gather additional perspectives on the technologies explored during the earlier future-making workshops. This included a screening of the early concept videos and sketches generated as outputs from the future-making workshops in order to gather feedback, which was then used to further refine and extend the scenarios in preparation for the next Phase.

Phase 5: Returning to users – video showcase

The final aspect of the intense two-week ideation process was a video showcase, presenting all of the ideas generated by both the future-makers, research team and summit attendees back to the original future-making workshop participants. We began the showcase by showing the films made by the videographers during the events, which encapsulated the process and approach of the workshops and summit. Sharing this video with our future-maker partners was essential to ensure that they were happy with the way we conducted, analysed and reported on the research. We then screened each of the idea videos from the summit event (Phase 4), and the scenario videos that had been generated over the whole process. After each video, participants spent time discussing the idea to probe its suitability, uncover potential issues, and then rate (1–7; 7 high) and rank each scenario in terms of how useful it would be for themselves, and their friends or family.

Key Insights

As might be imagined, a full cycle of the itinerative design method generates a vast amount of data and ideas. The focus of this report is primarily around the method, rather than the results of a specific iteration, so, we highlight here only the key scenarios and insights gathered from the single itinerative design segment detailed in the previous section.

Design challenges

Six core design challenges were identified after the future-making workshops. While many of these concerns might not come as a surprise to those working regularly with emergent users, their recurrence highlights how current ways of designing technology are not working for these communities.

Security: The most commonly highlighted design challenge was the topic of security, both in terms of personal safety (i.e., mugging) or that of possessions (i.e., burglary). As previous work has revealed, emergent users are often especially wary about being seen to use or own valuable technologies, so ways of discreetly carrying or using these devices are highly desirable

Money: Participants were adept at discovering ways to generate or save money, whether by publicising locations that provided free internet access, or sharing knowledge about discounts and special offers in local shops.

Connectivity: Keeping in touch is an essential activity in Langa, just as it is elsewhere. However, using mobiles to achieve this is a trade-off: data packages can be difficult to afford, and costs

without an internet-backed service (e.g., WhatsApp) are far higher (e.g., SMS; phone calls).

Education: Female participants in particular stressed the need for education, both for themselves and for their children. Finance issues arose again in relation to this challenge, including that of data connections and technology availability for children to complete homework.

Sharing: Participants spoke about how they would often borrow or lend phones between friends, both if consumables (such as battery, airtime or data) were low, but also if the borrowed device had better features, such as a higher resolution camera or a larger screen. This was often related back to topics such as homework, particularly on small screens.

Privacy: Many participants spoke of sharing a single device with other members in their family (often younger siblings or older parents), but voiced concerns over the privacy of their data and communications when doing so.

	Commercial technology	Research themes	Emergent user designs
1	Smart-watches	On-body touches	Speech recognition
2	Virtual reality headsets	Multi-screen devices	Service disaggregation
3	Quantified self trackers	Object manipulations	Deformable mobiles
4	IoT beacons	Phone gestures	Camouflaging

Theme preferences Technologies demonstrated in the future-making workshops of Phase 2, ranked in order of preference by theme (1: highest; 4: lowest).

Technology preferences

Turning now to the three technology categories participants experienced and interacted with in the future-making workshops. We asked participants to rank each category's technologies into order of potential usefulness. Aggregating these scores gives the listing shown in the table of *Theme preferences*, opposite, given in order of most (ranked 1) to least preferred (ranked 4).

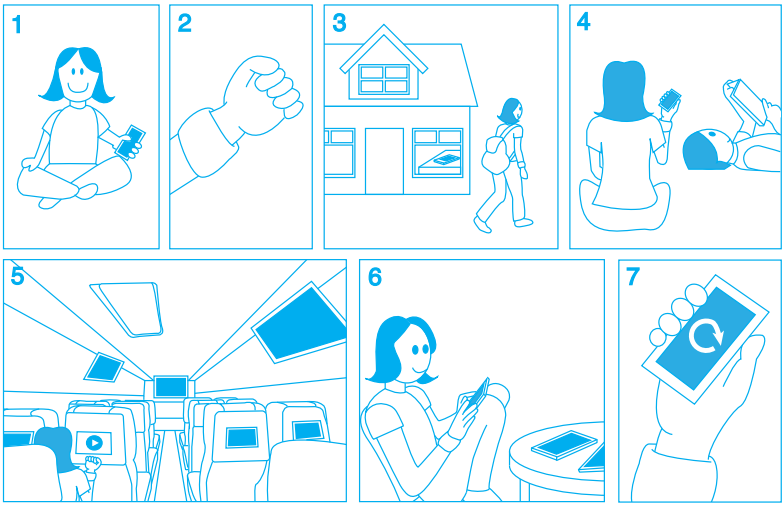
There was a strong preference for technologies that allowed for discreet or hands-free interaction, as demonstrated by the most favoured items in each category. The majority of the participants who selected a smartwatch as the most useful device in the commercial technology category reported that they did so because they believed it would be safer than carrying a mobile phone. That is, any potential thieves would not be aware that the smartwatch was a valuable object, which would make them less likely to be targeted for robbery. This theme of security also resonated in the preference for speech recognition, with many participants stating how useful it would be to be able to discreetly send or receive messages without needing to show their phone in public.

Themes and scenarios

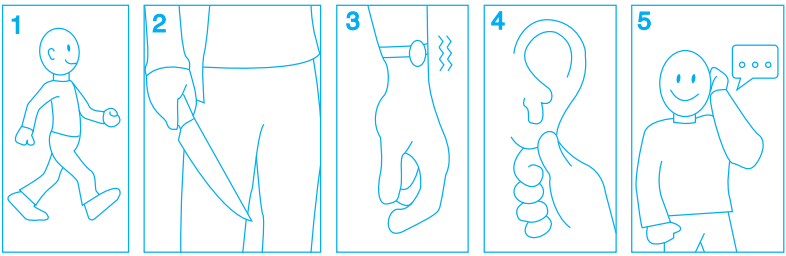
After the analysis, there were four distinct ideas for technologies as guided by the future-maker workshops. As described earlier, these were initially sketched as storyboards, and subsequently made into illustrated animations for use in the video showcase event (Phase 5). The diagrams on the following pages show extracts from the illustrations and voice over text for each of the videos created. The following sections describe each of the scenarios in brief, and highlight the key insights from future-maker participants that shaped their design.

Safety Pod

The Safety Pod scenario (shown on page 18) was directly influenced by several future-makers' comments regarding the smartwatch technology demonstration. The aim of the scenario



Safety Pod (1) Rini is worried about carrying her phone with her when she goes out, as she is scared it may be stolen. At the same time, though, she likes being able to access her information, make calls or take photographs. (2) So, she invests in a Safety Pod: a small, cheap device that she can wear discreetly on her wrist. (3) Rini leaves for school, wearing the Pod, but leaving her phone behind. (4) On the way, she stops at her friend Lucy's house. After getting permission, Rini picks up Lucy's phone and, upon entering her password, it automatically synchronises with her Pod, transferring all her vital information to the borrowed phone. Lucy's phone is now acting as Rini's own device, and she is able to view or add to her media, access her messages and call her contacts. During her time there, Rini uses Lucy's phone to take a selfie of the two of them together. Before leaving, Rini logs out of the borrowed phone, which updates any changes back to her Pod (including her selfie), and deletes any remnants of information left on Lucy's phone. (5) On the minibus taxi on the way to school, Rini logs into an entertainment system and uses it to watch the videos stored on her Pod. (6) Arriving at school, Rini heads to the library and picks up a communal tablet. Once her password is entered, the tablet becomes hers for the duration of her time with it, and she is able to catch up on emails about homework from her teacher. (7) When back at home, Rini picks up her own phone and synchronises it to her Pod. All of the updated data from the devices she used throughout the day has now been transferred back to her own phone.

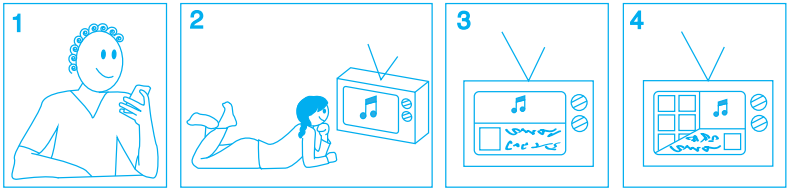


Audioliser (1) Tosin is walking down the street in a dangerous part of town. (2) He does not want to take his phone out of his pocket, as he is worried about drawing attention to himself. (3) Instead, he is carrying an Audioliser—a small, button-sized module that can be hidden in his clothing; perhaps in the sleeve of his jacket, or within a bracelet on his wrist—which vibrates gently when he receives a new WhatsApp message. (4) When he feels the vibration, Tosin can discreetly bring his arm to his face and make a natural gesture, such as tugging his ear. (5) This action triggers the Audioliser to quietly read out the message for him to hear.

was to separate the interface of a phone from its hardware, allowing users to share and co-opt other devices. As was highlighted in both the design challenges and technology preferences that participants discussed, personal and physical security aspects currently dominate their lives. The fact that the scenario involved a device that was "just a watch" and would therefore be less of a target for robbers, was critical. Other benefits of the approach, which overlap with the themes described above, are the ability to share resources (e.g., using someone else's phone to take a photograph, and saving this to a Pod, as described in the scenario diagram opposite). Privacy is also protected in this scenario, as the data on borrowed devices gets deleted after use, which makes the design useful for those who share phones.

Audioliser

The Audioliser scenario (see above) was also inspired by the overwhelming issue of safety and security amongst future-maker attendees. Many participants, having had devices stolen in the

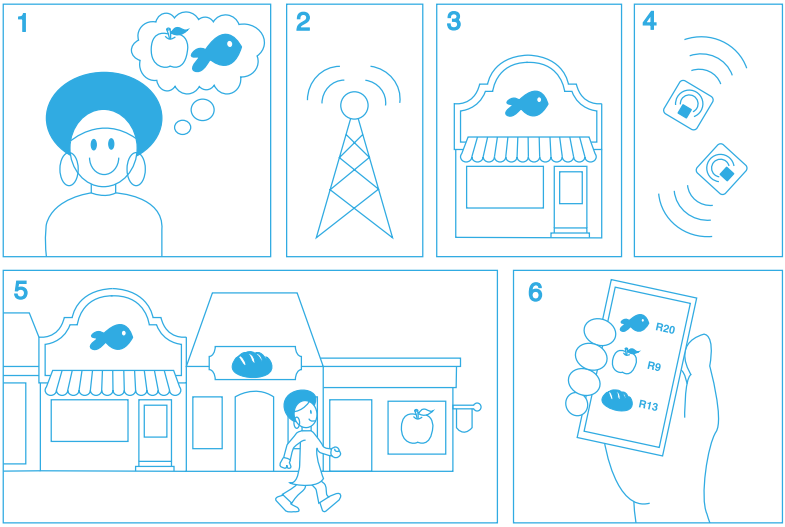


Screen Splitter (1) Ziggy is using his phone to research for a school project. He finds its screen very small for this sort of task, however, as there is a lot of text, and many pictures to display at once. (2) So, he moves to the living room, where his sister, Wani, is watching music videos on the family TV set. (3) Ziggy points his phone at the TV, and it splits the screen in half, showing his research on one section, and Wani's video on the other. The siblings each continue with their respective activities, sharing the screen. (4) Later, their mother arrives, and points her phone at the TV too – the screen splits again to give space to view her photos at the same time as Ziggy is doing his homework and Wani is watching her videos.

past, would not even consider using them in public, with most choosing to simply leave their phones at home when going out. It was also evident, however, that keeping in touch with friends and family was a big part of participants' daily lives, showing a clear disjoint between the desired and actual use of their devices. During the workshops, then, participants spoke of a device that could be hidden, perhaps in clothing, and that could use a combination of subtle gestures and speech recognition (as also highlighted in the technology preferences) to both quietly read out messages and discreetly reply without ever having to reveal that a phone was present.

Screen Splitter

The Screen Splitter scenario (see above) arose after it became apparent that screen-real estate was a major issue for many future-maker participants. Only having access to a single device, as many future-makers did, means that this single device—more often than not, a phone—is the only way of interacting with the digital world. This sole-device ecosystem means that screen size is critical, particularly when that device is used for studying, as it

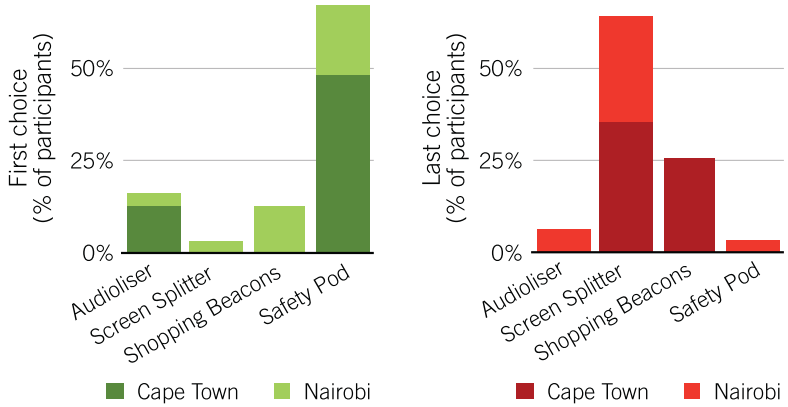


Shopping Beacons (1) Lele is going shopping, and is looking for good deals on fruit and fish. She currently has no airtime on her phone, though, so cannot look-up any potential offers beforehand. (2) Luckily, the town where she lives has installed a new Bluetooth shopping beacon system, allowing local businesses to broadcast their special offers for potential customers to see as they walk close by. (3) Today, for instance, Dick the fishmonger has specials on cob and hake. (4) Dick uses his phone to program his beacons with the special offers, and places them in his shop. (5) As she walks down the busy shopping street, Lele pulls out her phone to request from the beacons a list of special offers available in the stores nearby. (6) Being in range of a number of shops, her phone shows a list of her favourite items, and the special offers that near to where she is located.

was by many participants and their children. Typically, however, participants did have television sets in their homes. The concept of splitting a single larger screen to give multiple users access to more space was suggested during the demonstration of the multi-device splitter tool as part of the emergent user designs theme.

Shopping Beacons

The Shopping Beacons scenario (see above) was inspired by



Scenario preferences Combined results from the video showcases in Cape Town (with 19 of the original 24 future-makers) and in Nairobi. Each graph shows stacked results from the two locations. Left: the percentage of participants who chose each scenario as their favourite. Right: those who chose each scenario as their least favourite.

participants' desire to find and share ways to save money. One common money-saving technique, often recounted by participants, was to utilise and share shop "specials", which give reduced prices on certain goods. Although deals were common, participants complained that it was difficult to find which shops offered such discounts, even when in the vicinity of multiple retailers, as this required them to visit all of the stores and compare prices. The internet-of-things beacons, then, offered a cost-free way to broadcast offers beyond the physical boundary of the shop, helping the consumer to save money, and allowing the shopkeeper to promote their business more widely.

Video showcase

A week after the emergent user workshops, we ran two concurrent video showcases (Phase 5). One of these events was held with the original future-making workshop participants from Langa, Khayelitsha and Delft, and another was with a group of emergent

users from Nairobi, as part of the process of returning and reflecting to others transnationally.

In Cape Town, 19 of the original 24 participants attended the video showcase. There was a great deal of discussion around each of the ideas, leading, ultimately, to the Safety Pod scenario being chosen as the most preferred. 78% of participants chose this as their favourite design idea, and the scenario also received the highest overall rating of 6.9 in terms of usefulness (scale: 1–7; 7 high).

The second most highly rated scenario was the Audioliser design, with an overall rating of 6.3 out of 7, and the remaining 22% of participants picking it as their first choice. The least liked idea from the Cape Town group was the Screen Splitter, averaging 5.2 out in the Likert scoring, and with 56 of participants choosing it as their worst choice. The Shopping Beacon scenario received mixed results, with the majority of participants choosing it as their second or third choice, and scoring it 5.3 out of 7 on average.

We recruited 12 future-makers to take part in the video showcase in Nairobi. In this setting, the Shopping Beacon scenario was the most highly rated (6.5 out of 7 on average), with 33% of participants choosing it as their first choice. 50% of participants selected the Safety Pod scenario as their favourite design, despite giving it a slightly lower average of 5.9 out of 7. As in the Cape Town showcase, the Screen Splitter scenario was seen as the least suitable, with an overall score of 3 out of 7, and 75% selecting it as their last choice.

The overall results for participants' favourite and least favourite scenarios are shown in the chart opposite. There is a clear preference for the Safety Pod scenario in both locations, with 68% of all participants choosing it as their first choice. Qualitative results strongly support this choice. One Nairobi participant, for example, commented: "[the Safety Pod] is a mind blowing device that would almost eliminate the hassle of carrying a phone and

would definitely increase productivity". The Screen Splitter scenario was the least liked, with 65% of participants selecting it as their least favourite, followed by the Shopping Beacon scenario, which was selected as last choice by 26% of participants.

Completing the Cycle

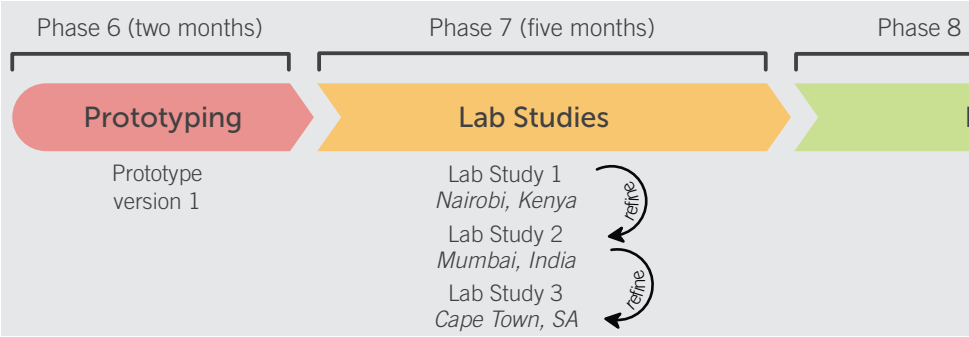
As the *Innovation sprint* diagram on page 8 illustrates, the five phases of the itinerative design process that we focus on in this report (i.e., 1–5), span a relatively short time period when compared to the remaining aspects of the process, which took approximately one calendar year. Immediately following the period of ideation and scenario generation we have described is an intense journey of prototyping and evaluation that involves significant engagement with multiple driver communities. The goal of pivoting ideas between these different sets of geographical future-makers is to refine and enrich the ideas to create truly diverse and applicable interaction and transaction techniques for these communities.

Prototyping, refining, deploying and evaluating

After completing the innovation sprint, we undertook an eleven-month cycle of development, refinement, deployment and evaluation, consisting of five additional aspects. Each idea generated through the innovation workshops has been developed through its own cycle of the following five phases:

Phase 6: Creating a basic working prototype of the design to demonstrate and reflect upon with participants in each driver region.

Phase 7: Lab studies in each driver region. Between each lab study in each location, prototypes are refined based on ideas and



Completing the Cycle An example of the subsequent development, refinement, deployment and evaluat
Pod. At each stage, designs, prototypes and results are reflected back, including, wherever possible, to t

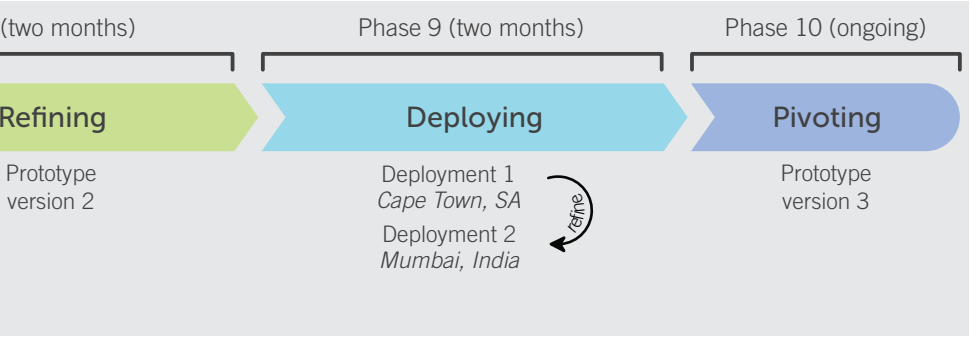
feedback from participants, before looping back into further driver communities for enrichment and enhancement.

Phase 8: Intense development work, creating a deployable version of the prototype system.

Phase 9: Longitudinal deployments with emergent user communities in driver regions, involving both original participants from the future-making workshops and additionally recruited testers. Similar to Phase 7, prototypes are refined, enhanced and enriched between each iteration.

Phase 10: Pivoting back and expanding to wider communities. Typically, this stage involves the release of an open-source toolkit, and a launch event to spur wider adoption.

A detailed study of Phases 6–10 of the itinerative design process in detail is beyond the scope of this report. However, to illustrate the next steps taken in the itinerative design process, we describe as an exemplar the subsequent stages we have undertaken with the most popular generated scenario: the Safety Pod design.



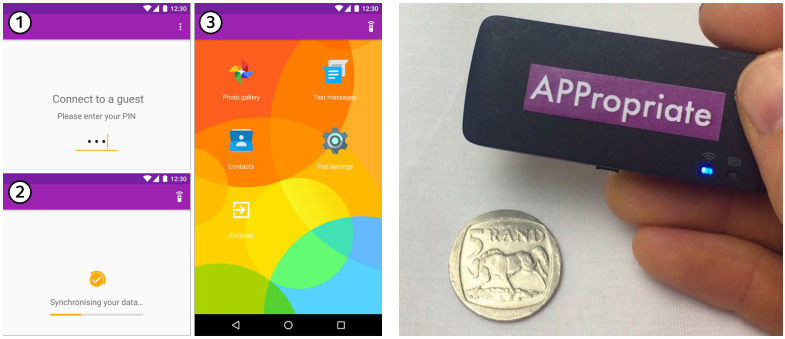
tion stages of the itinerative design process, in this case showing the steps undertaken with the Safety those future-makers who originally helped generate the ideas, then used to inform subsequent steps.

Illustrative example

The diagram above shows the overall stages in the continued development, evaluation, refinement and deployment of a generated scenario. As can be seen in the illustration, each stage of the process is highly focused on emergent user involvement.

For the Safety Pod scenario, we began by building a high-fidelity prototype of the design, using the comments and suggestions received from stakeholders at the summit event (Phase 4) and the feedback from the emergent future-makers (Phase 5) as a starting point in its refinement. Throughout the course of the following year, the core project team then travelled to three distinct emergent user communities across three driver regions to perform lab-based evaluations of an initial probe, adapting and refining the prototype between locations.

After feedback from trials in Kenya, South Africa and India, we constructed a deployable version of the prototype, compatible with the devices emergent users currently own. This version was taken on by emergent users in Cape Town and Mumbai for long-term deployments on community members' own devices. Finally, after the deployment, we undertook a further cycle of refinement, and



APPropriate The Safety Pod concept was developed into a fully-functional hardware accessory that allows users to access their own content on other devices. Left: synchronising media to a borrowed phone. Right: APPropriate hardware.

relased the tool—APPropriate—as part of an open-source toolkit, along with developed versions of each of the other scenarios.

In other cycles of the intinerative design process, the work has also led to a phone connectivity toolkit that has been used in an Indic language keyboard application that has been downloaded almost three million times; and, to a series of high profile research articles (see references at the end of this report). Such outcomes suggest to us that the process and perspectives it brings can and do generate ideas that are novel, fresh and useful.

Take Away

The aim of the itinerative design process is to think disruptively and imaginatively about future devices from the perspective of emergent users. Understandably, a good proportion of the work in HCI4D and ICTD areas to date has focused on the technologically lowest common denominators to reach as many people as possible – for example, by adapting traditional interactions and services for lower-end devices. Meanwhile, most commercial innovations and cutting-edge research endeavours focus entirely on the mainstream "first-world" population, typically being designed to fit a future, in terms of resource availability, cultural practice and literacy, that is out of joint with that lying ahead for emergent users.

So, our challenge in this work is to ask and address the question: whose future is it anyway?

We argue that involving emergent users in the creation of far-off future devices—in the same way that mainstream innovators have been involved for some time—not only gives these future-makers the opportunity to forge their own technological destiny, but also leads to unique and innovative ideas and solutions, examples of which we have shown here.

Our work points to ways itinerative design can be used to stimulate and refine ideas and solutions to the challenges faced by emergent users, allowing them to become co-creators of future technologies both for themselves and for others worldwide. We have given an insight to our method, and illustrated its benefits via a discussion of the reactions and generated scenarios from a single cycle of the itinerative design process.

Taking things further

We have developed the Innovative Digital Inclusion and Participation Toolkit, which is a method and set of open source future-looking digital and mobile tools created with and for currently under-served users. The toolkit can be found at:

digitalinclusiontoolkit.org

Further details on the overall project can be found at:

reshapingthefuture.org

We hope that you will use and adapt the methods in your own innovation work as well as extending and building on the hardware and software examples. If you do, please let us know:

hello@reshapingthefuture.org

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