

User Challenges and Successes with Mobile Payment Systems in North America

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ABSTRACT

As smartphones continue to increase in popularity in North America so too does the opportunity to expand their use and functionality. Our study looks at one of these new opportunities, Mobile Payment Services (MPSs). This study investigates user behaviours, motivations and first impressions of MPS in Canada and the United States through interviews with veteran users and interviews and diaries with new users to understand how the technology can be improved to increase user comfort and adoption. Participants used a variety of MPSs, including: Google Wallet, Amazon Payments, LevelUp, Square and company apps geared towards payments (e.g., Starbucks). Our findings identify the challenges and success that users faced in using MPS and found the number of challenges to be high and restricting towards use. These provide suggestions around designing for routines, expanding user's mental models, focusing on perceived usefulness and perceived ease-of-use, and leveraging entertainment (gamification) aspects of smartphones.

Author Keywords

mobile payment services, Google Wallet, LevelUp, Square, PayPal, M-Pesa, ubiquitous commerce, mcommerce, trust

ACM Classification Keywords

H.5.2 [User Interfaces]: User-Centered Design

INTRODUCTION

Recently, we have seen Mobile Payment Services (MPSs) increase in usage around the world. For example, in 2011, using feature phones—not smartphones—Kenyan demonstrated a higher preference to shop through a mobile device rather than through desktop computers or in-stores using M-PESA. China has also found some success with Alipay and GCash has had well documented success in the Philippines. It has been reported that these systems are often fueled by the user's lack of trust in their local country's banking systems and a wide range of social and cultural motivators [6,15,18].

Surprisingly, in the last few years North America has not been able to reach the success that these other countries have had with the adoption of MPS. With the recent addition of large online players (Google and Amazon), as well as more traditional payment entities (MasterCard and PayPal), and some well-developed startups (ex. LevelUp and Square), expectations for a societal shift towards ubiquitous commerce is both high and deemed of "critical

importance" [15] for the future of mobile and electronic commerce.

While a number of studies have looked at MPS in developing countries (e.g., [6]), and even developed countries in Europe [15,18] and Asia (e.g., [10]), this past body of work has not focused on the North American market and smartphones. This is because past studies were either completed a number of years ago and/or the MPS systems studied were only SMS-centric. MPS systems have just started to become available on smartphones in North America, therefore collecting empirical data on their usage prior to the last couple of years was not possible. Our research looks to fill this gap by focusing on understanding how users are participating in MPS in North America on smartphones with the goal of understanding how to design MPS to increase user experience.

We conducted a study with veteran and new MPS users focused on how they used several payment styles currently available in North America:

- **Carrier Billing** (e.g., Text2Pay): the consumer pays by text message and the charge is added to their phone bill.
- **Near-Field Communications** (e.g., Google Wallet): the consumer can pay at the point of sale by waving their phone in front of a terminal.
- **Closed Loop Mobile Payments** (e.g., Starbucks App): the consumer uses an app on their smartphone to pay, typically by scanning a barcode at the register.
- **Card Readers** (e.g., Square): these solutions allow merchants to take payment via a card reader attached to a smartphone or tablet.

Our users were predominantly from our own region within a major metropolitan city in Canada. However, we have also included a small number of additional users within the United States as points of comparison.

Existing users were interviewed about their past experiences and new users were interviewed after two weeks of using the technology where they kept an e-diary. Our study reports on three key areas: 1) user practices and motivations; 2) success and challenges of usage; and, 3) how MPS users mitigate trust. We specifically identify trust as an important construct in this study as it has historically been cited as a major barrier to the adoption of eCommerce [15]. We caution that our study does not investigate the long-term adoption of MPS as might be found in a study that lasts several months to years. Instead, we focus on first

reactions of new users along with the experiences of veteran users who have already adopted the technology.

Our findings showed that designing MPS around routines and habits aids in perceived usefulness and perceived ease-of-use. From a trust perspective, we saw that when compared to past work on mCommerce, trust levels between vendor and user are notably worse for MPS. Further, users of MPS reported positive social reactions from the use of mobile phones while making mobile payments, which contrasts past work on the use of mobile devices in public spaces [11]. The implication is that trust mechanisms should be developed more within MPS. Specifically, this could be done through attention to introductory pricing models, as well as thorough usability and security testing.

RELATED WORK

There exists a variety of research completed on mCommerce, MPS (outside of North America), and trust in eCommerce. In this section we discuss past research in these three key areas to inform and situate our study.

mCommerce and MPS

eCommerce has traditionally been viewed as a stationary act, performed at desktops in offices, homes, or other locations. Within this space lies mobile commerce (mCommerce): commerce activities occurring on a mobile device. MPS have been classified as a subset of mCommerce [??] and a form of eCommerce [18]. The definition of MPS has varied to include all mobile communication devices [22] to a more focused definition around just payments on mobile phones [5]. In our study, we adopt the later definition, similar to that of Schierz et al. [18] but with a focus on just mobile phones, defining MPS as “all payments for goods, services and bills authorized, initiated or realized” [18] with a mobile phone. While seemingly valuable, there have been noted shortcomings when comparing mobile commerce growth to its expectations [21]. Lack of adaption has been blamed on poor usability [21], social and cultural ideologies [11], and mobile technology limitations [9].

While there have not been any studies on MPS usage in North America with current smart phone technologies, there are some that focus on earlier versions of MPS in industrialized countries in Europe. First, Schierz et al. [18] tested MPS use in Germany based on the Technology Adoption Model. This model explains that the adoption of technologies is based on the perceived usefulness and perceived ease-of-use of the technology [1,2]. Scheirz et al.'s findings show that perceived ease of use, compatibility, security, and usefulness, along with individual mobility positively affected users' attitudes to use MPS. Second, and the closest study to our own in terms of its findings, Mallat [15] explored MPS usage in Finland over ten years ago when MPS was based solely on SMS (direct billing) technology. Mallat [15] stresses the importance of understanding adoption for MPS by using the

Diffusion of Innovation theory (DIT). DIT is based on five characteristics that affect adoption (e.g., [20]). The authors identify three of these constructs for the study: relative advantage (what is the advantage over other systems) complexity (what is the ease of adoption), and compatibility with the users' daily lives. Results showed that users found MPS faster and more convenient than cash; mobile payments were most compatible with small value payments; and complexities around the use of the systems along with a lack of large merchant acceptance were barriers to adoption [15]. Users also described issues with trust where they had feelings of “vagueness” and “perceived lack of control”. Users were also concerned about trust in network reliability and having their phone accessed if it was hacked, lost, or stolen [15]. While valuable, we caution that this study focused on feature-phones, not smartphones, from ten years ago. Technology and culture have radically changed in this time period.

MPS has also been studied in non-industrialized countries. Hinman and Matovu [6] investigated opportunities and challenges around mobile-based finances in rural Uganda. Their study found that users had a strong affinity to fixed assets, lacked access to capital and did not understand how MPS worked, and overall were confused by the mental model used to interact with the service [6]. Unlike developed nations, Ugandans lacked the reference point of transferring funds – “the movement of money from one person to another”, creating a “conceptual gap” [6].

Trust

Trust has historically been a major obstacle for the success of eCommerce [14,15]. The notion that users are vulnerable and likely to expose themselves during an online purchase is often a main concern [4]. Thus, past research has shown that the level of trust established between the user/vendor relationship dictates if a transaction will occur and to what scope [14]. Past work has showed us that not only does trust play a key role in the adoption of new technologies and the initial trust with a new vendor, it also results in repeat purchases and continued relationships [4].

Hillman et al. [7] identified that mCommerce users had few trust concerns while making transactions on their mobile devices over the Internet. They found this was because trust was built through: direct brand awareness; the ‘app’ approval process; and, purchase recommendations by friends and family. Within this, brand played the most significant role in trust for mobile commerce activity. Our study explores how this model applies to MPS. Building trust in eCommerce or mCommerce web environment, usually focuses on creating trust mechanisms that bypass the physicality restraints of online, for example by leveraging 3rd party certifications and user-to-user relationships [4,10]. However, often MPS is done in a retail store or the same physical location as the traditional commerce transaction would have taken place. In these cases MPS is just simply replacing another form of

payment. This brings into question the legitimacy of eCommerce trust models in relation to MPS. These mostly relate to building trust in an online space because one is not present in a physical store, yet MPS *can* occur in a physical store. In the Discussion section we explore this further.

The above related work provides a background for the study and also shows us that MPSs have been studied in a variety of ways, but there is no recent research on Canadian and American users of MPSs using smartphones.

STUDY METHODOLOGY

The goal of the study was to understand motivations, behaviours and first impressions of MPS users in North America. To address this, we investigated two main groups of participants through interviews: those who currently use a MPS, and those who do not. By selecting these two groups it allowed us to compare users whom were already very familiar with MPS as well as an authentic account of those trying a service for the first time.

Participants

Through postings on online forums and word of mouth, 21 participants (eleven female) were recruited for our study. Ages ranged from 21 to 49, with a median age of 27.

MPS	New	Existing
Google Wallet	0	3
Amazon Payments	0	1
App (ex. Starbucks)	7	7
Square	1	2
Bank Transfer	1	2
LevelUp	1	0
PayPal	0	6

Table 1: Breakdown of MPS by User Type

Seventeen participants were from within Canada with many from our own major metropolitan city. We augmented this with an additional four people from the United States to

offer a basic point of comparison. Yet we did not find any differences between the two, in terms of how they used MPS. Occupations of participants varied heavily. Participant's technical abilities would be described from average to expert and all participants owned a smartphone.

Table 1 above shows the breakdown of our participants MPS types by user. The skew of new users to the Starbucks app in particular speaks to what users were comfortable using MPS for and the monetary value risk during the start of adoption. This is discussed more in our Findings section.

Method

As described earlier, our study had two distinct user groups with two different methods:

Method 1: Current Users of MPS

The goal of Method 1 was to understand past experiences and behaviors of existing users. Therefore, we recruited eleven current MPS users for a semi-structured interview. Questions were based on understanding the user's specific instances of use and why they used the services the way they did. Sample questions included: What MPS systems have you used? When was the first time you used a MPS and why? When was the last item you purchased using an

MPS and did you choose this payment method over another? What time of day was the purchase made and why? Interviews usually lasted around thirty minutes.

Method 2: New Users of MPS

The goal of Method 2 was to understand the experiences of new users trying MPS for the first time, their experiences around use, behaviours and motivations. After the data collection of Method 1 was complete, ten users, who had not used MPS before were asked to complete an e-diary over a two-week period while trying out any MPS service(s) of their choosing. The diary method was chosen specifically to capture the user's experience in-the-moment over the first two weeks of use. This method has been used in similar studies [7].

During the two weeks, participants were asked to complete a minimum of four diary entries though we anticipated that some people may not complete this requirement if they simply found MPS too difficult to use or it did not meet their routines. A diary entry was required for every instance of purchasing they attempted. The four diary entry minimum was chosen as four was the average number of completed transactions by existing users as identified in Method 1 over a two week period. The diary was a web form which had fields asking the participants for the following information: title of the activity, date, time and location of the purchase, if they had any trust concerns when completing this activity, why they used MPS and not cash/credit/debit, a summary of the purchase, and their satisfaction level of the experience. Participants were told to complete the diaries as soon after the purchase as possible. This could be done on their phones in the moment, or later in the evening when at home. Participants opted to do a range of behaviours for recording entries.

After participants completed the diary entry phase, they participated in a semi-structured interview. During the interview, which also took around thirty minutes, participants were asked to review each of their diary entries and expand and/or clarify their entries. After, they were asked questions about the overall experience and if they thought they would continue to use MPS in the future.

Data Collection and Analysis

We collected audio recordings of all interviews, which were later transcribed, notes from the interviews, and users' diary text. All data was analyzed using open, axial, and selective coding to draw out the main themes. Each user group was first analyzed separately. We then reviewed the data from both users together. From these categories broad themes emerged, which are discussed in detail below. Our findings resulted in three main categories of users:

- **11 veteran users:** those who were users before the study and continue to be users (those involved in Method 1)
- **7 new users:** those who did not use any form of MPS before the study but indicated they would continue to use the service at the end of the study (a subset of non-users from Method 2);

• **3 non-adopters:** those who did not use any MPSs before the study (non-users) and indicated they would not use MPS after the study (a subset of non-users from Method 2). In our findings below, we often outline these user groups within the main themes to provide a deeper understanding of the MPS user experience.

PURCHASING ACTIVITIES

Veteran users reported a wide range of products and services they purchased through MPS including: coffee, clothes, sporting goods, electronics, bill payment, bank transfers to individuals, furniture, school tuition and even paying for a participation in a hockey pool. These products ranged in price from a \$2 cup of coffee to around \$3,000 for school tuition. Over 80% of veteran users reported that they used MPS at least once a week.

During the two weeks, new users purchased coffee, and made bill payments and bank transfers to individuals. New users' product prices ranged from \$2 to ~\$150. Although we asked participants to complete four diary entries over the two weeks, participants completed an average of 2.3 entries. Three non-adopters did not complete any transactions even though they tried or thought about paying but did not understand; we followed up on these instances in our interviews. Without these three outliers, the average number of diary entries / purchases was 3.2. The maximum number of entries was 4. This illustrates that MPS was an activity that typically occurred a couple of times a week for the new users. Thus, it was not a habitual or routine activity, which is to be expected for new usage when a person is still establishing a routine.

Within these purchase activities and experiences, our findings revealed clear successes that participants had in terms of MPS creating positive purchasing experiences. In addition, we also saw clear challenges that MPS posed for participants. Our results focus on these two main sections.

USER SUCCESSES WITH MPS

Participants had a variety of successes using MPS. These focused on routines, ease-of-use and usefulness, gamification, regulatory avoidance and social perception.

Habitual Routines

First, we found that MPS lent itself well to habitual purchases—purchases that were frequent and re-occurring. Participants who used MPS as a part of habitual purchasing activities felt it worked well, and they liked it, because they could easily fit it in to their 'routine'. Participants explained these purchases, sometimes as explicit knowledge, while other times it appeared to comprise only a tacit understanding of their habitual routines.

About half of veteran users reported that they very clearly had a daily habitual-type routine when using their payment service. For example, when asked how often P6, a veteran user, used MPS, she told us "everyday". She then proceeds to describe the time of day, and variations based on her

weekend and week schedule. But further to this, she also described how this routine has made her a more loyal user.

I rarely go to any other coffee shops [now]... I've just got accustomed to Starbucks... - P6, veteran user

Other veteran users had similar comments on how much they liked MPS because it fit well into their routine:

I have my cell phone already in my hand because I listen to a podcast every morning, all it is pause the podcast, get coffee... Always the same time of day... 7:45 in the morning... on my way to work. - P4, veteran user

This user also had similar thoughts around an increase in loyalty; P4 goes on to mention the process was so "easy", she frequented the store more often instead of going to a variety of stores. In other words, veteran users increased their loyalty when they used MPS at a company, but this did not increase the frequency in which they made purchases. For example, if they purchased coffee once a day before using an MPS, they would continue to purchase coffee once a day. However, what would change is they would avoid stores that did not offer the MPS solution.

From a new user perspective, P12 admits the ease of integrating MPS into her "daily routine" and comments on how surprised she was that it was so easy to integrate:

I think how quickly I became accustomed to doing it. I just don't even think about it anymore, [it's] just how I pay for things now. - P12, new user

Five veteran users had more of a semi-habitual routine. While these purchases were not daily and at a particular time of day, these users reported that they made purchases at the same place in certain time intervals for re-occurring purchases. For example, this included utility bill payments, purchases of coffee a couple times a week, or tuition payments for school that were paid once each term.

Moreover, users suggested services for MPS were heavily related to transactions that were frequent and routine, such as gas purchases, bill payments and groceries. For example P6, a veteran user, tells us they "wish" they could use MPS for gasoline purchases, because they filled up every few days or so. P4, also a veteran user, and P12, a new user, had similar thoughts around grocery store purchases as well:

I wish gas stations and grocery stores accepted mobile payment. - P4, veteran user

If my grocery store had it, that would be great. I would be reluctant to use an app like that in a place that I am not a regular patron. - P12, new user

Users also expressed disappointment when they tried to find ways to use MPS to pay their recurring monthly bills. For example P18, a new user, was unhappy that her power company did not have an MPS app:

Another thing that was really surprising for me was that there was no app for paying your hydro bill because... [this is] important for me. - P18, new user

Ease-of-Use and Usefulness

Veteran users and new adopters identified many motivations and benefits to using MPS. First, when asked for the benefits of using MPS, all veteran users and new users mentioned ease-of-use, with no bias toward the type of MPS. When asked to elaborate, responses mostly included two key elements: The process was *easy* and *faster* than other payment methods. For example, P17, a new user, mentions how the mobility and shortcut to make a bill payment allowed him to multi-task while in a class:

It was nice to actually be able to take care of [paying my bills]... when it popped into my head I wasn't doing anything and I was able to [pay some bills], so I just pulled out my phone and did it. Which was kind of a new thing for me and I actually really liked that. It felt very productive too, to get something like that done; I felt like I accomplished something in class today. - P17, new user

Second, somewhat surprisingly, MPS made it so payment methods were more often ready-at-hand and available when needed at a store. For example, a number of veteran users mentioned that they often forgot their wallets but never their phones. In fact, these users described paying by phone as a more natural process than using their wallet.

You always have your cell phone; I mean you forget your wallet nowadays way more than you do your cell phone. It is just easier to use. A lot of people have it in their pocket and it's just right there as opposed to ... trying to get your wallet and everything and so it just makes everything easier, one little device. - P4, veteran user

It was just easier to have my phone out than take my wallet out and find a card. - P2, veteran user

Gamification and Entertainment

Many MPS systems designed as phone apps provide gamification elements where a user can score points, level-up, and receive rewards for purchases. The majority of users mentioned that they enjoyed the gamification of the MPS they used. In fact, they would often describe the experience of purchasing as “more entertaining” and “funner” because of the gamification. For example, P12, a new user, described how much she enjoyed seeing the stars from the Starbucks app “dropping in the cup,” indicating she was getting closer to a free drink. This elevated the transactional experience compared to paying by credit card or cash. In this case, Starbucks has taken a desired action, buying Starbucks coffee, which is not normally game related and attached a game mechanism around collecting stars for rewards with every purchase. LevelUp also uses similar game mechanics, and while they are light and simple, it clearly has an added benefit for users. Some users also mentioned the gamification as a loyalty draw for them. In the example below, P11, a new user, discusses his first gamification experience through MPS:

I think it is cool to be able to use my phone to [participate in gamification]... I am probably more inclined to go to the deli that accepts LevelUp than other delis in my neighborhood... more for the gamification... - P11, new user

Social Perception

A number of findings around social issues were also identified. These included how users felt about people watching them use the services and confidence using the MPS. Overall, new users and veteran users generally described the MPS experience as a positive social experience. Moreover, non-adopters did not describe the process as socially negative, despite their lack of usage.

Participants often described how they felt “cool” using MPS, how the efficiency of payment aided in a positive social experience, and to a lesser extent, how it helped them engage with their community. Users described being watched by other patrons and sometimes even engaged in a positive discussion around MPS with friends or customers during or after purchases. The ease of using MPS would also allow the users to make payments faster (than debit or credit) which helped the lineup move faster, easing impatient employees and customers. For example, P21 talks about the experience of paying via MPS:

[Other store patrons] like it because the line moves faster you can see they are impatient if you are looking for cash or a lot of extra steps for [the employee] to key in a credit card purchase. - P21, veteran user

Veteran users generally described how many of their friends used the service. The majority also mentioned that MPS was becoming popular because it was a ‘topic of discussion’ within their work or school environments. In order for them to appear like they were ‘part of their community,’ they felt they should be able to comment on the new technology.

There was this discussion in the community I am in. It definitely prompted [my MPS use] in that sense... I know a lot of techies... the community would be, I guess, the geek or techie community. - P3, veteran user

Regulatory Avoidance

A number of participants also mentioned that they used a form of MPS to get around regulatory restrictions from banks. Some examples included credit limitations, much like pre-paid visas (e.g., PayPal); ordering gaming licenses from countries who did not accept the user’s local credit card information; and, making payments from consumer to consumer or small businesses, and charities collecting payments without a POS terminal from a bank (e.g., Square). For example, P1, a veteran user, told us he used Square for his business so he did not have to set up a merchant account at a bank. Being able to accept credit cards as a small business has altered the way he sells merchandise. He described how MPS has allowed him to accept credit cards and thus expand his business.

It is well known that the poor trust relations and fear between bank and patrons have helped drive developing countries’ MPS success [6]. While North American banks systems do not have the same mistrust, our users still used MPS to avoid bank charges and regulations, however, the

reported types of charges and regulations were specific to North America.

USER CHALLENGES WITH MPS

Naturally, like any ‘new’ technology, users also experienced challenges with MPS. In this section, we present the challenges that users faced, which focused on routines, lack of benefits, usability, privacy, lack of mental model development, and pre-purchase anxiety.

Non-Adaptors’ Routines and a Lack of Benefits

For non-adaptors the value of routines was still high. However their view on how MPS fit into their routines and to what benefit varied. That is, a main reason that non-adaptors did not take up the service was that it did not fit into their routines, thus providing little benefit. As an example, P19 explains how the MPS service did not fit his purchasing routines:

The Starbucks one is nice, it sounds quite cool but I don’t use-- I don’t buy Starbucks often enough to use it. - P19, non-adaptor

This quote speaks to the fact that MPS is currently only available in a small number of instances and stores within North America. For it to be readily used within Canada and the United States, MPS payment options must map to the specific stores or activities that a person regularly utilizes. The quote illustrates that people who use Starbucks can easily use MPS because Starbucks has a specific app. Yet people who might drink coffee at another location, such as Tim Horton’s in Canada, will not have the same opportunities because the store that they routinely frequent does not support MPS. This suggests that, over time, if more stores adopt MPS as a payment option, the practices of new users might be different. Until this point, new users often did not see the point of using a store ‘once in a while’ simply so they could use a MPS.

In addition to this, many non-adaptors did not see the benefits in using MPSs instead of a credit card, despite understanding how to use them. These users indicated at the end of the trial period that they felt they would not use MPS in the near future, but perhaps would give it a try if services fit their routines more in the future.

I think [I would maybe use MPS in the future] because it could become more popular and we are moving towards that, maybe when my friends and family start using it and when it becomes a norm. – P19, non-adaptor

This illustrates that people are often fairly engrained within their current payment methods. It suggests that unless there is a larger societal shift in payment options and usage that some people simply will not change their practices.

Usability Issues

Compared to other mCommerce studies [7], a larger number of user concerns emerged. These issues included simple growing pains within a new service and expanded all the way to serious concerns around privacy and security.

First, a number of usability issues were identified with the MPS systems that participants used. Many participants indicated they did not know how much they were being charged, before or during the transaction. This was true for a number of payment methods (ex. Starbucks app and Square). This was a key concern for them and was mentioned not only in their interviews but in a couple users’ diary entries. For example, P11, a new user, talks about the delay in being notified how much he just spent at a local deli:

A few minutes later you get a message on your phone saying you just used LevelUp and the amount was X so it’s just for the split second when they punch in the number they put in and then they charge your phone [you don’t know how much you are being charged]. - P11, new user

A common theme across MPSs was the lack of visual or audio indicators for feedback around transactional information. Users felt it was unclear when the transaction went through as there was little indication, leaving them unsure if the transaction was complete. This, in addition to lack of social cues from the employees, lead to participants being concerned that they might have been charged twice.

Trust: Security Breaches and Privacy Concerns

Three veteran users reported having serious data concerns, these related to trust concerns. P10, a veteran user, explained how one MPS he used was tied to his email account. His email account was hacked, which he assumed compromised his financial data. As a result, P10 no longer uses that particular MPS, but still uses other MPSs.

P6, also a veteran user, explained a situation she had when using a pay-by-phone parking service for metered parking. She explained how the system was tied to your phone number when you call in to pay and that she had just recently had her phone number changed. The system did not allow her to change her profile, which resulted in her having access to someone else’s account. This, in turn, left her with the assumption that someone had access to her account too. She told us the situation was “worrisome” and “a bit scary”.

Another veteran user reported having trust concerns over the security of paying through a barcode displayed on his phone. Because of this, he and his sister did a test where he sent his sister a screenshot of the barcode and she displayed the picture of the barcode at the store to make a purchase. To both their surprise, the barcode scanned successfully at the store and his sister was able to purchase.

All user groups had trust concerns around security of personal information they entered over Wi-Fi or other networks. For example, P20 had extreme concerns around the contract he had to sign to use the Starbucks app, as well as little understanding towards how the process would work. He even was concerned that he might be giving the company access to all the data on his phone.

Users also had concerns about data on their screen being visible to outsiders. P8, a veteran user, told us, *“It has to do with money, it’s kind of private, so then I try not to show anyone”*. P16, a new user, told us that she was nervous entering her credit card information on a bus.

I found [a payment app] which I could add [money] to with a credit card... so I added \$20 and paid with my card. I did it on the bus and I think that made me a little nervous, like, can anybody see me taking my card out? - P16, new user

Fragmented MPS Solutions

A few participants mentioned that they did not like to leave money or personal information untouched and not regularly used. That is, they really disliked the idea of creating multiple accounts for each vendor they might use. Instead they wanted just a single global account. The reason was they felt like having multiple accounts would increase the chances of them mishandling their money by perhaps forgetting about money in an account or not being able to keep track of all the account charges in cases of potential fraud. The participants specifically told us they needed to “touch” their money often (e.g., by spending small amounts with each MPS) to both ease trust concerns and overall fear of money loss.

For example, P17, a new user, mentioned how he had information saved in a PayPal account from years ago. He expressed concern about not regularly using the account and felt uneasy about having his information just “languishing” there for years. This ultimately gave him a negative feeling towards PayPal. He mistrusted PayPal as a brand and the information that was stored with them

Similar, P19, a non-adopter, also said he would not use a system for payment unless it was accepted at nearly all stores the person frequented. He, too, disliked the idea of having money in numerous places and was concerned this would lead to a loss of money as it “just sits in an account somewhere.”

Mental Model Development

Mental models often help shape behaviour and explain a person’s thought process on how something works [3]. Some participants, both within the non-adopting and new users groups, described how they just could not understand how paying with their phone worked or how to start the process. For example, P16, a new user, explained during the interview that she had a complete lack of knowledge around what direction to proceed to even start the study. She said she did not know what apps to look for or download. As a technically engaged individual this was shocking for her. She told us:

I didn’t know, like when I agreed to do it, I didn’t know what apps to download, I didn’t even know what to look for. - P16, new user

Other users made specific comments around not having the “mental model” to see their smart phone as a payment source. P20, a non-adopter, was surprised that payment over a phone was even possible. While P17, a new user told

us “it never even occurred” to him to use his cell phone to make a purchase. For him the thought of doing something serious like making a payment on the same device he uses to make “stupid text messages” from seemed unheard of. In his mind “the mental model for what a cell phone does did not include paying for “stuff.”

Pre-purchasing Anxiety

A common trend throughout all user groups was pre-purchase anxiety. That is, before they made the purchase, users often tried to get their phones ready and were nervous the phone would not be ready to be scanned. They harbored anxiety that the phone would turn to screen saver mode, and then require a password to be entered, or the barcode would not be ready to be scanned. This could cause a longer wait for people in lines, confusing discussions with store clerks, feelings of inadequacy in not being able to know how to use the technology, or the need to switch to another payment form. For example, P12’s diary had numerous entries on pre-purchase anxiety:

I like making sure I have the screen ready -- that my screen does not go to sleep. It has more to do with my performance anxieties than the app or the interaction. - P12, new user

Overall, the amount of tension around using MPS was far greater than participants thought they would feel. Surprisingly, while these feelings did diminish over time, they were still mentioned by veteran users.

DISCUSSION

Our findings showed a range of MPS user’s routines, motivations and benefits, as well as concerns and social issues that add significantly to the understanding of the North American MPS experience. In this section, we further reflect back on our related works section, as well as introduce new literature as a lens to interpret key components of our findings around MPS.

Mental Model Development

By the clear distinction of user groups, veteran users, new users and non-users, there was some obvious trends around who indicated they would continue to use MPS and why. Our findings showed that all veteran users perceived their MPS use as easier and faster than other payment methods. They also described how their phone was often a more convenient solution to make payments. In contrast, we see non-adopters almost puzzled by why these services were easier and faster than the current payment methods they used (credit card, debit card, cash). It is clear from these findings that ease of use is a key inhibitor to use. Further, lack of user’s mental model development seems to be a key factor to achieving perceived usefulness.

As mentioned in our related work section, Hinman and Matovu [6] found similar mental model and conceptual gaps between their users and MPS use. In their example they found that Ugandans who could relate the service to buying and selling cellular airtime, something they could conceptually understand, helped in adoption [6]. While our

participants understood the exchange of funds for services, some did not seem to conceptually understand payment through their smartphones and the benefits associated with it. We see a number of potential solutions to this. First, one could consider trying to relate MPS payments to their current routines and habits by offering MPS at stores they frequent. Creating a routine around these services through habit was very clearly important within our findings. However, most surprisingly was that all three categories of users expressed this sentiment: current users, new users, and non-adopters. We had expected that would be the case for veteran users but not non-adopters.

Second, one could design for teachability. Hinman and Matovu [6] mention the importance of “designing for teachability” in the case of MPS in Uganda. Our findings also showed that MPS is a community topic and discussions with other patrons around MPS can breakout in stores, giving users the ability to teach new potential users if the technology was designed for easy teach-ability. While designing for teach-ability is a good lesson to carry forward to help develop user’s mental models, our participants tensions around MPS use appear to be more social and cultural, just not reaching the tipping point (e.g., not surpassing a critical number of adopters). In other words, teachability could work to increase the number of MPS users, but, according to our findings, most MPSs are straightforward and easy to use. Thus, increasing the teachability of MPS in North America is not likely to increase adoption very heavily.

Third, another possible solution for mental model development could include simply waiting for people to gradually use and learn it over time, although waiting for people’s attitudes to change as the technology is mass adopted might result in a lengthy adoption period. Perhaps mass media education via a large company could step in to build trust and cultural acceptance with users. However, this could also backfire; the topic of finance and money is a sensitive issue and entering the space could negatively affect a company whose brand does not align with their attributes. To be more specific, for example, if a company like Apple introduced a “wallet” solution, would this result in adoption or confusion and trust issues around the true intentions of Apple and the access they would then have to private data?

Gamification and Social Benefits

One of the key benefits of MPS over other payment methods was the gamification and rewards features in current MPSs. These attributes have the potential to elevate traditional transactional behaviours into a more emotional and exciting experience. In this section we reflect on these findings and what they could mean for MPS in the future.

The Long-Haul

In our findings the use of gamification appears to be a factor in MPS use. This is not surprising as the popularity of casual games has risen dramatically among smartphones

users [16]. However, if we take a look at past work by Lindqvist et al. [12], who investigated why users use Foursquare and collect badges, they described the gamification element of collecting badges as a decreasing motivator as users had a slow decline of participation after 200-300 days. However, our findings showed that two of our veteran users, with over one year of MPS experience, still sited gamification as a positive element to their MPS experience. While we cannot be sure if they are declining use due to fatigue, we believe that this gamification element coupled with a perceived useful commerce application and habitual routines might just be enough to hold the users attention for the long-haul and surpass novelty status. That said, our sample of only two long-term users is small and this warrants further investigation. At the very least our findings showed that gamification in North American MPS is a great complementary component for new users and should continue to be a focus of MPS designs.

Social Cohesion

Part of the positive experiences we found for MPS related to social cohesion. Ling [13] describes social cohesion as a strong ‘current’ in society and strong bonds linking individuals, which affects how we interact with one another and what we know about each other. This is the opposite of individualism [13]. Related to social cohesion is the idea that people have negative attitudes towards people on mobile phones in public situations and locations [11,13]. That is, using one’s mobile phone in public areas has been deemed socially rude and is often met with negative connotation [11,13]. However, in our findings, participants described the opposite. They felt that MPS use created a positive experience for people around them. They explained that this was because they were using their mobile phone in socially positive ways, which in this case was speeding up the line and eliminating wait times for others. The participants felt their MPS activity allowed the user to “help out” fellow patrons resulting in social cohesion [13]. Of course, there is the chance that while the purchaser *thought* the experience was positive for others, it may have in fact been unpleasant or annoying. We did not ask others present during MPS purchases about what they thought of the activity to know for sure. This suggests future work that investigates public reactions.

Of course, negative experiences around social cohesion can also obviously arise. As discussed in the findings, users ‘fiddle’ with their phones before use because of pre-purchase anxiety, and this could negatively impact social cohesion if patrons are in groups (face-to-face) when purchasing. This further draws attention to focus MPS usability around inclusion of groups (e.g., through gamification), or joint purchasing, or making, at the very least, the process of MPS payment less distracting for the payee. For example, in recent versions of Apple’s iOS software, the phone’s camera functionality is available from a locked screen with a single finger swipe. Payment options could similarly be integrated in such a manner if

people feel safe with such easy access to payment options. Overall current gamification and social benefits are helpful, but there are still issues. These are described in the next section.

Finally, as mentioned in the findings MPS was also associated with a "coolness" factor when one was using it. Yet once mass adoption occurs, this coolness could easily diminish and it is not clear what feelings people may have toward the appearance of using the technology once this occurs.

Trust

In this section we discuss our findings around trust and how they compare to past studies on similar activities.

Cost of Purchases

Perhaps most importantly, we believe our findings around habitual routines extends past work by Mallat [15] who suggested MPS is most compatible with small value payments. In contrast, our findings show users did not report any issues with the monetary value of the payment but rather focused on the actual compatibility the purchase has with their daily routines and habits. The exception was new users who preferred small payments. Again, it should be noted that Mallat's [15] study involved feature phones and was conducted over ten years ago.

Web mCommerce vs. MPS

As reported in the findings there was significant trust concerns amongst all types of users—even veteran users. This differs heavily from work done in past mCommerce studies that have focused on purchasing products over the web [7]. In this past work on mCommerce over the web, trust mechanisms were very prevalent and came in three distinct forms: family and friend recommendations, brand awareness and leveraging trusted marketplaces such as iTunes and Google Play [7]. Our findings showed users did not report on distinct trust mechanisms, suggesting that overall trust amongst both users and non-users was lower than mCommerce web users.

Usability and Security

Our findings also showed significant usability issues, as well as real and perceived trust issues. In order for users to gain initial trust and ongoing trust with MPS these issues have to be taken seriously and resolved.

What is truly astonishing is that the exact perceived risks observed by Mallat [15] over ten years ago were described by our users in this study. Users are still concerned about network security, vagueness of transaction, and lack of control. Moreover, not only are users concerned that their mobile phone will get lost, stolen or hacked, we were presented with stories of this *actually occurring*. Naturally, not all reported issues from Mallat's [15] study remained. Usability and complexity concerns around 'clunky' SMS and direct payment methods used to be a major concern for users, however, this has been erased with mobile phone

advancements [15]. Our study showed these concerns diminished or were eliminated altogether.

The Retail Element

As mentioned in our related work section, MPS has a very different characteristic than eCommerce in that the transactions can and often do take place in a retail setting. This means the trust models developed around eCommerce over the web lack the bricks-and-mortar element. That is, they do not have a physical store presence in which one can shop and purchase items. Bricks-and-mortar trust mechanisms typically focus around patrons seeing the investment companies have made in their physical space. This could include investment in building and environment such as quality of décor and layout. With the high level of trust concerns reported by our participants, it appears the bricks and mortar trust mechanisms are not enough to establish trust for MPS – and thus the problem is around the trust in the technology. Developing how and what trust mechanisms are important for the MPS user requires much future work with a focused approach beyond the scope of this paper. However, below we present some reflection on our findings that identifies some alignment towards Zucker's trust model [23] and possible future directions.

Unlike other trust models, Zucker's [23] framework was designed for trust in general and not specifically an eCommerce model. This framework relies on three main types of trust mechanisms: character-based trust (relying on similarities between consumer and customer), process-based trust (trust built through past experience and transactions), and institutional-based trust (trust based on third party guarantors such as certification and professional organizations) [23]. In our findings we saw both brand transfer and building off past relationships as a positive form of trust building, an example of process-based trust. However, users also trusted new applications such as Square and LevelUp. The trust placed with these services seems to stem from friend referrals and the bricks-and-mortar companies they were aligned with. In our examples, this included charities and large restaurant chains. This is another example of character-based trust.

Generalizability

Shopping routines within Canada are typically thought to be very similar to that of consumers in the United States given the similar culture shared by the two countries. However, studies have shown that Canadians tend to use debit cards more than Americans who still use cash as their primary payment method [17]. When it came to MPS in our study, we did not see any differences between Canadian and American participants. The caveat is that we only had four participants from the United States and there is a chance that other users may present different behaviors. This suggests further studies. That said, given that all four of our American participants exhibited the same behaviors, we would anticipate that one would not find any large differences between Canadians and Americans in additional

studies. Another caveat is that while we studied North Americans, we did not collect any data from Mexico (also part of North America); we would expect payment practices in Mexico to be much different than Canada and the United States given the country's vastly different culture.

It is clear that the area of trust in MPS in North America is underdeveloped and should be a looked at closely by researchers and designers in the future.

CONCLUSION

To summarize, mobile payment services are in their infancy in North America. The potential to enhance users experience with faster and more useful transactions is possible. There is also potential for MPS to aid in social cohesion [13], which has previously been missing in mobile use, as well as a greater sense of usefulness than current payment options provide. However, user challenges with MPS still exist. These include trust issues, security and privacy issues and a lack of mental model development. In order to move past these obstacles, this paper has outlined key areas for improved user experience: mental model development, trust mechanism development, and incorporating gamification and social cohesion.

REFERENCES

1. Cho, D., Kwon, H., and Lee, H., Analysis of Trust in Internet and Mobile Commerce Adoption, 40th Annual Hawaii International Conference on System Sciences, pp. 1-10. (2007).
2. Davis, F. D., Perceived Usefulness, Perceived Ease of Use, and User Acceptance in Information Technology, *MIS Quarterly*, 13 (3), pp. 319-340. (1989).
3. Forrester, J., Counterintuitive Behaviour of Social Systems, *Theory and Decision*, Volume 2, Issue 2, Springer, pp. 109 - 140. (1970).
4. Head, M. and Hassanein, "Trust in e-Commerce: Evaluating the Impact of Third-Party Seals", *Quarterly Journal of Electronic Commerce*, 3(3), (2002), pp. 307-325.
5. Henkel, J. Mobile Payment. In G. Silberer, G., Wohlfahrt, J., and Wilhelm, T., *Mobile Commerce*, Gabler, Wiesbaden, 2002.
6. Hinman, R., and Matovu, J., Opportunities and Challenges for Mobile-based Financial Services in Rural Uganda, *Extended Proceedings of Computer-Human Interaction*. pp. 3925-3930. (2010)
7. Hillman, S., Neustaedter, C., Bowes, J., and Antle, A., Soft Trust and mCommerce Shopping Behaviors, *MobileHCI 2012*. pp. 113 - 122.
8. Hillman, S., Neustaedter, C., Pang, C., and Oduor, E., "Shared Joy is Double Joy": The Social Practices of User Networks within Group Shopping Sites, *CHI2013*. pp. 113 - 122.
9. Kalakota, R. and Robinson M., *M-Business: The Race to Mobility*. Mcgraw-Hill Trade, pp.1-84. (2001).
10. Kim, C., Mirusmonov, M., and Lee, I., An Empirical Examination of Factors influencing the intention to use Mobile Payment, *Computer in Human Behavior Journal*, pp. 310-322, (2010).
11. Kindberg, T., Sellen, Abigail, S., and Erik Geelhoed, Security and Trust in Mobile Interactions: A Study of Users' Perceptions and Reasoning. *UbiComp 2004: Ubiquitous Computing*. pp. 1-16. (2004).
12. Lindqvist J, Cranshaw J, Wiese J, Hong J, Zimmerman J., I'm the Mayor of my house: examining why people use foursquare—a social-driven location sharing application. In: *Proceedings of CHI*. ACM Press, New York, pp. 2409–2418. (2011).
13. Ling, R., *New Tech, New Ties: How Mobile Communication is Reshaping Social Cohesion*, Massachusetts Institute of Technology, (2008).
14. Luo, X., Trust Production and Privacy Concerns on the Internet - A Framework Based on Relationship Marketing & Social Exchange Theory, *IMM*, 31,(2002).
15. Mallat, N., Exploring Consumer Adoption of Mobile Payment – A Qualitative Study, *Journal of Strategic Information Systems* 16, pp. 413-432, (2007).
16. Neustaedter, C., Tang, A., and Judge, T., Creating Scalable Location-Based Games: Lessons from Geocaching, *Personal and Ubiquitous Computing Journal*, Springer, pp.1-14. (2011).
17. New, C., Cash is Still the Most Popular Form of Payment for Most Americans, (2012). http://www.huffingtonpost.com/2012/01/24/cash-most-popular-payment_n_1224636.html
18. Ondrus, J., and Pigneur, Y., Towards a Holistic Analysis of Mobile Payments: a Multiple Perspective Approach, *Electronic Commerce Research and Applications* 5 (3), pp. 246-257, (2006).
19. Schierz, P., Schilke, O., and Wirtz, B., Understanding Consumer Acceptance of Mobile Payment Services: An Empirical Analysis, *Electronic Commerce Research and Application*, pp. 209-216, (2010).
20. Teo, T., and Pok, S., Adoption of WAP-enabled Mobile Phones Among Internet Users. *Omega* 31 (6), pp.483-498, (2003).
21. Ventakesh, V. Ramesh, V., and Massey, A. P. Understanding usability in mobile commerce. *Communications of the ACM*, Vol. 46(12), pp. 53-56. (2003). *Model, Information and Management* 42 (5), pp. 719-729, (2005).
22. Zmijewska, A., and Lawrence, E., Implementation Models in Mobile Payment, In *Proceedings of the IASTED International Conference*, Puerto Vallarta, (2006), pp.19-25.
23. Zucker L. Production of Trust: Institutional Source of Economic Structure: 1804-1920, *Research in Organizational Behavior*, 8, JAI Press (1986), pp.53-11.