Including Local Entrepreneurs in ICT4D

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ABSTRACT

This position paper outlines both long-term and short-term methods for building platforms that enable entrepreneurs to guide future ICT4D research. While in the future we envision inexpensive and ubiquitous hardware platforms that facilitate rapid application development, it is also possible to build platforms for application development on existing infrastructure. Protocols such as USSD can act as a universal user-interface — enabling any GSM-enabled phone with the ability to browse menus and interact with server-side databases. Alternatives to mobile money transfers can include repurposing airtime-sharing protocols and scratch cards. Given the significant potential benefits of directly involving local entrepreneurs in testing and evaluating new ideas emerging from the ICT4D research, we see it as a core challenge of this community to build the platforms necessary to ensure this happens.

1. INTRODUCTION

Many projects in Information and Communication Technologies for Development (ICT4D) are based at world-class universities and partner with local organizations for day-to-day operations. This relationship works well for certain types of projects — for example, remote medical examinations. However, a significant group of local entrepreneurs are underserved by the current approach. Instead, much like the phone acts as the springboard for deploying applications in developing regions, local entrepreneurs should be directly involved in testing and evaluating new ideas emerging from our work.

One potential drawback to working directly with entrepreneurs is that it can lead to a short-sighted, incremental approach. They cannot develop technology on platforms that do not exist. It is this community's role to carefully consider and develop cost-effective platforms that they can use — but with a longer horizon than they can afford.

An example of a platform that this research community should develop is a "cloud" for entrepreneurs. If we began from a blank slate and assumed that, like now, many people have phones, what kind of cost-effective client (on phone) and server (local, cheap) platform could be provided so that people could build a business on a shoestring? The roadblocks to doing this currently are so large that it is hard for large corporations. Instead, what if a system like Amazon's Elastic Compute Cloud existed? We believe developers could start businesses with three orders of magnitude less seed capital.

What would this platform look like? It would require phone-side and server-side intelligence. It would require a clear mechanism for deploying new and updating existing applications. It would need to work on existing communications infrastructure (voice, SMS, USSD, GPRS), and tolerate the exigencies of the local network (power failures, high loss rates, long down times). It would also require secure personal and business payment and escrow services. Ideally, because we imagine that many of the businesses the platform would support would be small, the information that they each have should be mutually accessible — both by the phone-side of each application and the server-side.

Legacy phones and their operating systems are perhaps the largest impediment to the platform we envision. Saying that one's application works on J2ME or the iPhone or Android is irrelevant: these are all too heavyweight and expensive. Instead, this community should assume the existence of a very low cost device that multitasks, runs Linux at its core, has a camera, but is memory and processor constrained. In our personal opinion, an open, usable phone-platform like this seems so compelling that its emergence seems almost a certainty. Let us build for it.

We believe that there exist a set of local developers and entrepreneurs eager for such a platform and clearly there is a demand for applications. For example, the Skunkworks group in Nairobi, Kenya [2], is full of technically strong people. However, this group and others like them cannot set the rest of their work aside to develop a clean-slate solution. We see it as a core challenge of this community to develop ideas for and prototypes of this platform, and for the larger industry players to help academics deploy it.

2. CHALLENGE AREAS

We see the main components of this platform as including:

Phone-side components Similar to standard mobile platforms, safe deployment of new applications will require a "sandbox" limiting the application's functionality while protecting important user data. Phone operating systems should provide a set of components that connect to form many types of applications. The concise descriptions of these connections would constitute an application and could be deployed in a few SMS messages. Getting these components and their interconnection language right would be hard.

Server-side "cloud" For the early stages, this would be run much like *PlanetLab* [1], where students would have easy access to SMS, USSD, and voice-based services. Getting sharing to work well in PlanetLab has been difficult, and this hosting service would have similar challenges.

Intelligent networking A reliable DTN transport needs to exist between the phone platform and hosted services.

Financial Services Assuming that banking services like MPESA continue to be successful, how would this open platform offer *transparent* financial services?

3. BOTTOM-UP DESIGN

The design of technology for the developing world has been almost exclusively top-down. Western corporations determine the specifications and functionality of a platform based on their assessments of the local market's needs and technical savvy. While these corporations are becoming more in touch with local needs, reflected in increasingly appropriate design of these platforms, we believe there is much to be gained by incorporating local entrepreneurs into the design loop.

Empowering local entrepreneurial developers with a platform for easily launching innovative services and products has several advantages for major companies:

Entrepreneur-Informed Design We believe that providing local entrepreneurs with a monetary incentives for successful applications is an extremely effective method of understanding and meeting local market needs;

Rapid Prototyping With a "cloud"-like system that dramatically reduces application development and deployment times, many more products and services can be market-tested. This enables their commercial viability to be rapidly assessed and provides an opportunity to conduct many more design iterations and leading to more "killer" applications;

Learning Local, Applying Global Lessons that are learned by empowering entrepreneurs with the ability to easily deploy applications to local markets has a potentially large global impact. While it is important to allow the innovators to maintain ownership of their innovations within the local market, the lessons learned through this iterative design process may be applicable to other companies and other markets.

4. INITIAL METHODS

While the proposal above outlines an ambitious long-term agenda, there are specific aspects the research community can pursue in the short-term. One of the major, and significantly underutilized, tools that can be used for rapid application deployment across the developing world are universal protocols such as USSD. Additionally, until mobile banking and money transfer services become ubiquitous, it is possible to integrate other payment mechanisms into mobile services such as airtime-sharing protocols such as Me2U or even customized scratch cards.

USSD While USSD is almost unknown in the West, it is available on all GSM phones. Unlike SMS, USSD is a not a store-and-forward protocol, but rather is session-based (a difference similar to that between email and telnet). Typically, USSD is the method for prepaid subscribers to check their balance and top-up their account. Initiating a USSD session is typically done by entering the following numbers * *shortcode* # *command* # and pressing send. It could function as the basis for many new services.

Integrated Airtime Sharing While interactive mobile banking and financial transactions services such as MPESA have yet to be deployed, airtime sharing is available in many regions. These types of services can provide the foundation for an entirely new suite of applications that can leverage future mobile payment systems. One example of this is a water pump company in Nairobi: this company has sold water pumps in rural Kenya for many years, but they recently changed their business model away from hardware sales, and instead they sell water "vending machines." They now attach phones and solar panels to their water pumps, instead of paying for the pump with upfront capital, villagers get the pump for free and transfer small amounts of money (or airtime) to the pump in exchange for water.

Repurposing Scratch Cards In most of the developing world, mobile phone subscribers purchase scratch cards from local vendors to "top-up" their airtime credit. Because billions of people are comfortable with scratch cards, and there already is an infrastructure for selling scratch cards in even remote areas, there is an opportunity to repurpose scratch cards as a mobile payment mechanisms for other commodities. For example, in Rwanda, until recently individuals had to travel to the capital and wait in line at the national electricity company, ElectroGaz, to "top-up" their electricity accounts. This posed a dilemma: most people could not afford to outlay a significant amount of capital, but they did not have the time to go into town and wait in line every few days to keep their electricity account topped up such that their service is not automatically shut off. Jeff Gasna at SMSMedia in Kigali recognized that just as prepaid airtime can be sold by scratch-card dealers, so could prepaid electricity. Jeff partnered with ElectroGaz and printed his own electricity scratch-cards. Within a year of launching this service, over 30% of electricity users in Rwanda are now using their mobile phones to buy electricity using Jeff's system.

5. REFERENCES

[1] L. Peterson et al. A Blueprint for Introducing Disruptive Technology into the Internet. In *HotNets*, Princeton, NJ, October 2002.

[2] G. P. Zachary. Ping: Inside Nairobi, the Next Palo Alto. *New York Times*, July 2008.