FRAMING M4D: THE UTILITY OF CONTINUITY
AND THE DUAL HERITAGE OF "MOBILES AND DEVELOPMENT"[1]

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ABSTRACT
The paper suggests that research on the role of mobile telephony for socioeconomic development (M4D) draws on two frames. One frame stresses the relative freedom of telephone users to do whatever they choose. The other stresses how technologies and technology-led interventions are embedded in recursive, context specific relationships with user communities. Together these frames support M4D's "dual heritage". After detailing current M4D archetypes representing each heritage, the paper introduces a conceptual and practical synthesis, that is, large-scale platforms for distributed, semi-constrained interaction. This paper considers two examples of such platforms—MXit, South Africa's mobile social networking service and M-PESA, Kenya's mobile money transfer system—including both anticipated and unanticipated consequences of operating "at scale" and beyond the confines of a controlled M4D intervention. Finally, this paper introduces implications of the dual heritage and of the rise of hybrid platforms for research and practice.

Keywords:
Mobile phones, Cell phones, Socioeconomic development, ICT4D, M4D

1. BACKGROUND INFORMATION
As a community of practice, M4D doesn't even control its own acronym. As of mid-2010, an Internet search for the term "M4D" was as likely to return top results for "marketing for dealers" as it was for the topic of this paper, "mobiles for development". However, as a recent arrival in the broader ICT4D (Information and Communication Technologies for Development) discussion, M4D is growing quickly. Researchers and practitioners have explored how mobiles can be used in almost every traditional development domain, including agriculture, health, education and financial services (Donner, 2008; Heeks and Jagun, 2007). Numerous reports explore the potential of "mobiles" to be harnessed towards development outcomes (e.g., (Vital Wave Consulting, 2009; Vodafone, 2005)), international workshops and conferences are convened under the M4D banner (e.g., (Kushchu, 2009; Petterson, 2008)) and a small but discernable meta-conversation is emerging about the nature of M4D as a community of practice (Donner et al., 2008; Postill and Osorio, 2010).

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[1] This article began as three presentations in early 2010; at *ICTs and Development: An International Workshop for Theory, Practice, & Policy*, in New Delhi (http://bit.ly/bwUe2u); at the Annual Conference of the Centre for African Studies at the University of Edinburgh (http://bit.ly/birSqQ); and as an invited talk in the Information and Communication Technologies for Development 2010 Lecture series at the College of Communication Arts and Sciences at Michigan State University (http://bit.ly/awkiNM). The author is grateful to the conference hosts and attendees for their support and feedback.

The reason for this burst in interest is simple. During the first decade of the 21st century, affordable personal telephony came within the reach of billions of low- and middle-income individuals throughout the developing world[2]. The rapid uptake of mobile phones has brought fresh vigor and optimism to the ICT4D community, but M4D has come to occupy a curious position. Barely a decade old, the community of M4D scholars and practitioners already confronts a swiftly moving target. The use of mobiles throughput the developing world has jumped dramatically. Handset costs are dropping and functionality is improving. Cameras, sensors, better interfaces and, perhaps most importantly, data connections are becoming more common in the "Swiss army knife" (Jenkins, 2006, p. 5) that is the new mobile handset.

Similarly, the constellation of services and applications accessible via the world's mobile networks is broader and more diverse; from m-banking to citizen journalism, mobiles are used for purposes far beyond conventional person-to-person voice calls, in ways that blur the lines between computers and telephony. These trends are already palpable to readers in the Global North, who are bombarded by advertisements for smartphones. However, they are equally relevant to ICT4D researchers and practitioners, who must now make sense of not just billions of phones but also the promise of billions of potential new ways to exchange and process information and to connect to the Internet.

This paper will consider the implications of these shifting technical affordances for the M4D community. However, to do so it will look backward before looking forward. It will explore the intersection of two traditionally separate research traditions: the one around person-to-person calls enabled by the switched telephonic network; and the one around ICT4D interventions, particularly machine-mediated processes enabled by software, the Internet and the World Wide Web. The paper will argue that these frames are not merely distinctions of the technical moment, but rather are indicative of entrenched differences in theoretical and practical approaches to the application of ICTs for social and economic good. By explicitly linking M4D to its dual heritages, the unique implications of convergence (Jenkins, 2006) for M4D can be brought into closer focus. On the one hand, the glimpse backwards reminds us how much is already known about how ICTs enable economic and social development. On the other hand, this discussion will illustrate how a new group of mobile applications and systems, specifically platforms for distributed interaction, begin to take M4D (and ICT4D more generally) into uncharted and theoretically problematic spaces, spaces that have been described as open ICT ecosystems (Smith & Elder, forthcoming), ICT4D 2.0 (Heeks, 2008a), Web2.0forDev (Ashley et al., 2009) and Development 2.0 (Heeks, 2010).

2. THE DUAL-HERITAGE OF M4D

M4D draws extensively on theoretical and practical framings developed around two distinct phenomena: the phone (as an enabler of choice) and the computer (as a system to alter social contexts). This is not to say that there is a monolithic "theory of the phone" and separate "theory of the PC" as they are applied in ICT4D. Instead, these represent distinct interpretive frames (Goffman, 1974) used by researchers to select from a myriad of datapoints, assertions and theories to describe of how users interact with technologies. M4D, from its very inception, has drawn on these two broad frames.

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[2] There are lingering questions about barriers to "universal" mobile use. Even in a world with over 5 billion mobile subscriptions (ITU, 2010), many people live outside the signal range of a mobile base station or cannot afford even basic handsets or the airtime to sustain them. Others are unable to use the device due to linguistic or skills limitations, or are prohibited from owning a device by a spouse or parent. That said, even in many small villages, and in the poorest neighborhoods of the megacities of the Global South, the mobile device has become more commonplace than extraordinary.

2.1 Framing the Phone: Enabling User Choice
The mobile phone often serves as an extension of the terrestrial telephone network. Thanks to common numbering systems and interconnection agreements, mobile networks allow calls to originate on a landline and terminate on a mobile, or vice versa. Although more personal and portable than the placebound landline, (Ito et al., 2005; Katz and Aakhus, 2002), the mobile shares a common sociology with its stationary sibling, in that it has uses as varied as the people who adopt it. It is an amplifier of human action rather than a narrow causal agent (Fischer, 1992). As Pool (1977, p. 4) noted in his introduction to the seminal *Social Impact of the Telephone*:

> The phone, in short, adds to human freedom, but those who gain freedom can use it however they choose. Rather than constraining action in any one direction, the telephone is an agent of effective action in many directions….[its study] demands a logic more complex than that of simple causality—a logic that allows for purposive behavior as an element of the analysis.

There are two important components to this quote and to this perspective. The first is implicit: that although connectivity depends on an elegant and complex combination of infrastructure, networks, regulators, markets and handsets (Cherry, 1977), the "plain old" person-to-person phone call is the central function of the technology. Most elements of the network to support such calls are invisible to end users, who are free to worry about whom to call (and how to pay for the call). This remains the case with the mobile phone, where countless billions of voice calls and SMS messages support every kind of human relationship and endeavor.

The second component is explicit. Pool argues that in this facilitation of choice, the telephone often has effects in diametrically opposed directions, such as supporting both the dispersion of authorities into field offices and the centralization of such authorities in command headquarters. The cacophony of effects makes it difficult to describe, assess, or even theorize about the telephone's overall social impact. This is not to say that phone use creates infinite freedom, nor that local impacts are impossible to discern, but it does suggest that users' choices will be a central part of most analyses of phone use.

For the M4D researcher, in particular, the most important extension of this telephonic heritage is that *some* calls or text messages individuals *might* choose to make *might* lead to beneficial development outcomes. Decades of evidence suggests that landlines improve "market information for buying and selling", improve "transport efficiency and regional development", reduce "isolation and regional security" and enhance "coordination of international activity" (Saunders et al., 1994, pp. 23-29). Similar evidence is being gathered for mobiles (Jensen, 2007; Muto and Yamano, 2009), although it is neither as complete or as generalizable yet. It is this general quickening and integration of economies and systems, brought on by lower-cost telecommunications and increased individual agency, which underpins the macro-level GNP growth attributed to mobiles by Waverman et al. (2005).

The best micro-level evidence in the literature for these effects may come from Jensen (2007), who demonstrated how fishermen on the coast of Kerala used mobile phones to do more extensive scans for price information and potential buyers—lowering waste, raising productivity and generating higher incomes—all almost immediately after the cell towers were constructed and wireless connectivity came to their villages.

Granted, connectivity did not come to the shores of Kerala without some involvement from national regulators (McDowell and Lee, 2003) and international agencies (the IFC was an active early investor in many mobile operators (World Bank Global ICT Department, 2005)). However, no non-governmental organization (NGO), government agricultural extension worker, or aid agency rolled up in 4x4s to train these particular fishermen; nor did

any institution introduce fishermen-specific applications or services. In Pool's parlance, the fishermen used voice calls and text messages, as they chose, for "effective action".

Of course, not all calls lead to better markets or to development outcomes. One concern is that it can be challenging to see where a social call ends and an instrumental call begins (Donner, 2009a). Further, there are concerns that individuals are spending high proportions of their disposable income on airtime, to the detriment of a family's financial well-being (Heeks, 2008b). Finally, not all users may benefit to from using mobiles to the same degree; for example, Jagun et al. (2008) found that traders and middlemen in a Nigerian weaving cluster got more benefit from mobiles than poorer producers. A frame that stresses telephonic freedom and micro-level choice allows researchers, practitioners and policymakers not only to see markets in action, but also to assess how mobile use may be at cross purposes, with both detrimental and beneficial impacts on individual users, households and communities.

2.2 Framing Applications and Services: Embedded Directionality
What about "everything else" that newer mobile technologies support? A host of features and functions make mobile look more like computers (and cameras and video players and sensors and game consoles) every day. Most of these applications and services are designed to enable particular subsets of human behaviors. As such, the designers and users of these systems are operating in closer contact with each other than is required to facilitate a content-neutral voice call. Broadly speaking, the research traditions, centered around sociotechnical systems (Emery and Trist, 1960) and development informatics (Heeks, 2002), use a myriad of overlapping specific theories to frame applications and services as both products of and influences on the social structures that organize human behaviors. One articulation of this view, Adaptive Structuration Theory (AST) (DeSanctis and Poole, 1994, p. 125):

> …focuses on social structures, rules and resources provided by technologies and institutions as the basis for human activity. Social structures serve as templates for planning and accomplishing tasks… Designers incorporate some of these structures into the technology; the structures may be reproduced so as to mimic their nontechnology counterparts, or they may be modified, enhanced, or combined with manual procedures, thus creating new structures within the technology. Once complete, the technology presents an array of social structures for possible use even interpersonal interaction, including rules (e.g., voting procedures) and resources (e.g., stored data, public display screens). As these structures are brought into interaction, they are instantiated in social life. So, there are structures in technology, on the one hand and structures in action, on the other. The two are continually intertwined; there is a recursive relationship between technology and action, each iteratively shaping the other.

From markets to schools to national health care systems, ICT4D (and M4D) initiatives seek to weave technologies into social systems. The action and challenge is the in the match itself, the recursive fluidity and embeddedness of technology, social context and practice. Some ICT4D initiatives use off the shelf technologies in directed ways, through training, organizational support, or equipment subsidies and purchases. Others adapt or deploy specialized versions of technologies to address development challenges. But in both cases the "4D" in ICT4D and M4D is the moniker of an intentionality (Donner et al. 2008) to alter social structures and to enable and guide action toward more desirable outcomes and social states. The "4D" is indicative of what DeScantis and Poole (1994, p. 126) called the "spirit of the feature set", that is, the "official line which the technology present to people regarding how to act when using the system… supplying a normative frame with regard to the behaviors that are appropriate within the context of the technology".

This frame illustrates how the close, recursive relationship between users and designers presents particular challenges for ICT4D and M4D practitioners. Heeks (2002)

argues that many ICT4D projects fail because of broad gaps between the system as designed/intended/imagined and the "actuality" of the context into which it is deployed. Further, the "fit" (match) and utility of ICT4D interventions can be both time- and context-dependent. Consider Grameen Village Phone, perhaps the archetypal M4D project. For the Village Phone Program, Grameen Bank merged its microfinance models with special public mobile payphone systems to encourage Bangladeshi women to become telecommunications providers for their villages. Run by an NGO and targeted specifically at women entrepreneurs, the Village Phone program offered "spirit of the feature set" which merged the mythology of the empowering phone call with that of the empowering microloan. The resulting initiative was good for the entrepreneurs (who received income) and for the villages (which received telecommunications services), resulting in a double-layer of development outcomes (Aminuzzaman, 2002) replicated in thousands of villages and in multiple countries. And yet, the same shared-access model that made the program so successful is less appealing (and needed) in an environment where personal handset ownership is rising quickly (Shaffer, 2007); the solution was context- and time-dependent.

A decade after the Village Phone program began, M4D initiatives now come in a variety of shapes and sizes (Donner et al., 2008), from small-scale SMS agricultural price information systems (Donner, 2009b) to large-scale national deployments of specialized information systems, such as Voxiva in Health (Casas and LaJoie, 2003). In each case, these deployments can be imagined, assessed and improved by utilizing the embeddedness frame brought to the forefront by the STS and development informatics communities. While those working in self-described "M4D" endeavors generally have goals and impacts in mind (better price information, more timely disease surveillance, richer learning experience, etc.), the study of software systems in the last few decades has indicated that these actors and actions are embedded in social structures that create powerful feedback pressures on the technologies themselves and make those goals and impacts harder to identify, achieve and sustain in practice than in theory.

In sum, the differences between the relative freedom of the phone and the denser tangle of social and structural interdependencies confronting services and applications are a matter of degree, not kind. There is enough overlap that one could apply a "user choice" frame to almost any sociotechnical system, or an "embedded directionality" frame to the mobile voice call. (e.g., even the most basic calling features on mobile handsets run on software, are supported by complex networks and are buffeted by social forces that take the technologies in sometimes unexpected directions (Donner, 2007; Trosby, 2004).

But for researchers, these M4D archetypes (the Keralan Fishermen, the Bangladeshi Village Phone Operator) are more amenable to interpretation from these two distinct frames: one relies on explaining user choice, while the other demands a focus on the interaction between the creator of an application (or a technology-enabled organizational initiative) and its users—a relationship packed with intentionality, guidance, assistance and feedback, where the "spirit of the feature set " is the desire to help better people's lives. Neither frame has an exclusive claim to the underlying processes of M4D; these frames, instead, are M4D's dual heritages.

2.3 The Dual Heritages: Synthesis and Strain
These alternate frames, these dual heritages, have coexisted throughout the short history of the M4D conversation. User choice studies on the microeconomics of fish (Jensen, 2007) or the macroeconomics of growth (Waverman et al., 2005) were mentioned in the same narratives alongside descriptions of M4D programs like Grameen Village Phone (Aminuzzaman et al., 2003; Bayes et al., 1999) and Voxiva's health information systems (Casas and LaJoie, 2003; Prahalad, 2005) As the community grew in size and visibility,

interested parties could draw on one or both frames as desired, in order to make sense of the ways in which mobile telephony fit into the development puzzle.

As is often the case after the introduction of a conceptual thesis (M4D as user choice) and antithesis (M4D as directionally embedded services and applications), a quasi-Hegelian dialectic and corresponding synthesis seems appropriate (Kaufmann, 1965). This paper will not break with tradition. As mobile technologies have spread, diversified and converged (Jenkins, 2006) the contrasts between communication and information processing—and between telephony and computing—have blurred further. So, too, have the lines between intervention and arms-length enablement of development processes. Quite simply, new mobile systems are emerging, at scale, with millions of users, which may not be assessed adequately via either the user choice or the embedded directionality frames that have served M4D so well. These platforms for distributed interaction and their implications for M4D practice and theory, will be the focus of the remainder of the paper.

This paper is not the first to posit synthesis of this kind. In an influential paper, Heeks (2008a, p. 28) describes how the potential of ICTs to contribute to development outcomes has been shifting from exclusively data transmission and communication towards also facilitating service delivery and productivity tools. He describes two "extremes along the continuum of different approaches to technology and development", a "passive diffusion" view (where market forces seem to do most of the work) and an "active innovation" view in which "intervention is required in the form of innovations that will better help to meet development goals". (2008a, p. 29). He then offers a synthesis in the form of ICT4D 2.0. Led by flexible, affordable and often Internet-connected ICTs, ICT4D2.0 emphasizes platforms, demand-driven models and modes of engagement that stress working alongside poor communities (to enable and empower them) rather than intervening or working on their behalf.

Heeks further refines some of these ideas in a later discussion of "development 2.0" (2010, p. 2). Development 2.0, to Heeks, includes new forms of mediated development including direct development, which disintermediates traditional development institutions, networked development, "a mesh of actors and institutions that are connected and work together though ICTs" and grassroots development in which communities themselves harness ICTs more effectively for development.

Others have made similar integrative efforts, such as the special issue of Participatory Learning and Action on "Web2.04Dev" (Ashley et al., 2009) and Smith and Elder's (forthcoming) discussion of open ICT ecosystems. Kolko et al. (2007) propose that mobile social software makes an excellent "site" or "base" (e.g., platform) for development activities.

This paper adds a further contribution to these broad analyses by focusing on the mobile component—both because it is a subtopic of particular concern to the ICT4D community and because it offer a distinct bridge back to the "telephone" literature which has been largely ignored by a PC-focused two decades of ICT4D research. The paper now turns to a discussion of two new "platforms for distributed interaction" as a way to consider the theoretical and practical synthesis of the frames. Its ruminations are primarily about M4D but can be interpreted within (and further elaborate on) the broader shift in ICT4D as outlined by Heeks.

3. MOBILES AS PLATFORMS FOR DISTRIBUTED INTERACTION
The outlines of a synthesis of "user choice" and "embedded directionality" frames are clear: some of the most intriguing recent M4D initiatives have created and deployed platforms that guide and enable distributed interaction in ways that lead to better development outcomes. These include virtual marketplaces, such as Manobi (David-Benz et al., 2006) and CellBazaar (Quadir and Mohaiemen, 2009); mobile money systems, like MPESA (Hughes and Lonie,

2007; Mas and Morawczynski, 2009; Morawczynski, 2009); and crowd-sourcing tools for election monitoring and disaster response, like Ushahidi (Hersman, 2010).

Consider this practical "platform" synthesis in the framing of Frontline SMS. It is an SMS-management tool that allows NGOs even with only basic IT capabilities and modest budgets to create and deploy two-way SMS information systems to suit their needs. It has been used in a variety of contexts, from agriculture to telemedicine. The Frontline SMS website echoes Pool's "user choice" frame: "What you communicate is up to you, making Frontline SMS useful in many different ways"(FrontlineSMS, 2010a). Its flexibility notwithstanding, it is nevertheless self-described as an effort to facilitate development outcomes: "A lack of communication can be a major barrier for grassroots NGOs working in developing countries. Frontline SMS is the first text messaging system created exclusively with this problem in mind"(FrontlineSMS, 2010b). With such text evoking the implied directionality of an advanced information technology working in a particular milieu, an application of the embedded directionality frame would suggest that the "spirit of Frontline SMS's feature set" is "4D".

The synthesis is also evident in what systems like MPESA, Ushahidi and Frontline SMS are not: namely, publication channels through which central authorities can push "content" or "information" to end users. They are neither as flexible as person-to-person voice calls nor as routinized and hard-coded as many information systems. They are, instead, dependent on the content created and exchanged by users. Users retain the choice of with whom to exchange and for what reasons, but are facilitated by the M4D intervention/technology towards interactions that collectively will yield development outcomes. They are not channels for information dissemination or directed behavior change; rather, they are vehicles for communities to transact, coordinate and improve without necessarily requiring micro-level interventions.

4. BLURRING THE BOUNDARIES OF M4D

In a few cases, these mobile platforms for distributed interaction have achieved impressive scale, reaching millions of users. This section will describe two of them in detail: 1) MPESA, perhaps the pre-eminent mobile money service in the developing world, started as a development initiative but expanded beyond these roots and 2) MXit, a popular chat application in South Africa, which did not start as an M4D application yet, in certain cases, behaves like one. The platforms frame, borrowing both from the freedom of telephony and the embedded directionality of applications and services, helps M4D and ICT4D researchers assess both the appeal and tensions presented by these systems.

MPESA is a mobile-phone based money transfer service offered in Kenya by Safaricom (Hughes and Lonie, 2007; Mas and Morawczynski, 2009; Morawczynski, 2009). Dozens of other mobile money services are offered throughout the continent and MPESA itself is extending to Tanzania and South Africa. However, nowhere is mobile money as popular as in Kenya, where there are more mobile money users than there are bank account holders. By leveraging Safaricom's airtime sales network, MPSEA allows individuals to cash in (exchange hard currency for electronically stored money linked to their SIM card), transfer funds between users and cash out. Millions use it as a safer, more reliable and lower cost alternative to existing remittance systems, sending money to friends and family throughout the country. Recognizing the potential importance of mobile money as a way to bring financial services to a large proportion of unbanked households, the UK development agency, DFID, was an early backer of the MPESA service (Hughes and Lonie, 2007). Yet, individual users may not see MPESA as a "4D" service; MPESA can be used to send money home (its straightforward advertising slogan), but also to pay for drinks at a bar (Morawczynski, 2008), an electric bill, or even a bribe (Macharia, 2009). Indeed, some see it as a service of "the

rich", meaning the urban middle class, rather than a service of and for poor rural residents (Morawczynski, 2009).

South Africa's MXit is its most popular social networking service. South Africa is a mobile-centric environment (Gitau, Marsden and Donner, 2010), with low PC-based Internet usage (8.4%) and high mobile penetration (90%) (ITU, 2009). MXit has been able to go mainstream in this environment, enrolling millions of users who take advantage of inexpensive GPRS-based person-to-person messaging (replacing costly SMS messages) as well as fee-based premium services like chat rooms, games and wallpapers (Bosch, 2008; Chigona and Chigona, 2009; Chigona et al., 2009; Kreutzer, 2009). MXit works on the common "feature" phones in South Africa, with basic Internet access via a GPRS connection and the ability to run mobile Java applications. MXit was not intended as an M4D service, but it is remarkably pervasive and is, in essence, the first, primary and sometimes only Internet experience for many South Africans (Gitau et al., 2010). As such, organizations are using the MXit platform to craft M4D interventions, such as math tutoring (Butgereit, 2007) and peer counseling for HIV and drug addiction (Nitsckie and Parker, 2009).

Both MPESA and MXit's successes at achieving scale follow well-trod paths along the diffusion of innovations (Rogers, 1983). Each presents low barriers to adoption, high observability, easy trialability (low risks and low startup costs), simplicity and high value relative to alternatives. Both take advantage of network effects and become more useful as a higher proportion of a community adopts them (Valente, 1995). They are woven into everyday life, because each brings a function taken for granted by the world's "top billion" (in this case, stored value and a digital identity respectively) to the "middle billions" in affordable and accessible ways. Yet indeed, concomitant with their popularity and scale come integration with a wider set of political, social and economic factors in society and a broader set of complicated factors to consider.

For example, MPESA pays no interest on the stored value that users hold in the system. Its success notwithstanding, M-PESA is NOT a bank and is not regulated (or guaranteed) like a bank by the Kenyan Government. Indeed, if it paid interest, it would have to be regulated like a bank and might not be permitted to continue in its current form[3]. MPESA was originally labeled as a money transfer system but evidence suggests that some users use it as a savings mechanism (Morawczynski, 2009). Researchers have also been exploring how the very introduction of a money transfer system like MPESA can put strains on extended families, leaving husbands away from wives for longer periods of time, or presenting long-lost relatives with an excuse to try to ask for money from distant relatives (Morawczynski, 2009).

MXit has had to wrestle with issues of editorial control, since it is both a platform for person-to-person messaging and a content provider and because there is some concern about the misappropriation of MXit services for illicit activity such as underage sex, pornography and cyberstalking (Bosch, 2008). MXit's hands-on approach was evident during the run-up to the 2009 presidential election in South Africa, when MXit, citing its policy restricting "content containing religious, political and/or common social issues, such as abortion and suicide"[4] declined to allow any of the major parties to sponsor chatrooms (e.g., purchase ads) on the MXit platform. Although individuals may have used MXit to chat with each other, ad-hoc, about politics, there was no venue on the site where political conversation was encouraged or aggregated. Thus the platform was not a factor in the election and a major

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[3] Fortunately, in mid-2010, MPESA entered into an agreement with a large Kenyan bank to offer linked savings accounts.
[4] MXit 'Content policy [external policy] - Annexure', 2009, personal communication, 31 August 2009. Cited in (Walton and Donner, 2009)

opportunity for digitally mediated political engagement was missed (Walton and Donner, 2009).

5. IMPLICATIONS FOR M4D AND ICT4D RESEARCH

The importance of platforms for distributed interaction like MPESA and MXit for the M4D community is linked to the scale of their use, their network effects and their relative openness and flexibility. That the systems are having some M4D outcomes, but not exclusively M4D outcomes (nor indeed exclusively good outcomes), is what make them intriguing grounds to push M4D theory and practice into its second decade. And yet, it is at exactly this moment that researchers should not ignore the past heritages and frames that have served M4D (and ICT4D) so well.

The M4D community should be cautious about embracing terms which suggest overarching, linear phase shifts. This is a quibble more than a critique, since Heeks (2008a) is cautious to evoke the ICTD 2.0 label as a call for a multiplicity of approaches, scalability and collaborative projects and not as a rationale to abandon old theoretical frames. However, in the case of M4D, it particularly important to keep the existing frames in the forefront for two reasons:

First, because most of the use of mobile telephones in the developing world continues to be concentrated in the voice call and perhaps the SMS, it is important not to lose the momentum on the research about the role of basic connectivity in the development process. Over the next few years, the remaining pockets of non-connectivity will further recede, as telephones "reach the village" (Hudson, 1984) for the last time. The opportunity remains to watch the micro-process of telecommunications adoption unfold in real-time. Designs can also take the longer view—reminiscent of work in the Pool (1977) volume on the telephone—bringing 4D in line with macro-trends in urbanization and shifting resource allocations between industries and employment sectors in societies. For the near future, these questions will require a continued focus on basic telecommunications rather than specialized M4D services. In particular, work remains to be done to stitch anecdotes into evidence and umbrella statements into specific assertions about how mobiles are affecting the development process and refining multivariate, "middle-range" (Merton, 1949) theoretical assertions about where productivity gains are greater and for whom. Despite the current enthusiasm for mobile applications, convergence and the mobile Internet, most benefits of the mobile in development processes remain unobserved and under-studied, in unorganized "peer to peer" voice calls and text messages.

Similarly, there is an ongoing need to design, evaluate and improve M4D interventions using the panoply of approaches, such as structuration, embeddedness, recursivity and contextual fit coming from the development informatics frames. As long as there are plans and budgets and programs to harness the power of mobiles to explicitly seek any development objectives, the lessons of decades of experimentation with ICT4D will apply to M4D.

The overarching stance unifying both these needs is the importance of emphasizing continuities between the role of the "new" mobile telephone in development and the body of theory and practical guidance that has already been developed about the role of "older" (but in actuality very much copresent, e.g., Edgerton, (2007)) technologies such as the telephone and the Internet enabled PC. As Sandvig and Sawhney (2006, p. 21) stress in their meta-review of the rise and fall of a research literature on the videotex,

> The least we can do is to make sure that we do not consider every new technology to be a discontinuity. Scholars saw the start of videotex research as a "new beginning" or a discontinuity rather than a new example of a larger phenomenon or a theoretical continuity. One the reason for this ahistoricism is that the researchers kept extremely "close to the machine" (to borrow a phrase from programmer slang).

If the rapidly-evolving M4D community elects to focus its efforts on articulating technological discontinuities to the exclusion of the continuities, it risks, as was the case in the videotex example, creating a body of research which is relatively ahistorical and over-specified and yet relatively light on lasting theory. Conversely, the sooner and more forcefully M4D research is connected to the broader conversations on ICT4D (and on technologies and societies), the stronger it is likely to be.

Despite the importance of continuity, it is the platforms for distributed interaction, like MXit and MPESA, which place the most strain on established M4D frames. Neither of the frames identified in the first part of this paper are well equipped to handle the full variety of questions and issues such platforms raise, particularly when they reach the scale of MPESA or MXit. As with telephones, user choice generates a cacophony of "impacts" and cross-purposes. Yet it seems unsatisfying to weight all behaviors and outcomes as equally likely or equally desirable, particularly when systems like MPESA were designed and deployed with the early support of development partners. As is frequently the case, new media strain existing theory (Morris and Ogan, 1996).

One approach is to heed Sandvig and Sawhney and to keep working within the frames of the dual M4D heritage, relying on relatively little in the way of new theory. In this frame, such platforms could be understood as systems with a set of many affordances and relatively few constraints, such that "user choice" is apparent in abundance. The same could be said about email, or postcards, or multi-player games. In each case a few protocols establish the dynamics for interaction between people and a wide variation of such interactions emerges. By this logic, mobile-based platforms for distributed interaction are just new and particularly powerful variants of systems we have seen before.

The challenge, however, is that platforms for distributed interaction action have been relatively scarce in the context of developing economies and correspondingly in the ICT4D literature. We can return to Heeks (2008a, p. 28), who 1) crystallizes the shifting landscape of ICT4D (as influenced by mobiles and by greater overall levels of access to advanced tools for collaboration and coordination) and 2) calls for further, more explicit links to the development studies literature. By describing per-poor innovation models and by its very title, Heeks' paper hints at a participatory Web 2.0 paradigm, but it does not draw on its theoreticians and popular advocates (Benkler, 2006; Bruns, 2008; O'Reilly, 2005; Shirky, 2008), nor does it explicitly suggest that they have a seat at the theoretical table alongside computer science, information systems and development studies. To the extent we might look anywhere for additional "new" theory, external to ICT4D, to interpret these new combinations of affordances and constraints, the emerging web 2.0 literature may be the most apparent source.

6. IMPLICATIONS FOR M4D AND ICT4D PRACTICE AND POLICY

This exploration of the different heritages of M4D is most useful if it yields recommendations for practitioners and policymakers (Heeks, 2001). In the case of mobile communication, individuals and communities have demonstrated the ability to extract considerable value from the basic voice call, independent of localized/institutionalized interventions. Therefore, designers, policymakers and evaluators must consider what incremental or non-substitutable value-specific M4D initiatives can deliver, beyond what communities can do on their own using voice and P2P text messaging. This is not to say that ambulance trackers, inventory management systems, or networks that warn of disease outbreaks are not valuable, but it does suggest that evaluations of those systems must be done vs. the spontaneous and unorganized telephone call. This will be particularly germane in evaluating solutions for "sub-scale" problems, where small communities or relatively low levels of required information transfer may make the costs of developing and deploying specialized systems harder to justify.

Conversely, some of the most interesting innovations in applications and services in developing countries may not be exclusively recognizable as "4D" applications. For practitioners, the importance of social software as a driver to the mobile Internet (Gitau et al., 2010; Kolko et al., 2007) means that social networking and mixed-use platforms may be a fruitful component of change campaigns and development initiatives. MXit was profiled above. Another example is Nokia's Life Tools, a set of applications that combine an easy-to-navigate graphical front end with SMS data messaging behind-the-scenes. These tools are receiving attention in the M4D community for offering crop prices and weather information to farmers, but the same "tools" also include ringtones, entertainment news and astrology (Nokia, 2010).

Similarly, in 2010, the popular social networking service Facebook launched its "zero" applications, which are offered in the hopes of expanding the Facebook community to those with limited or no access to a PC. This last issue points to a breaking down of the lines between M4D services and applications, and a broader arena of collaboration tools and platforms. For example, Ushahidi (Okolloh, 2009), a web+mobile crowd-sourcing tool, is useful for mapping reports, incidents and outbreaks in real-time under conditions where central surveillance and coordination is difficult. First tested as a response to the post-election violence in Kenya, it was subsequently used effectively in the days after the 2010 Haiti earthquake. However, its co-founder does not want it to be described as ICT4D (or M4D) software: "labeling Ushahidi as ICT4D makes as much sense as saying the same for Mozilla. We're a non-profit tech company, not an NGO and this software platform isn't just for the third world or just for non-profits" (Hersman, 2010).

Conversely, consider the role of the international social networking services such as Facebook and Twitter in facilitating information exchange and real-time reporting after the same Haiti Earthquake (Heppler, 2010). Initiatives which echo, build on, or link to existing broader mediated networks may be well positioned for scale and fast adoption.

This paper has tried to focus on "what's new" in M4D by somewhat counterintuitively beginning with a discussion of what is not so new. On the one hand, the volume of "plain old voice calls" being made across the mobile networks of the developing world is still increasing and demands continued theoretical attention. At the same time, the growing array of M4D interventions demands conceptual and practical nuance. To do so, we need to remain careful in the attribution of the "4" in M4D and must seek explicit, testable, additive models to guide intervention, design, investment and policy. This paper has suggested that the dual heritages of M4D, represented by in Pool's freedom of the telephone and in DeScantis and Poole's "spirit of the feature set" that is common to sociotechnical systems, will and should continue to provide alternative framings to inform both theoretical models and practical policy. At the same time, we can seize once-in-lifetime opportunities to deepen our understanding of underlying social processes of communication, coordination, information exchange and mobility, and to design the next wave of mobile devices, applications and services to facilitate them.

M4D research is beginning its second decade. Though the discussion of M4D's dual heritages of user choice and embedded directionality, this paper has argued that there is an abundance of theoretical and practical continuities between mobiles and other ICTs in "4D" processes. Mobile use does not demand an entirely new theoretical corpus and can be mainstreamed into ICT4D research. That said, the rise of new "at scale" systems such as MPESA and MXit underscores how the essence of the mobile remains its ability to amplify and enable decentralized interaction. The patterns of use associated with these "at scale" platforms in resource-constrained settings will have tremendous implications for whether and how poor communities will participate in the informational society (Castells, 1996) and we should bring every tool at our disposal, including the new literature on "web 2.0", to bear on

understanding these phenomena. Multidisciplinary in scope, ICT4D research has been criticized for not having much in the way of grand unified theory (Raiti, 2006). In a roundabout way, the complication of mobile platforms operating at scale with some "4D" effects might push the field towards such new, inclusive and technology-independent theoretical efforts.

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