

Examining the Societal Impact of Mobile Payments: Analysing Social Interactions at the Checkout in the Smartphone Era among Digital Natives in the Netherlands.

Sanne Jansen

1824260

s.c.m.h.jansen@student.tue.nl

Nour Kamel

1828126

n.kamel@student.tue.nl

Helena Mossel

20233306

h.t.mossel@student.tue.nl

Femke Neelis

1835297

f.c.neelis@student.tue.nl

Niek Seinen

1807862

n.seinen@student.tue.nl

ABSTRACT

This paper explores the social interactions between the payer and the seller at a checkout: How does paying with your phone via Apple Pay and Google Wallet change the interaction between the payer and the seller? Further investigation is done into why people use their phone as a payment method and if there is a difference in social interaction when paying with your phone or with analog money? The study will also explore different locations where people pay, such as grocery stores and bakeries. Elaborating on this; seeing if these different locations affect the social interaction with the payer and seller. Inspiration for the study is done via deployment of probes.

Authors Keywords

Mobile Payment / Checkout / Social Interaction
CSS Concepts

- Human-centered computing



In the smartphone era, there is a noticeable surge in the reliance on mobile devices across the general population. The rapid evolution of applications designed to enhance users' lives has elevated smartphones to a necessity. Mobile banking, facilitated by apps like Apple Pay and Google Wallet, plays a pivotal role in centralizing various aspects of daily life for users. The ability to make payments swiftly and securely by simply scanning the phone has contributed to the widespread adoption of mobile payments, transforming daily transactions⁹.

This shift towards mobile payments not only streamlines transactions for the seller but also ensures a quick, easy, and secure experience for payers. Consequently, the popularity of mobile payments has witnessed a global increase, to the extent that in some regions, paying with cash has become scarce ⁸.

As mobile payment methods gain popularity, research efforts have intensified to enhance the security and user-friendliness of these applications ¹⁰. Simultaneously, there is a growing body of research examining the impact of this emerging payment method on users, delving into the motivations behind users choosing mobile payment options ⁴. The research shows that the main motivations of choosing mobile payment lie in factors such as convenience, reflection, and security, and they all have different usage patterns of the actual usage.

The body of work mentioned before provided some insights into the decision-making process of choosing mobile payment applications for transactions, as well as helping us understand the impact of mobile payments on individual behavior ⁶. In addition the study on money work shows that money is not just a means of exchange and a store of value, but a "system of relationships, a chain of promises, and a record of people's transactions with one another "(⁷). However, we believe more research should be done on How can design enhance the social interaction when paying by mobile phone, card and cash, over paying at a self-scan. In general, we see our work in line with the search for a more conscious use of smartphones and a highlighting of the importance of human interaction ¹¹.

This study is situated at the checkout of a store, where payment through mobile apps like Apple Pay and Google Wallet takes place. The distinction between these two applications is that they are tailored to the two most predominant manufacturers Apple and Samsung ², making them widely recognized and utilized. On the other hand, checkout is a contact point location for social interaction between the seller and the payer, which provides an interesting point to study the behavior of individuals. However, numerous factors pressure this social interaction; including the individuals involved (payer, seller), the people waiting in line, the technology employed, and the location. This study seeks to take a step closer and observe the interactions that take place at that specific moment, connected to the employment of a mobile payment system

As mentioned above the study will involve both payer and seller, however, we will be focusing on the target group that is made up by the millennial and the current generation Z. This target group is characterized by their status as digital natives, defined by Marc Prensky as a person born or brought up during the age of digital technology ¹. Their advanced understanding and quick learning capability when it comes to technology make them an interesting target group. In addition, their daily use of technology also changes their social interactions and perception of the world.

To narrow down the research scope further the study will focus on University Bachelor students in the Netherlands, a subgroup within the larger population of digital natives who are at ease with technology. This group is especially intriguing due to their recent acquisition of financial independence, being self-reliant in handling various aspects of personal finance. University students, as they navigate responsibilities of their daily life such as grocery shopping, as well as other more leisure purchases, such as a cup of coffee with friends or buying clothes, provide a unique perspective on the intersection of technology and payment methods.

The insight gathered from this study may have broader applications, potentially offering valuable understandings that extend to other groups of young adults or millennials, who also use their phone as payment methods. Research indicates a notable prevalence of mobile payment app usage within the age range of 18-34, with a significantly higher likelihood of adoption compared to individuals aged 35 and above ³. Consequently, the study's outcomes may have broader applicability, encompassing the wider demographic of Digital Natives.



Cultural Probes in Mobile Payment Design:

Employing Cultural Probes in our study enhances our understanding of customer-seller interactions in mobile payments. The probes offer key advantages:

- 1. Rich Insights:** Collecting diverse data provides richer contextual information than traditional surveys.
- 2. User-Centered Approach:** Allowing participants to document experiences captures nuanced aspects missed by other methods.
- 3. Holistic Understanding:** Exploring various facets of users' lives ensures a comprehensive understanding crucial for solution design.
- 4. Inspiration for Innovation:** By immersing designers in real-world contexts, Cultural Probes inspire solutions aligned with users' needs.

Chosen for these advantages, Cultural Probes are the preferred method for gathering information on social interactions in mobile payments.

Deviating from Traditional Cultural Probes:

Our literature review exposed a gap in traditional Cultural Probes designs, lacking an internal reflective component. Previous versions primarily focused on the study's subject, lacking a dedicated section for participants to reflect on the activities themselves. Recognizing the potential for inspiration in participants' perceptions, we introduced a platform for expressing opinions about the activities.

Participant Recruitment:

Higher education students voluntarily enrolled in the research, recruited through our network. Five volunteers were provided with the Cultural Probes Kit for a two-week period. Ensuring diverse geographical representation across the Netherlands aimed to present comprehensive perspectives of payers and sellers nationwide.

Data Collection Process:

Researchers will collect the probes at the study's conclusion, followed by thematic analysis. Thematic analysis, a qualitative method, systematically organizes and interprets textual or visual information to identify patterns (themes). This process aims to offer insights into the research question: designing for social interactions between a payer and a seller using mobile payment methods.

We believe this method will uncover patterns inspiring the design of social interactions in mobile payments, addressing the study's central question.

Sequence of the Cultural Probes Kit activities:

Participants engage in a versatile set of activities within the Cultural Probes Kit:

1. Respond to five cards covering activities, emotions, and memories.
2. Complete three maps focusing on preferences and observations.
3. Capture photos related to cashier interactions.
4. Internally reflect on the probes' activities.

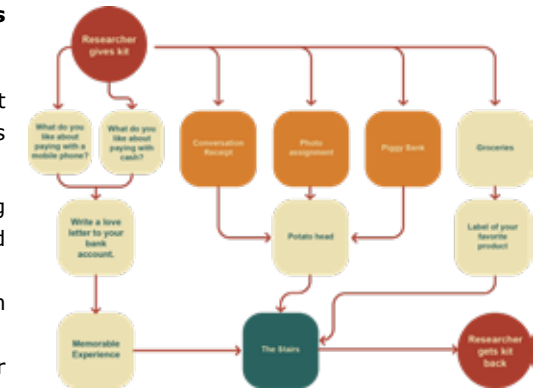


Figure 1: Flow chart

Designed for seamless integration into daily life, the activities, tailored for grocery shopping—a weekly routine—allow participants the freedom to use probes as preferred. While flexible, a suggested direction is provided in the attached flow chart (Figure 1).

Description Of the cultural Probe to the Participant:

For description see Figure 2. For the description of the study it was important for use to make clear to the participant that their implication in the study was fully voluntary and that they were at all time free to stop the process.



Figure 2: Description Given to Participants.

Ethical Considerations:

In this user-focused study, ethical considerations guide our approach. Three key features prioritize ethical conduct:

- 1. Secure Data Storage:** We ensure data protection using Surfdrive.nl, minimizing the risk of leakage.
- 2. Minimization of Unnecessary Data:** Thorough reflection prevents unnecessary data collection, with prompt deletion of irrelevant information.
- 3. Participant Privacy:** Pseudonyms safeguard participant identities, with a commitment to delete this data when no longer needed, ensuring ongoing privacy protection.

Lucas, a twenty-year-old student, immerses himself in his headphones, playing loud music, as he embarks on his weekly grocery shopping at Albert Hein (Figure 3.1). Having spent the entire day in his room without uttering a word, he calmly fills his cart. Approaching the checkout, he discovers a new system offering two lanes, each with its unique features (Figure 3.2).

In the fast lane, Lucas can maintain his solitude. He keeps his headphones on, effortlessly pays with his mobile phone via Apple Pay, and proceeds without interacting with anyone. However, the slow lane offers a different experience. While it requires human interaction, it also introduces a unique payment method. In this lane, Lucas cannot swiftly use his phone. Instead, he discovers an application specifically designed for the checkout process (Figure 3.3 / 3.4 / 3.5)

As Lucas joins the slow lane and removes his headphones, he observes that there's a dedicated app for payments. To initiate the transaction, he needs to open the application, engage with the cashier, and verbally unlock the payment on his phone. This introduces a conversational element to the payment process, as opposed to the quick and silent transaction in the fast lane.

Deciding to explore this alternative, Lucas initiates a chat with the cashier as he opens the app. He asks about her experience in the new slow lane, and she responds with a smile, expressing how it has significantly improved her day with the positive comments she now receives.

Completing his purchase, Lucas pays using the designated application for the slow lane, orchestrating a more deliberate interaction compared to the rapidity of the fast lane. He wishes the cashier a wonderful day and contemplates adopting the slow lane more frequently. The unique payment process, intertwined with meaningful conversation during checkout, leaves him feeling considerably happier than his usual expedited experience in the fast lane.

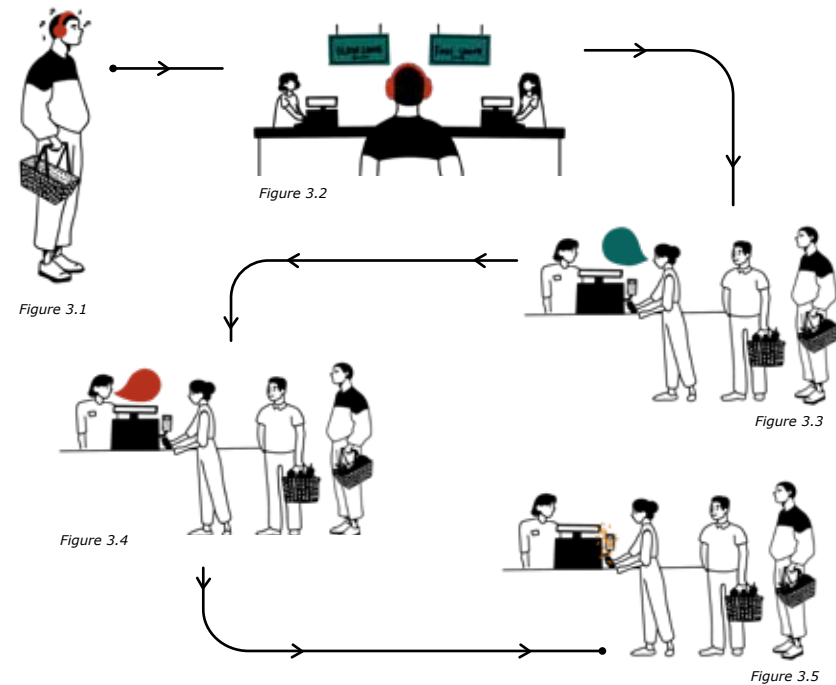


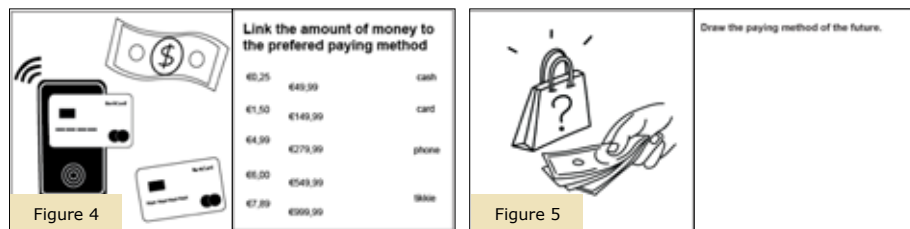
Figure 3: Scenario

- What is the motivation for people to use their phone as a form of payment?
- What experiences do customers search in a grocery shop, and do they have to do with the payment method? Does this experience change depend on the type of shop?
- What is the difference in interaction when paying with cash or mobile payments?
- What sparks an interaction in the shop between the customer and the seller?
- Is there any unspoken understanding between the customer and the seller?
- Why do people choose the self-scan and why do they use the normal checkout?

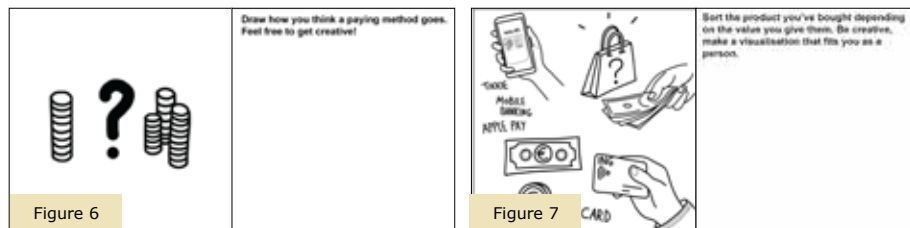
Our research delves into mobile banking, focusing on the nuanced dynamics of payment interactions. This study seeks to understand the emotions and sentiments associated with payments made through various mediums such as phones, cards, and cash. In this exploration, we go beyond mobile payments, investigating participants' viewpoints on traditional methods like cash and card transactions. The aim is to unearth both distinctions and commonalities, providing comprehensive insights into the intricacies of the entire payment process. Our primary objective of this cultural probe study is to uncover the emotions, interactions, and personal values tied to the act of paying, particularly with mobile phones.

Probe kit content: Our probe kit comprises four distinct postcards, each with unique questions:

The kit includes four cards:



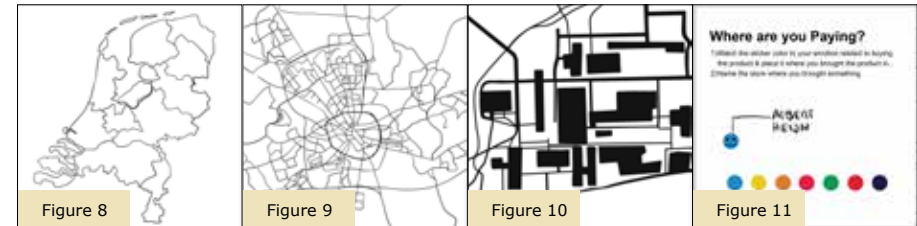
- Link the amount of money to the preferred paying method. (Figure 4)
- Draw how you think a paying method goes. Feel free to get creative! (Figure 5, 20)



- Draw the paying method of the future. (Figure 16, 18)
- Sort the Product you've bought depending on the value you give them. Be creative make a visualisation that fits you as a person. (Figure 7, 19, 21)

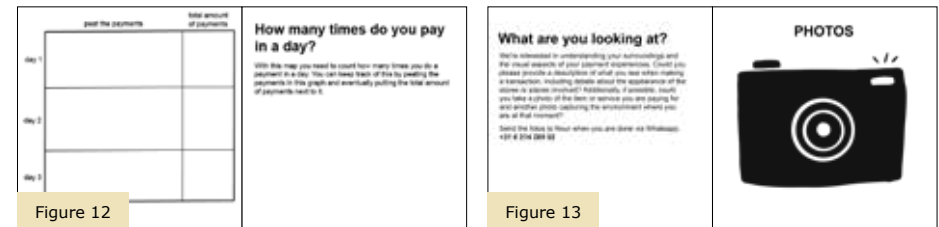
The chosen cards assess participants' views on payment, covering the value attributed to payments and how they perceive the payment process.

Additionally, the kit includes four maps:



Associate emotions with payment locations using colored stickers. (Figure 8, 9, 10, 11,17)

- Map of TU/e.
- Map of Eindhoven.
- Map of the Netherlands.



- Record the frequency of daily payments. (Figure 12)
- The probe also incorporates a photo exercise, prompting participants to describe their surroundings during transactions and capture images of the items or services being purchased along with the environment. (Figure 13, 23)

Maps were utilized to geographically, quantitatively, and emotionally map payment activities, aiming to identify spending patterns and emotional reactions among participants. Additionally, the photo exercise captured participants' experiences during payment.

Probe Design: In the first instance, we designed a probe set to better understand how participants used their phones to pay. However, after seeking feedback and reviewing lecture materials, we realized that our initial attempt was too focused on finding specific answers. The questions, such as "Where are you paying?" and "What do you prefer paying with?" sought direct answers, collecting information rather than inspiring further exploration. The initial card formulations were too straightforward, limiting responses to specific numbers or marks. Realizing this constraint, we decided to give the assignment a second try.

Inspired by the lecture, we sought to explore participants' perspectives and experiences.

We crafted a set of four cards with broader aspects. Our favorite assignment was "Envision the payment method of the future." Through this question, we could understand participants' future visions and their feelings toward technology-based payments. Maps were designed to capture emotions during phone payments at specific locations and the frequency of payments in a day.

Our material and design approach were to design cards and maps that had a minimalistic feel (Figure 14, 15). We used only black and white except for the stickers and a one-liner illustration style. We also use paper as our material to provide accessibility to the participants (we wanted them to use the paper, not scared of writing on our cards). A material choice was also made, to make the kit easier to transport. The goal of these choices was to give the participants the sense of creative freedom, we wanted them to add their own color ideas to the paper.



Figure 14



Figure 15

Returned Probes and Insights: The probe deployment provided insightful information about participants' preferred payment methods and emotions during transactions (Figure 17). Probes showed the value participants assigned to purchased products and the number of daily payments (Figure 19, 21, 22). However, a more speculative question proved more inspirational for design implementation than specific mapping tasks (Figure 18). Our minimalistic style did not fully inspire participants' creativity, with most adhering to the minimalistic look (Figure 16).

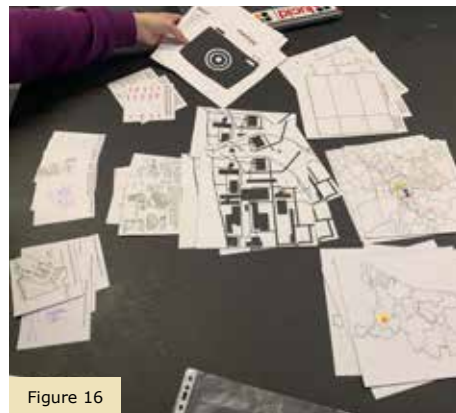


Figure 16

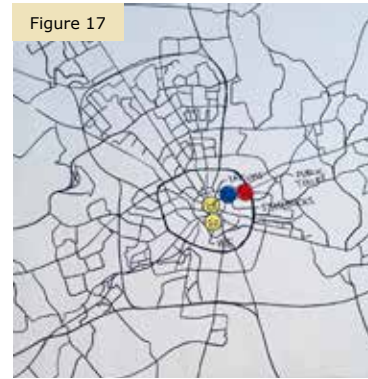


Figure 17

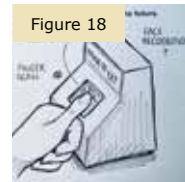


Figure 18

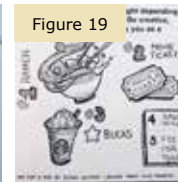


Figure 19

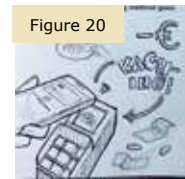


Figure 20



Figure 21

	total the payments	of payments
day 1		5
day 2		2
		5

Figure 22

Observing other groups' probes during feedback sessions inspired us to enhance our cultural probe kit. Some groups incorporated prompts on a phone case, while others used origami prompts. Motivated by these ideas, we aimed to improve aspects of our previous attempts.

Future Iterations and Improvements: For the next probe, we aim to iterate on prompts, experimenting with more openness to allow a wide array of possibilities. Exploring 3D probes involving activities like cutting and folding, in addition to drawing prompts, is on the agenda. We also plan to investigate social interactions surrounding mobile payment apps, an aspect not fully visualized in previous kits.

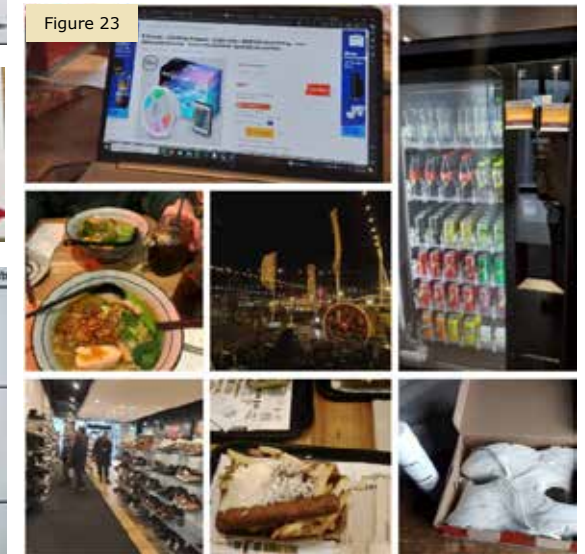


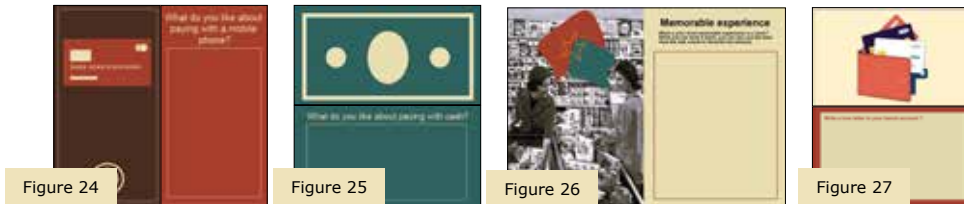
Figure 23

Iteration on the research question: After analyzing the former probes, we realized our curiosity lay more in the social interactions resulting from mobile payments rather than the act itself. Thus, our refined research question asks, "How does paying with your phone via Apple Pay and Google Wallet change the interaction between the payer and the seller?"

Our research focuses on the social interactions between the payer and the seller at a checkout: How does paying with your phone via Apple Pay and Google Wallet change the interaction between the payer and the seller? Through this probe, we investigate the general social interaction as well as the personal experiences of customers in a store. We also aim to understand the emotions and feelings tied to paying with a phone, card, or cash during this interaction. Our probe design not only concentrates on phone payments but also explores what value participants link to paying with phone, cash or card. This helps us gain insights into the complete payment process and why people choose certain payment methods. We aim to uncover the emotions, interactions, and personal values linked to the act of paying with your mobile phone.

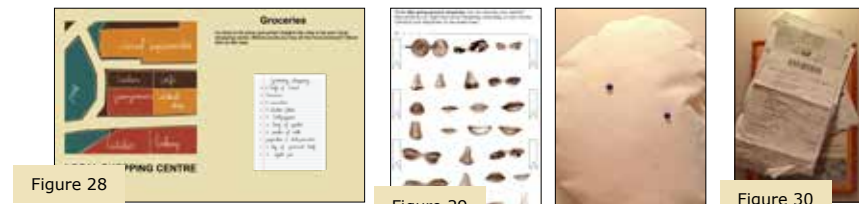
Probe kit content: Our probe kit comprises four distinct postcards, each with unique questions:

The kit includes four cards:



- What do you like about paying with a mobile phone? (Figure 24)
- What do you like about paying with cash? (Figure 25)
- What is your most memorable experience in a store? (Figure 26)
- Write a love letter to your bank account. (Figure 27)

Additionally, the kit includes four maps:



- Groceries: It is time to do some groceries! Imagine the map to be your local shopping centre. Where would you buy all food products? Show this on the map. (Figure 28)
- Potato head with cushion: To do after going grocery shopping; Can you describe your cashier? Note anything you might have found interesting, surprising, or even normal. Construct your description on the potato head: (Figure 29)
- Look at the receipts and write on each receipt if you would choose to use the self-scan or use the checkout. (Figure 30)

Other exercises:



Figure 31

- What is most important or meaningful to you? And what is most important to your seller or cashier? (Figure 31)

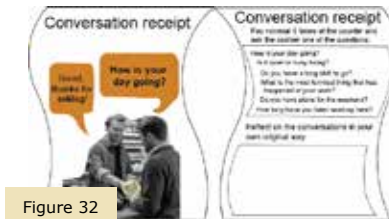


Figure 32

- Pay minimal 6 times at the counter and ask the cashier one of the questions. (Figure 32)



Figure 33



- Create a label for the packaging of your favorite product. (Figure 33)

Figure 35

- Create a top 5 about the exercises of the probe kit and argue briefly on the stairs on which you based this choice. (Figure 35)



Figure 34

- Photo assignment: Take pictures of all the topics you think of that you would talk about with your cashier. For clarity, please list them here as well. (Figure 34)

Reflection on the making of the second probe kit:

- **Portraying the whole context of the research topic**

The preparation of the second deployment was focused on picturing the whole context of paying in a store, rather than the previous focal point of the specific action of the paying method. This did not only apply better to our new research question regarding the interactions between the payer and the seller (and how mobile paying influences this), but it also added a layer of depth into our investigation. By taking the wider context into account, we aimed to capture the nuances of the entire experience, including the payer-seller interaction but also the customer's personal thoughts, values and sentiments related to these interactions, experiences and payments. It was recognized that the act of paying is just merely an element in an intricate web of social interactions and emotions while buying.

- **More creativity and inspiration instead of information**

Since the goal of our first probe was to gain more information instead of inspiration, we changed the format of our second probe. We wanted more creativity in the second probe and more variation between the exercises. Variation was mostly needed in the maps of the probe, since the maps of our previous probe were almost similar, which resulted in non-useful insights.

Other results of the first probe have shown that creative assignments, such as drawing provided detailed responses. We got more perspectives from questions through those assignments, since everyone had a different imagination. Therefore, we used more different kinds of creative assignments in this probe, such as designing the label, the potato head and the piggy bank. This to ensure more personal and detailed information.

Our probe also tried to put some spontaneity in the probe and to not seek for specific answers. Doing this will make the probe more engaging, but also more interesting for us. By not seeking to answers by our biases, the most surprising answers will arise. The participants are not in the same tunnel vision as we are, which will show unexpected insights.

- **Coherency of the whole probe related to our topic**

The coherence of the probe is an essential element, since it refers to the connections of all elements, ensuring that every component aligns with the goal of gaining creative insights. Therefore, the probe itself also needs to be attractive to the participant by a coherence theme. We used a kind of retro theme for the colors. Due to all the different kinds of assignments, the probe can look a bit overwhelming, but this will stimulate the participant's curiosity, which is one goal of the probe.



Reflection on the deployment of the second probe kit:

It has been noticed that the participants have put quite a lot of effort in the probes. The participants were not required to finish every task in the probe, surprisingly the participants almost did every exercise in the probe. This shows that they found it engaging to work with. Which also means that our probe was attractive and not too boring.

Looking at the stair exercise, where the participants reflect on the exercises of the probe, the love letter was a preferred exercise. Participants said that the exercise was fun to do, since it was something they have not done before. This exercise also showed the engagement of the probe.

Moreover, it was noticeable that two exercises were not on the stairs; the postcards of questions about what the participants prefer with paying with mobile phone/cash. These exercises of the probe were quite simple questions and the stairs showed that all participants did not put those in their preferred top 5 questions of our probe. From this we conclude that more creative and diverse exercises increase the engagement of the participants, which results in more inspiring insights.

On the other hand, the conversation receipt exercise was not executed very often. The feedback received about this probe exercise was that participants found it awkward to randomly start a conversation in the middle of the store, and would rather utilize the self-scan. This gives an indication that most users are not used to social interactions in a store, especially not with a cashier, which is insightful for the analysis regarding the research question. Therefore, this observation suggests that further research should be steered towards ways in which this social interaction in general can be stimulated in stores, after attempting to find out how the difference in paying method can alter an interaction. On that note, the research question has been re-formulated to fit this direction.

Iterated formulation of the research question based on the probe kit design:

How can design enhance the social interaction when paying by mobile phone at a checkout, over paying at a self-scan?



Participants Interaction with Cultural Probe Kit:

Study participants, chosen from higher education students, voluntarily engaged in the research by receiving and using cultural probe kits over a two-week period during the Christmas break. Notably, Participant A demonstrated exceptional creativity and effort in various tasks, such as the Potato Head exercise (Figure 35) and crafting unique packaging for a favorite grocery store product. They also showcased a distinctive perspective in recreating mall and supermarket layouts.

It's worth mentioning that only one participant completed the conversational receipt task (Figure 36), as others faced challenges, which were expected given the nature of the probe kit. However, participants reflected on the difficulties, providing valuable insights for analysis. Surprisingly, the top three activities from the stair probe revealed a lack of social interaction, a noteworthy observation for our analysis.

Description of the data

After reviewing the results from the Cultural Probe Kit and how participants completed the probe, we analyzed the outcomes using a thematic analysis system. Initially, we grouped similar probes together and conducted a 20-minute analysis to identify the underlying codes in participants' responses. Following a comprehensive review of all the probes, we convened to discuss our findings to ensure the accuracy of our data interpretations.

The codes identified in the first analysis were as follows:

Good experience/ Bad experience / Warmth and Familiarity / Tangibility / Satisfying / Speed/Ease / Small talk / Overstep limits / Spending too much money

After compiling these codes, we deliberated on potential sub-themes to organize the collected data:

Familiarity with the cashier / Social interaction in the grocery store / Cash / Paying with a mobile phone

Ultimately, the main themes derived from this analysis were:

Figure 35



- Familiarity fosters interaction
- Small talk due to social awkwardness
- Cash vs. Phone

Figure 37



These themes englobed the following results of the study:

Familiarity fosters Interaction

Analyzing responses to the "memorable times in a shop" probe revealed that positive experiences were closely linked to participants' familiarity with cashiers. Participant A was delighted when an older cashier recognized them as a regular customer, fostering mutual recognition and paving the way for interaction (Figure 37). Participant B encountered an old friend working as a self-scan cashier, once again emphasizing the importance of familiarity in driving interaction. One

participant preferred the check-out over the self-scan simply because they knew a person working there.

In responses about what is important, participants associated meaningful qualities with cashiers, seeking smiles, warmth, and kindness (Figure 38). During the conversation receipt, Participant B highlighted how engaging in conversation uplifted the cashier's mood, emphasizing that asking questions and showing interest facilitated interaction between customers and cashiers.

Figure 36

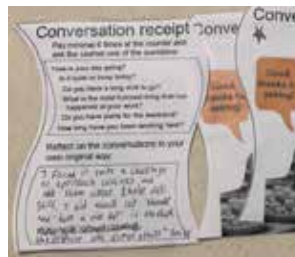


Figure 38

Small Talk Due to Social Awkwardness

When asked about conversation topics with cashiers, four out of five participants mentioned the weather as a potential subject (Figure 39). Notably, identified topics were safe and non-personal, avoiding questions like "How is your day going?" Participants hesitated to delve into personal matters.

In the conversation receipt, aimed at genuine interaction with cashiers through personal questions, only three out of five participants engaged. There was a prevalent discomfort in initiating small talk, as expressed by Participant E, who found it "incredibly uncomfortable." Participant C noted the challenge of asking about a cashier's day but highlighted that expressing gratitude always made the cashier smile.

Figure 39

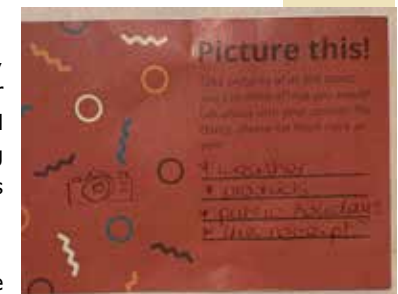


Figure 40



This discomfort suggests a declining practice of conversing with cashiers, possibly influenced by the preference for more efficient self-scan options, where social interaction during payment is less common.

Preference for the Self-Scan:

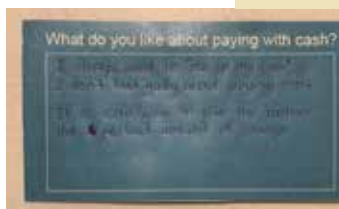
Insights concluded from the probe, where participants indicated their preference for either the self-scan or normal checkout (Figure 40), revealed that a majority favoured the self-scan. The ease and speed of the self-scan compared to the conventional checkout were cited as reasons for this preference. Participants’ desire to avoid queues and prioritize speed at the self-scan may also be linked to the broader trend of minimizing social interaction, especially in the context of potential social awkwardness.

Cash vs Phone Payments:

Cash:

Most participants found cash tangible and satisfying, with Participant B noting the satisfaction of having the exact amount and Participant A enjoying giving the cashier perfect change (Figure 41). Conversely, three out of five participants found cash less challenging to spend, avoiding the impact on their bank account balance during purchases.

Figure 41



Phone Payments:

Phone payments were preferred for their speed and accessibility. Participant C emphasized, “I almost never forget my phone, so accessibility.” (Figure 42). They also appreciated the convenience of not carrying physical money. Additionally, Participant B noted that paying with the phone didn’t feel like spending money, creating a unique connection with the sentiment associated with paying in cash.

Figure 42



Commonalities:

Contrary to expectations, both cash and mobile payments shared a theme of perceived spending invisibility. Cash made participants feel like they weren’t spending much, while paying with a phone felt more invisible. Comments on the ease of mobile payments suggest that ease of use may be a critical factor, irrespective of the payment method. Importantly,

none of the mentioned reasons relate to social interaction, hinting at a potential lack of connection between mobile banking usage and seller interaction.

Design Implications:

When designing to enhance the social interaction inside the shops, we have concluded that the following requirements have to be taken into account. The design must evoke social interaction in a non-intrusive manner without hampering efficiency and shopping convenience. The design could also focus on normalizing social interaction in the shops and try to prevent people from becoming socially awkward in shops.

Discussion

The analysis of the probe kit results does not provide a definitive answer to our research question, which explores the potential differences in social interaction when paying by mobile phone, card, and cash compared to using a self-scan. The assumption of a discernible difference in social interaction between payment methods is not substantiated by the probe kit findings. As a result, we infer that there may be no inherent connection between the two, or participants may be unaware of such a connection.

Limitations

The study’s limited sample size of five participants in a specific age group hinders a comprehensive understanding of how payment forms impact social interaction. A critical reflection on probe questions suggests the need for more focused inquiries. Further investigation is crucial, especially regarding the relationship between mobile payment speed and the preference for self-scan checkouts, to gain valuable insights.

Future Paths

If further investigation is pursued, the initial focus will be on exploring the potential relationship between self-scan and social interaction at regular checkouts, based on hints from probe responses. The probe has also sparked new research questions, including “How do humans respond to social interaction at the checkout?” and “Can a payment method be designed to combine mobile phone accessibility with cash-like satisfaction, fostering spending consciousness?” These questions offer intriguing avenues for further exploration, enhancing our understanding of the dynamics between payment methods, social interaction, and user satisfaction.

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