The Unbearable Modernity of Mobile Money

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Abstract. In this paper, we describe an ethnographic study of a mobile money infrastructure, especially its design, organization, and implementation, and its potential consequences for financial inclusion goals. Through using the analytic lens of infrastructure studies to ground our findings, we observe is that infrastructures emerge in organized practice and use. Moreover, they are constantly evolving with no specific beginning and end; any bounding is contingent on our own methodological and theoretical affiliations as well as our logistical constraints. To this end, we focus our attention on the two different infrastructures – the mobile money and the loan management infrastructures – that were operating in tandem to connect low-income auto-rickshaw drivers to mainstream bank loans. We specifically privilege the human work that goes into making and sustaining this mobile money infrastructure. In doing so, we challenge the 'unbearable modernity' of mobile money and its purported effects on helping the poor manage their unpredictable cash flows.

Eventually, we make two main contributions. First, we demonstrate that what appeared on the surface to be solely a 'mobile money infrastructure' is in fact a complex and, often, visibly seamless organization of at least two interacting infrastructural systems. These come together in an intricate, layered way to enable mobile money to be used for loan repayments in this low-income setting. It becomes especially important to emphasize that an infrastructure is not always organically built or spontaneously accessed in order to challenge the dominant narratives around mobile money where an insulated infrastructure is thought to enable all digital transactions and thus achieve financial inclusion. Second, we privilege the human work of what is otherwise often considered an exclusively technological infrastructure. Bringing attention to these sidelined human workers is an important concern for CSCW with its focus on the work that enables systems to function seamlessly. Indeed, mobile money remains a favorite topic of interest for development scholars and practitioners and in the emergent conversations the focus continues to remain largely on the technological innovations. Even where the retail agent networks are discussed, their work is not completely understood. Bringing attention to these sidelined human workers is an important concern in this paper.

Keywords. Mobile Money, Infrastructures, Financial Inclusion, Ethnography

1. Introduction

1.1 The Birth of the *Magical* Mobile Money Narrative

Mobile money first entered the larger public's consciousness in 2007 after Safaricom, Kenya's largest mobile network operator, piloted an "innovative payment service for the unbanked" with encouraging initial results (Hughes & Lonie, 2007). M-Pesa registered over 20,000 customers within the first month of testing – far more than that was anticipated. The uptake did not stop there – today M-Pesa is used by at least one member in 96% of the households across Kenya (Suri and Jack, 2016). Initially conceived of as a microfinance repayment tool, Safaricom redesigned M-Pesa as a remittance pool based on user feedback; these users were mostly economic migrants who came to Nairobi to work and regularly remitted money back to their hometowns/villages. In the absence of robust brick-and-mortar banks, leveraging an existing network of airtime retailers for cash-in/cash-out, and basic feature phones for transacting was a great opportunity for bringing financial services to under-served areas[1]. Although often presented as the first of its kind digital financial service in the developing world, M-Pesa actually debuted around the same time in 2007 as six other similar services across four countries in the East Asia and Pacific region (GSMA 2017). However, M-Pesa's unprecedented success was so dramatic that it was, and still is, frequently presented as unassailable evidence of mobile money's transformative effect on the "unbanked", especially in the aid sector. The excitement around mobile money has steadily escalated since then, itself a product of the rapid diffusion of mobile phones in the developing world and their potential in achieving social and economic development (Maurer, 2012).

However, as Mas & Morawczynski (2009) point out, M-Pesa has had a somewhat unique run in this space with its early competitors (such as M-Pesa in Tanzania and Wizzit in South Africa) lagging far behind in terms of uptake and adoption. They point to an almost perfect combination of factors that led to its stunning success. For starters, Safaricom's dominant market presence in the Kenyan telecom sector and thus its branding and signage fostered an institutional trust that helped initial uptake. Moreover, Safaricom also closely monitored the M-Pesa customer experience at the retail agent points which helped amplify this trust and confidence in the service. Kenya's regulators also took a rather progressive stance and relaxed a lot of their guidelines in order to let M-Pesa flourish. Furthermore, Kenya witnessed post-

[1] To elaborate, the conversion of cash to digital currency (cash-in) and vice versa (cash-out) happens via an agent network. This agent network is generally comprised of local mom-and-pop stores whose primary business is often selling airtime, small grocery items, lottery tickets etc. Once the digital currency is in their wallets, mobile money users can now transact from the comfort of their homes.

election violence in 2007 that greatly restricted the movement of people and goods around the country for a couple of months as arterial roads were blocked and parts of the railway system were vandalized (Morawczynski, 2009). Many M-Pesa agents chose to keep their shops open even as banks and MFIs remained closed. Its services were thus tested – successfully – during a time of insecurity and turmoil which further strengthened its position in the market. Clearly, M-Pesa was fulfilling a very real need within the Kenyan context. Yet its spectacular success led to similar solutions being designed and deployed around the developing world in a bid to fulfill the needs of the homogenous, undifferentiated 'unbanked'.

The international aid sector has been invested in mobile money from the very beginning. Hughes & Lonie (2007) note that the M-Pesa pilot was funded in part by the U.K. government's Department for International Development (DFID – now UKAid). As similar solutions started cropping up the world over, other key players in poverty alleviation, such as DFID, but also the Consultative Group to Assist the Poor (CGAP), the World Bank's International Finance Corporation (IFC), and the Bill & Melinda Gates Foundation, started actively supporting mobile money research and development (Maurer, 2012). Major international industry consortia of telecom and high-tech companies like the GSM Association (GSMA) also followed suit. In fact, the term 'mobile money' was first claimed by the GSMA to "describe services that connect consumers financially through mobile" (GSMA 2009, p. 7). Of course today, amongst a plethora of similar terms such as 'mobile banking', 'mobile transfers', 'mobile payments' etc, it has almost exclusive ownership on the phenomenon of bringing financial access to unbanked and under-banked populations in the developing world[2]. In fact, as Anke Schwittay observes, 'mobile money' has become a catchall phrase for capturing this trend of formatting the poor as not just financial customers, but also "technology consumers" in the developing world (Schwittay 2011, p. 387).

Slowly and steadily, a nascent mobile money industry was born that today has became almost indistinguishable from the broader financial inclusion industry as innovation in mobile money has expanded to include savings, credit, and microinsurance options as well (GSMA credit/insurance report). Meanwhile, the aid sector's stalwarts continue to promote the claim that digital delivery channels (including the humble mobile phone) can bring financial inclusion to the unbanked around the world. The Gates Foundation claims that digital platforms are "the most effective way" to achieve this (Bill & Melinda Gates Foundation, n.d.); The IFC (in a joint statement with the Mastercard Foundation) lauds mobile money as "revolutionary" because it brings banking to one's fingertips via the mobile phone (International Finance Corporation, 2018); CGAP observes that more digitization

[2] One way to broadly differentiate between these terms is to check if they are 'additive', that is if the tool is a supplementary platform for conducting financial transactions, or 'transformational', where the tool makes an entry into unserved regions as the one of the few platforms for conducting financial transactions (Porteous, 2006). 'Mobile money' immediately indicates *transformational* tools – a term with many positive, dramatic undertones that further propagates the perceived, magical possibilities of mobile money in the developing world.

(such as developing open APIs and fully digital delivery models) is the way forward for overcoming the many challenges in the mobile money domain, such as achieving scale in financial services like savings and loans that otherwise require significant interaction between customers and providers (Consultative Group to Assist the Poor, n.d). Such claims when taken out of context only aggrandize the role of the technology in helping the poor access suitable financial services. Of course, the international development community is aware that technology alone cannot accomplish the goals of financial inclusion. For instance, the 2017 Global Findex Database[3] report observes that the poor can only benefit from digital financial services when there is also a "well-developed payments system, good physical infrastructure, appropriate regulations, and vigorous consumer protection safeguards" (Demirguc-Kunt et al. 2018, p. 10). Still, these details often get lost in the reproduction of success stories amongst the elite, technocratic circles of the aid sector for a variety of reasons. For starters, the aid sector is prone to rapidly scaling "successful" solutions, like it was quick to do with M-Pesa that the numerous (less successful) copycat solutions around the globe have demonstrated. This pursuit of generalizability often obscures the particularities of a given context, lending itself well to a parsimonious representation of the real world. These representations (or rather, misrepresentations) are especially well-received by policy-makers and donors because they are seemingly more actionable (Srinivasan & Burrell, 2015). In general, development discourse, especially that which leads to 'actionable' policy, benefits from a degree of ambiguity to appeal to diverse audiences (Cornwall, 2007). It also benefits from a process of de-politicization where the problem of poverty is no longer a structural or political problem, but a "financial" one that can directly benefit from "technical" solutions, such as better delivery channels for financial services (Schwittay, 2011). This process of depoliticization not only speaks to the constraints within which the international development industry must function, but also continually justifies its existence (Mitchell, 1991; Ferguson, 1995).

As the past ten years of mobile money is celebrated as "incredible" because "more than half a billion accounts were registered as of the end of 2016, with more than 170 million active accounts around the globe" (GSMA 2017, p. 6), we need to take a step back and consider what this really means. With money being poured into mobile money initiatives at the cost of targeting the more structural reasons behind poverty and inequality, we have to know and reproduce faithful accounts of how mobile money actually works on the ground. Registered and active accounts serve as a reasonable yet an imperfect proxy for what is expected of financial inclusion goals – that is to help the poor in managing their cash flows in the face of unpredictable earning patterns (Morawczynski et al., 2010). Accomplishing this requires human work that remains largely missing from the dominant narratives on mobile money. For instance, a recent article published in Science finds that access to mobile money lifted 2% of the Kenyan population out of poverty (Suri & Jack, 2016). This was a remarkable finding and was predictably reproduced everywhere (GSMA, 2017;

[3] The Global Findex database collects data on financial inclusion around the globe, and was launched in 2011 by the World Bank with funding from the Gates Foundation.

Innovation for Poverty Action, 2016; Dawson, 2017). However, very few of these reproductions mention that the authors determined the causal effect of M-Pesa on the economic well-being of households by measuring the change in access

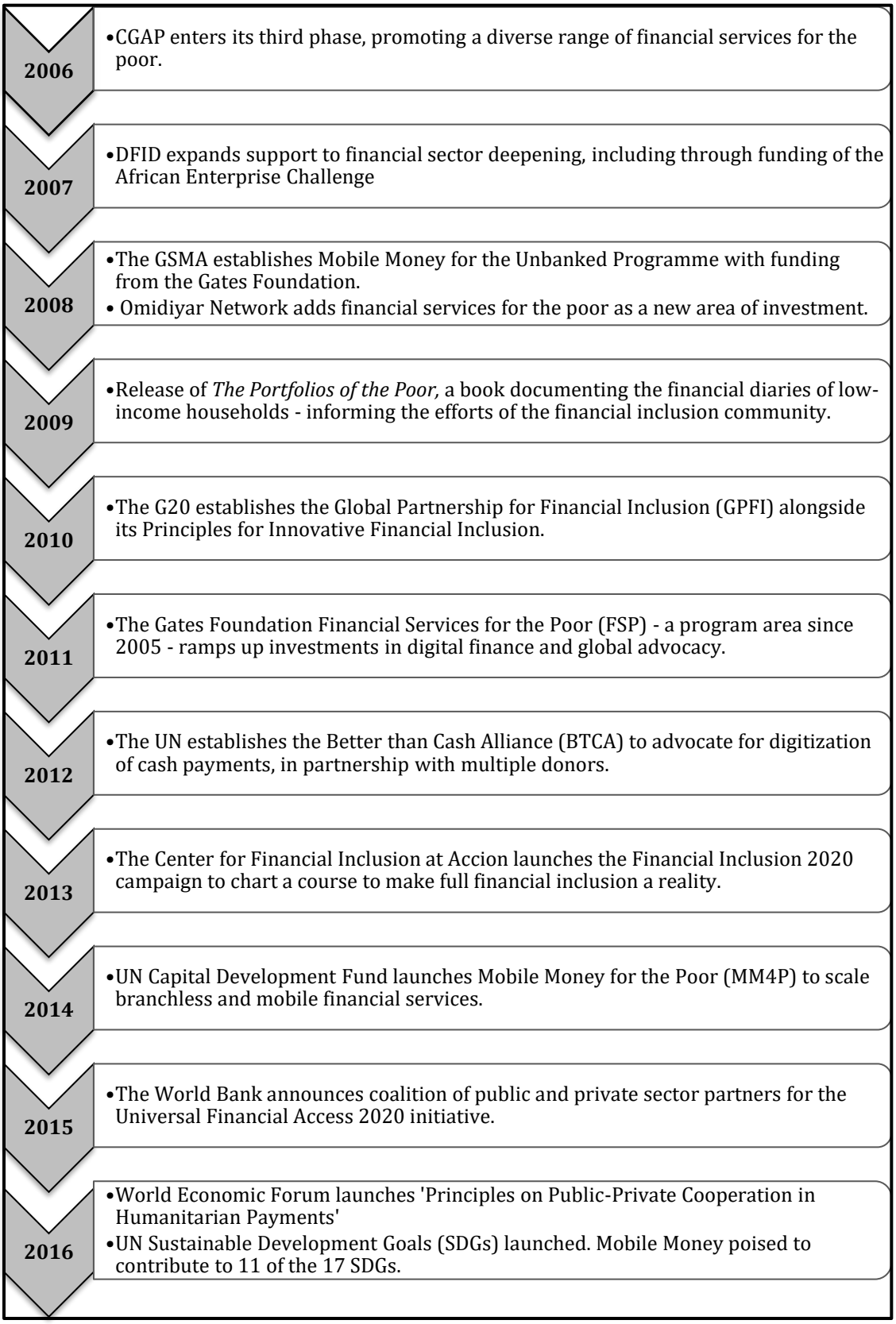

Figure 1: The Rise of the Mobile Money Community[4]

to M-Pesa agents, not just adoption of the M-Pesa service or access to a mobile phone itself. That Kenya's dense network of agents contributed to the goals of financial inclusion was often lost in the more pithy, catchy claims that 'one connected handset can transform the life of not just its owner, but also the lives of his or her family and the broader community.' (GSMA 2017, p. 6).

Eventually, dominant narratives around mobile money bring the technology into sharp focus at the cost of discounting everything else that goes into making mobile money work. While it seems obvious, mobile money is not just the mobile phone as a delivery channel, it is an entire *infrastructure* that brings financial services to the unbanked. Even in doing so, it does not operate as an isolated, standalone infrastructure. We discuss this in more detail next.

1.2 Mobile Money as *Infrastructure*

> 'Mobile Money, while often described as a money-transfer product, is in fact a network infrastructure for storing and moving money that facilitates the exchange of cash and electronic value between various actors, including clients, businesses, the government, and financial service providers.'
>
> - Kendall, Maurer, Machoka, & Veniard, 2011

As we discussed in the previous section, in unduly according greater visibility to the mobile phone technology in mobile money narratives, we run the risk of depicting a rather disingenuous version of how mobile money actually works on the ground. To counter this, Kendall et al. (2011) draw out an analogy between mobile money and other network infrastructures, such as canals, railroads, and telecommunications that have historically transformed the ways in which people, goods, energy, and information have been moved around. While the authors are quick to observe that mobile money still displays the characteristics of a 'platform', much like other network infrastructures, it is in fact reconfiguring retail finance and how cash is moved around especially in low-resource settings in the developing world (Kendall et al., 2011; Mas & Morawczynski, 2009).

More generally, the terms of a mobile money 'ecosystem' (Jenkins, 2008; Kendall et al., 2011) or 'environment' (Porteous, 2006) have been used to capture the variety of stakeholders, that is the financial institutions, regulators, and agents. Any of these terms may provoke us to think beyond the delivery platform, but we propose here that thinking about mobile money as an *infrastructure* is particularly valuable

[4] Adapted from GSMA's State of the Industry Report on Mobile Money – The Decade Edition (GSMA 2017, p. 27).

because it allows us to focus on approaches that specifically foreground infrastructural studies and thus provide us with a theoretical vocabulary to capture and articulate these. This becomes all the more crucial because infrastructures demonstrate a spectrum of (in)visibility – that is, certain aspects of infrastructures remain obscured while other parts are overtly visible (Larkin, 2013). Moreover, the same parts of an infrastructure are invisible to some actors while constituting a daily, very visible, reality for others. In general, Larkin advocates for examining 'how (in)visibility is mobilized and why' (ibid, p. 336). This is particularly relevant to this paper as we attempt to refocus the disproportionate visibility afforded to the technology platforms in mobile banking to its more invisible aspects, such as the human work that is invested in building and maintaining these systems [5]. Furthermore, infrastructures are now increasingly, and certainly more accurately, understood to be evolving instead of being static and irrevocably constructed to a plan (Edwards et al., 2009). Still, it is desirable for infrastructures to outwardly demonstrate a state of 'relative stasis' in order to signal a state of order and stability (Mathew and Cheshire, 2017). Such inherent tensions only reinforce the need for tools that can facilitate an *in situ* understanding of infrastructures. The literature on infrastructures privileges its otherwise invisible state (or specific aspects of its invisible state), which helps us trace its consequences, makes visible the emergent roles that are associated with them, and brings its politics into sharp relief (Bowker et al., 2010). This literature tells us how infrastructures are made, maintained, and repaired, including how they fit into installed bases and their myriad of artifacts, human habits, norms, and roles; what the transformation to a new infrastructure entails (including shifts in power relationships and consequent conflicts); how we can capture exceptions or divergences from established standards; and how to look beyond the mere functional goals and execution of infrastructures to capture detail about its intrinsic tensions, contradictions, and conflicts (Edwards et al., 2009).

We started out with a plan to conduct a comparative study of two different mobile money systems, examining their design, organization, implementation, and potential impact. Having chosen to do an ethnographic study, we were of course expecting to encounter the technological mobile platform, as well as people, practices, and norms. Still, as data collection and analysis is intimately (and iteratively!) tied up in an ethnography, we soon realized that our analytic approach would determine our understanding of what was happening on the ground even during the data collection phase. In studying mobile money, while the 'technology', the 'platform', the 'material object' becomes immediately obvious to the senses (not least because of the dominant narratives around it that likely predisposes us in specific ways), the practices that it engenders, the relationships that it fosters, the norms that it generates is often

[5] Larkin's claim diverges from the more dominant understanding of infrastructures and their invisibility. Much of the academic literature notes that infrastructures are invisible to us in our daily lives unless a breakdown exposes us to its many components and organized, embedded practices (Star 1999, Collier 2011). However, Larkin (2013) argues that such predominant notions of infrastructures breaking down to reveal their invisible parts are 'fundamentally inaccurate' because some aspects will always remain more invisible than others and it is worth asking why (ibid, p. 336).

relegated to the our peripheral awareness. Thus, analyzing mobile money from an 'infrastructures' perspective is one way of preventing the unduly privileging of the technological object. Of course, Larkin points to the 'productive instability' of infrastructures as a basic unit of research (ibid, p. 339); a statement that far from being discouraging actually compels us to explicitly acknowledge the imprecise boundaries of an infrastructure. Thus, what we choose to isolate and study as an infrastructure then becomes a conscious decision in demonstrating our epistemological, methodological, and political allegiances – certainly a constructive endeavor while doing and writing up an ethnography.

To this end, we describe an ethnographic study here of a mobile money infrastructure, that was in fact two different infrastructures operating in tandem connecting auto-rickshaw drivers to mainstream bank loans. We privilege the human work that goes into making and sustaining this mobile money infrastructure. In doing so, we are engaging in a 'categorical act' of streamlining the potentially infinite number of things, people, and networks that can be mobilized at a given point in time to understand infrastructures (Larkin 2013, p. 330). This intellectual exercise of selecting which parts of an infrastructure will be studied, and which ignored, is itself a reflection of our disciplinary and epistemological allegiance, and sometimes, of the limits of our methodological choices. In this paper, we turn our attention to the complexities of the mobile money infrastructure and all the messiness that comes along with it, even as the ideal of cashless/electronic payment mechanisms is touted to be 'modern' and 'efficient'. To this end, this paper concerns itself with the following broad research questions. When is the mobile money infrastructure, and can it be isolated as a standalone substrate over which financial transactions are conducted? Who are the people, organizations, and networks that constitute a mobile money infrastructure? And, how are they arranged and aligned in order to accomplish the human work that supports this system, otherwise primarily understood as technological? In answering these questions, we complicate the seeming naturalness, the ready-to-hand texture of the mobile money infrastructure. More importantly, we complicate notions of its 'efficiency' and how it is expected to magically simplify what are otherwise considered as non-digital financial infrastructures. We further question if we can truly understand the scope and scale of mobile money, and how it is expected to accomplish financial inclusion goals, without first studying the human work involved in building, maintaining, and repairing its infrastructures on the ground. Is complete digitization of this to accomplish greater scale even possible, as CGAP would like to believe (Consultative Group to Assist the Poor, n.d.)?

We make two main contributions. First, we demonstrate that what appeared on the surface to be solely a 'mobile money infrastructure' is in fact a complex and, often, visibly seamless organization of at least two interacting infrastructural systems. These come together in an intricate, layered way to enable mobile money to be used for loan repayments in this low-income setting – something that a standalone mobile money was unable to achieve without the existing loan management infrastructure, as we demonstrate later. We call this overarching infrastructure the "*loan management-mobile money infrastructure*" throughout the rest of the paper for the

sake of clarity. In presenting the multi-layered infrastructural organization of what is generally thought of as a "mobile money infrastructure", we echo what the literature on infrastructures already tells us - that an infrastructure is not in fact an isolated substrate with a clear beginning and end. Still, it becomes especially important to emphasize that an infrastructure is not always organically built or spontaneously accessed in order to challenge the dominant narratives around mobile money where an insulated infrastructure is thought to enable all digital transactions and thus achieve financial inclusion.

Second, we privilege the human work of what is otherwise often considered an exclusively technological infrastructure. Bringing attention to these sidelined human workers is an important concern for both CSCW, with its focus on the work that enable systems to function seamlessly, and ICTD, with its focus on marginalized populations. Indeed, mobile money remains a favorite topic of interest for development scholars and practitioners and in the emergent conversations the focus continues to remain on the technological innovations that allow for branchless transactions to complete in the first place. Thus, the human work that enables mobile money transactions continues to get obscured. Bringing attention to these sidelined human workers should certainly be an immediate concern.

2. Background: The Study of Infrastructures and its Invisible Workers

> 'An infrastructure is an underlying framework that enables a group, organization, or society to function in certain ways, such as the series of pipes, drains, and water sources that comprise a water system.'
>
> - Lee et al., 2006[6]

This is a useful, common-sense point to begin thinking about infrastructure as it confirms our most fundamental understanding of infrastructure as something that is just 'there', 'ready-at-hand', as a 'substrate' that props up working systems (Lee et al., 2006). Still, by virtue of it being an 'underlying framework', our consciousness and subsequent understanding of infrastructures are often limited. Susan Leigh Star articulates it evocatively in her paper on the ethnography of infrastructure – 'This article is in a way a call to study boring things' (Star, 1999). These 'boring things' often get relegated to the peripheries of our awareness, which in turn impedes our ecological understanding of sociotechnical systems as the very interactions, networks, and arrangements that enable them continue to remain invisible. This

[6] It is, however, noteworthy that this paper uses a broader definition of infrastructure in their paper; that is they attempt to provide a relational understanding of human and technological infrastructures, and in doing so firmly establish 'human infrastructure' as an 'analytical lens with which to magnify the social' of an infrastructure whose social and technical properties are anyway, otherwise, firmly intertwined (Lee et al., 2006).

invisibility is deliberate in order to maintain a façade of relative stasis (Mathew and Cheshire, 2017). Yet this invisibility not only obscures the many ways in which infrastructures fundamentally support a system, but it also fails to bring out the many variances in practice that cultivate an infrastructure *in situ*, further obscuring its sociopolitical consequences (Star & Ruhleder, 1996). Thus, practicing 'infrastructural inversion', or the foregrounding of the infrastructure(s) in question, becomes necessary (Bowker, 1994). Of course, such a foregrounding cannot merely focus on an infrastructure's material and social components – for that matter, how do we ascertain what is infrastructure and what is not? Instead shifting this focus to understand infrastructures as a fundamentally relational concept is more useful. It becomes infrastructure in relation to organized practices. It becomes infrastructure when it is when it is connected to activities and structures. Therefore, a more pertinent question may be *when* is infrastructure (Star and Ruhleder, 1996).

Further, when thinking about how an infrastructure is made, maintained, and repaired, it is necessary to think about how the enduring tensions between the social and the technical, and the local and the global are resolved (Bowker et al 2010). These tensions also determine the range of support mechanisms (social? technical? both?) that sustain an infrastructure in different ways at different points in time. In essence, infrastructural work, to develop, sustain, and mend itself, is ongoing, and very often performed by unrecognized workers thus rendering it as invisible as well. Steven Shapin (1989), when discussing the work of the mostly undervalued technicians and assistants (as opposed to the more celebrated 'reflective individual thinkers') in the laboratory of Robert Boyle, argues that as long as their work remains invisible any understanding of scientific practice will be impoverished. Susan Leigh Star (1991) further argues that by privileging 'expensive, elitist institutional arrangements' we run the risk of obscuring the very work (and the workers) that supports them. Restoring this work, she continues, enables us to better understand not only the nature of the invisible work, but of the work organization as a whole.

Lee et al. (2006) quote the director of the National Partnership for Advanced Computational Infrastructure and the San Diego Supercomputing Center who recognizes that when determining the success of a cyberinfrastructure, the human infrastructure consisting of 'hundreds of researchers, programmers, software developers, tool builders, and others' is unquestionably the most critical element; a detail that is very often lost in the extensive narratives on hardware resources and software tools, that is the technological infrastructure. Larkin terms this enduring condition as "the unbearable modernity of infrastructure" (Larkin 2013, p. 332) – a condition that reveals the inextricable link that is presumed between 'technologies' and 'modernity', and that further sidelines the less glamorous human work that goes into building and maintaining these infrastructures. Such an "unbearable" condition only begs for more light to be shed on these underreported and underappreciated human workers, as we attempt to do in this paper.

3. Field Setting and Method

Essentially, we examined two different mobile money systems – Novopay and Airtel Money. Both were designed to include low-income populations but used different approaches to do so. Airtel Money connected users to a mobile money wallet using which they could potentially conduct a whole host of transactions (including loan repayments) on even the most basic of feature phones directly. Users had to go make a visit to an Airtel Money outlet for loading money on to their wallets, but once this was done they could conduct any transaction themselves from even the comfort of their own homes till their balance ran out. However, Novopay provided no such service – instead users went directly to the Novopay agent retail outlets to physically hand over cash to the agent who acted as an intermediary and completed all transactions on his smartphone. Of course, how these approaches actually played out in practice is something we describe in our findings later. Still, our initial interest in conducting a comparative study was based off of this crucial distinction in the two mobile money solutions.

More specifically, we conducted an ethnographic study of auto-rickshaw drivers using mobile money to make loan payments in Bengaluru, India. The data collection took place from June until September 2016, whereas the analysis and writing-up process lasted well into 2017. The auto-drivers in our study were paying their loan installments to Three Wheels United (TWU) – a social enterprise which acts as an interface between the rickshaw drivers and mainstream banks, to enable the drivers to take out loans to buy their own auto-rickshaw[7]. TWU manages the loans for the drivers, including carrying out collections. In an effort to reduce the cost and risk of cash collections, they were themselves experimenting with two different mobile money systems – Airtel Money and Novopay – which provided us with the perfect setting for our fieldwork since we had already negotiated access to sites with TWU directly.

We relied on interviews and observations for this study. We would approach both TWU as well the mobile money partners to ask them to refer us to potential informants. Yet we also recruited separately during training sessions as well as during our observation sessions every Sunday at a Novopay outlet. These observations occurred at a Novopay retail agent's shop that a cash collector from TWU would visit every Sunday from 3-6 PM. His primary purpose was to help the auto-drivers transition over from a paper-based, in-person loan repayment process to a wholly digital one (although this did not quite work out to be such a straightforward transition, as we will see later on). As far as interviews were concerned, we conducted a series of informal conversations as well as in-depth interviews. We also relied on recurring interviews. This method involved purposive sampling where an initial in-depth interview was conducted. These initial interviews helped us draw out a smaller, more focused sample of informants whom we would

[7] Auto rickshaws are especially popular in South Asia and are a motorized three-wheeled rickshaw that can be publicly hired to go between places. They are generally cheaper than taxis, but more expensive (and arguably more convenient!) than mass public transit systems such as the bus or train.

continue to interview once or twice a week over a period of three months – wherever consent was granted. This method helped us gain an insight into the financial inflows and outflows of our informants over time, making us privy to specific consumptions shocks and windfalls, and how their financial lives revolved around these. To this end, we initially interviewed 22 prospective informants in Bangalore, eventually narrowing our repeat interviews to 10 informants.

Our informal interviews and observations generated hand-written field notes, which were later organized and typed up into a digital format, almost always within the same day where recent memory would be useful in streamlining the roughness of the hand-written notes. We also collected photographs and videos whenever an interesting or unique moment presented itself that we felt would benefit from more high-fidelity documentation. For instance, we video-recorded some of the auto-drivers self-navigating the Airtel Money application thath helped us better understand the role of the agents and cash-collectors in helping them through this process. The in-depth and recurring interviews were semi-structured and generated audio-recordings. Whenever the interviewees were able to converse in Hindi (which was about half of our sample) the first author would conduct the interviews herself. The rest were conducted in Kannada where the first author used the services of an interpreter. In these cases, both audio recordings and field notes were generated, with the first author jotting down notes while the interview was going on. This technique certainly helped in keeping track of an interview that was otherwise unintelligible to her, and helped her in asking follow-up questions. All in-depth interviews were transcribed and translated into English.

The authors read through and discussed all the observation and interview notes/transcripts in various analytic sessions that began during the field study in June 2016 and lasted until May of 2017. These sessions helped organize the data into themes as interesting topics began to emerge. These initial emergent themes were helpful when revisiting the field and conducting further interviews and observations, as is the case with the iterative nature of ethnographies. Eventually, as we began to evaluate these emergent themes through the lens of infrastructure studies, we were able to arrive at our main findings.

In the following sections, we describe these findings.

4. Findings

4.1 Inextricably Inter-tangled Infrastructures

Very soon into our fieldwork it became apparent that the loan repayment and mobile money infrastructures were inextricably inter-tangled. We started out by asking, what *is* the mobile money infrastructure? The answer, as we came to realize, differs from context to context. The immediately apparent infrastructure for mobile money invokes imagery of mobile telephony and electronic currency that can now facilitate

financial transactions across distance. The retail agents who enable the cash to electronic float conversion round up this imagery of the infrastructural backbone of mobile money. However, in practice it was the interaction of two different infrastructural systems which enabled mobile payments - 1) The immediately apparent mobile money infrastructure of mobile phones, digital currency and retail agents, and 2) a loan repayments infrastructure of cash, paper ledgers, loan officers and cash-collectors. As we will describe, it is the *combination* of these that constitutes the overarching infrastructure enabling mobile money to work in this setting.

Of course, within these infrastructures, we can mobilize many other material technologies, social networks and relations, that form their own sub-infrastructures that can help us better understand the broader mobile money infrastructure, but, we engage in what Larkin (2013) calls a "categorical act" of scoping out what we choose to, and what we can, study as infrastructure here. We will now describe the different infrastructures in play, that is, the loan management infrastructure and how it interacts with the Novopay and Airtel Money infrastructures, before moving on to describe the human work to make these infrastructures work.

4.1.1 Three-Wheels United: The Loan Management Infrastructure

Surveys typically classify Indian auto drivers as urban poor (based on housing and income) (Natarajan & Abdullah, 2014). Moreover, auto-drivers are employed in the informal sector and earn small amounts of cash daily. This poses a fundamental barrier to generating lumpsums to meet bigger expenses such as rent, medical expenses, or purchasing an auto-rickshaw. Of course, banks are typically wary of lending money to auto-drivers as they are classified as high-risk borrowers. Thus, many auto-drivers will rent their vehicles from an informal moneylender, somebody commonly known as "*seth*" in Hindi - an agreement that requires a fixed daily rental fee to be paid out, generally around 200 INR[8] per day.

Three-Wheels United (TWU), in a bid to empower these auto drivers who otherwise lose a percentage of their daily earnings to rental fees, stands in as a guarantor on behalf of the drivers and secures a loan for them from a formal bank. Thus, TWU is now responsible for these individual loans, a risky endeavor to say the least. However, TWU has a risk mitigation strategy in place. For starters, they have partnered with local NGOs who work in auto-driver communities and recruit potential borrowers from within these based on familiarity and driver recommendations in lieu of a formal credit history. TWU also used these NGO partners to collect payments from the drivers at the time of the study. Whilst repayment to the banks is on a monthly basis, collections typically take place more frequently to match the auto drivers' income streams. Each NGO has a different method of collecting from the drivers - either going to the drivers' homes or the auto stands (which is where autos generally collect in their neighborhoods) on a regular basis to collect the repayment money from them

[8] At the time of writing, 100 INR = 1.53 USD.

directly; facilitating a drop-in service where drivers can drop by an office anytime to pay, or holding weekly meetings where auto drivers are given a 3-4 hour window to come and make their payments. Payment due is around 220 INR per day (six days a week), thus similar to the typical rental expenditure. The loan tenure is for three years and TWU factors in a small charge over and above the cost of the auto and interest[9]. This overpayment provides a buffer for the missed payments, which are almost inevitable in a long-term loan to such a financially vulnerable community. At the end of the loan, the auto belongs to the driver.

Of course, cash collections are a notoriously labor-intensive task. If auto-drivers are paying on time and in full, then collectors' work becomes a little easier. However, most drivers struggle to make the payments in full and collectors must chase them, talk to them, commiserate, and negotiate with them. They often accommodate them after-work and on holidays, even suffering the odd misbehavior once in a while. Collectors maintain meticulous and detailed documentation of each individual transaction, entering the transaction details in their ledgers, filling out a (carbon-copy) receipt for the drivers as well filling in their yellow TWU log books. An SMS confirming this transaction is sent to TWU where it is recorded by their internal I.T. system, and an SMS receipt returned to the drivers. Moreover, there is the added responsibility of managing and handling cash. Collectors hold on to cash payments until they have collected a reasonable lumpsum, before making a trip to the bank for a deposit. This prevents multiple trips to the bank as well as multiple deposit fees (charged per transaction). Before making a trip to the bank, a cash payment list is prepared. At the bank, cash managers fill out a deposit slip, get this signed and sealed by the bank, and bring this back to the office where it needs to be scanned and emailed to TWU, if the collectors are still working for the NGO, or taken directly to TWU's office if they are employed by TWU.

To reduce the burden of cash collections, TWU experimented with two different mobile money systems – Novopay and Airtel Money - designed with low income users in mind. Mobile money has the potential to considerably reduce the workload, in theory at least. Collectors no longer need to go out and meet the drivers to collect money from them. Drivers should be able to make more regular payments – whenever they have money to hand. The risks and costs of handling physical cash are completely alleviated. It is little wonder then that TWU was pushing for more repayments over mobile money. In fact, all costs for making the mobile money transactions were absorbed by TWU as an operational cost – the benefits of offloading the work of collection to the digital money intermediaries, as well as the work of managing the cash and back-end accounting, seemed worthwhile to TWU. Furthermore, the back-office processes for the NGO partner using Airtel Money were vastly reduced since Airtel sends one monthly report that provides the cumulative amount that each auto-driver has paid that month towards their loan. Rather than

[9] This includes TWU's service fees. Additionally, since most auto drivers are unable to pay the upfront security deposit amount, they take out another, smaller loan, which is repaid over 18 months.

having to update her records each time a payment is made, issuing a receipt, updating the log book and sending the SMS, the collector, who also manages the back-office processes, only needs to make one entry for his or her own records.

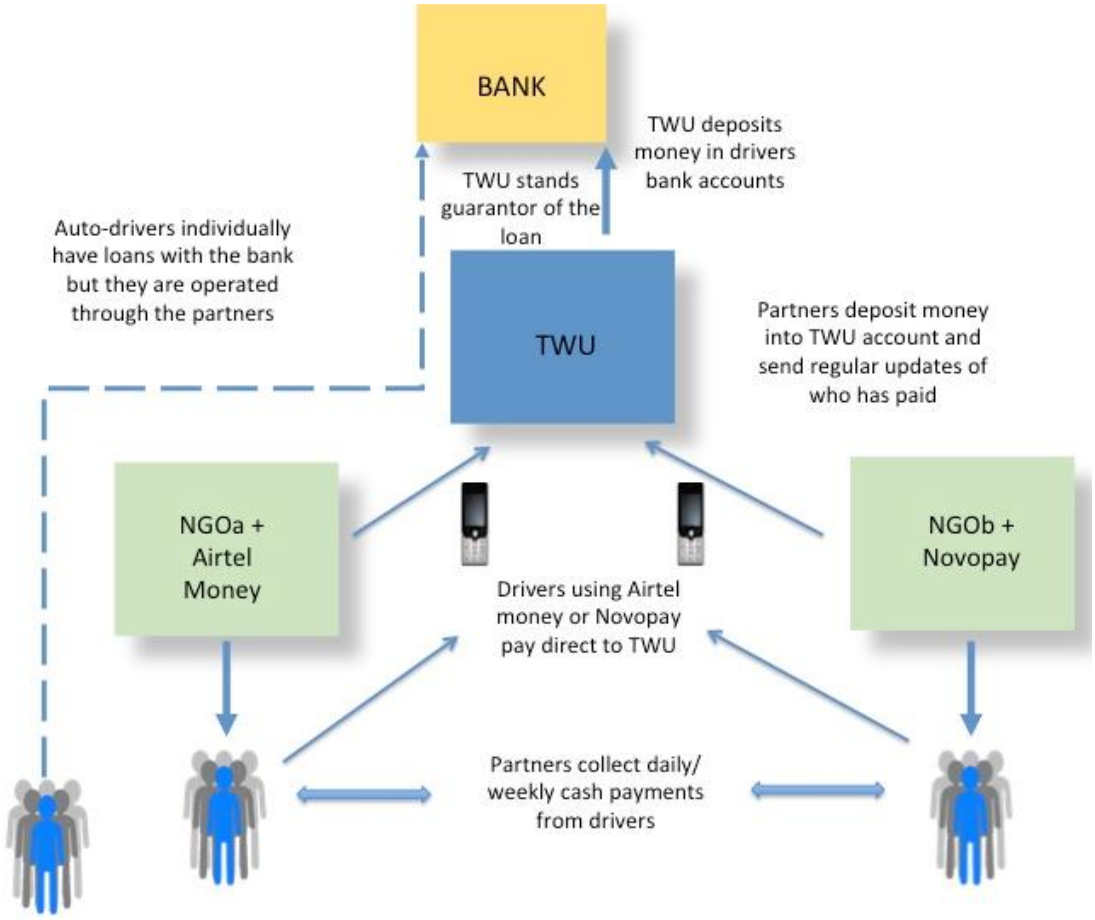

Figure 2: The Loan Management Infrastructure of Three-Wheels United

We now describe the mobile money infrastructure that plugged into this loan management infrastructure to facilitate the loan repayments.

4.1.2 The Mobile Money Infrastructure

Before we describe the specific details of the mobile money infrastructures that we studied during our fieldwork, we describe the ideal infrastructure, one that researchers, designers, and policy makers in the mobile money space have been advancing for a while now. To begin with, mobile money users should be in possession of a digital wallet that can keep money digital as stored value, yet also enable the movement of money for payments and transfers. This storage of value is

especially crucial to jumpstarting the ideal infrastructure that can support a host of different financial services across multiple vendors. Further, to cater to unbanked and under-banked populations, especially in the developing world, most of whom are likely low-income, transacting with this digital wallet should be possible on a basic, feature phone. Ideally, this mobile money infrastructure will be dense, much like how ATM networks, with an agent on every corner. This moderates the dependency on one, or a few, outlets, especially if agents are not able to manage their electronic float (for customers to top up their digital wallets) and/or their physical cash store (for customers to cash out), or if they are facing server issues. The agents themselves will not merely be cash-in/cash-out agents; instead, at the very least, they should be able to seek out new customers, provide on-the-spot assistance and light troubleshooting, and manage any system downtime in a way that does not terribly inconvenience their customers.

We worked with TWU, and two of their NGO partners (henceforth referred to as NGOa[10] and NGOb) over the course of three months in 2016, building on a previous study in 2014 (O'neill et al., 2017). TWU was already using Airtel Money in 2014, but by 2016 they had added Novopay to their mobile money suppliers. NGOa used Airtel Money and NGOb used Novopay. The mobile money infrastructures of Airtel Money and Novopay were broadly similar, and they plugged into TWU's infrastructure in much the same way. However, there were some notable differences that speak to our broader findings. Thus, here we describe each NGO and its mobile money infrastructure separately.

4.1.2.1 NGOa and Airtel Money

TWU chose to partner with Airtel Money, a digital wallet service owned by Airtel that allowed for a host of different actions (such as money transfer, payments, recharges etc.), as a way of reducing collection costs and risk. However, only the drivers from NGOa adopted Airtel Money. Although NGOa had been offering Airtel Money since early 2014 only one driver had adopted it and most drivers paid cash by visiting NGOa's offices during office hours. However, a series of interrelated events changed this – NGOa was due to move offices 15km away; two months or so before this they began a major training drive to encourage adoption tying it in with their upcoming office move; as drivers began using Airtel Money successfully word of mouth persuaded others to adopt it. Moreover, after the office move, drivers taking new loans had to sign up to Airtel Money. Although they were free to pay in cash at the office, the aim was to encourage them to use Airtel Money. At the time of our study, around 80% of their auto drivers were using Airtel Money to make their repayments. This is a substantially high proportion, given a customer base with little or no familiarity with digital money tools. The office move was critical to the auto-drivers' enthusiasm in shifting to repayments over Airtel Money – locating a more proximate service center and making their payments there was, in many cases, more convenient

[10] NGOa is NGO2, and NGOb is NGO3 in previous work on this (O'neill et al., 2017).

than commuting the extra distance to make the payments in cash. Furthermore, drivers brought into the 'sell' of anytime, anywhere payments (O'neill et al., 2017)

Airtel is one of the largest telecom providers in the country, and therefore had an existing retail infrastructure that they could leverage for their mobile money services. This was, seemingly, a huge advantage as auto-drivers most likely already recognized and trusted the brand. Moreover, they were either already familiar with existing Airtel outlets (especially if they were already using an Airtel SIM) or, if not, they could seek one out of the many strewn across the city on their commutes through the day. In many cases, NGOa's auto-drivers were asked to get an Airtel SIM if they did not already own one.

Only a few of NGOa's drivers owned smart phones and none of those had data packages, so most of the drivers were using Airtel Money on their feature phone. Since setting up Airtel Money on a feature phone is a little complicated, especially for drivers who largely used their phones only for calls, NGOa helped them set up their accounts and taught them how to make payments – a simple process over the USSD[11] platform, involving just a few steps. However, it turned out that although the actual process of making payments was relatively easy, getting money into the account so that those payments could be made was less so. This is because the Airtel Money network is considerably smaller than the Airtel network and often drivers had to go to service centres to recharge, of which there are around only 20 in Bangalore (O'neill et al., 2017).

4.1.2.2 NGOb and Novopay

In 2016, TWU entered into a partnership with Novopay, a retail payments solution provider like Airtel Money but without the well-established retail agent network. Novopay is a relatively new entrant to the fintech scene in India, and at the time of our study, had very few agents across Bangalore. NGOb was the first one to start using their agent network, with NGOa also following suit towards the end of our study. During this time, Novopay was aggressively looking to expand and any exclusive partnerships, such as the one with TWU, influenced the search for new agents. For instance, most of the auto-drivers affiliated with NGOb lived in the Tilak Nagar neighborhood in Bangalore, and thus TWU was able to convince Novopay to find an agent in that neighborhood. They eventually appointed a cyber café as their agent in Tilak Nagar which offered internet and scanning/printing services – this cyber cafe became a focal site for us during the course of the study. It is worth noting that agents born out of such exclusive agreements are often guaranteed a minimum stream of income because Novopay, in this case, can largely predict the inflow of cash transfers coming in through NGOb.

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[11] Unstructured Supplementary Service Data (USSD)is a communications protocol used by GSM cellular phones. Most mobile money services in the developing world (excluding M-Pesa in Kenya actually) use USSD for users to communicate with their financial platforms.

All the auto-drivers affiliated with NGOb were asked to start using Novopay immediately. Any resistance was met with a reassurance from NGOb that their cash collector would be present during scheduled hours every week to help them make the transition smoothly. What this meant was that auto-drivers could expect to meet with the cash collector at the cyber café in Tilak Nagar every Sunday between 3 and 6 PM and make their repayments then. While some auto-drivers slowly and steadily started making their repayments outside of this scheduled 3-hour window, for the most part, the auto-drivers remained committed to making the repayments in person to the cash collector. Thus, he remained an integral part of the proceedings during the course of our study, even after the initial training and familiarization process was complete. It is worth noting that in the absence of regular, scheduled meetings in the case of NGOa-Airtel Money right from the time of the office move, auto drivers were far more independent in conducting mobile money transactions, whereas in the case of NGOb-Novopay, the continuation of the affordances of the previous, non-digital payment infrastructure, even if conceived of as temporary, greatly hindered this.

4.2 The human work of the mobile money infrastructure

On beginning to unpack this mobile money infrastructure, we uncovered the crucial role that TWU, and its loan management infrastructure, plays in making the mobile money infrastructure work for these drivers. Further, we privilege the human work in these interdependent infrastructures – focusing more on the agents in the mobile money infrastructure, and the cash collectors in the loan management infrastructure who might seem like analogous actors embedded in their respective infrastructures but who play very distinct roles in the overarching loan management-mobile money infrastructure. We also reveal the work that is done by the service providers and the auto-drivers to build and maintain this infrastructure.

4.2.1 The human work of the mobile money agent infrastructure

The mobile money infrastructure imagines a disruption in the predominantly cash-intensive daily economies of the unbanked and under-banked populations. Retail agents are indispensable to this process as local stores become the points-of-service where physical cash can be converted to digital money (deposit) and vice versa (withdrawal). Any further movement of money occurs digitally to service remittances and micro-transfers/payments. Of course, there is another round of conversion of digital money to cash (and back again) that is happening, invisibly to users, in the background at the Airtel Money/Novopay source. Generally, the bigger retail agents (often known as super-agents) will take all deposited cash to pre-established banks at which point the equivalent electronic value will be transferred into their agent accounts. These super-agents will also, in many cases, be responsible for getting the cash off the hands of the smaller agents, for which they will be incentivized separately. In other cases, local distributors, wherever available, will go to each agent's shop and collect the cash in person, and then take this back to the bank or the service provider's

office. As more and more retail agent outlets join the network, any combination of these interactions, that is most suitable, will determine the cash-electronic float conversion process. The stage is thus set for using digital currency to conduct a host of financial transactions that were previously completed using cash. The mobile money infrastructure can now disrupt how money is stored, exchanged, or expended in what was previously a cash infrastructure.

Still, this is not the extent of the human work of the agent infrastructure – building and maintaining it is a time and labor-intensive process that often escapes its prescribed bounds. We document this here.

4.2.1.1 Building the agent infrastructure

> 'My suggestion to that typically is to have a range of outlets not just one. So that if not one guy, then the other guy does the transaction. But in the case of TWU we saw that the auto drivers are not yet at point where they are motivated enough to go wherever. I am going to give him over a stretch of 10 kms some 20 outlets or 30 outlets. But TWU has not been able to go talk to those guys and do that piece. So they would probably once in a while face this problem that the agent runs out of (digital) balance so they are going and giving the TWU collector their money. It is all dependency on one outlet which is not really our code model. Our model was to disperse so that the market forces would decide what each retailer will do. If the retailer feels he needs the business, he will need to have (digital) balance, otherwise somebody else in the neighborhood is going to take away his business.'
>
> - Senior Representative, Novopay

Infrastructural density, in terms of opening agent outlets, remains crucial to building the dream mobile money ecosystem where dependency on one outlet is moderated. However, building and maintaining the agent infrastructure to achieve this is an endless task, and not quite as easy as Novopay would have you believe. Seeking out potential agents in localities or neighborhoods of promise, convincing them to make an initial investment [12], running a quick background check by assessing their government-issued IDs, the scope and longevity of their business, and then further

[12] This initial investment amount can vary, but Novopay argues this is only a nominal amount and is expected as a sort of guarantee to ensure that agents will focus on their specific business. However, when agents do not see the kind of business they were expecting, they will lament this initial investment – money that can be withdrawn at any point for a small cost but money that is locked away nevertheless. This is particularly consequential when we remember that agents working in the types of areas where auto-drivers live are also by and large going to be running cash businesses with a limited turnover, making the initial investment more burdensome.

spanning out in their neighborhoods and making casual inquiries about them, ratifying them, and finally appointing and training them, itself takes some time and effort. After they have been appointed, service providers need to routinely assist them in marketing efforts. Any regulatory changes or dictates require a new bout of training and ramping up. Of course, in the case of Airtel one would imagine that leveraging their existing agent network to double up as mobile money agents would be an easier task. However, whereas Airtel offers good incentives to agents for mobile phone top-ups and trade is brisk, the uptake of Airtel Money in Bangalore to-date was much slower than Airtel had wished for[13] so they were not investing in building the agent infrastructure through good incentivisation. Therefore, few of the local small shops offered Airtel Money services, and many that did charged for it.

Another way of appointing agents is when service providers enter into exclusive corporate agreements with individual vendors, as Novopay did with TWU. TWU required agents in very specific neighborhoods with very specific requirements, thereby initiating an entirely different kind of search and ratification process. Such agents will generally be assured a steady stream of business which makes it easier to convince them about any upfront investments, and offers some predictability around how much digital balance to maintain at any given points in time. Of course, maintaining a substantial balance means investing the equivalent amount in cash into the business – a barrier that automatically excludes the smaller agents. Sourcing these richer, more successful agents, who are willing to make the initial investment, and then doing a thorough background check to limit cases of fraud or theft, is again a time and labor intensive job. The Novopay agent outlet in Tilak Nagar, as we mentioned previously, is a successful cyber café that sees many footfalls throughout the day. However, initially TWU had hoped that Novopay could provide multiple agents in driver communities around the city, so that drivers could just drop in their cash to pay the loan, in an ideal world, on their way home from work. However, this never materialized and there was tension between Novopay and TWU about who's 'fault' this was. As is evidenced in the quote above, Novopay is placing the blame firmly on TWU and the unmotivated auto drivers, whereas TWU blamed Novopay for not being able to find the right agents in the right location. The result is something of a chicken-and-egg situation, with the mobile money provider unwilling or unlikely to be able to develop the infrastructure without more customers and the customers unlikely to come without the infrastructure[14].

It is also worth noting that corporate agreements, such as between TWU and Novopay can result in significant tweaks to the existing product or process, to suit the needs of the mobile money customer. For instance, in the case of the TWU-Novopay partnership, the digital wallet was not offered to the auto-drivers, in a bid to

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[13] From personal communication between TWU and Airtel Money.

[14] Interestingly, this is similar for Airtel Money, who lamenting the lack of uptake of Airtel Money do not invest in their infrastructure, but without the infrastructure to make Airtel Money usable by low income communities, enthusiastic take-up of Airtel Money becomes ever more unlikely. This might be conceived of as a sort of Catch-22 of market forces!

circumvent their usual pricing structure where both deposits into the wallet and transacting from the wallet were charged (unlike Airtel Money, where only transacting is charged). By eliminating the wallet, Novopay was able to eliminate the deposit charges, this reduced the cost to TWU by half, but altered the affordances of the mobile money infrastructure in a significant way.

Of course, the human work of building and maintaining the agent infrastructure is not merely restricted to the service providers. Often, recharge agents or local mom-n-pop storeowners will approach service providers or their local representatives directly and sign up to become agents; generally, they are convinced by observing a friend's or colleague's agent business or through the repeated requests of their existing customers. While certainly some of the auto-drivers in our study had persuaded local shops to become Airtel Money agents for them, by and large we did not observe this effect, presumably because the auto-drivers from one social enterprise did not form enough of a market to create that agent demand. Of course, once they have become agents, the bulk of the responsibility of acquiring new customers rests squarely on their shoulders. Their service providers will help them out with painted signboards and posters, but mobile money agents are rarely ever *just* mobile money agents. They handle multiple businesses at a time[15] and thus receive multiple providers and vendors on a weekly basis who come loaded with flyers and posters to stick to their inside and outside walls. Therefore, the visible information at these outlets is constantly changing. A more reliable way of ensuring business is to seek out customers yourself. Generally, every retail outlet will have a steady stream of loyal customers who will be introduced to the agent's range of products and services over time. Otherwise, agents are expected to go out into the field and acquire new customers through door-to-door canvassing.

4.2.1.2 Repairing breakdowns in the agent infrastructure

Sometimes, mistakes will be made, breakdowns will occur, and when this happens, the "relative stasis" of the mobile money infrastructure will be disrupted, if even temporarily. Indeed, a desirable feature of infrastructures should be to retain a façade of stability even through a breakdown. Yet, the human work expended in achieving this is often unseen and unheard.

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[15] In fact, service providers prefer that agents manage multiple businesses at a time so that the burden of sustainability is not just borne by the mobile money business – if anything, the mobile money business is driven by volumes and can seldom be the primary business for a small shopkeeper. The only situation in which it becomes the primary business is when super-agents are able to invest in a big space and mobilize a steady stream of migrant customers (generally, in a neighborhood that is almost completely made up of immigrant communities) who remit money back home on a frequent basis. Loan repayments do not quite offer the same margins or value proposition.

Figure 3: A typical agent's shop in Bangalore with the different types of flyers/posters outside

For instance, sometimes agents at the Novopay outlet in Tilak Nagar were overloaded with their cyber café customers or other business. Or, at other times, they would run out of digital balance or the Novopay server would be down. Thus, the auto-drivers would be unable to make their digital loan payments directly. If the payment was being made at a time when the TWU cash collector was not present, the agent would keep the money and make a note in their notebook, and fulfill the transaction when they had recharged their accounts or the server was up again. If the cash collector from NGOb was present, he would start collecting the drivers' cash and then making the entries into his ledger. Later, when the problem at hand resolved itself, the agent would come by and sit beside the cash collector with his phone, and open up the Novopay application. The cash collector would then refer to his ledger, mention the name of the auto driver, his phone number, and hand over the appropriate amount to the agent, who would then fulfill the mobile money transaction. At this point, the auto-drivers would receive an SMS confirming their transaction. Sometimes, the money would not add up, and would thus force a careful examination and recalibration of all the auto-drivers who came in that day, the amounts of money they had deposited, and the amounts transferred on the Novopay application. Another time, on a long weekend, the Novopay outlet store was shut when we reached it. Like us, neither auto-drivers nor cash-collector had been informed of this. The cash collector sat down inside a driver's auto and started collecting cash and marking this in his ledger. Midway through these transactions, one of the Novopay agents showed up and joined the collector in the auto, fulfilling all subsequent transactions on the Novopay application. Eventually, the shop owner came and unlocked the shop and the agent

was able to complete the earlier transactions. However, the cash collector had to stay behind to take care of this. This exercise of allowing auto-drivers to make their repayments even when there was a provisional breakdown in the infrastructure could last anywhere from a half hour to a couple of hours, and both the agent and the cash collector worked relentlessly each time to provide a makeshift solution on the spot. This only goes to demonstrate that breakdowns in the agent infrastructure are not handled by the mobile money infrastructure alone – instead, the existing loan management infrastructure often steps in to repair and manage these as well.

Figure 4: Cash collector sitting in the auto-rickshaw and completing the transactions

4.2.1.3 Going the extra mile: the "informal work" of the agent infrastructure

Agents will often engage in informal practices that subvert the prescribed rules, but that nevertheless facilitates, and in some cases simplifies, both access and use of the mobile money infrastructure for its users. In articulating this range of informal work, we reinforce the analytical construction of infrastructures as something that becomes infrastructure in relation to organized practices; in other words, infrastructure can never be studied as a "thing stripped of use" (Star & Ruhleder, 1996).

A common informal practice that agents engage in is keeping their shops later than usual to accommodate the occasional auto-driver. Auto-drivers who want to get their day's earnings, that they have earmarked for their loans, off their hands as soon as possible, will call to make this request if they are on their way to the agent's shop. Agents will often comply with this request and keep the shop open for a half hour or

even longer. If these drivers come to the Novopay agent outlet, they are handed paper receipts by the mobile money agents to mark these transactions. Indeed, this was a common practice that we observed where informal paper receipts were issued to those drivers who came in to the shop outside of the scheduled hours on Sundays to make their repayments. These paper receipts generally had the name of the auto-driver, their mobile number, and the amount they deposited, while a "paid for TWU through Novopay" message was added in from time to time. Auto-drivers collected these receipts until they were able to come in on a Sunday and have their transaction details entered into the ledger by the cash-collector. In general, paper receipts remain a trusted, time-honored artifact to confirm financial transactions. Thus, NGOb and the Novopay came together to plan and issue these paper receipts to mimic the affordances of loan repayments that auto-drivers were traditionally accustomed to, despite the presence of the "formal" SMS receipts that auto-drivers otherwise received on completing a transaction[16]. Again, it becomes worth pointing out that the persistence of the affordances of the non-digital infrastructures for loan repayments (the paper receipts and the ledger for recording transaction details, despite the presence of digital receipts and reports) is symptomatic of this unique situation where two infrastructures are running in parallel, and where often a reliance on existing, trusted artifacts and workflows becomes necessary for managing access and use of new systems.

Finally, the nature of this informal work could intensify depending on how intimate the agent-driver relationship is. We observed one case where an Airtel Money agent and auto-driver were very close friends. On occasion, when the auto-driver was unable to make his monthly repayment, he would ask his agent to deposit the amount that he was due to pay to TWU into his wallet so that he could make the loan repayment, in effect borrowing that amount from the agent. TWU would register the auto-driver as having made his repayment on time, and he would repay his agent later at his own pace. The auto-driver was quick to clarify that he did not take indiscriminate advantage of this source of informal credit to manage his auto loan. However, the agent trusted him not only because they were friends, but also because he was privy to his repayment patterns over Airtel Money which made him more confident that he would eventually be repaid.

5.2 The human work of the loan management-mobile money infrastructure

We now focus on the overarching loan management-mobile money infrastructure which reveals the human work of the loan management infrastructure in training and

[16] See also previous work (Ghosh, 2013; Panjwani et al, 2013) that has recorded the use of these informal paper receipts in mobile banking transactions where their real legitimacy, especially in the event of any transgressions or lapses, remains limited.

tracking users once the decision was made to go digital. As we observe, the bulk of this burden is taken over by the cash collectors and administrative staff at the two NGOs, that is almost exclusively by the existing loan management infrastructure.

5.2.1 Training users within the loan management-mobile money infrastructure

A core part of on-boarding auto-drivers onto the mobile money infrastructure for loan repayments is training them, to overcome barriers to adoption, such as concerns about technical ability and change in process, as well as to give them the methods and skills to perform loan payments on this new mobile money infrastructure. The mobile money agents will seldom have the bandwidth, skill or trusted status necessary to accommodate the intensive training that new, low-literate users might require. Instead the cash-collectors from the loan repayment infrastructure first familiarize themselves with mobile payments, then train the drivers to conduct them on their own.

When customers have to conduct transactions from their digital money wallets, as in the case of NGOa and Airtel Money, the affordances of their transactions change. However, in the case of NGOb and Novopay, customers have to hand over their money, ideally, to the Novopay agent, but generally they interface with NGOb's cash collector. Thus, apart from the location change, there is no discernible shift in the affordances of their loan repayments. Therefore, one might expect that there will be no immediate requirement for training customers on how to use mobile money. However, as we found, the cash collectors remained an integral part of the loan repayment proceedings even when mobile money was introduced.

For instance, the cash collectors tried to familiarize their borrowers with the new entity in the picture – the Novopay agent. Once borrowers walked into the shop, they almost immediately turned to the right towards the cash collector, who would invariably redirect them to the front of the shop where the agent sat. The collector generally issues two quick instructions to the borrower – "Give him your mobile phone number and hand him your money." Borrowers would do this and then head to the collector with their passbooks to have it filled in and signed. Often, borrowers who were familiar with this routine would still head to the collector first, perhaps because they were better acquainted with him. In fact, on days when the collector was delayed, borrowers would wait outside in their autos until he arrived before making their repayments. Thus, this kind of "training" requires a gradual habituation to handing over money to a, generally, less familiar, less sympathetic intermediary.

In the case of NGOa-Airtel Money however, borrowers now have to be introduced to the concept of a digital wallet. This requires intensive training since they have to conduct the micro-transfer all on their own once they have loaded money into their wallets. To begin with, the loan managers/cash collectors accompanied the auto drivers to the Airtel Money centres where they were shown how to load money into their wallets. Thereafter, they were asked to conduct transfers of small value in the presence of the loan managers/cash collectors so they could get some practice under

supervision. The loan managers/cash collectors entered the USSD number that needs to be keyed in to initialize Airtel Money and saved it as '**NGOa**' on the drivers' phones. Interestingly enough, dialing this number took auto-drivers directly to the loan repayment option in the application, bypassing all the other available service options such as bill payments or remittances – a feature that at once streamlines yet constrains this digital money infrastructure. Further, for those drivers who have limited English or general print literacy skills, the collector provided instructions in writing. This may seem counterintuitive but having a step-by-step list that mimics the text that pops up on your screen followed by a 'Press **OK**' or 'Enter **1234**' becomes a helpful guide. Moreover, they are encouraged to bring in their children or other family members who are better educated. Here, the loan manager gives us an insight into how she trains the auto drivers.

> 'But I will tell them, sir here you write down the amount. Here ID no. is required, you input it here. If you don't know, you ask someone in your house. You bring your children, I will teach (them). Means some auto drivers will be uneducated but their children will be SSC[17] no? Because they have studied till the 10th standard, they can do it. We will teach them. See first, it will come like this, don't press Ok[18]. Enter amount, you should put 550 rupees (as an example). You put Ok. Then, you put in the confirmation. Then press ok. Then send. Then again it will ask for the PIN number, I will write the PIN number, I will write 1234 (as an example), then press Ok. Then money will go, message will come. Confirmation. That's all. Those who are educated, they don't want this in writing, we will tell them practically. Those who are uneducated, we will teach them practically plus give the instructions in writing. If they forget also, they can see and know they can do this.'
>
> - Cash collections Manager, NGOa

Of course, loan managers/cash collectors will often know the PIN of the auto drivers – in this case since the money is going to TWU, this is not much cause for concern. In fact, the written instructions provide great reassurance to auto drivers. One auto driver told us that when he lost his written instructions, he went back to the NGO to get them written out for him again - this despite the fact that he had been using Airtel Money on his own for a few months without any complications. Therefore, introducing new users, especially those that have had limited access to, and thus aptitude of, the digital money infrastructure necessitates an intensive time and labor investment.

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[17] The equivalent of high school in the local schooling system.

[18] This is just a generic welcome message that pops up before the Airtel Money transaction menu begins.

5.2.2 Monitoring & tracking within the loan management-mobile money infrastructure

It is expected that auto-drivers will find it easier to make repayments digitally at agent outlets that are located within their neighborhoods, or if they spot a service center on their daily commutes. This is true to some extent, where the proximity is certainly helpful in getting any money off the drivers' hands before it can be spent elsewhere or lent out to a needy friend or neighbor. Still, to imagine that digital repayments alone can stem default rates is optimistic and precludes any understanding of the challenges that daily wage earners face. Monitoring auto drivers, especially those who are routinely delinquent, is a time and labour intensive task even within the digital money infrastructure. Cash collectors keep a track of non-payments, and over time, based on drivers' repayment patterns, have an approximate sense of the conscientious borrowers and the habitual defaulters. During the cash collection rounds, the collectors will make quick calls, between receiving payments and updating their ledgers, to those auto drivers who haven't shown up to make their repayments. Often, expectedly, these calls will go unanswered, which will prompt the cash collector to try sourcing unfamiliar numbers (for instance, a friend's or colleague's number) from which to make these calls. If this fails, in-person visits to the drivers' homes or the auto stands where they congregate becomes necessary.

Generally, monitoring & tracking involves some commiseration, some negotiation, and, at times, aggressive warnings. This is seldom a one-time activity - auto drivers who start to fall behind find it harder and harder to catch up to their regular repayment cycle. Thus, once identified, cash collectors will go the extra mile to keep an eye on these auto drivers in order to help them get back to a payment schedule they feel comfortable with. For instance, cash collectors will part with their home address, if it is closer to the auto-driver's home or daily route, and accept payments there. They will even accept payments late into the night, generally after an auto-driver has worked all day to earn some money. In general, regularly delinquent drivers will be asked to make a lump sum payment every few months, so that they are compelled to clear off some portion of their loans in less frequent, but larger value payments. Of course, transitioning to a digital repayments infrastructure has its own limits. For instance, due to the Reserve Bank of India's stringent KYC[19] rules, there is a repayment limit of 10,000 INR per wallet per month. Sometimes, auto-drivers will use this as an excuse to explain any delay in their lumpsum repayments, making it necessary for cash collectors to insist on an immediate cash repayment. The following excerpt from an interview with the cash collections manager at NGOa provides an insight into the negotiations and decisions made with a delinquent driver.

[19] KYC or Know Your Customer regulations are imposed on banks and other financial institutions to prevent money laundering and fraud.

> ‘See again today Narendra (name changed) has come. He makes his repayments through Airtel Money. Suddenly, he didn’t pay for three months. He had 18-20,000 INR pending. Then we confiscated his auto, because we said you have to pay immediately. He refused and said he will make the payment to his regular Airtel store. We said you have to pay cash immediately. Then immediately he had to pay 18,000 INR, and only then we let go of his auto. After that, he started paying to Airtel Money again. We said that’s fine as long as you pay regularly. Then 1-2 months again he didn’t pay. Again, we caught his auto and again he paid 10,000 INR. Today morning at 6 o’clock we went to his house and caught (him) again. What? Again, 30,000 (INR) pending? Then I said no, you pay the 30,000 amount, only then you go. See, in Airtel Money only 10,000 INR you can pay per month. Per month, he can’t pay more than that. So, that is the excuse they will take. I said, no need, don’t worry, you come here and pay cash. So then he came today morning, we caught him, and we took 5500 INR from him and we said balance amount pay weekly through Airtel Money only. Because he is an Airtel Money customer.’
>
> - Cash collections Manager, NGOa

The NGO will sometimes confiscate an auto, a far less serious eventuality than if the bank itself sends debt collectors after the auto-drivers, in order to compel drivers to clear at least a part of their pending balance. As this excerpt shows, there remains a clear advantage of the cash infrastructure - payments are direct and transactions are sealed on the spot. During the particularly sensitive time of negotiating with defaulting auto-drivers, any delay in payments, no matter how small, can become a missed opportunity and propel auto-drivers further into more debt. Thus, even for those auto-drivers who were exclusively repaying through Airtel Money, making that critical lump sum payment in cash, immediately, just made more sense.

5.3 The human work of the auto-drivers to sustain the loan management-mobile money infrastructure

No conversation on infrastructures can be complete without revealing the human work of its users in building and maintaining it. Let us revisit the case of the auto driver who is close friends with his agent, and from whom he borrows money from time to time to maintain his loan repayments. Here is a quote from an interview with him:

> ‘We are daily wage earners. For daily wage earners, there needs to be daily rotation (of money). If I have paid off my share for today, then I have no tension. Even the auto repayment has to be like this. Minimum is 6000 right? Without the 4 Sundays, it becomes 5200-5400. If I have to pay that lump sum once in a month, it will be very problematic for me. I am not able to hold on

> to that money for an entire month. Instead if make the payments daily, it becomes easier for me. Whatever amount it is, minimum 100-200, if I pay every single day, then that daily amount is cleared and I have no tension. Our money is through daily rotation, right? If I earned a monthly salary, I could have paid the amount once a month. For me money is coming in every day, if I can pay every day then I have lesser tension.'

This auto-driver was very cognizant of how easily he could fall behind on his loan repayments if he is unable to get the money, that he has earmarked towards his repayment, immediately off his hands. The auto-driver described how he went around searching for an Airtel Money agent outlet that was close to his home. This way, he mused, he could stop by the shop every night on his way back home and deposit the earmarked amount from his daily earnings into his Airtel Money wallet. At the end of the week he could transfer the lump sum to TWU. After much searching, he found one shop that was 2 kms away from his home, a significant enough distance that he felt he would be tempted to forego on the nights he was feeling tired or lazy. Eventually, the auto-driver approached his close friend whose shop was only a few meters away from his home. He was already an Airtel agent, but for recharge cards. The auto-driver requested him to become an Airtel Money agent, citing his specific anxieties and promising a steady Airtel Money customer in himself. The friend, as we know, complied.

This is a specific example of how auto-drivers can build their mobile money infrastructure bottom-up. Still, auto-drivers worked towards sustaining the infrastructure as well. They brought in prospective new borrowers. They negotiated on behalf of their family and friends who were falling behind on their payments, or who needed trusted intermediaries to vouch for their unique circumstances. We observed auto-drivers making an effort to spend time with the collectors in order to build and maintain a relationship. Those auto-drivers affiliated with NGOb would often insist on buying tea and/or a cigarette for the cash-collector, a thoroughly social activity filled with light-hearted banter that provided a quick break for the collector as well. Some auto-drivers who were falling behind on their payments would actually show up anyway to tell the collector their reasons in person; the in-person affect was considered evidence for the sincerity of their delinquency. Eventually, their work in building and maintaining the mobile money infrastructure, even as users, cannot be overlooked.

6. Discussion: The Mobile Money Infrastructure and Financial Inclusion

> 'Our main argument will be that a social and theoretical understanding of infrastructure is key to the design of new media

> applications in our highly networked, information convergent society.'
>
> - Star and Bowker 2005, p. 230

We have followed this line of argument by Star and Bowker very seriously in this paper. In laying out the mobile money infrastructure, and not 'product' or 'platform' that dominant narratives tend to provoke, often inadvertently, we attempt an improved understanding of this sociotechnical infrastructure. In doing so, we reveal the tremendous work needed to not only build, repair, and maintain it, but also to accomplish its financial inclusion goals – the very reason, purportedly, for its existence. Through ethnographic fieldwork, and a conscious analytic lens of infrastructure studies, we became privy to the quotidian, invisible labor that the cash collectors, the agents, and the auto-drivers have to do in order to make mobile money work in this specific context. Yet when speaking to the 'generalizability' of qualitative work of this nature, we find that our findings in this specific setting can address the materialities, the socialities, the practices and processes of mobile money infrastructures everywhere. As interest and investment in mobile money continues unabated, and it is poised to contribute to the U.N.'s 'Sustainable Development Goals' (refer Figure 2), we believe that our study complicates the easy association made between mobile money (with a disproportionate focus on the 'mobile') and the realization of financial inclusion goals, where the poor are better able to manage their cash flows in the face of unpredictable earning patterns. To this end, we will be able to present some design implications for mobile money in this section.

6.1 The Mobile Money Infrastructure: *When* is it and *Who* sustains it?

Infrastructure is never absolute. It is relational to working conditions, and organized practice and use. Therefore, to ask *what* is mobile money infrastructure is a futile exercise. Instead, asking *when* is infrastructure is more useful (Star & Ruhleder, 1996). What immediately comes to mind when we begin to think of mobile money as an infrastructure, as Kendall et al. (2011) insist we do, is the mobile phone, the retail agent network, banks, payment card firms etc (Donovan, 2012). Such an elementary understanding of the mobile money infrastructure is nevertheless very helpful because it immediately does two things: i) it provokes us to think beyond the mobile phone delivery platform when imagining how mobile money works, and ii) it makes obvious that at any given point in time the mobile money infrastructure is at the least interacting with the mobile telephony infrastructure, the banking infrastructure, payments infrastructure etc. In fact, where one begins and where one ends is hard to isolate until we begin to identify the practices around mobile money. It is within these, that a more specific infrastructure begins to emerge.

This is important because dominant narratives in the international aid secotr assume a homogeneity of mobile money infrastructures, which then bolsters their confidence in replicating 'success stories'. Yet very few spin-offs of the Kenyan M-Pesa, if any at all, have seen similar success (GSM Association, n.d.). This is further complicated

when one moves from financial services like remittances to offer savings and credit as well. In general, remittances tend to be discrete, ephemeral and of smaller value unlike savings or credit which are of higher value and require a long-term relationship with the financial service or institution. Therefore, trust plays a huge part in facilitating these services (Ghosh & Bajpai, 2013). We saw this in our study as well[20], where the perceived trustworthiness of institutions (such as of Airtel) and interpersonal trust that is generated of ongoing social relations (such as with your cash collector) were important in making the mobile money infrastructure usable. Frequently though, these social relationships and modes of interaction shaped a mobile money infrastructure whose format deviated from what is assumed of a standardized mobile money infrastructure. For instance, the mobile money agents within the Novopay-NGOb infrastructure were unable to offer the same kind of training, monitoring, and tracking experience that the cash collectors of NGOb could. Consequently, this mobile money infrastructure only became usable for the auto-drivers because the cash-collectors remained an integral part of the process. In discussions about the importance of retail agent networks in mobile money (for instance, see Suri and Jack, 2016), the role of intermediaries outside of these 'mobile money agents' is seldom acknowledged. However, when designing mobile money infrastructures, we need to identify the right intermediaries who can assist users in using its services. And where the right intermediary is inaccessible, time-honored modes of interaction can make mobile money usable. The use of paper receipts, which has no legitimacy in a digital financial services infrastructure that confirms completed transactions through SMS, was rampant and gave auto-drivers the necessary confidence to transact with the mobile money agents instead of their cash-collectors.

As we watched these mobile money infrastructures in action, we began to appreciate their constantly evolving nature, moving away from a more static and immutable understanding of not only infrastructures but also of mobile money itself. In the field, it was challenging to isolate *just* the mobile money infrastructure - as the dominant narratives around it had told us to expect - without actually engaging with the (supposedly separate) loan-management infrastructure that made it usable for the auto-drivers. Of course, at any given point in time the 'standalone' mobile money infrastructure is interacting with many different infrastructures to make it usable (the mobile telephony infrastructure being the most significant). Still, within the limits of our epistemological and disciplinary allegiances, and our logistical constraints, we bound our study to focus on the i) loan management-mobile money infrastructure, and ii) the often undervalued and invisible human work of building, maintaining, and repairing this.

Both of these have important design implications. In demonstrating the intimate interacting of the mobile money infrastructure with the existing loan management infrastructure, we are revealing that in this context, and by extension in other

[20] There is a rich, vast literature on trust and trustworthiness (for instance, see Hardin, 2002) that is certainly relevant to this study but is outside of the scope of this particular paper.

contexts, although perhaps in differing ways, a standalone mobile money infrastructure cannot possibly accomplish the very challenging task of helping low-income users manage their unique, precarious cash flows – a task that requires dedicated, intensive attention and work. As we saw throughout our study, much of the labor-intensive tasks of training and monitoring are undertaken by the agents/collectors within the loan management infrastructure. Of course, mobile money agents also went over and beyond their prescribed duties to keep the system familiar and make it usable for the auto-drivers. For instance, they replicated artifacts and workflows from the existing non-digital loan management infrastructure. Or in the one example we saw, an auto-driver relied on his agent friend to pay his loan repayment amount as a kind of short-term, informal loan – an act that certainly helped the auto-driver manage his cash flows without expensive penalties. Therefore, faithful accounts of how mobile money works on the ground cannot ignore the human work of its many actors. These supposedly 'technological infrastructures' were made usable only because they were embedded within the loan payment infrastructure, with all its associated embedded human work towards building financial inclusion. Eventually, it is important to note that this human work is often hidden but still necessary to understand if we are thinking about how to make mobile money work for low-income communities.

6.2 The Unbearable Modernity of Mobile Money

We borrow the title of our paper from an excerpt in Brian Larkin's thoughtful paper on the unbearable modernity of infrastructures (Larkin, 2013). Larkin observes that this condition reveals the inextricable link that is presumed between the technological materialities of infrastructures and 'modernity', rendering invisible the less glamorous human work that goes into building and maintaining these infrastructures. This excerpt resonated with us as we were studying and thinking deeply about mobile money infrastructures. The dominant narratives around mobile money, especially in the international aid sector that cultivates and maintains the hype around it, also privileges its technological features at the cost of sidelining the less glamorous human work in what are essentially socio-technical infrastructures. New technologies and delivery channels are presumed to unilaterally improve efficiency through automation and by 'offering more convenient access and reduced cost to the end-consumer' (International Finance Corporation n.d., p. 10). Yet if the advocates for mobile money want their systems to be usable and achieve financial inclusion goals, they need to recognize the work needed to make this happen. For instance, monitoring and tracking auto-drivers so that they do not fall off the repayment cycle and deeper into debt – something that should certainly be a part of any financial inclusion program – was a decidedly labor-intensive process. Repairing breakdowns and maintaining infrastructural stasis required human work. Even seemingly standardized job functions were constantly confronted and flouted as cash collectors and mobile money agents both went over and beyond their prescribed duties. Moreover, the human work of mobile money infrastructures can alter its very affordances. For instance, top-down decisions at Novopay eliminated the digital

wallet altogether that essentially eliminated an easy, relatively secure place for auto-drivers to store money in. Moreover, NGOa trained the auto-drivers affiliated with them to take a shortcut to the loan repayment option directly. Thus, entire steps to unlock the broader potential of these wallets were bypassed, effectively denying any interaction with a larger suite of digital financial services. This had important consequences for financial inclusion goals – in these cases the human work was actually diminishing them. It is therefore important that we privilege conversations on what financial inclusion is and how we can help support its goals through mobile money. Thus, assuming an easy correlation between technology, modernity, and financial inclusion needs to be constantly challenged.

7. Conclusion

We set out to understand how two different mobile money systems were being used by a low-income community as part of a financial inclusion program. This program targeted auto-drivers who traditionally had trouble acquiring a loan to purchase their own auto-rickshaws. Essentially, the program helped them in securing and repaying mainstream bank loans, and used two different mobile money services for the repayment process. These mobile money systems served low-income populations in quite different ways: while Airtel Money provided a digital wallet to its users and could be accessed by users on the most basic of feature phones, Novopay serviced all transactions through the agent's smartphone and had thus eliminated the digital wallet altogether. This distinction became the primary motivation for our interest in this program as an academic project - we were interested in understanding the consequences of these two different mobile money systems for the auto-drivers and how they did (or did not) help them in managing their daily cash flows.

We soon realized that what we were contending with were not standalone mobile money platforms, but entire infrastructures. Therefore, we turned to the well-established infrastructures literature to ground our analysis. This literature helped us recognize the broader infrastructure around the immediately visible mobile money delivery service, and how to articulate this. Of course, in doing this, we can isolate an infinite number of technologies, social networks, and relations, which becomes untenable to study after a point. Therefore, within the limits of our methodological and logistical choices, as well as our epistemological and disciplinary allegiances, we bound our study of the mobile money infrastructure to focus on i) the interactions of two seemingly distinct yet inextricably interlinked infrastructures that enable this specific context of mobile money enabled loan repayments, and ii) the often undervalued and invisible human work of building, maintaining, and repairing these supposedly "technological" infrastructures. In continuing to advocate for mobile money services to be understood as an infrastructure (Kendall et al., 2011), we are refocusing the dominant attention away from its technological features, and thus circumventing any attention that may be directed to the technological

infrastructure exclusively. And in demonstrating the intimate interacting of the mobile money infrastructure with the existing loan management infrastructure, we are revealing that in this context, and by extension in most other contexts, although perhaps in differing ways, a standalone mobile money infrastructure cannot possibly accomplish the very challenging and labor-intensive task of helping low-income users manage their unique, precarious cash flows. To this end, faithful accounts of how mobile money works on the ground cannot ignore the human work of its many actors, and where financial inclusion goals are achieved, it is crucial to understand how much that achievement came out of the human work, rather than the technology per se.

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