The Times They Are A-Changin': Mobile Payments in India

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ABSTRACT

We report on an ethnographic study of payment and banking practices in India. Currently a mobile payment mechanism is being developed in India and we were interested to see how it would fit with various current payment systems for various types of users. Therefore we studied a variety of current payment situations and gained an understanding of the banking and payment practices and needs of a diverse community. Our aim was to inform the development of interface elements, applications and services that would support the needs we uncovered. We describe our findings and the design ideas they provoked.

Author Keywords

Mobile payments, ethnography, payment practices, India, interaction, ecosystem, services, financial inclusion

ACM Classification Keywords

H 1.2 Information systems, models and principles, user/machine systems, human factors

General Terms

Human factors, design

INTRODUCTION

In recent years the CHI community has shown an increasing interest in previously neglected countries such as the BRIC nations (Brazil, Russia, India and China) where rapid economic and technological development is underway. The local specificities of these countries are less understood in the West and this is also often coupled with a desire to aid social improvement. It is a phenomenon which is sometimes known as 'design for the other 90%' [17]. Recently research and academic articles have focused on innovation in these places [10,14,15]. From a research perspective these new areas are interesting for a number of reasons: various technologies – most notably the mobile phone – have been reconfigured in an innovative fashion to suit local needs and requirements in different ways to Europe or North America; some modern technologies in 'developing countries' are relatively inexpensive and may be widely available, while at the same time elements of large scale economic and technological infrastructure may be relatively undeveloped; the widespread take up of technologies is happening in different orders and at different rates than in the west. This different usage, customization and adoption of technologies offers new opportunities for innovation and design. Against this backdrop, we report on the findings of a series of ethnographic studies of current payment situations and practices, undertaken by the first author as part of a project on the design of a mobile payment (m-payment) standard for India. These studies were carried out to understand how an m-payment system might fit into the Indian market. The results are not simply a series of design implications, although we certainly discuss what might be needed to make the system work, plus possible value-added services to encourage system take-up (i.e. where the system offers advantages over current payment mechanisms). However, we also consider m-payments in a wider context: how might they fit into current payment workflows, where might they work easily and what might their problems be, and could they even aid financial inclusion?

BACKGROUND

In India, a large scale m-payment initiative is being undertaken by a public-private consortium – the Mobile Payment Forum (MPF) of India [16]. The members are banks, telecom companies, payment providers, credit card companies, plus academic institutes such as IIT Madras. Together they are developing standards for a system which enables people to make merchant or person-person payments using their mobile phone, without the need for credit or debit cards, whether they have high or low end phones. A key aim behind the system is financial inclusion; providing electronic payments to those who currently do not have access to them. The mobile phone seems to be the ideal tool. Given the widespread penetration of mobile phones in India, the idea is that people, such as small merchants, auto-drivers, etc. will be able to use the system without having to purchase costly additional equipment or infrastructure. Since the Indian financial market is highly regulated, the Government of India has mandated that

mobile payments will have to be routed through banks [16] (see figure 1 below). This means that the system is necessarily different in both set-up and use from systems which use only telecoms providers such as M-PESA [5]. System take-up will be limited by the number of bank accounts, which at present is approximately 400 million. Whilst de-linking mobile payments from the banking network does have advantages given the large number of unbanked in India, it carries the risk of default by mobile payment service providers. In India many people on low incomes or in rural areas have difficulty getting bank accounts for a variety of reasons, including travel distance, their perceived unsuitability by banks and so on. For example, a study by a microfinance organization looking at spending patterns of auto-rickshaw drivers and cab drivers found that none of them had bank accounts [1]. They did however have small amounts of money to spare suggesting there is spare capacity for banking services if they could be conveniently and beneficially provided. Similarly in the study reported here we interviewed two waiters at a guest house in Delhi. Neither had a bank account, although they were in the wage bracket to be served by one (Rs 5-15,000 per month). They reported that they have a full day (9am to 9pm) job and by the time they finish the banks are closed.

In parallel with the development of m-payments, the Indian Government has instigated a large scale financial inclusion program to bring banking to the unbanked through, for example, enabling shopkeepers to set up as bank agents. In combination, m-payments and schemes to increase banking penetration promise opportunities for financial inclusion. Thus the motivation for introducing m-payments is twofold. Firstly its potential impact on society, in terms of financial inclusion, can be pervasive, and secondly, it has enormous business potential. Even amongst bank account holders, debit and credit card penetration is relatively low and it is envisaged that m-payments will be a cheaper form of electronic transaction that is simple to use (even for those with poorer literacy), convenient and secure. On the business side m-payment is envisaged as a low-charge service for many daily (or micro) purchases, as well as allowing person-to-person transfers. The idea is to allow payments up to the price of a domestic airline ticket (~ Rs 10,000). The hoped for convenience and amount of transactions mean that even a very small charge per transaction can make it a good business opportunity due to market size.
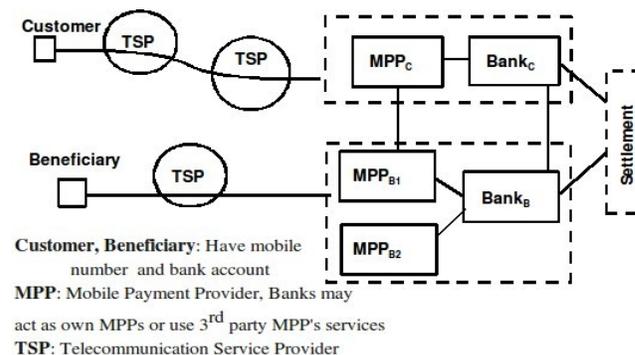
Mobile phone use in India
One reason that m-payment systems offer such promise in the Indian market is the widespread penetration of mobile phones. In the last ten years the subscriber base has reached 450 million with an approximate growth of 9 million a month [18]. More Indians own a mobile phone than a PC, thus technology adoption is likely to be more 'wireless' than PC centric. Hence it may be the mobile phone and not the PC that has the maximum potential to bridge the digital divide between the rich and the poor. If m-payments are to

be accessible to the poorer sections of the population, however, the system needs to be easily usable, including for non- or semi-literate users. Studies looking at mobile phone use in the non-literate population of India [3,7] found that non-literate users can call but cannot message or use address books. They also face problems in dialing national or international numbers because of the extra digits. In comparison semi-literate users can enter and manipulate numbers. This is likely due to exposure to number-based data formats and tools such as calendars and calculators [4]. That number literacy outstrips literacy was a motivator for the MPF to design a system which requires at minimum only entry and reading of numbers. However, studies like [3] also point out that non-literate mobile phone users are unwilling to explore the functionalities in the phone as they are concerned about making mistakes and having to pay etc. From these studies we can infer that although the semi-literate and non-literate user groups are the ones who are greatly in need of a banking service, they might have some problems with m-payment systems unless (and perhaps even) if they are very well designed. However, another study [13] which showed that technology use in slum areas was often facilitated by a neighbour or family member, offers hope of use in these communities. *Intermediation* enables persons for whom technology is inaccessible due to non-literacy, lack of skills, or financial constraints, to benefit through digitally skilled users, thus expanding the reach of technologies. Certainly any m-payment system with the goal of financial inclusion needs to work on both high and low end phones, meaning that whilst many high-end services might be offered for the wealthy a more basic service is also required. This need for both low and high end functionality makes an interesting design challenge.

Finally, there has been some preliminary work examining the conditions for acceptance and usage of mobile payment procedures [2,5,6,8]. Amongst other findings these studies have identified essential conditions like cost, security and convenience. However, there has been no work describing in detail the features that an 'easy-to-use' and 'convenient' system should have. We will partially address this here.

INDIA'S M-PAYMENT SYSTEM
The chosen architecture for the m-payment system is shown below in figure 1:

Customer, Beneficiary: Have mobile number and bank account
MPP: Mobile Payment Provider, Banks may act as own MPPs or use 3rd party MPP's services
TSP: Telecommunication Service Provider

Figure 1: Mobile payment entities

As well as payers and beneficiaries it involves Banks, Telecom Service Providers (TSP's) and Mobile Payment Providers (MPPs). It will function according to the following workflow: The customer C pays the Beneficiary B by entering the mobile phone number of B, the Bank Identifier Number of B's bank and B's account identifier digits. The transaction is carried by the Telecom Service Provider's network to the MPP/Bank. C's Bank transfers funds to B's Bank and the settlement happens later during the day. The architecture provides flexibility for the transaction to be initiated by either party. MPPs are likely to be the entity that provides value added services. The first author is involved in the MPF consortium and lived through a number of changes in the standards, such as payments only requiring the entry of numerals to support the semi-literate. Yet added security concerns and the need to support people with multiple bank accounts (a different population to the semi-literate) meant that more and more numbers were added. Currently around 20 numbers need to be entered to make a m-payment. Often when the user population was being invoked to make choices about standards and so on, it was based on conjecture. We therefore decided to use ethnography to try to understand what might be involved in creating a really usable m-payment system for a variety of users in various situations.

METHOD

As m-payments of the type being designed are not already in use, the ethnographic studies covered a range of existing payment practices and situations to understand how they are played out in practice. The aim was to understand how m-payments *might fit* into various pre-existing payment situations, or not, and *how they might be delivered or supported* in order to work (or stand a good chance of working) in various settings for various types of user. M-payments will have to be made at home in the world of buying, selling and paying [12]. Consequently the first author carried out a series of ethnographic studies [9] in order to understand how current payment situations unfolded. The studies involved participant-observation of various payment situations; on buses and auto rickshaws (low cost motorbike taxis), in railway stations, supermarkets, different shops, roadside vendors and so on. Some situations were more *participant* and others more *observational*, at times she accompanied informants as they e.g. went shopping, dining, etc. The data was analysed ethnomethdologically [9]. To further understand peoples' experiences with banking and payment situations and technologies, unstructured one-to-one interviews with open-ended questions were also conducted for example with workers such as waiters, carpenters and so on. Such workers fall into the income bracket of Rs 5–15k and as such *should* be able to access banking, and are a key target grouping for mobile payments. The study covered semi-urban areas such as Gutkar, Mekal and Mandi in Himachal Pradesh and urban areas including New Delhi and Lucknow in the north and Chennai in the south. We wanted to cover a large variety of payment situations across lower, middle and upper middle class families. Thus the studies covered a range of locations, environments and people.

FIELDWORK FINDINGS

Paying for a good or service is a sequential, ordered interaction which can glossed, in many cases, as follows: customer arrives at point of sale ready to pay (perhaps with product in hand or ready-to-buy, or having already partaken of the service e.g. dinner!), the seller totals up the price, the customer hands over either cash or a credit card, the seller in the case of cash may give change, for a credit card may ask for a signature or PIN number. Terminating the transaction, the seller often hands over a receipt and the customer is free to leave. This ordered interaction, of course, takes place in a wider workflow and the exact way in which the order plays out in the service workflow varies across situations: even for a particular type of activity, such as buying food there are a number of ways in which the workflow might be ordered (just think about the difference between going to a fast food drive-in and a posh restaurant). We will first look at some features of what we might call payments 'in the narrow', before considering the wider payment workflow and how different payment mechanisms fit into and influence that. Finally, since m-payments are also intended to be used for person to person payments we consider some features of current payment practices as they relate to this. To illustrate our points in the following sections we have selected a number of vignettes from the various studies we carried out that show interesting features of various payment situations, and that can be relevant to design requirements.

Payments 'in the narrow'

As might be expected in a country with so many people, payment situations are often pressured and time critical and this is keenly oriented to by the service provider. For example, on the bus a conductor collects fares. When the bus is not too full, he will move up and down the aisle, giving prices, collecting the money and exchanging it for tickets. As shown in figure 2 the conductor keeps notes between his fingers and tickets in his hand to facilitate rapid processing of each fare.

Figure 2: Bus conductor with notes between his fingers

When the bus is too full for the conductor to navigate the aisles, passengers will shout up the aisle to find out fares then pass the money up the bus via other passengers – whilst keenly watching the progress of the money and the return of any change and the ticket. When busy, successfully managing payments on the bus relies on the conductor's observation, memory and rapidity but also knowing cooperation and a degree of trust within the crowd. That it can be observed helps ensure the moral and practical order of the emergent queue which is not based purely on a spatial order. This suggests to us that in mobile payment situations with similar features, where payments may arrive in a 'disorderly' manner (i.e. not sequentially visible or clearly observably traceable to payers) attention will need to be paid to how they can be attributed to specific individuals. This may of course be achieved technically (e.g. tagging, recognition) or organizationally (ensuring visibility and tracking via a workflow). Furthermore, two types of ticketing were observed on the buses: manual ticketing where the conductor had a book of tickets of different values and ripped out the right one and a ticket machine where the conductor entered the information and the machine printed a ticket. There is no doubt that the first is quicker than the second, however the conductor with the ticket machine preferred it because it saved him considerable time in cashing up at the end of the day.

There were many situations where queuing was commonplace and as such the service provider attempted to deal with each customer in a timely fashion. For example, at both the railway reservation counter and mobile phone bill counter, the assistants left the money in a largely unordered mess on their desks – both coins and notes intermixed, because 1) the time between each customer was so short and 2) this provided them with convenient access to the money. When they had short periods of quiet they would order the notes and change (Figure 3).

Figure 3: Organising the notes when there are no customers at the counter

Thus, although cash *can be* convenient to access, keeping it in order and cashing up can take considerable work, whether during or at the end of the day. However, it is frequently undertaken outside of the buyer-seller interaction where the focus is on the speed of processing customers. A clear feature of cash payments is that change can be a problem, especially where the transaction frequency is high and transactions are micro in nature, or may come to random amounts, e.g. in supermarkets. Customers and shopkeepers orient to the problem of change by for example 1) keeping a workable 'float' i.e. a reasonable amount of coins and small denomination notes, or 2) trying to ensure that less complex change is required (comprising fewer coins and notes). This is an occasioned practice, instigated by either party according to particular circumstances, the most obvious being when a merchant asks for more exact tendering of money. In other circumstances customers clearly use shopping as a means of specifically getting change themselves, e.g. to 'break' a higher denomination note or to get specific change for a purpose. Excerpt 1 and the discussed examples demonstrate some of these 'change management' practices.

Excerpt 1: *A lady was getting her purchase billed. She had shopped for her household, the bill amount was Rs 320 and she gave the cashier Rs 400.*

`Cashier: Please give change. Give me Rs 20.`
Lady (digs in her bag for 2 mins. Looks upset as she has to dig in her big bag)

`Lady: I don't have any change`
Cashier (looks into his cash drawer again and comes up with change)

Excerpt 1 reveals the cashier's orientation towards his float. He has not asked for Rs 20 because he is unable to give change, rather he is orienting towards keeping a reasonable float for future transactions. Commonly the customer *was* able to provide the money such that a round amount of change could be given, which might even mean two or three rounds of cash exchange. For example, where the bill amount was Rs 56 and the customer gave Rs 60, the cashier returned Rs 5 and the customer gave the cashier Rs 1. In other situations, the customer has to wait for the right change even after the billing has been done. We observed in situations like the railway station that customers were even asked to step out of the queue and go and find change (e.g. from family members) before having their transaction completed. In some situations, if a customer has the exact amount of change for the purchase they may jump the queue ahead of someone with problematic change (i.e. they can help to ameliorate the change problem), or even jump the queue full stop. In a Chennai supermarket queue jumping was occasionally observed when customers had the exact amount for payment, often for a single item. The cashier would take the purchase and bill it (keeping the entitled customer on hold). These situations show that customers, too, orient to the issue of change, and to the privileges (or the avoiding of inconveniencies) that having the correct change may give you! Indeed many of these features are widespread cross-culturally and may well be already familiar to the reader.

Having the correct money and carrying change is also a problem in other situations. During an interview with a textile company in Chennai that employs networks of workers in rural areas we found out that paying and distributing salaries to the field force, who are unbanked, was a major task. The salary amount (for 60-70 workers) is transferred to the unit manager's bank account in the village. The unit manager withdraws the cash from the bank and pays it to the workers. Salary disbursement in this way is not only time consuming but also potentially insecure as the manager must carry a sack-full of coins and low denomination notes worth Rs 10,000 so all the individual wages can be paid exactly. To provide this the bank has to be informed in advance.

We can see then that speed and convenience are key features of payment situations and the workers have developed practices which enable them to smoothly and quickly complete the transactions. Both workers and customers orient to the tangible and finite nature of cash. In the last situation where the payment is for payroll the requirement to use cash is a major logistical burden.

THE WIDER PURCHASING WORKFLOW

Payment practices (to merchants) are part of a service or goods provision workflow. It is important for m-payment design to understand this workflow and its implications. What constraints might it impose on m-payments and conversely are there places where m-payments can offer added value over other payment mechanisms? A good illustration of this wider workflow comes from the railway reservation counter in Lucknow where ticket officers provide a valuable service in enabling customers to get the 'correct' reservation. In theory, customers simply complete a reservation form in advance and then the ticket officer would issue the ticket and take payment. In practice the form in many cases serves only as a initial draft and orienting device which begins a conversation that refines the selection. In Excerpt 2 we see an example of the valuable service they provide in highlighting potential common mistakes in proposed bookings, thus allowing customers to double check:

Excerpt 2: *A person hands the reservation form in which the date of departure is 16th. The officer looks at the reservation form given to her.*

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Officer: The train is at 12:30 AM so do you
want the ticket for 16th night or 17th
night?
Person: 16th night
Officer: Then change the date in the form to
17th because it is at 12:30 AM
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Officer hands over the form to him, he changes the dates and returns it.

In Excerpt 3 we see another important service being provided – helping customers navigate through the slightly labyrinthine system of trains and possible reservations:

Excerpt 3: *Another passenger in the queue hands over his form to the officer sitting at the reservation counter. The officer enters the details of the form in the computer and gets the status.*

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Officer: Waiting 106

Person: Check in this other train which goes
from Lucknow to Ghaziabad at time 2:00 PM. I
only know the source and the destination,
don't know the train name.

Officer [checks in the computer]: The name
of the train is Neelachal Express but it
doesn't run on the dates you want to go

Person: Check for this other train, name
Sadbhawana Express

Officer: It has no 'sleeper' class, only Air
Condition class(AC)

Person: Check in Tatkal  (late reservation option)

Officer: The status in all the trains
running from the source and destination on
that date is this [gives status of trains]
Person: Do it in the one with the least
waiting
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Officer hands over the form and he changes it.

Different trains of different names run the same route so the customer relies on the officer being able to identify the correct train. Furthermore, express trains in India offer various 'class' options as well as 'waiting' (with 'waiting' you may be able to board a train with a ticket, but you are not guaranteed a seat) that the officer can help the customer navigate through to a preferred choice. Interestingly this is clearly a customer who knows the system to some extent but still requires help to work up the best option. In this study the vast majority of customers needed some sort of assistance in purchasing their tickets, often in the form of several question and information exchange 'rounds'. What this material makes clear is that when buying tickets customers do not necessarily know in advance just what it is they want or what the best solution would be – they need help in choosing, refining and checking. They are not in a position to successfully purchase their tickets unless supported in some way and although taking payments and issuing tickets is an important part of the reservation clerk's job it is by no means the main part.

A second example can be seen when we look at the various functions of receipts in purchasing workflows. Certainly receipts are not one single thing serving one single purpose. If we think of the payment as one activity within a wider exchange of goods and/or services that has contractual elements (whether socially and morally defined in informal situations e.g. with roadside vendors, or more explicitly defined in more formal situations e.g. buying off the Internet, where we 'sign up' to agreements) we can see the importance of the receipt in marking out contractual rights and obligations. Receipts, whether printed or written, often

serve as a proof of payment/purchase, after the fact of buying and receiving goods. As such, we saw them used in two fashions – proof of purchase in the light of a problem with the goods or services or as a means of claiming expenses. In different types of purchasing models the orderings and temporal relations between receiving receipts and receiving goods or services alter. For example, buying something off the Internet, you will often receive the digital (though printable) receipt (for payment) in advance of the purchased good – in which case it serves as a promise to deliver, and then once delivered as a proof of purchase. Receipts can also serve as tickets (or vice versa) as observed on the buses where the payment is made and the ticket is collected. The paper ticket serves as a (a) ticket (b) receipt/proof of payment (c) potentially as a bill for expense claims. The receipt-as-ticket may also have corresponding timestamp, alighting and destination information.

Another interesting example comes from observations in a Chennai restaurant, Tiffany's. Here, people go to the counter, order, pay and get a receipt (listing food ordered, amount paid etc.) which then acts as a token. The receipt/token is handed in by the customer at the service counter, where the order is prepared (here this consists of putting pre-cooked food onto trays according to the combination ordered). Once ready the dish is called out and the customer, who usually hangs about in the vicinity takes his tray. In one situation a customer wanted their receipt/token back for an expense claim, but this was not particularly easy since the server had to find it amongst the pile of unordered tokens on his table. This example reminds us that receipts are designed and deployed as organising elements in *workflows*. Tiffany's is a fast food restaurant and managing the customer flow is aided by the way the service is ordered through the receipt. People pay up-front then go to the service counter where the token triggers the preparation of the meal, which is then called out for the customer. The receipt features in efficiently and relatively dependably dealing with many customers in a quick-fire manner. Here the potential need for the receipt to be returned to the customer is not well catered for. When claiming expenses, the receipt that was part of the paying for goods 'workflow' becomes part of another workflow within the employer's human resource systems.

Bargaining and haggling

In the final set of examples in this section we examine practices of haggling and bargaining. In many transactions in India – fares for autos, roadside shopping and even in larger stores prices can be flexible. The price of the commodity/service often varies and getting the best or the correct price can rely on local knowledge. Excerpts 4-6 all come from 'haggles' with auto drivers that illustrate some interesting features of the activity. Firstly, auto drivers invariably, unsurprisingly, try to get the best price for themselves, which mostly involves setting it initially high (see 4 and 5). However, the success of this tactic relies on the customer lacking the local knowledge to spot the

inflated fare, or whether they can be bothered to bargain or are willing to accept a higher price. In excerpt 4 Rs60 is accepted even though is a bit high, in Excerpt 5 the customer simply declines the haggle and the auto.

Excerpt 4: *During the study the ethnographer observed: 'While coming back from Besant Nagar, the time was 9.15 PM. I thought we'll take a bus but Professor suggested we take an auto. We stopped an auto going on the other side of the road. He crossed the road to meet us at the other end'.*
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Prof: IIT Gate
Auto: 90
Prof: Too much, 40
Auto: Night time sir
Deepti: You don't even have to take a U-turn
Prof: We came in 40.  Okay, how about 50?
Auto: No sir 60 is okay
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'I think Prof was either tired or he did not want to bargain more so he said okay'.

Excerpt 5: *During a study the ethnographer stopped an auto. The destination from the place of boarding was 5 km away.*
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Deepti: IIT Gate?
Auto: 90
Deepti: No
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Without bargaining or saying anything more the ethnographer walks away for the requested amount is so unreasonable it is not worth negotiating. The ethnographer stopped another auto.
Looking again at excerpts 4 and 5 we can see that there are *tolerances* to haggling. In 5 we see that the customer does not even bother because the initial price is too high. Indeed this is common in India where autos are readily available and if one deems the initial price to be too high, it is often not worth continuing. Tolerances include the possibility of overpaying but only within reasonable amounts, for example, Rs 10. Of course different people have different tolerances! Another feature of haggling is the notion of how it should proceed – that initial positions should be taken that are reasonable (within tolerances for both) and that the haggle should proceed rapidly and reach a mutually accepted mid-point quickly. There is, however, an asymmetry in relation to initial positions as to the *what next* action if either party deems these to be inappropriate; while the buyer will often just walk away, the seller may well exhibit his consternation but will mostly continue within the haggle. Excerpt 4 illustrates a fairly classic pattern while 6 really shows features of a 'good haggle' – brevity and rapid concordance:

Excerpt 6: *The ethnographer stopped a running auto.*
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Deepti: IIT Gate
Auto: 50
Deepti: 40?
Auto: No
Deepti: Okay
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The ethnographer did not bargain a lot with him because in the first go the auto driver quoted a decent price.

The ability to haggle effectively and quickly relies heavily on the knowledge and experience of the participants, because this sets out what customarily good starting points are, what a reasonable tolerance may be and so forth. This can pose as much a problem for Indians moving city as for foreigners as there is not a clear standard fare across the country. Returning to the theme of change introduced above, getting change is a known problem when catching autos, particularly where a fare has been bargained down from say Rs 100 to Rs 90, where drivers will frequently withhold the Rs 10 change under the pretext of it being a long ride, rush hour etc. Consequently it is common that people prepare for auto rides by having a variety of notes and change. Although keeping the extra money is a form of cheating it is within *socially acceptable limits*. It may provoke some annoyance but little more. Drivers never seem to try to keep much more than a few rupees, presumably as otherwise this would provoke a more extreme reaction. Hence, there are unsaid norms which are maintained by both the payer and the payee, and there is a moral dimension to haggling.

A haggle is to some extent a social activity in itself – like a kind of greetings exchange – it is not simply about final price. The next examples further show this social and moral dimension. In the first situation the ethnographer stopped at a roadside coconut vendor to buy a coconut. When he quoted it as Rs 20, she asked for a cheaper one and he showed her one for Rs 15 and began to cut it. While she was looking for Rs 15 in her wallet she realised she didn't have enough money so immediately asked him to stop. The vendor asked her how much she had and she showed him Rs 9.5. She was searching for a couple of more coins in the bag and wallet but couldn't find anything. The vendor said Rs 9.5 was fine and didn't even count the money when he got it. Due to the way the activity was conducted, with the ethnographer sincerely searching for more coins, the shopkeeper trusted her. This 'unintentional haggle' was accepted because it appeared genuine and trustworthy – i.e. not as some kind of ruse. Conversely, if haggles 'go wrong' people may be offended. The ethnographer sometimes visits a small roadside footwear shop in Chennai. One time when she visited she had a problem with the shopkeeper. He initially quoted a price of Rs70 for a pair of slippers but quickly changed it to Rs 60 without a haggle. But, he would not reduce the price further for a bulk buy of 6 pairs. The haggle degenerated so she left. Conversely, when she returned after 6 months and the shopkeeper's father was in charge he quoted a price of Rs 80 a pair. When he was told that she would buy 6 pairs he reduced the price to Rs 70 a pair. Even though the slippers were more expensive the second time, due to the fact that the haggling proceeded in the 'correct' manner, i.e. a discount *should* be given for buying multiples, a successful transaction was concluded.

PERSON TO PERSON PAYMENT PRACTICES

The Indian m-payment system is not just being designed for merchant payments, it may also be used for transferring cash between people, we therefore briefly consider a couple of current practices which we believe relevant to this function, namely transferring money to family members and sharing of credit/debit cards.

It is common practice for family members with jobs, often in the cities to transfer money home to the family, who remain living in rural areas. Sending money home is an expensive and insecure affair for the unbanked who often come from the poorer villages to earn money in big towns and cities. Most people send money by informal networks such as (a) an agency, where the sender pays the money to a broker/agent in his/her city. The agent calls up another agent in the beneficiary's town/village and asks him to deliver the required amount. The agent charges 10-12% of the total amount; (b) *Angandia service*, which is a kind of a courier service where the sender pays the money to a person who travels to the beneficiary's town and delivers the money. The charge in this case is 15-20%. (c) Post office transfer, which is a government provided service where the postman transfers the money to the beneficiary. The problem in this case is that the postman does not pay all the amount in one go, he will pay the beneficiary in installments and will keep rotating the money in the market. Sometimes they even charge a commission of another 15% to deliver the amount to the intended beneficiary. (d) Informal/black market networks with money lenders/intermediaries. E.g. one of our interviewees, working in a hotel sent money home regularly through an acquaintance who then transferred the money to a distant relative in his home village who would then pass on money to his parents. These types of money transfer are very common amongst 'migrant' workers who need to send money back to their families but transfers like this are fraught with risks and many have tales of losing money.

Of relevance when we think of the implications of a new m-payment system on the above activities is that sharing of debit/credit cards is common practice amongst the banked in India. For example, our studies and interviews of students and people above 40-45 years of age, found that (a) they had their friends' card details with them and would use them anytime after informing the owner of the card; (b) the owner of the card would give their card details to someone else (a son or a daughter) and ask them to book tickets/services with the cards; and (c) the settlement between the owner of the card and the user happens in cash or in kind, depending upon the relationship. Implications for m-payment systems of the sharing of payment mechanisms and our other findings are discussed below.

DISCUSSION

Although understanding payment situations might seem rather straightforward, their very routine nature can mean that the order inherent in these day-to-day practices disappears for us as we live them. Through ethnographic study we are able to begin to address a number of questions central to the design of an m-payment system:

1) How might we go about designing elements of the interaction model for mobile payments?

2) What is the *ecosystem* required to support mobile payments? We introduce the notion of ecosystem here as it emerged as an important idea in our study. It was clear that enabling an m-payment system to work is not simply about standards or interaction design. We need to think about the interaction of the core payment system with a number of other 'elements' to be successful. That is, what types of hardware, software and services, in what sort of configuration would be required to support different types of mobile payments for different users in different settings? This is the *ecosystem*. In part, this is an infrastructure question. For example, it involved envisioning how to handle m-payments for booking railway tickets or paying an auto fare, both from the payee and the payer sides.

3) How might mobile payments work in two markets? These are encapsulated by two types of phone – a middle to upper-middle class audience, more technically savvy, more likely to have an Internet enabled phone, and a lower class audience, more likely to have a more basic phone, less educated and less technically savvy? Of course, these groups are 'glosses' but from a design point of view, useful. The former allows us to think about more state-of-the-art solutions, while the latter allows us to think about basic and simple solutions that go towards aiding financial inclusion.

Interaction elements of mobile payments

Payment situations are often hurried and both buyers and sellers adopt practices to deal with the need for speed e.g. the bus driver with notes between his fingers or customers preparing the right change in advance. They also entail a socially understood moral and practical order. In the next sections we consider how the system could be designed to deal with money efficiently and effectively, how m-payments may impact social aspects of transactions, and what added value services may be attached to m-payments.

1) Number Entry: The current m-payment system requires the entry of around 20 numbers to make a payment and this is likely to be a major barrier to use as it will take time (and concentration). Hence good number entering solutions are key. Number entering might be eased through a number of possibilities for high end phones: Bluetooth could be used for example in shops, where the customers can scan their phone past a pay-point near a till and receive all the numbers relevant to the shop (phone number, account details and so on). The additional infrastructure requirements here mean that initially this would be likely in India only for users of high-end phones shopping in high-end shops. Lower-end merchants could consider printing business cards with a data glyph or bar code which could be read by a phone with the required application and a camera. Customers would still need high-end phones but the infrastructure costs for the merchant would be much less. Speech to text for converting spoken numbers is also a possibility, as well as to pre-fill numbers of regular

merchants from a payments address book stored on the phone. However, there are many fewer options to manual number entering for low end phones, verbal number entry is one possibility, either via IVR or human operators in a dedicated call centre. The transaction would then be completed over the call centre computer system. For low-end phones or when paying merchants without extra infrastructure, beyond the call centre option, customers will currently have to manually enter the numbers. Where this can be done when queuing or riding an auto it might be less of a burden, certainly one can imagine the seller posting a board with the details of his phone number, bank identifier and account identifier in a visible location to enable the customer to prepare in advance. A simple design requirement then for m-payments is that the amount payable should be the last thing entered to enable preparation by the customer.

2) Cash and Cashing Up: While cash can often be quickly exchanged in busy situations, potentially making it preferential to m-payments there is a burden to ordering the change and cashing up – currently this is often done outside of the customer interaction (although, e.g. in supermarkets, the ordering of cash is done at the time through use of tills). However, if the m-payment system can be designed such that it reduces the burden of cashing up there might be incentive for merchants to adopt it even if it makes the payment interaction a little slower (as for example with the bus conductor's automatic ticket machine). Thus being a little slower or more difficult to use is not a complete block for adoption of the m-payment system as long as it offers added-value to customers and/or merchants. This added-value could simply be from paying electronically in places where you currently cannot, e.g. the auto. The m-payment system avoids the problem of having to have the right change and, in the case of the autos, would mean you could bargain for a fare and then pay exactly the right amount, avoiding the chance to be cheated. There is a fine balance between ease of use and added-value that will affect adoption of the technology and it is not possible to specify in advance where it lies. However, what we can do is describe potential problems and opportunities, as we understand them from our studies, to enable the m-payment system designers to take them into account during design.

3) Tangibility & the Social Order of Payments: Cash is a tangible, physical object which is exchanged for goods during the payment interaction. Its tangibility is both useful (both parties know it has been exchanged; the available amount can be made available to both parties as a part of bargaining e.g. with the coconut seller) but it can also be problematic (can run out, problem of change). With m-payment the exchange is 'virtual', which has similarities to credit cards. However, when we consider the buyer-seller interaction with credit cards, we see that although the actual exchange of money is virtual (going on behind the scenes, digitally) the payment interaction still involves the transfer of the card from the buyer to the seller, who runs it through

their system and demands verification from the customer. The purchasing interaction is a tangible, ordered exchange from individual buyer to individual seller. M-payments change this since the transfer of money is virtual and involves no physical exchange (of cash or card). The m-payment system is currently being designed such that both buyer and seller will receive a notification (by SMS or USSD) containing either 1) the phone number of the person making the transaction and the amount or 2) the phone number of the person to whom the transaction is made and the amount, depending on whether you are (payee/payer). This notification is to serve as verification of payment. It is important that this notification is fast, otherwise the merchant is unlikely to be willing to let the customer leave until it has been received. If it arrives quickly, in one-on-one interactions it is probably adequate, e.g. the small shop keeper or auto-driver will be satisfied they have been paid if they receive prompt notification of the amount arriving into their account. However it could introduce problems for situations with many buyers as in the bus example. Customers could be treated sequentially as a conventional queue but this would not be innovative or efficient. It would be much better to allow payments from multiple customers at once but this raises the issue of how do you easily identify the customer and match them to the payment? We will discuss the latter possibility below.

4) Added Value Services: In terms of added value, one of the key things that the mobile phone offers as a payment channel which is not offered by most existing channels is that communication (and document) services can be offered hand-in-hand with the payment mechanism. Only the Internet offers this but in India it is less available in a private or mobile manner and most online payment is through credit cards. In the current design of the system, the customer only receives a simple notification, yet we have described how receipts are central parts of many interactions. There is certainly an opportunity for m-payment providers to provide receipts through the mobile phone – whether simple SMS receipts, containing details such as merchants name, products purchased, etc., so as to be useful to the customer (rather than just a list of notifications with phone numbers and amounts), or more complex document services linked into invoicing and so on.

Initial ideas for m-payment ecosystems
We mentioned above the issues surrounding transactions when there are numerous customers paying at the same time. This is partly an infrastructure issue. When thinking about one-pay-point-to-one-customer situations, the minimum m-payment system does not require additional infrastructure for it to work. All it requires is that both buyer and seller have a mobile phone and bank account (and have registered with the service). However, once there are multiple payers and/or pay points it becomes more complex. Let us take for example a grocery chain store with five check-outs. The cashiers might well have their own mobile phones, but certainly the grocery would not want the

money being directed to the cashiers account! Rather they are likely to have a central account into which the payments go. We then have a number of options, all which require additional infrastructure: 1) a mobile phone is purchased for each till point, all linked to the same account 2) a computer system is purchased to handle m-payments 3) only one till accepts m-payments, using either a phone or a computer system. We should note at this point that the majority of grocery stores visited in India, even of large chains did not have computerised tills, so purchasing in a computer system for each store could be a prohibitive investment and apart from option three there is still a problem of associating the customer at your till with the payments being made on the system. The Bluetooth number entering system described above could address this, since information exchange could be two way, however as mentioned this is only feasible in high end stores for customers with high end phones so more innovation to refine this clearly possible.

Now let us consider another situation, requiring a different ecosystem – railway ticket reservation. Ticket booking is one of the most important online services offered in India. Booking a ticket involves looking up the various options and then choosing the most suitable one, this means a lot of displays and selections. Since ticket availability is rapidly changing it requires a fast real-time connection to the booking system. Remote ticket reservation then is an option on high end phones with Internet connectivity. A potential value-added service is to provide the ticket on the mobile phone, initially this is likely to be through a notification with a number which enables customers to print out a paper ticket, but one could imagine wholly digital tickets in the future. For low end phones other options are required, for example kiosks where selections can be made and then payment is simply by entering you mobile phone number and then pin number. Such kiosks could enable printing out of receipts and tickets. They also offer possibilities for sharing m-payment services amongst family members, since users would just need to know the mobile phone number and the pin number, rather than actually to carry it around with them. There is a question mark however around whether such kiosks would really take off in India, given that even in internet cafes intermediaries may be used to do the actual ticket selection and payment.

The situation where m-payments might seem to work best is in one-on-one payment situations, such as the auto or small merchant (fruit seller, shopkeeper) etc. Currently there is no alternative payment mechanism to cash for these situations, thus they might benefit from an electronic payment mechanism. It could reduce problems around change and the numbers could be entered during the ride or wait. It would not require additional infrastructure, but is likely to require either manual or IVR number entering.

M-payments for financial inclusion
To wrap up we would like to say a few words on the topic of financial inclusion. If we imagine that good ecosystems

and services are put in place for number entering and so on then the most likely immediate users of the system might well be literate, middle class, professionals with high end phones. This population already has access to debit/credit cards, but we can imagine that m-payments will be able to offer added value through a range of services e.g. receiving tickets on the phone, notifications when payments are due and so on. For all populations, person to person payments offer a real value add as these are often difficult now, unless through cash, involving creating arrangements for individual people to be able to transfer money between different bank accounts. If handled correctly and in parallel with new banking programs, m-payments can help new communities achieve financial inclusion. It is unlikely that there will be immediate widespread adoption amongst the poorest and least educated communities. Even those who have basic number literacy might struggle with the entering of so many digits, however dedicated call centres/voice services could help, although they might also push up the transaction cost. However, for the currently unbanked communities between the very poor and the middle class there is real potential. For these markets though there needs to be a simple system to be used on low end phones. For example a simple SMS could be sent to a 'generic payment number' e.g. 777 containing <beneficiaries phone number, bank ID, account code, amount>. Although this requires a lot of number entry, given the cost and insecurity of transferring money by current routes, it would offer a considerable value-add that might encourage adoption. Sharing and intermediaries [13] in the community could also enhance the reach of the service into the poorest communities e.g. only one family member in the rural home need have a bank account for all to benefit.

CONCLUSION
We have reported on a series of ethnographic studies of payment practices in India and have described some of the arising implications for m-payments, not just in terms of interaction and functionality design, but also how m-payments might fit into or impact existing payment workflows. We also consider how m-payments could impact financial inclusion. These ideas do not represent the final say in design and should be seen as a first exploration of possibilities. As m-payments develop we are bound to see unexpected innovations and changing practices but balancing creativity while looking at how they might work in reference to today's practices seems a good place to start.

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