Experimentally prototyping towards a

Digital Euro

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Design for Interaction
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Executive summary

Currently in our payment system, the usage of cash is declining and our card payments are dependent on American payment companies. For these reasons, the ECB is researching to issue a Digital Euro, a European payment system offered by a public institution, often explained as digital cash. I argue that instead of distinguishing itself on increased convenience or usability, Digital Euro rather provides indirect benefits, which have to align with people's values.

As a scope, this project investigates how to communicate the value of **privacy** in the Digital Euro during in-store payments. As an approach, first various tensions around (the perception of) privacy are mapped out, namely:

1. Do users want to access Digital Euro through a public or private party?

2. Do users want to pay fully anonymously or identify towards a trusted intermediary?

3. Do users want to have complete choice over which data to share or have a determined standard of information sharing?

Then, these tensions were translated into speculative prototypes used for research. These are meant to present dilemmas around privacy and let participants relfect on their values. User research was conducted through in-depth interviews and and in-context evaluation to enact payments. The user research showed that:

1. Familiarity is deemed more important in selecting an intermediary than that party being public or private.

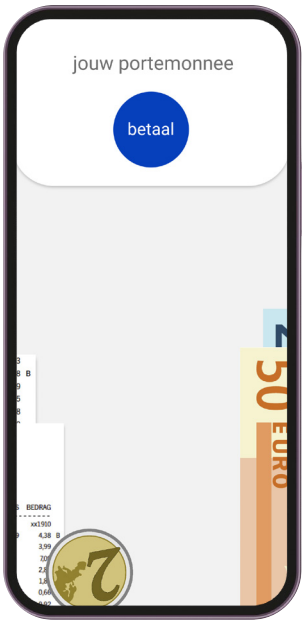
2. Few users are interested in cash-like anonymity, especially when this would increase the risk of losing money.

3. All users appreciate having the choice beforehand of which data to share with which parties.

Other insights are communicated in the form of a vocabulary on the way participants reasoned about their values, personas that reason based on long term values or direct benefits, and detailed insights per prototype page. Finally, design recommendations are given for communicating privacy.

A public payment app that promotes collective European goals and lets users fully identify.

A payment app that provides users with autonomy of choice to engage with commercial parties without judgment.



A payment app that serves as a fully anonymous digital wallet, without giving users choices what to share.

0. Introduction

This report communicates the conducted analysis, design activity, user research and findings from my graduation project about the Digital Euro (D€), a possible new payment method currently investigated by the European Central Bank (ECB).

This project took place in the context of a graduation internship at De Nederlandsche Bank (DNB), the central bank of the Netherlands, at the division of Retail, Payments & Research (RBO). Here, they monitor the Dutch payment system, conduct research into consumers' payment behavior and topics such as accessibility. They also facilitate meetings between stakeholder such as banks and consumer interest groups.

A few years ago, a Digital Euro team has been created within RBO, closely collaborating with teams at the ECB and other national central banks. They are involved in its design process, conduct research about the Dutch context and manage the contacts with Dutch politics various stakeholders. This team sent out the graduation assignment.

In the original assignment, DNB suggested to explore the width of the Digital Euro by prototyping its various forms and investigate how to communicate its differences with current electronic money. Initially, I aimed to approach this by starting with user research, mapping out needs of Dutch consumers for new payment methods. But when starting the project, I realized Dutch consumers were already content with their payment options, thus requiring a different approach.

In this chapter, background information is given about the Dutch payment system and the current developments that caused the ECB's investigation of Digital Euro. Then, I compare the proposed Digital Euro to the needs of Dutch consumers and conclude: rather than designing for increased convenience, Digital Euro needs to investigate how it aligns with people's values.

The project is scoped down to focus on researching the value of privacy during in-store payments, which often relies on trust. Finally, the three phases of the project are introduced:

1. Analysis of value tensions.
2. Translation of these tensions into designs.
3. Evaluation with users to discover their values.

Contents

0.1 Our Current payment system

In order to explain the Digital Euro and the reason for its existence, it is crucial to provide contextual information on its environment: the payment system in the Netherlands. While everyone knows the products they pay with, such as cash, bank cards or payment apps, the workings of these systems behind the scenes are less known. Since developments in these systems form the main motivators for the Digital Euro project, a short explanation is given.

0.1.1 Types of money

In our current payment system there are two types of money: public and private money.

Public money
Public money is issued by central banks, we currently only know this in the form of cash. As a direct claim to the central bank, it is risk-free and holds value in itself. More fundamentally, public money guarantees the singleness of money: our collective agreement that 1 euro coin is worth 1 euro. It serves as an anchor that the whole system is based on, which also helps for collective trust: knowing there's a fire escape in the ATM if your bank gets in trouble is a calming thought. It's the backup option for when things go wrong.

Besides, public money is free for individuals, and should ideally be universally accessible and accepted. As a public institution, the central banks issuing the money have no commercial incentive to monetize its circulation or usage. Instead, public money is a way for them to stays present in the economy as a regulatory institution, allowing them bring stability by controlling its supply.

Private money
Private money is issued by commercial banks, currently known as the money in your bank account. When opening an account at, for instance, ING, this is similar to a loan given to the bank for them to further invest. In return, the customer still holds access to their funds in the form of private, deposit money through credit creation, for which a banking license is needed. The bank stores their money, possibly gives an interest and lets the customer use convenient payment instruments such as bank cards.

0.1.2 Payment systems

To use our money in transactions, several payment systems are used to facilitate these transfers of value:

Cash
For cash, the only current public money, the Netherlands has an infrastructure facilitated both by central banks and private banks. The Eurosystem, consisting of the European Central Bank (ECB) and all national central banks using the Euro, including De Nederlandsche Bank (DNB), issues the cash. Newly printed bills arrive at DNB's location in Zeist as worthless pieces of paper and leave the building valued at their face value, ready to be distributed by private parties. DNB is the only party in the Netherlands that can create and destroy cash, or replace damaged bills.

Distribution of cash is facilitated by private transport companies and Geldmaat, owned by the three big commercial banks of the Netherlands: ING, Rabobank and ABN Amro. With their ATMs, Geldmaat is consumers' interface to withdrawing cash from their private bank accounts.

Credit transfers
In order to pay with private money, multiple payment systems exist. With credit transfers, a account holder requests their bank to transfer a certain amount to another account, be it at the same, another Dutch or foreign bank. The flows of money and data and

the settlements between banks happen according to European protocols, such as the Single European Payments Area (SEPA) initiative governed by the ECB.

Card based payments
However, paying at a Point-of-Sale (POS) terminal, such as in a store, runs through different systems. For this, card based systems are used, in the Netherlands fully dependent on the American payment companies Mastercard and Visa. These companies have agreements with Dutch commercial banks to issue debit and credit cards for their customers.

During a payment, money and data flows between parties according to the four party model, with a central role for the card companies, as shown in figure 1.

When paying, the terminal sends an authorization request to the merchant's bank, which then communicates with the customer's bank through Mastercard's protocols to authorize the payment. Once agreed, both customer and merchant are notified by their bank.

As an individual, the customer pays a monthly fee for having a card, while the merchant pays their bank a fee per transaction, part of which is then given to the payer's bank. Both banks have deals with Mastercard or Visa of how much they pay them per transaction.

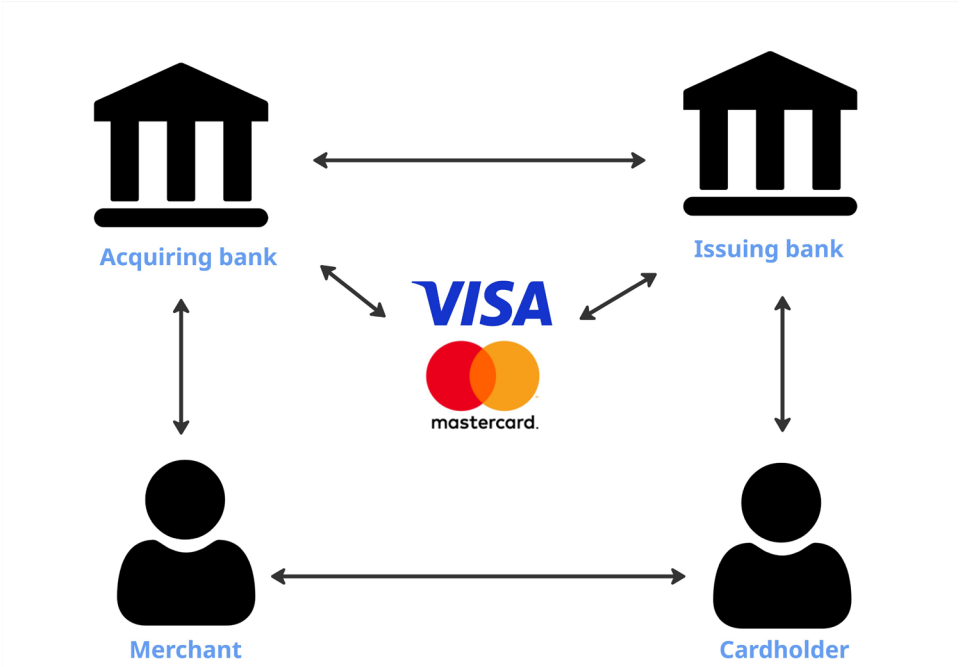


Figure 1: Four party model showing money and data streams during a card payment

0.1.3 Payment instruments

The third level are the actual payment instruments themselves, that consumers interact with to make a payment.

Cash

Cash started out as coins made of precious metals, later joined by paper money, representing a certain value of gold. After being detached from gold in 1971, cash became valuable of its own.

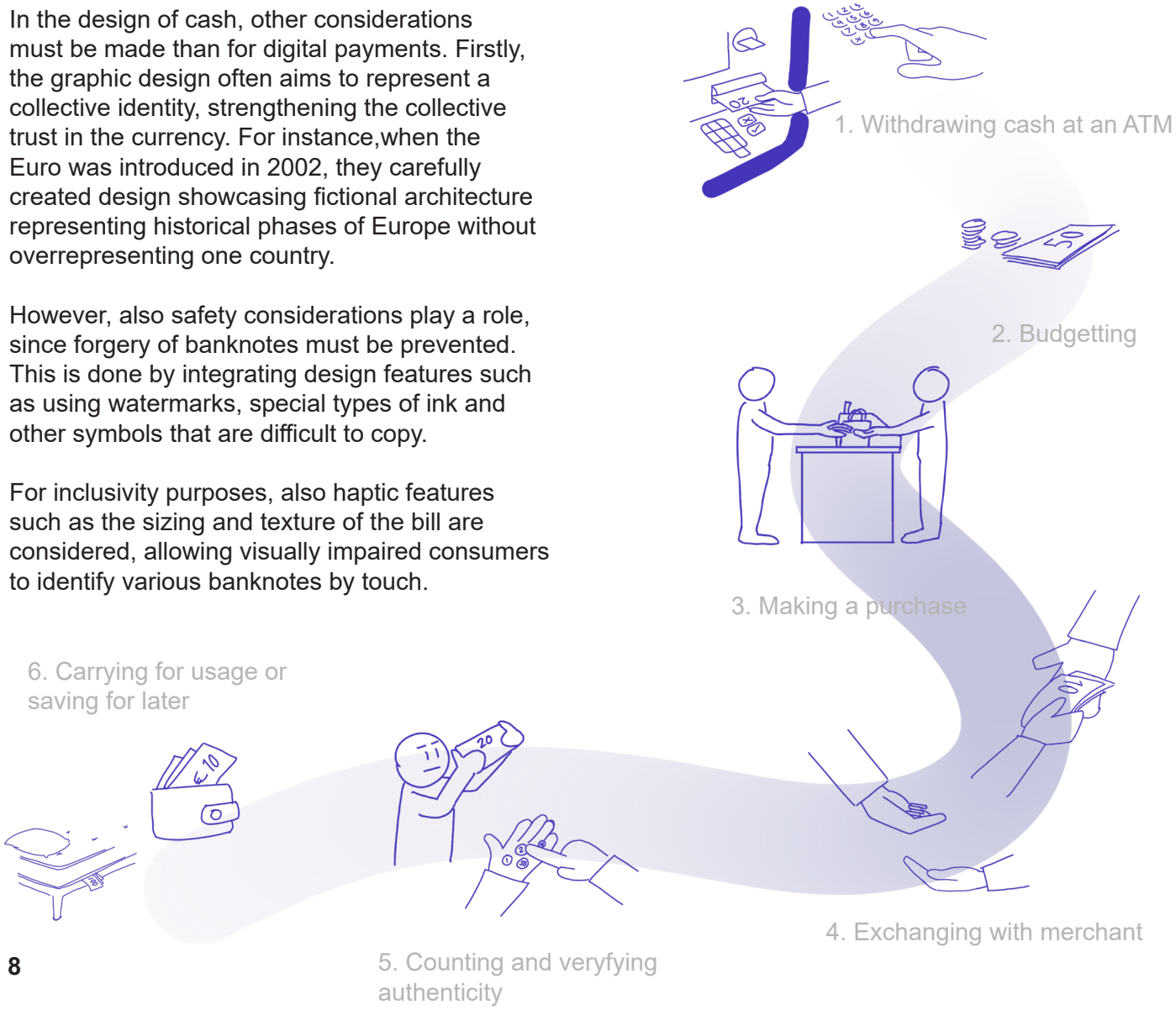
Cash carries distinct associations with it for different demographic groups. In general, it has a higher “pain of payment”, the psychological pain of spending money. However, due to the decreasing usage of cash especially among younger consumers, cash is more easily spent, since it does not affect their bank account balance (Broekhoff & Van Der Cruijsen, 2024). Another association is one of criminality, with larger amounts increasingly being associated with illegal activity (Panteia, 2021).

In the design of cash, other considerations must be made than for digital payments. Firstly, the graphic design often aims to represent a collective identity, strengthening the collective trust in the currency. For instance,when the Euro was introduced in 2002, they carefully created design showcasing fictional architecture representing historical phases of Europe without overrepresenting one country.

However, also safety considerations play a role, since forgery of banknotes must be prevented. This is done by integrating design features such as using watermarks, special types of ink and other symbols that are difficult to copy.

For inclusivity purposes, also haptic features such as the sizing and texture of the bill are considered, allowing visually impaired consumers to identify various banknotes by touch.

The user journey of cash

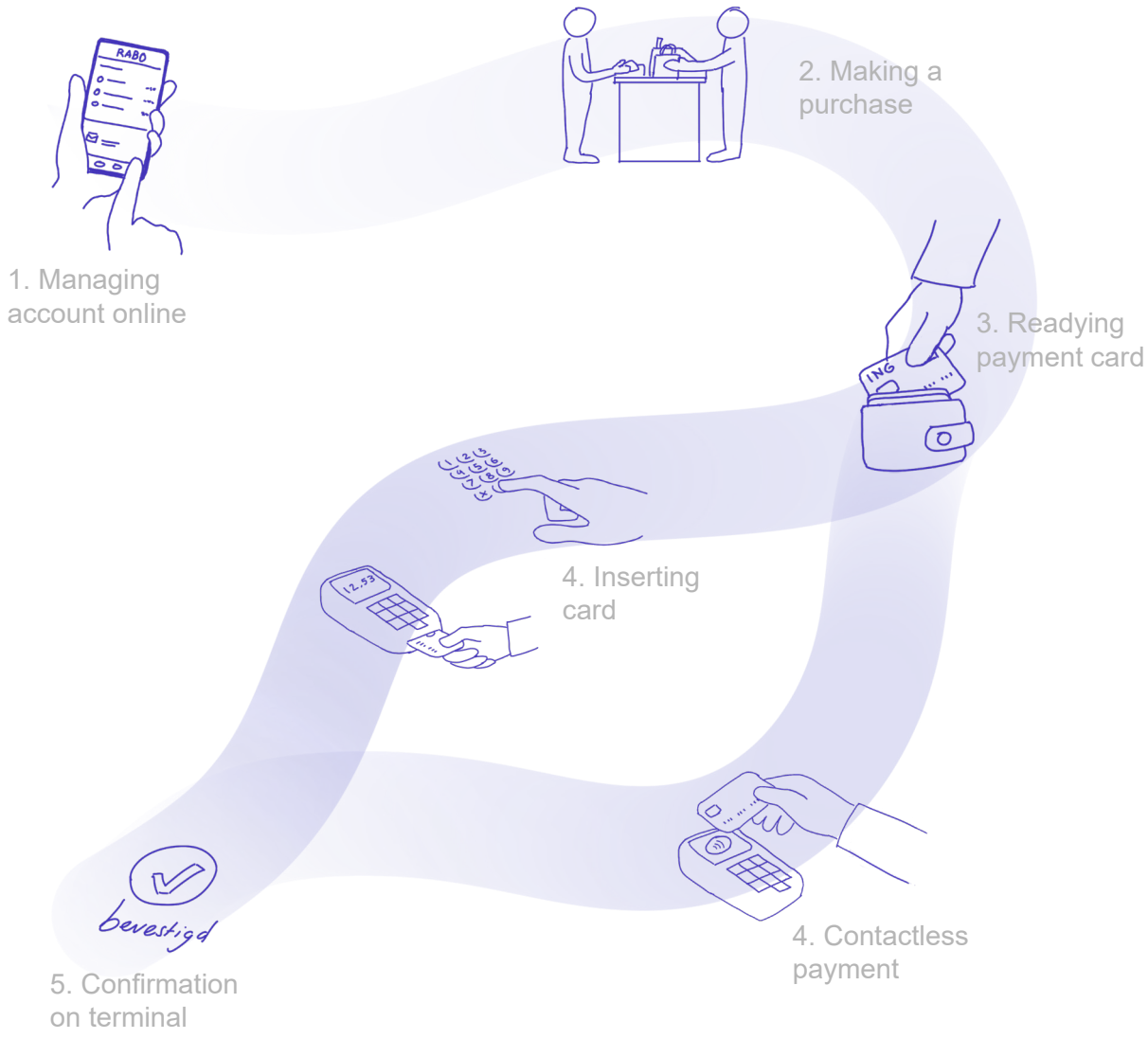


Card

Since 1985, Dutch consumers can pay in store and withdraw cash using a payment card. Currently, this is the most common way of paying in stores. Although both debit and credit cards are offered by commercial banks in the Netherlands, mostly debit cards are used. These are issued by the American card companies Mastercard and Visa, in collaboration with Dutch commercial banks.

In recent years, newly issued cards offer the possibility to make contactless payments through an NFC chip, which further reduced the friction for making a payment since the user has to insert their code less often.

The user journey of paying by card

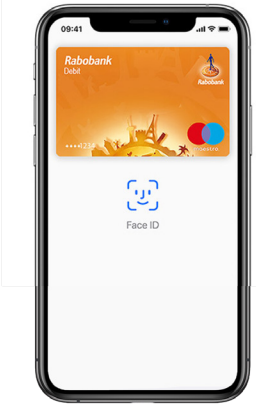


Mobile

Another recent development is the rise of mobile payment apps. These apps also use the NFC technology in smartphones to connect to the payment terminal. They run on the same card based systems offered by Mastercard and Visa and are also designed to visually resemble a wallet, with the user being able to add various cards to pay with.

Recently, Dutch banks have stopped providing their own payment apps and instead let their customers connect their banking card with Apple Pay or Google wallet, depending on the phone's manufacturer.

On the one hand, these Big Techs, especially Google, receive transaction data, which can be used for commercial purposes such as targeted advertisements (Eerenbeemt, 2024). On the other hand, these services provide an extra layer of privacy, since they use tokenization protocols to hide account numbers from merchants and acquiring banks.



The user journey of paying mobile

1.Managing account online

2. Making a purchase

3. Readying and unlocking mobile payment app

4. Contactless payment

5. Confirmation on terminal and phone

0.2 Current developments

Over the past years the usage of cash has declined in the Netherlands, decreasing from 57% of all payments in 2013 to 20% in 2021, a stable share ever since (figure 2). With less public money being used and accepted, its role as a monetary anchor decreases. How can people fall back on cash when you cannot spend it? Also, when using less cash, the presence of central banks in the economy decreases, lessening their ability to provide financial stability by controlling its supply.

At the same time, contactless card and mobile payments are increasing (figure 2), which not only creates a growing dependency on American payment companies such as Mastercard and Visa, but also on Big Techs such as Google and Apple. This is concerning considering the rising geopolitical tensions due to unpredictable political hostile actions of the US government, which is also voiced by DNB (NOS, 2025). Especially Mastercard and Visa have been used as instruments for political sanctions before, such as during the Wikileaks banking blockade back in 2010 (Wikileaks, 2011).

Another development in mobile payments is that banks have shut down their mobile payment apps last years due to high cost and competition with Big Techs (Eerenbeemt, 2024). This leaves Google Pay or Apple Pay as the only options for users, depending on their phone's manufacturer. With especially Google collecting detailed transaction information for commercial purposes, this decreases consumers' privacy when paying .

Besides, the threat of unregulated currencies is also rising. On the one hand, the benefit of increased adoption of decentralized crypto currencies can be questioned due to their volatility, often being a risky investment rather than a payment method (DNB, n.d.). On the other hand, in 2017 Facebook announced investigating issuing their own money, creating a risk that payment systems become detached from our current economy and in the hands of commercial instead of public organizations (Het Financieele Dagblad, 2019).

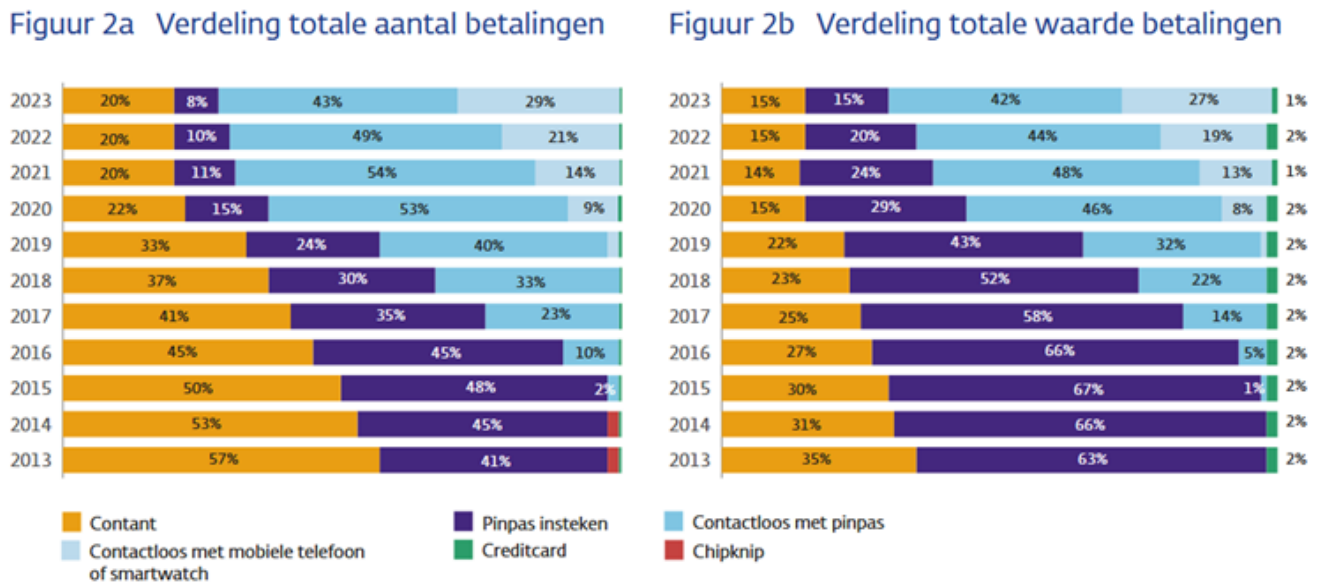


Figure 2 (Betalen aan de kassa, 2023)

0.3 The Digital Euro project

In order to keep public money relevant, strengthen European strategic autonomy, prevent foreign commercial companies from becoming too powerful and provide users with a safe, private digital payment method, the ECB is researching whether to issue a European Central Bank Digital Currency (CBDC): the Digital Euro (D€).

Often described as “Digital cash”, Digital Euro would be public money issued by the central bank, run on a European infrastructure and be available in current familiar forms such as card and mobile.

Currently the ECB and the Eurosystem’s national banks are preparing possible issuance of the D€ by investigating its feasibility through technical experiments, creating a legislative framework and rulebook, gauging political acceptance and conducting quantitative and qualitative user research. Currently, the project is waiting on political approval, after which next steps can be taken of actually realizing the product. According to policy makers it would take another four or five years before being implemented (Nagel, 2024)

0.3.1 Public money in a digital environments

The Digital Euro would be a new form of public money, as an addition to cash and other private payment methods (European Central Bank, 2023). Unlike crypto currencies, it would be centralized. Its public nature means that its a direct claim to the ECB, and users’ money would be issued by and stored at the ECB servers, however without interest. It would be free to use for individuals and have a legal tender status, enforcing its acceptance. This way, the ECB hopes to increase the share of payments done with public money. To prevent people from withdrawing all their money from their commercial bank accounts, causing a bank run and financial instability, holding limits will be set, for which appropriate heights are currently being investigated.

0.3.2 A European payment system

To reduce the dependency on American payment parties, payments with the Digital Euro would run through a European payment infrastructure, mostly facilitated by the ECB. However, Payment service providers (PSPs) would still play a role in this process, managing user accounts, conducting fraud checks and providing access through their payment apps. This way, the ECB will only receive pseudonymized user data, preventing them from identifying people.

0.3.3 Familiar payment instruments

Although the Digital Euro would offer a new type of payment system, it would be accessed through the same types of payment instruments as current private digital accounts: card and mobile.

The ECB envisions a distinction between two types of D€ functionalities: Online and offline D€. Online D€ would have similar user experience and functionality as current commercial bank accounts, being able to pay in web-shops, stores and transfer money to other users. However, the offline D€ would provide a more novel functionality, giving users the opportunity to locally store D€ on their card or phone, to make payments without internet connection. Besides, the transaction data would remain between payer and payee, without third parties watching along. In their accounts, users would use online D€ by standard, and have a separate environment to fund with offline D€, like withdrawing some cash for on the side.

0.4 How does a digital euro fit in our payment system?

Within a European fragmented payments landscape, full of different payment cultures, PSPs and payment systems, national central banks represent the different needs of their country. Likewise, DNB looks at the Dutch context, which differs greatly from other countries.

Where many countries would welcome such an efficient, unified payment system like the Digital Euro, the Dutch payment system differs regarding costs, preferred payment instruments and consumers' satisfaction, possibly causing a different acceptance of D€ with the public.

Yearly research shows that Dutch consumers are already quite satisfied with the services of their main bank, scoring it a 7,8 on general satisfaction. Especially basic services, such as checking one's account balance, last transactions and initiating a payment, score higher than an 8.0, a number that is only increasing since 2021. The few points of dissatisfaction concerns areas such as the costs of payment services for consumers, the ability to deposit cash and the distance to the nearest bank offices, all scoring lower than a 6,0 (Toegankelijkheidsmonitor Consumenten en Ondernemers 2024, 2024).

User research on new digital payment methods, commissioned by the ECB for the Digital Euro project, showed that the Netherlands is relatively satisfied with existing payment methods compared to other countries, with few people being open to using a new one. Also, the idea of a digital wallet was often rejected, since it would not bring enough added value compared to their current options. (Study on New Digital Payment Methods, 2023).

Besides, the costs of the payment system are already very low in the Netherlands, compared to other countries. For domestic private payments, we pay €0,13 per electronic transaction, which is 37% lower than the European average of €0,21. Also per retail account, costs are 19% lower in the Netherlands compared to the rest of Europe.

Especially our most used payment method, debit cards, stands out in cost efficiency. With a unit cost of €0,17 per debit card payment, the Netherlands already has a very cheap payment system compared to other European countries included in a recent study, all having unit costs of more than €0,33 (Junius et al., 2022).

In our efficient payment system, with low cost and relatively high satisfaction, DNB deems the online D€ account less distinguishable from current private bank accounts. However, the offline functionality could provide added value in terms of resilience and privacy.

0.5 Approach: Values

Considering the Dutch payment landscape, it would be challenging for the Digital Euro to provide enough additional convenience or lower costs to compete with current private payment options. Even the novel offline functionality would not make payments significantly faster, cheaper or easier.

Instead, Digital Euro provides indirect benefits, preventive of possible future problems concerning privacy of personal data during data leaks, safety and autonomy of our money during international conflict and resilience of the payment system during outages. Whether users care for these issues depends on whether it aligns with what they find important in life, with their values. Therefore, as a focus of this project, I will design to research human values, rather than designing to increase usability and convenience.

But what are values? According to Schwartz (2012), values are defined as:

"(a) concepts or beliefs. (b) about desirable end states or behaviors, (c) that transcend specific situations, (d) guide selection or evaluation of behavior and events, and (e) are ordered by relative importance."

or put more simply:

"what is important to people in their lives, with a focus on ethics and morality."
(Friedman, 2003).

Designing with human values in mind, comes from the wish of creating technologies and products that are ethical, inclusive and socially responsible. At the Delft Design for Values institute, it is recognized that technology cannot be fully neutral and influences and is influenced by human values. They developed several methods for operationalizing values into designs are created, such as the values hierarchy in phase 1.

Another methodology in this segment is Value Sensitive Design (Friedman, 2003), who provide various ways of integrating explorations of values in to the design process through conceptual, empirical and technical experiments. Instead of quantifying values into measurable design requirements, their focus is rather on qualitative user research and integrates philosophical perspectives. Especially during the third phase of this project, their adapted interview structures and data analysis methods are used during the user research.

0.6 Value focus: Privacy

Privacy is a multifaceted concept that has evolved over time as new technologies developed. The first philosophical discussions regarded the private sphere, often associated with family domestic privacy. This space is separated from governmental authority and allows for self-regulation, and is closely related to the concept of property. This later evolved in “the right to be left alone”, when inventions such as photography increased levels of publicity

Later, a control based view was proposed: One can determine who has access to their person or personal information. Often, privacy is described in three dimensions: decisional privacy, concerning autonomy over personal and lifestyle choices), informational privacy (controlling who knows information about you) and local privacy (someone’s private sphere, often the home) (Stanford Encyclopedia of Philosophy, 2023).

More recently, privacy was also defined following the concept of Contextual integrity by Nissenbaum (2004). She situates the sharing of information in various contexts and states that each contexts has their own “appropriate” information flows, based on norms and values. For example, it’s not okay for children to spill classmates’ secrets on the playground at school.

This rich, somewhat ambiguous definition of privacy makes it an interesting value when discussing systems like digital payment methods.

2.2.1 Privacy in Dutch payments

A European study on payment attitudes conducted by the ECB and DNB researched whether European consumers cared for their privacy by asking if they wanted their transactions to be private and if they worry about possible commercial usage without their consent. Where the majority of Europe (60%) was worried about privacy, in the Netherlands 60% of consumers did not have concerns over this matter. (Study on the Payment Attitudes of Consumers in the Euro Area (SPACE), 2024)

The user research on the digital euros shows different preferences for privacy. In a survey among European citizens (European Central Bank, 2021), privacy was deemed D€ most important feature by participants, with 43% labeling it as such. Contrasting with the aforementioned indifference, Dutch participants gave privacy an above average score close to 50%, while countries as Portugal, voicing the strongest concerns over privacy in the research above, did not seem to care about privacy.

However, in the later qualitative research (Kantar public, 2022), many European participants admitted they are not concerned with privacy while paying, reasoning that they had nothing to hide, or ubiquitous tracking happens anyway. Still, a medium privacy level was preferred, allowing visibility of payments for one’s own bank,

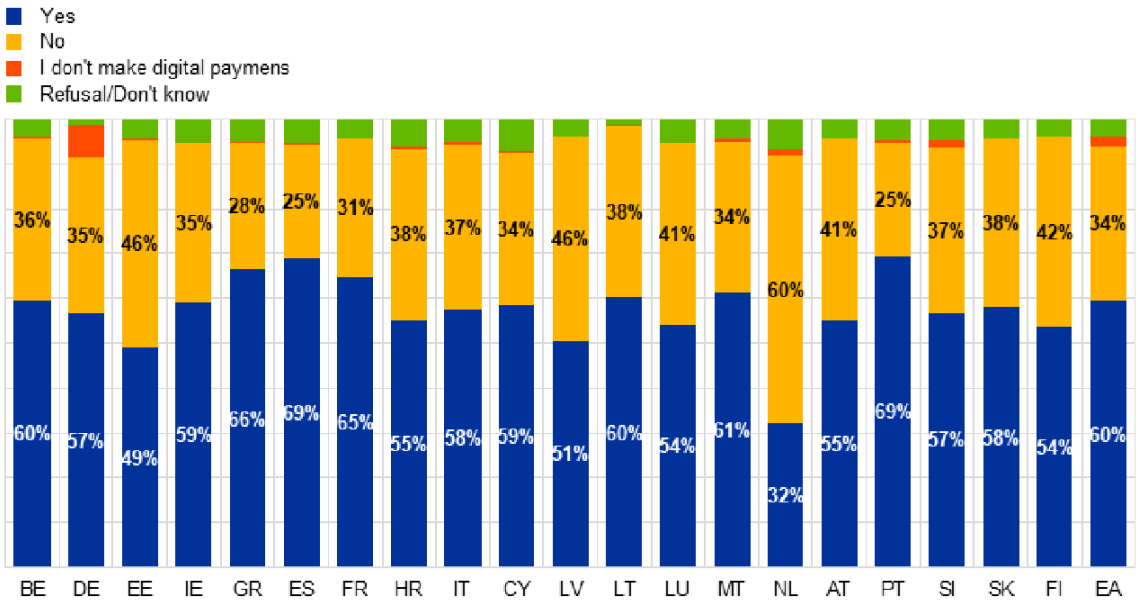


Figure 2: Privacy concerns about digital payments (SPACE, 2024)

but not for commercial purposes. Flexible settings and having an individual choice was valued, also in the Netherlands.

The different valuation of privacy between the studies might be by how the D€ was introduced to the participants. In the qualitative study by Kantar, users are presented with a “digital wallet”, focused on its novel functionalities, such as budgetting tools. These specific features were described in detail using scenarios for participants to “grasp the practical unfolding” of the features. The concept of a “digital euro” was only introduced afterwards. However, in the quantitative survey “digital euro” was mentioned directly, asking participants to rank nine short descriptions of end goals, such as: “I want to be able to use it throughout the euro area” or “I want my payments to remain a private matter”. This suggests that immersing users in a usage scenario elicits different reactions on privacy than talking about their high level goals.
Research on data sharing practices during payments by (Van Der Cruijsen, 2017; Bijlsma et al., 2021) confirms that privacy is not a one-dimensional topic, with participants’ valuation of privacy depending on various factors. For instance, participants differentiated between types of data, with personal identification, financial and health data being viewed as more privacy sensitive than others. Regarding the receiving party, people trust their own banks more than insurers, Big Tech companies or web shops. Another factor was incentives, certain demographic groups are more strongly motivated to share by financial rewards, such as men, younger people or highly educated groups. Also the purpose mattered, since participants were more open to share for improving services and security than for commercial purposes.

It can be concluded that Dutch consumers' attitudeds on privacy in D€ is still uncertain and possibly dependent on the used research method.

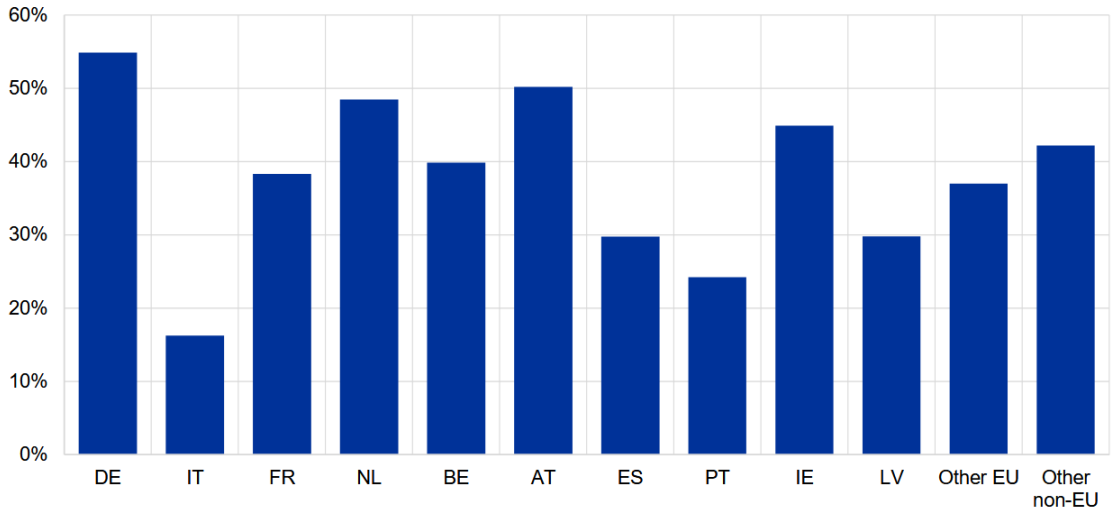


Figure 3: Share of citizens per country who ranked privacy as most important feature (ECB, 2021).

0.7 Value focus: The lens of trust

2.3.1 Trust in payments

Besides privacy as a main topic, it is important to sometimes look through the lens of trust. Trust serves as the backbone of our payment systems: our intersubjective agreement that money represents real value allows us to let it mediate our transactions and transfers of value. Uslaner describes it as: “trust enables exchanges that could otherwise not take place, reduces the need for costly control structures, and makes social systems more adaptable” (2002).

In this way, trust supporting money as a unit of account is even more important than the tangible object of money. Throughout history, even when currencies disappeared after an empire had fallen, people still used it as a unit of account way to keep credit for services they exchanged (Graeber, 2011). In more recent times, our money system was officially detached from gold in 1971, with cash not representing value fo gold anymore, but rather value in itself. This is illustrated by DNB removing their promise “DNB promises to pay the bearer” from banknotes (De Nederlandsche Bank, 2022).

In payments, trust is often considered an intrinsic value, indicative of the health of a payment system. For instance, DNB conducts yearly research into consumer’s trust in institutions and the payment system (De Nederlandsche Bank, 2024). However, in this project, I will look trust as an instrumental value, used to convey other values such as privacy. In order to understand how trust works, the basic model of interpersonal trust is explained below, from which many other trust situations can be derived.

2.3.2 The basic interpersonal trust model

The basic situation of interpersonal trust is an interaction between two parties: A trustor who put their trust in a trustee, risking non-fulfillment of their trusting action. Trust is an attitude towards someone or something else, which, if strong enough, can result in a trusting action. It is something else than trustworthiness, which is a collection of factors that determine whether the trustor will actually fulfill the trusting action. (Riegelsberger et al., 2005) calls it a “configuration of trust warranting properties in a specific situation”. The trustor tries to assess these properties to decide whether to engage or withdraw.

2.3.3 Signals

For the trustor to engage in the trusting action and putting themselves in a vulnerable position, they need to asses whether the trustee is trustworthiness of the trustee based on signals. These signals can be seen as evidence of trustworthiness and can come in the form of symbols or symptoms.

Symbols have an assigned meaning, such as a trust seal, or a company logo. For a symbol to work, trustors must believe in its meaning,

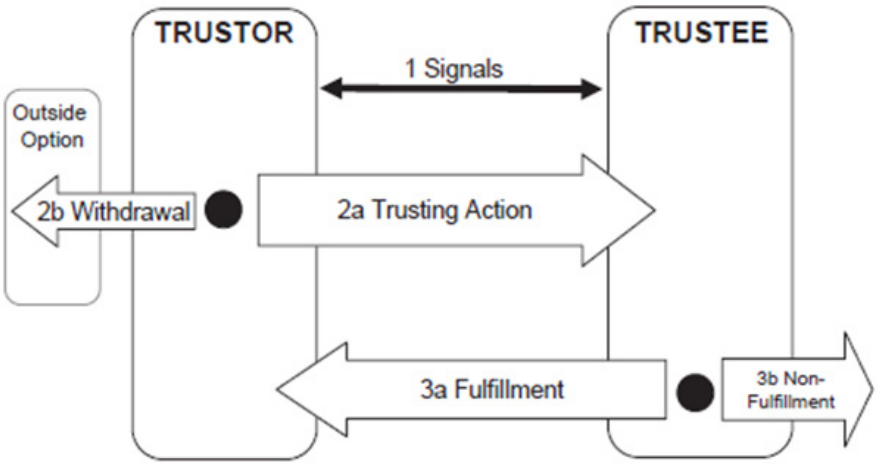


Figure 4: The basic interpersonal trust model (Riegelsberger, 2005)

therefore, “trustees need to invest in emitting them and in getting them known, or they can be protected by either making them very costly or by sanctioning their misuse.”

Symptoms, however, are a by-product of trustworthy behavior and therefore have a stronger effect than symbols. One example is having many user reviews. On the other hand, trust can also be absence of symptoms of untrustworthiness (Riegelsberger et al., 2005).

2.3.4 Trust in digital transactions

As cash usage decreases and payment interactions become more mediated by digital systems, the importance of trust grows.

With cash, there are inherently human signals between payer and payee to assess trustworthiness, such as someone’s gaze, facial expression and gestures. Concerning the money, trustworthiness is assessed through physical cues as the payee inspects the validity of the banknote and the payer the quality of goods. It’s an immediate exchange, where both parties can inspect the each other’s actions, reducing dependency and the need for trust.

In digital payments both parties depend on a third, intermediate party that processes and verifies the payment. This creates a certain institutional guarantee that decreases the need for trust between payer and payee. However, now both parties have to trust the intermediate, from which they are separated by technology, which leaves less natural cues for assessing trustworthiness. They entrust the intermediary with their money and data, but cannot inspect what is happening in their systems, having less control and thus having to rely more on trust. The only thing they see is the user interface, which therefore needs to send the right signals to convey trustworthiness.

This is an example of disembedding: as former direct face-to-face interactions are now conducted over time and distance through automated systems, opportunities for interpersonal trust decrease. As Riegelsberger (2005) mentions: “Trust is be formed as a by-product of informal exchanges, but if new technologies make many such exchanges obsolete through automation, trust might not be available when it is needed.” While this is deemed a reduction of channels, also new information can be provided, such as reputation rating scores.
On the other hand, mediation by institutions that verify the transaction and have nothing to gain from non-fulfillment, might also facilitate trust, since the consumer does not of fully relying on a payee.

Concluding, the payment takes place in a web of trust relations with additional parties such as the intermediaries, and the technology that the systems rely on. While more parties have to be trusted, this can also serve to replace or strengthen current trust relations.
Trust is important to consider in interface design, since it emphasizes the difference between designing for a trusting attitude, and actually creating a trustworthy system. Designers have the responsibility to one the one hand design an objectively trustworthy system, but then also design the right signals to signal this trustworthiness, and let users subjectively perceive that the system is trustworthy.

Only designing the signals, the evidence of trustworthiness can be dangerous when the system does not deliver on the promises. This can lead to untrustworthy actors designing trustworthy signals, a form of mimicry. An example of this is phishing.

0.8 Context: In-store payments

Digital Euro is intended as a payment method for all types of transactions: online, between people and in stores. To scope down the context, this project will focus on in-store payments, where currently users pay by cash or make payments at a Point-of-Sale (POS) terminal using their card or mobile phone. The Digital Euro would also transfer through these terminals and is researching how new generations of terminals could support the novel functionalities of D€, such as offline payments.

In-store payments is the most relevant context, since the dependency on American payment companies is the biggest here. All Dutch payments with card or mobile run through Visa or Mastercard, which provides a big opportunity for D€

Also, although the usage of cash is declining, most people know what it's like to pay with cash in stores. Therefore they have a point of reference of what it is currently like to pay with a public payment method, an extra perspectives when introducing Digital Euro in this context.

Finally, paying with a D€ app in stores entails an interaction that is both physical and digital, combining human customs of exchanging goods with a dependency on online intermediaries that communicate through a user interface. This allows for richer reflections than for instance e-commerce transactions.

0.9 Methods and Research questions

Research through design

Instead of focusing on coming up with a final mobile payment app, in this project I will use a research through design approach, and create several designs with the intention of producing knowledge. Not only will they serve as high quality research prototypes that support interviews, they will also be a way of communicating the research contribution to the world (Zimmerman et al., 2007). By creating multiple designs, they can relate to each other as different framings on a problem, creating discussion and inspiring further design activity with more traditional approaches (Cross, 1999)

According to Zimmerman, this is includes combining several types of knowledge: “interaction design researchers integrate the "**true**" knowledge (the models and theories from the behavioral scientist) with the "**how**" knowledge (the technical opportunities demonstrated by engineers). Design researchers ground their explorations in "**real**" knowledge produced by anthropologists and by design researchers performing the upfront research for a design project. Similarly, I aim to embody "**true**" and "**how**" knowledge present in the D€ project requirements and research literature into research prototypes, to facilitate gaining "**real**" knowledge by testing with people.

This approach is also partly inspired by Alfrink et al. (2023e) and his research on transparency in EV-charger interfaces. Through participatory action research he followed the design process of a design team, uncovering their assumptions about user’s norms and values. The resulting prototype was then evaluated to find the actual user’s norms and values, which resulted in interesting nuances and tensions between intention and outcome.

A similar structure is used in this project, where first the values around privacy in D€ are mapped out, based on a creative session and policy documents. Then, tensions around these values are embodied into prototypes, after which they are evaluated with users to find out what consumers’ values around privacy in payments are. This leads to the following project structure shown in figure 5.

Phase 1: Mapping out value tensions

Research question: What are DNB's and the ECB's values around privacy in the D€ project? And which tensions arise in trying to satisfy them?

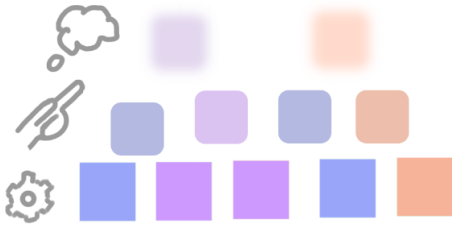
Methods

Participatory design

By involving policy makers in a co-design session about D€, considerations in the project were concretized, which helped to map out values and norms behind the project.

Values Hierarchy

Based on policy documents and the creative session, this framework by Van der Poel (2013) for translating values into norms, into design requirements helped to idenitfy value tensions.



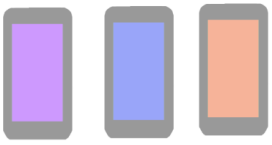
Phase 2: Translating tensions to designs

Research question: In which ways can these value tensions be translated into designs?

Methods

Speculative design

To immerse participants, spark reflection on mundane interactions during the resaerch, speculative designs were created based on the extremes of the value tensions. This way, they each represented a fictional exaggerated approach to privacy, and might also server to broaden the design space.



Phase 3: Discovering users' values

Research question: What are consumers values around privacy in payments? Where would they want new payment app to position itself on these tensions?

Methods

Usability testing

Elements from standard usability testing protocols were used to evaluate the prototypes with users.

Value Sensitive Design

Additionaly, interview structures used for eliciting values were used to from VSD by Friedman et al. (2017), structuring questions by evaluation and justification based on values.

Figure 5: Overview of the different phases

Conclusion

In our payment system there is public money, that we know as cash, issued by the central bank. Also there is private money, that we know as the money in our bank accounts issued by commercial banks.

Currently, the usage of cash is declining and our card based payments are dependent on American payment companies such as Visa and Mastercard. For the Europe to remain strategic autonomy and the ECB to maintain relevant in the economy and able to create financial stability, the possible issuance of a Digital Euro is researched.

This would give European consumers access to public money in digital environments and create independence from payment parties outside of Europe by processing payments in Europe. It would feature the same types of payment instruments as we know today: cards and mobile apps.

However, considering consumers' satisfaction and the efficiency of the Dutch payment system, D€ is unlikely to provide additional convenience. Rather it provides indirect benefits in privacy, safety and resilience. Acceptance of this depends on whether it aligns with what consumers deem important in life, with their values. This project aims to investigate the Digital Euro from the perspective of values.

As a focus, the value of privacy was chosen, due to its multidimensional nature and various definitions. Besides, user research in privacy gives contradicting outcomes: sometimes Dutch consumers deem it crucial, while at other moments they do not care. It seems that different research methods with different levels of engagement cause these different outcomes.

Another value is the lens of trust. Not only is trust crucial in our collective agreement that money has value, it also plays a role to convince users that their personal data is safeguarded in a system that they cannot inspect themselves. This is increasingly the case as payments move to digital systems, mediated by intermediaries with the only way of checking being the user interface. It is therefore important to design the right signals to convey this trust.

In-store payments were chosen as a context scope, due to the full dependency on American card companies, combination of both physical and digital interactions and the possibility to compare with current public money: cash.

The project will consist of three phases:

1. First, the values around privacy will be mapped out and tensions are identified.
2. These tensions are embodied into designs that serve as research artifacts.
3. The designs are evaluated with users, to discover their values around privacy in payments.

Phase 1: Mapping out values

In this first phase, I aim to map out the values around privacy behind the Digital Euro project, and the accompanying norms and design requirements. While the focus is on privacy, other associated values are also included. The information is gathered from a combination of literature research of policy documents by the ECB and a participatory creative input session with DNB policy makers. The values are then structured in a values hierarchy (van der Poel), hierarchically structuring values and their connected norms and design requirements. From this structure tensions between and within privacy are identified.

Contents

1.1 Creative session

Together with fellow graduation intern Sterre Witlox, a creative session was organized to elicit DNB policy makers' values and norms around privacy regarding the Digital Euro. Currently, the Digital Euro is in a phase of technical experimentation, rather than in a state of design and user experiments. By guiding DNB policy makers through a quick design session, I simulated the next steps in the design process: ideation and conceptualization. This way, I could learn more about their values, since they were forced to concretize their norms, assumptions and considerations around privacy in the Digital Euro. Additionally, the goal was to let employees participate in the design process and look at values from their personal perspective as well.

Method

Sensitizing booklet

Having only 2 hours, a creative session benefits from starting with warmed up participants. According to (Sanders & Stappers, 2012), involving participants in a problem or situation for some time prior to a creative session, helps to elicit deeper layers of understanding. Giving them "homework" in the form of a booklet with daily self-documentation exercise to share thoughts or experiences around the topic helps to familiarize and immerse themselves, and be prepared for the session.

Although deeply involved in the Digital Euro project, the perspective of human values might be new for the participants. Therefore, a sensitizing booklet was developed to let the DNB employees think about the core values of privacy, safety, resilience and collective interest in their personal life, and recall memories where these values played a role. Finally, to make the link to the embodiment of values into product attributes, they were asked to bring along an object that was linked to the value memory they deemed most important.


Welkom!

Met dit boekje nodigen we je uit om de komende dagen te reflecteren op enkele waarden in jouw dagelijks leven, als voorbereiding voor de sessie van donderdag.

Bij DNB zijn we gewend aan een economische definitie van waarde, maar in deze opdracht kijken we naar menselijke waarden.

Menselijke waarden zijn:
1. De dingen die mensen of groepen belangrijk vinden in het leven
2. Overtuigingen die specifieke situaties overstijgen

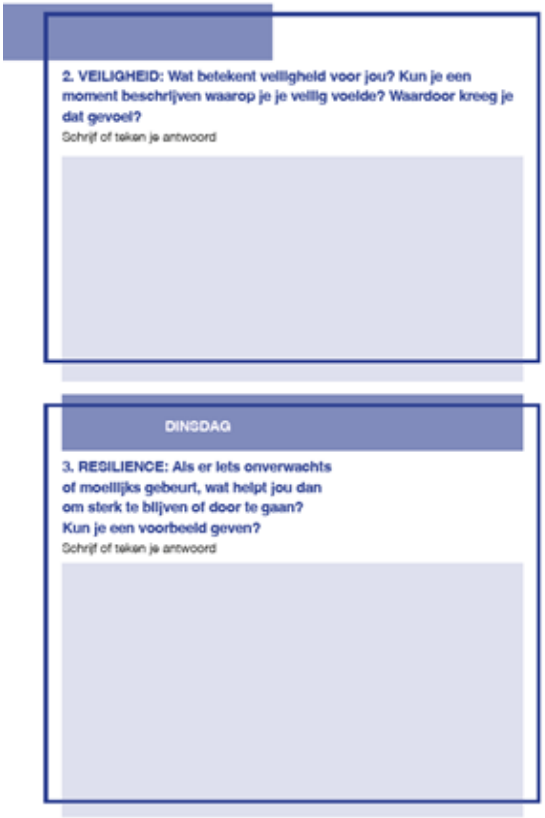
Waarden kunnen op verschillende manieren worden ingevuld. We gebruiken onze waarden als een lens om naar de wereld te kijken en maken er keuzes mee. Zo kan de waarde van vrijheid onder andere worden geïnterpreteerd als: "Ik mag gaan en staan waar ik wil" of "Ik kan zeggen wat ik denk". Je kan vrijheid ervaren in relatie tot andere mensen of objecten: Vrijheid ervaren omdat je kinderen het uit huis zijn, omdat je op Facebook je ongezouten mening kan delen of omdat je in je auto het land kan rondscheuren.

De komende dagen hebben we enkele vragen voor je. Probeer ze na werk in te vullen, om even uit je rol als DNB'er te stappen. Voel je vrij om je antwoorden te schrijven, tekenen of op een andere manier te documenteren. Voel je niet verplicht dingen te delen die je liever voor jezelf houdt. Veel succes en tot donderdag!

Groetjes,
Joost en Sterre

MAANDAG

1. PRIVACY: Wanneer en waarom is het voor jou belangrijk om iets voor jezelf te houden? Kun je een situatie bedenken waarin privacy voor jou belangrijk is?
Schrijf of teken je antwoord


2. VEILIGHEID: Wat betekent veiligheid voor jou? Kun je een moment beschrijven waarop je je veilig voelde? Waardoor kreeg je dat gevoel?
Schrijf of teken je antwoord

DINSDAG

3. RESILIENCE: Als er iets onverwachts of moeilijks gebeurt, wat helpt jou dan om sterk te blijven of door te gaan? Kun je een voorbeeld geven?
Schrijf of teken je antwoord

Session
At the start of the sessions the booklets and brought objects were discussed to get the participants warmed up. Then, the objects were discussed, after which the group split up and each chose one of the four values. My group chose privacy, since they felt most engaged with the topic.

The group started by defining the problem. This led to a discussion about the definition on privacy. After that, both groups started with a traditional brainstorm, producing as many ideas as possible. Next, they did a creative exercise with a metaphor, eliciting inspiration from another domain with a similar interaction.

Finally, all ideas were clustered into groups and combined into one concept for an offline D€, which was then presented to the group. The full session plan can be found in appendix 3.

Insights

The final concept “Standard anonymous paying” of the creative session can be seen in figure 7. The concept consists of several privacy interventions that all assume a default setting of high privacy measures, after which the user can later finetune their preferences in settings menu. Also, external audits were included to verify trustworthiness.

However, more importantly, to find the norms and assumptions of the policy makers, the sessions recordings were transcribed and the reasoning behind their ideas was analyzed. The underlying values, norms and resulting design requirements are added to the value hierarchy in the next chapter.

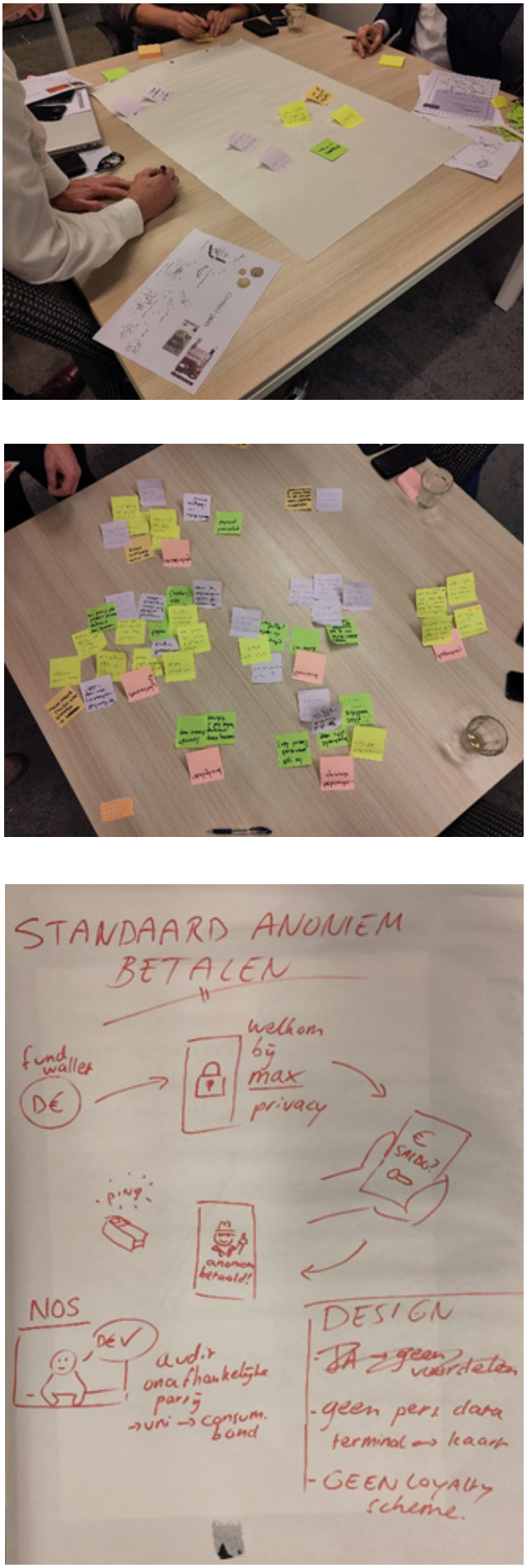


Figure 7: Process and outcome of the creative session

1.2 Values Hierarchy

To map out the relation between the values and the design requirements of the Digital Euro, a Values Hierarchy (2013) was made, focused around the value of privacy (figure 8). This framework consists of 3 layers where values are specified into norms, turning it into a rule, and often adding a usage context. In the next layer, these norms are specified into design requirements, explaining tangible characteristics of a D€. Although in literature these requirements should be measurable, in this early stage of the D€ project many requirements are not yet precisely defined.

A values hierarchy can be used for developing new products or to analyze existing products. It can have a top down process of specifying values into design requirements, asking “how?”, or a bottom up approach, where designs choices are analyzed to find underlying norms and values, with the question “for what sake?” in mind. This way it can help to concretize towards a design, or map out which values are at the core of a design. As an analysis tool, critical questions can be formulated based on a Values hierarchy, such as: are all relevant questions included? Are the relations between values, norms and design requirements appropriate? Do they satisfy the layers above and below? Or is something missing?

Based on the D€ progress reports (ECB, 2024) (ECB, 2025), an ECB privacy blog (Daman, 2024), topic specific presentations and the ECB website(European Central Bank, n.d., n.d., 2023, 2024a, 2025, 2025, 2024b; 2024c; 2024, and reasoning of policy makers during the creative session and an interview, I analyzed which values and norms are considered, and how they are concretized into envisioned designs. Various tensions were found between privacy and other values, these are described in the next section.

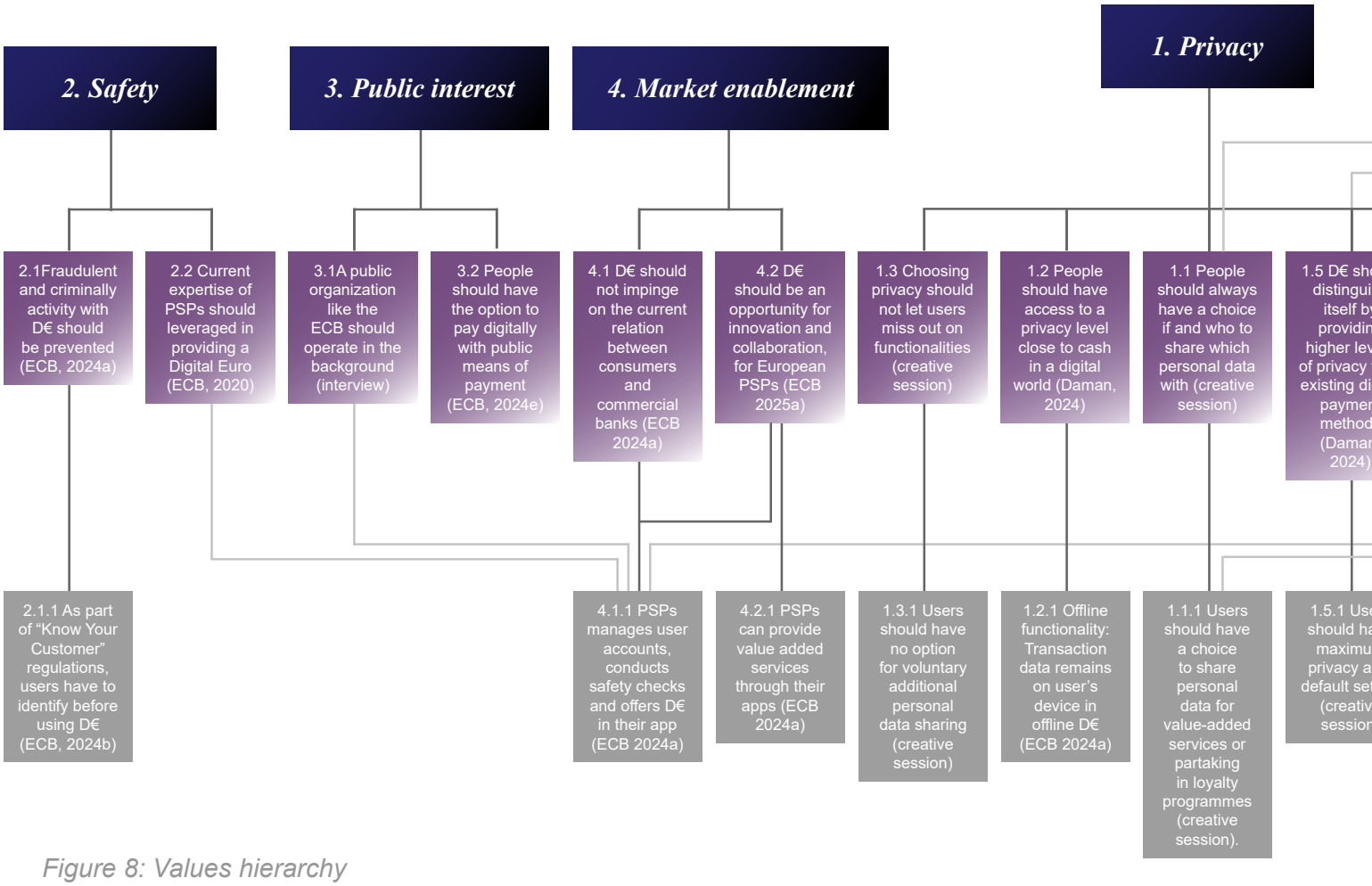
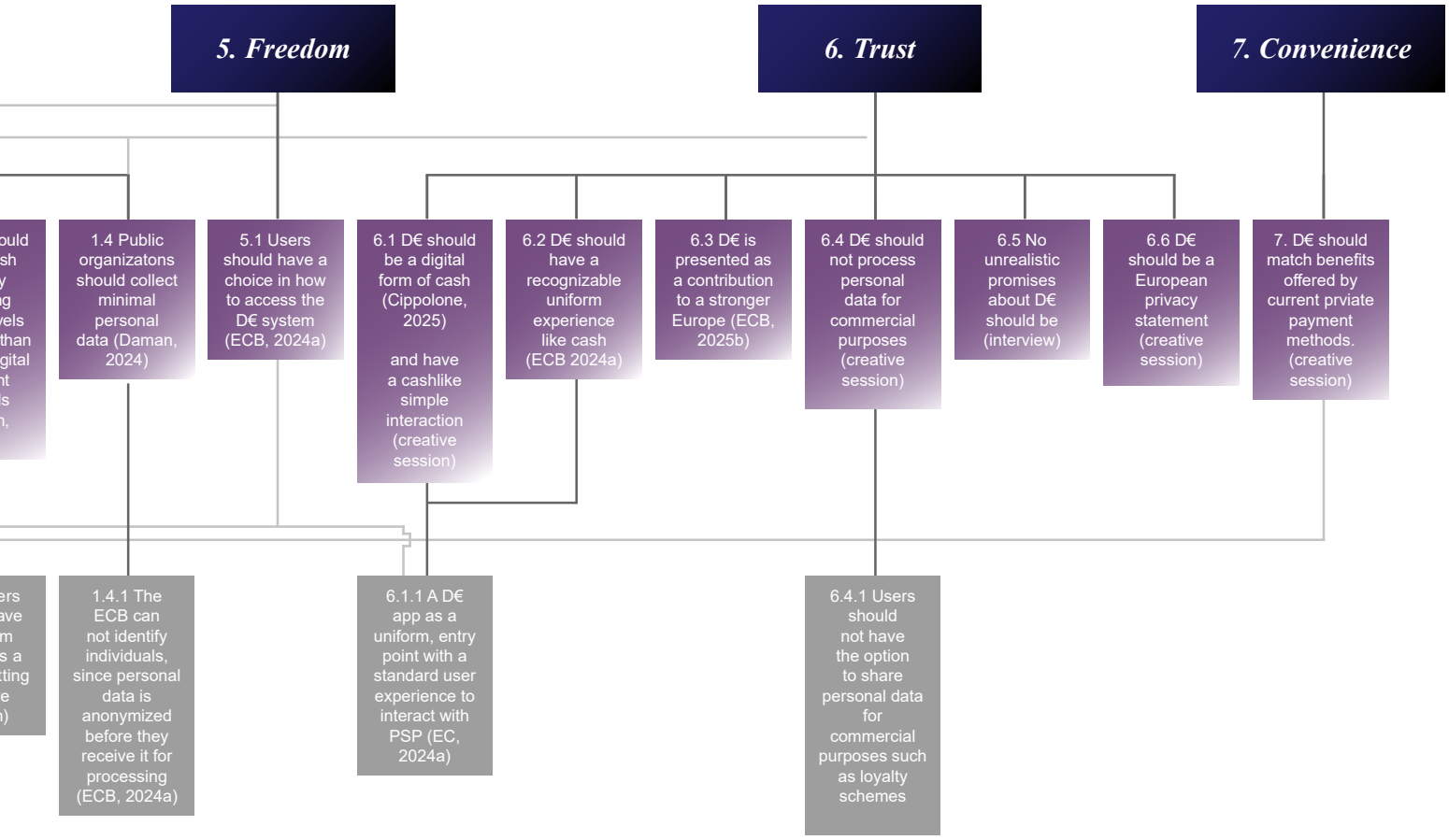


Figure 8: Values hierarchy


5. Freedom
6. Trust
7. Convenience
1.4 Public organizatons should collect minimal personal data (Daman, 2024)
5.1 Users should have a choice in how to access the D€ system (ECB, 2024a)
6.1 D€ should be a digital form of cash (Cippolone, 2025)
and have a cashlike simple interaction (creative session)
6.2 D€ should have a recognizable uniform experience like cash (ECB 2024a)
6.3 D€ is presented as a contribution to a stronger Europe (ECB, 2025b)
6.4 D€ should not process personal data for commercial purposes (creative session)
6.5 No unrealistic promises about D€ should be (interview)
6.6 D€ should be a European privacy statement (creative session)
7. D€ should match benefits offered by current prviate payment methods. (creative session)
1.4.1 The ECB can not identify individuals, since personal data is anonymized before they receive it for processing (ECB, 2024a)
6.1.1 A D€ app as a uniform, entry point with a standard user experience to interact with PSP (EC, 2024a)
6.4.1 Users should not have the option to share personal data for commercial purposes such as loyalty schemes

1.3 Tensions

1.3.1 Tension: Anonymity - Identification

While longing for privacy characteristics of cash such as anonymity, values of safety and trust call for higher identification of users when making a payment. How should the Digital Euro position itself on this axis?

Digital cash
On the one hand, the Digital Euro is often introduced as “Digital Cash” (Cipollone, 2025). Although this might be a logical association as the only reference point for public money, the ECB is actually interested in some of its characteristics, such as privacy.

During the creative session policy makers “dreamed of a digital traceless payment method”, just like cash. However, this was deemed unrealistic immediately, stating that digital systems leave traces per definition. Instead, the ECB envisions “cash-like” levels of privacy (European Central Bank, 2024) through the offline functionality, where transaction data stays between payer and payee during payments between persons and in physical stores.

“Personal payment data stays solely your bank, your friend’s bank, nor th the personal payments data.” (sourc

Safety measures
However, besides leaving no traces, cash also provides the user with anonymity, but copying this characteristic to D€ conflicts with satisfying the value of safety. As the ECB states: "User anonymity is not a desirable feature, as this would make it impossible to control the amount in circulation and to prevent money laundering." (European Central Bank, n.d.). Therefore, as with current payments, intermediaries are tasked with conducting “Know Your Customer” protocols: identifying users before opening a Digital Euro account.

Having to identify before being able to use offline D€ violates anonymity. While policy makers in the creative session wished for “maximum privacy as a default setting upon installing the app”, this envisioned "Know your customer" (KYC) identification would create a threshold before accessing the truly private environment. This is not the case when you are being handed a banknote by someone. Also, in an interview, a policy maker stated that no false promises should be communicated to the public. By selling the payment method as “digital cash”, full anonymity might be expected, causing disappointment when this is limited.

“Default is bare, or maximum priva settings. If you want to give away m you can do that in settings.” (source

Perceptions of safety
Besides the debatable question whether the system satisfying Anti Money Laundering (AML) regulations are a matter of “need-to-know” or “nice-to-know” (Milaj & Kaiser, 2017), safety measures also influence users’ perception of the system, which is more applicable to design. The ECB states that "fraud detection and prevention is a key demand by consumers and retail organizations and is crucial to ensuring trust in a digital euro." (ECB progress rep.). Similarly, this association is also “cash-like”, with research showing that around 50% of people perceive 200 and 500 euro banknotes to be mainly used for illegal activities (Panteia, 2021).

These two claims that both anonymity, the absence of identifying

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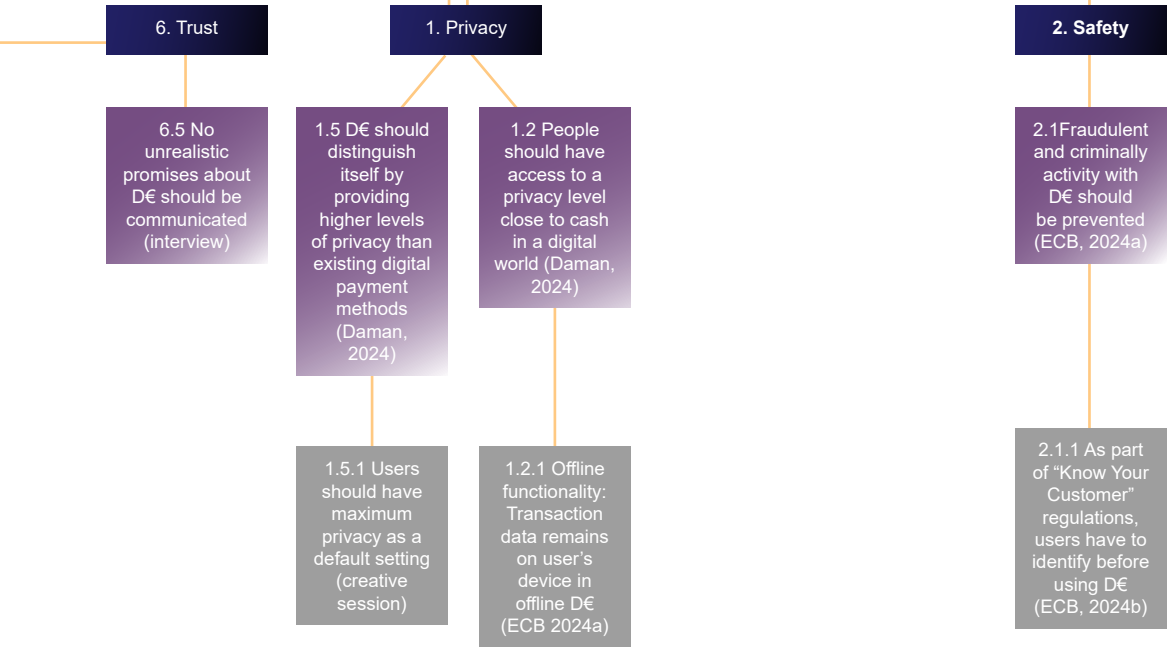


information associated with an interaction (Friedman et al., 2000), and “Know Your Customer” protocols, where one has to identify themselves, cause trust and a feeling that one is safe, correspond with research by Friedman (2000) on anonymity in online communities. She states that “on the one hand, anonymity can erode a climate of trust by making assessments of potential harm and good will of others more difficult. On the other, if we focus on protecting ourselves from the potential harm and ill will of others, then anonymity can help cultivate a climate of trust by putting in place greater safeguards.”. Translated to payments, the assurance that one’s personal data is not collected gives comfort, but the thought that other parties might use this aspect for the sake of criminal activities can create discomfort.

Conclusion

Striving for cash-like privacy is envisioned through an offline functionality, keeping transaction data between payer and payee. However, “cash-like” would logically also imply anonymity, not being able to be identified. However, due to safety regulations, identification towards a PSP is needed as part of “Know your customer” protocols, which would clash with policy makers’ desire for maximum privacy upon entering the app. This creates the question: to what extent would participants like to identify themselves towards the payment system to be able to pay? Would they be interested in full anonymity, just like cash? Or would safety concerns outweigh these benefits?

3.3.2 Tension: Public – Private

The Digital Euro project aims to provide consumers with public money in digital environments. But can it be considered "public" when it is issued by the ECB, but intermediated by private PSPs? Should its distinctive public nature be communicated? And how?

"The digital euro would exist
to people's growing preference

One of the goals behind the Digital Euro, is to enable consumers to use public money in digital environments, letting it innovate alongside other forms of money, and bring its benefits of risk-freeness and inclusivity to this "new" sphere where now only private payment methods are available.

The roles of PSPs and the ECB

At the same time, PSPs are still involved in distributing D€, to stimulate innovation for European payment parties, prevent excessive impingement on their current customer relations and leverage their existing expertise in this area. Their roles are to manage user accounts, carry responsibility for preventing fraud through safety protocols such as KYC and AML checks, and provide user access through their apps. This means that they will also be handling users' personal data. For smaller PSPs that cannot provide their own payment app, a separate, basic Digital Euro app will be made.

Besides practical reasons, the PSPs' involvement is due to the role that the ECB sees for itself as a public institutions. They believe they should not suddenly have 300 million customer relations and handle that much personal data, something that is not an issue with issuing cash. Therefore, they would rather operate in the background, providing the infrastructure and only handling pseudonymized user data.

Is Digital Euro a public good?

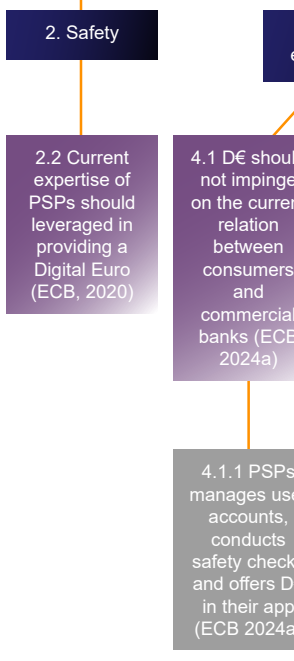
However, when facilitated by private parties, can the Digital Euro still be considered public money? According to the economical definition of a public good, something needs to be non-excludable and non-rivalrous, meaning that people cannot be excluded from its usage and that someone's consumption of the good does not prevent someone else from consuming it (Reiss, 2021).

While all money is rivalrous by nature, public money distinguishes itself from private money by being non-excludable, as opposed to e.g. banks, who have the possibility to reject people wanting to open an account. Since PSPs will have to accept all individuals wanting to open a D€ account, Digital Euro can be seen as a public good. This is similar to cash, where the infrastructure is also partly facilitated by private parties, such as Geldmaat, which is co-owned by the Netherlands' three big banks.

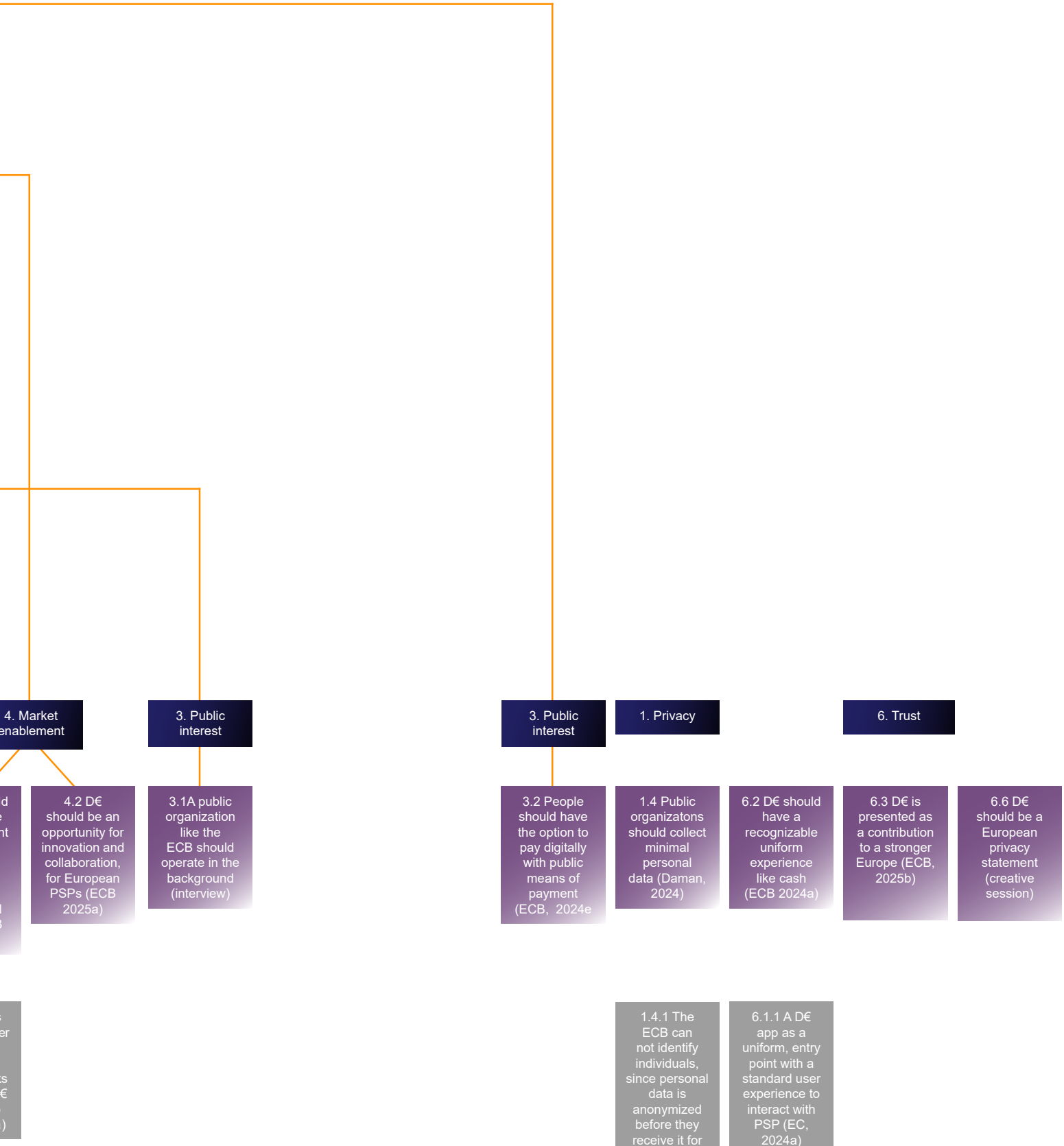
Communicating the nature of the facilitating party

As a physical product, the interaction with the issuer or distributer of cash is limited. With digital money, there is an ongoing technical dependency on the intermediating parties, the user is interacting in the digital environment of the PSP. Therefore, besides technically being a public good, we can ask: Does the nature of the providing party play a bigger role in the consumers' understanding and acceptance of the Digital Euro? Does it matter for consumers' trust and perception of privacy whether they interact with a commercial or public party?

On the one hand, trust banks is relatively high. According to research by DNB, 53% of people have lots of trust in financial institutions, a number that has been stable for years. (Vertrouwen in banken, verzekeraars en pensioenfondsen stabiel, 2024). Specifically when sharing (additional)



alongside cash in response
e to pay digitally"



personal data, (Bijlsma et al., 2021) show that people have most trust in their own main bank, compared to other financial and tech companies. Although, public institutions were not taken into account, another US study shows that in entrusting their personal data towards another party, consumers have higher trust in traditional financial institutions than government institutions, FinTech and certainly BigTechs (Armantier et al., 2021). If applicable to Europe, this would support the ECB in taking their preferred role in the background.

On the other hand, scandals around privacy might have erode trust in financial institutions, such banks looking into customers' personal data (NOS, 2024). In the end, banks aim for commercial profit and might be associated with that, which might conflict with the nature of public goods, described as "opportunities for public gain" by Ver Eecke (2013).

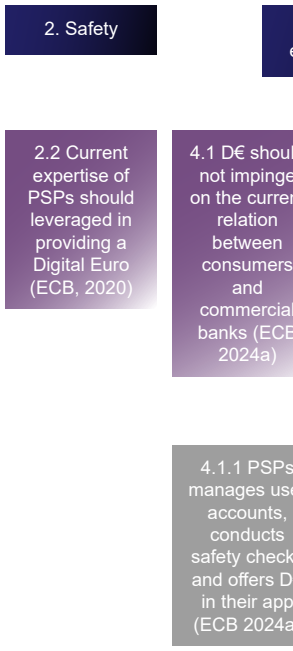
"What is perhaps even
is that the digital euro
Public institutions like
with payment data." (M

This difference is also emphasized by the ECB as an instrumental proof to convey its higher privacy standards. Also during the creative session, policy makers stated that it should be a "European privacy statement."

It is also mentioned as an intrinsic motivation of contributing to "A stronger Europe". This way, the public character can actually be leveraged for greater adoption. Research into consumption of public goods shows that when consumers buy a public good, they gain higher moral satisfaction. This corresponds with the "warm glow" effect, after buying sustainable products. The user feels better by contributing to the collective (Kahneman & Knetsch, 1992).

Showing character through design

Another consideration is D€'s relation to current private digital money. Already, in everyday payments there is little practical difference between the two. For instance, it is difficult to convey public money's risk-freeness, since our private bank accounts are protected by safety nets such as the Dutch Deposit Guarantee, covering our losses up to €100.000 when a bank goes bankrupt, which also hardly happens due to other protection measures. By presenting the Digital Euro through PSPs' apps, another one of public money's unique characteristics, collective gain, is obscured. This is different in the separate D€ app, where the ECB expresses a desire for a distinctive character, by comparing the Digital Euro to cash, stating that is should have "a recognizable uniform experience like cash". But considering that most PSPs in the Netherlands have their own app, this design might not reach the widespread recognizability of cash.



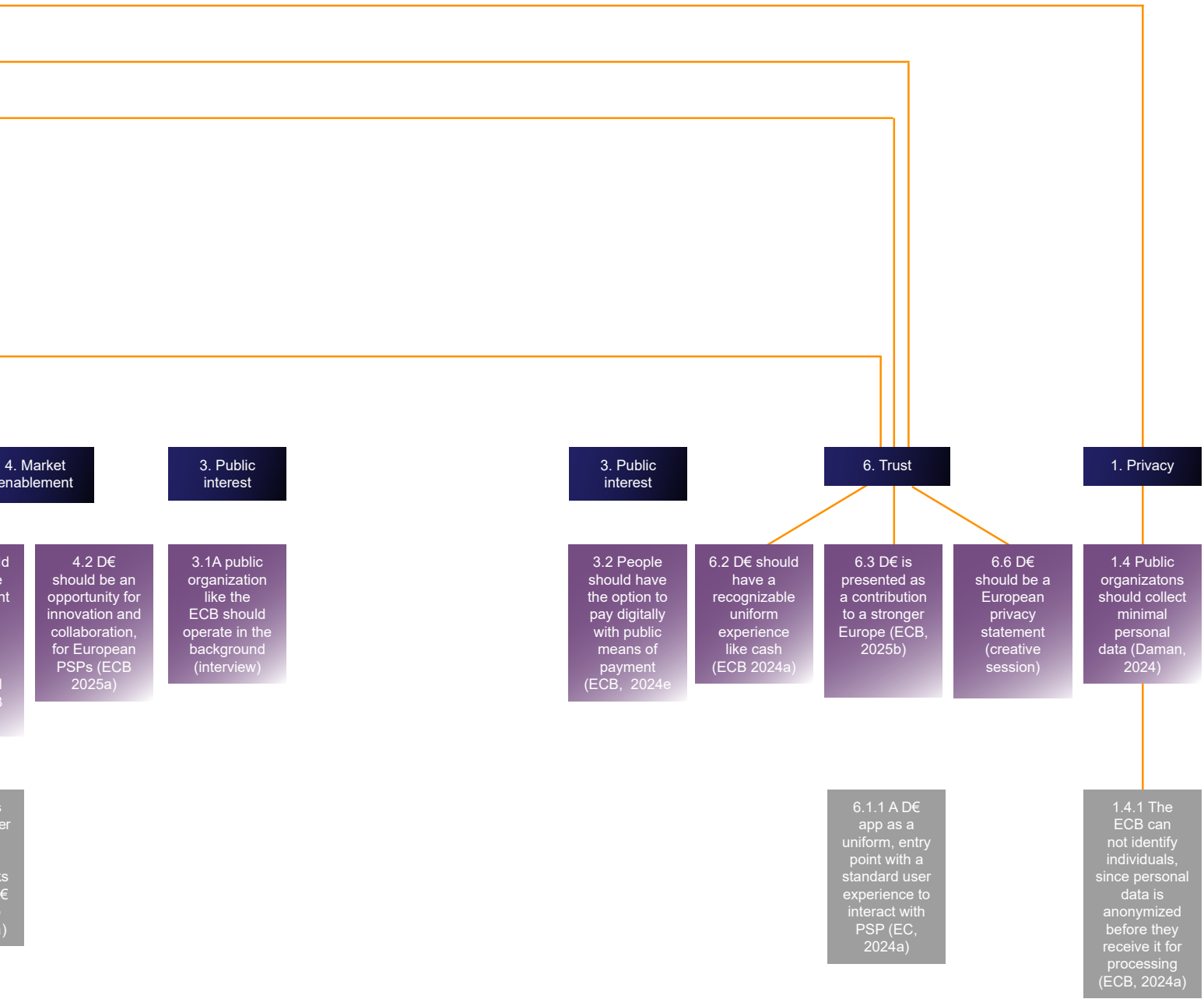
This is also sketched out by Vickey van Eyck from positive money (2024): "When there are two accounts in your bank app, and one of them is normal, like your current bank account, and the other has a maximum of 3000 euros and doesn't include interest. I think I know which one people would choose."

Conclusion

To stimulate collaboration, innovation and leverage existing expertise and customer relations, PSPs play a role in the Digital Euro of managing accounts and conducting fraud checks, and providing value- added services. However, presenting D€ in a PSP's app might conflict with communicating the European, public nature of the project and using this to convey integrity and contributing to a good cause. Also, it clashes with the wish for a uniform recognizable user experience, just like cash.

Would a public character convince consumers of higher privacy levels for the Digital Euro? Or would they not differentiate between parties in this way, or not care at all who to share money and data with?

more important than the technical details
is a public project. Why is that important?
the ECB have no interest in making money
Making the digital euro truly private, p. 3)



3.3.3 Tension: Choice - Determined

Autonomy is an important value in all levels of the Digital Euro project. Whether it is collective strategic autonomy of Europe's payment system, or individual autonomy of consumers getting an extra payment option in the Digital Euro. Also in the privacy debate, the degree of autonomy plays a role. Should users be given the freedom to choose which data to share with which parties? Or should we set a collective standard for data sharing to protect individuals?

Freedom of choice
The Digital Euro project aims to provide consumers with freedom of choice in their payments in several ways. On the one hand, D€ itself is framed as an extra option besides cash. Within the system, users would have a choice of which PSP to engage with as their account manager, and then whether they would like to prefer the ECB's D€ app, or their PSP's payment app.

Within that PSP's app, they would then have access to additional value-added services, such as account information services (e.g. spending insights), automated payments or split payments (Digital euro project team, 2022), requiring additional personal data.

This exchange aligns with developments in the European regulatory landscape, where initiatives such as PSD2 and the EU data act aim to remove barriers for creating one single European data market, enabling a centralized protected exchange of (personal) data, which would spur innovation, benefiting both businesses and consumers (source). Naturally, this requires the informed consent of consumers. However, this presumes that individuals can make rational choices about their own privacy when given these consent mechanisms.

To choose or not to choose?
During the creative session, the policy makers revealed a fundamental divide. Some argued that individuals should retain the ability to exchange data for additional benefits, matching their current functionalities of private payment systems.

Others contended that such a system would create an unfair divide: those who value privacy would be penalized by missing out on services.

Instead, they preferred to set a default standard of maximum privacy, without giving a choice for additional data sharing. A certain simplicity like cash. Not only would this protect people, it would also distinct itself relative to other payment services, and make a European statement about privacy, which would also distance them from commercial associations around data sharing.

"In any case, we don't want our data being commercially. That is a Unique Selling Poin compared to private money"

The policy makers revealed a tension between on the one hand providing users with individual freedom and autonomy, seeing them as rational actors that can decide for themselves when informed properly, which corresponds with the following definition:

"Privacy is the claim of individuals, groups, or institutions to determine for themselves when, how and to what extent information about them is communicated to others." (Stanford Encyclopedia of Philosophy, 2023)

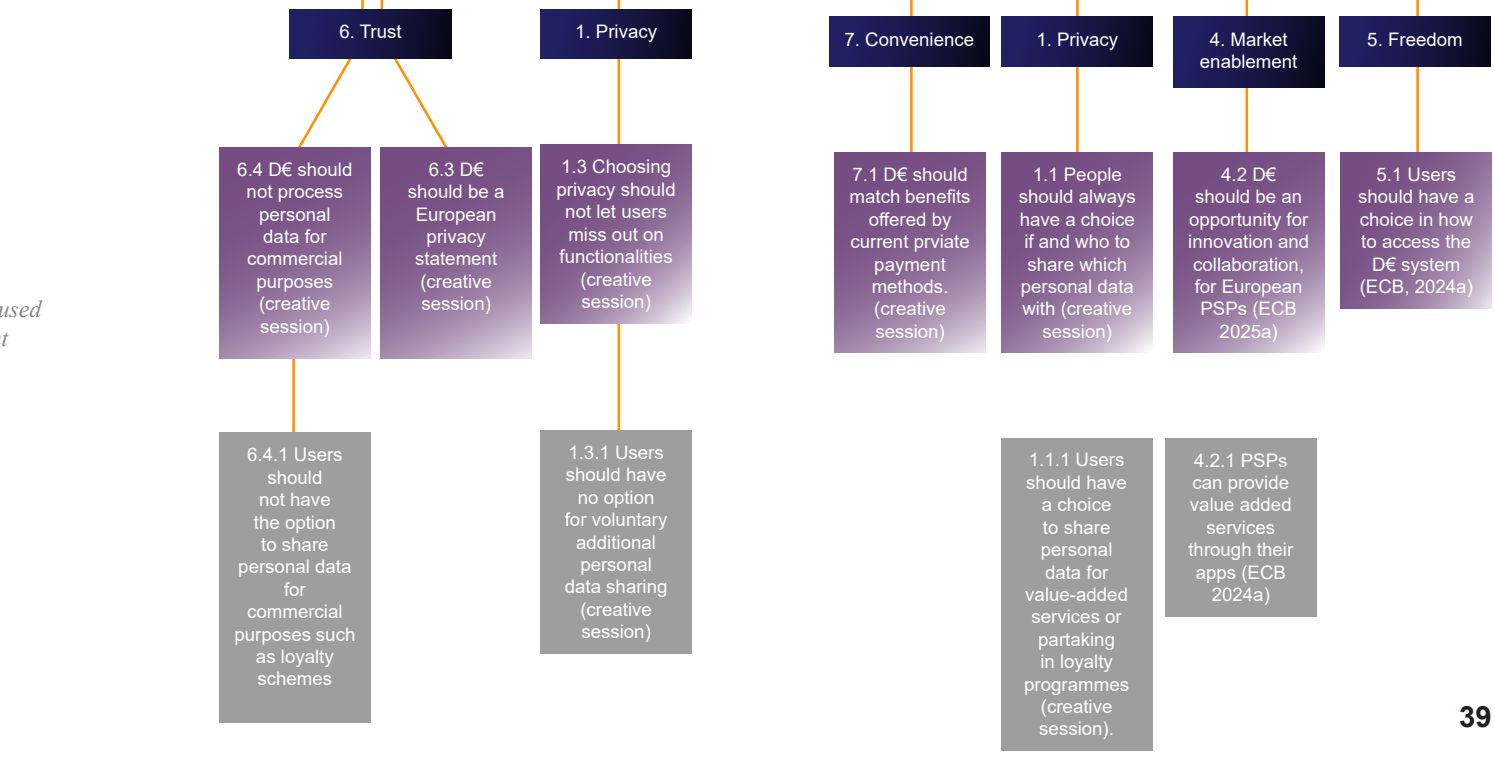
On the other hand, when viewing this choice in relation to other users, and other payment methods, policy makers argued that it would not fit

"Having control yourself, you give that by giving a choice. Choosing who to give data to. .... There are people who would like loyalties."

"But people do get those benefits with Mastercard and Visa, we'll make it difficult for ourselves."

"I don't agree, if you don't want to share, you miss out on all kinds of things, just like rejecting cookies ... anonymity should not be punished, like now."

"You also have to stand for something. In Europe we deem privacy important, you have to stand for that."



the character of the Digital Euro. According to literature, another reason for limiting choice is the privacy paradox, a phenomenon describing the discrepancy between intent and usage of how people handle their personal data: individuals claim to value privacy, but easily give their personal data away during transactions for minor benefits.

Rather than hypocrisy, this is due to several mechanisms. On the one hand, risks are abstract and reminders raising privacy awareness are often absent, while the benefits of data sharing are very visible and tangible. Also, the cognitive load of making an informed decision plays a role. Described as the concept of “bounded rationality”, people have limited ability to acquire, process and remember information, thus they apply a simplified mental model to the situation (source). However, if people have difficulty acting according to their long-term privacy interests, to what extent is it ethical to frame privacy as an individual responsibility?

Conclusion

The wish of providing users with choices of which data to share with whom, in exchange for value added services or loyalty programs, clashes with the wish of not providing options for additional data sharing, but rather determine a standard of low information sharing, because otherwise people choosing privacy would miss out. Also, if people have difficulty acting according to their long-term privacy interests, to what extent is it ethical to frame privacy as an individual responsibility? Should privacy become a market choice in exchange for benefits? Or would that make privacy a luxury and should data protection instead be a public good?

The following tensions have been found and will be explored in the following design phase:

1

Access D€ through a public party
for the sake of:

1 **Privacy**
1.4 Public organizatons collect minimal personal data
3 **Public interest**
3.2 People should have the option to pay digitally with public means of payment
6 **Trust**
6.2 D€ should be a European privacy statement
6.3 D€ should have a recognizable uniform experience like cash
6.6 D€ is presented as a contribution to a stronger Europe

or

Access D€ through a private PSPs app
for the sake of:

4 **Market enablement**
4.1 D€ should not impinge on the current relation between consumers and commercial banks
4.2 D€ should be an opportunity for innovation and collaboration, for European PSPs
3 **Public interest**
3.1 A public organization like the ECB should operate in the background
2 **Safety**
2.2 Current expertise of PSPs should leveraged in providing a Digital Euro

Would a public character convince consumers of higher privacy levels for the Digital Euro? Or would they not differentiate between parties in this way, or not care at all who to share money and data with?

2

Full anonymity in payments, like cash
for the sake of:

1 **Privacy**
1.2 People should have access to a privacy level close to cash in a digital world.
1.5 Users should have maximum privacy as a default setting.
6 **Trust**
6.5 No unrealistic promises about D€ should be communicated.

or

Identify towards PSP before using D€
for the sake of:

2 **Safety**
2.1 Fraudulent and criminally activity with D€ should be prevented

To what extent would participants like to identify themselves towards the payment system to be able to pay? Would they be interested in full anonymity, just like cash? Or would safety concerns outweigh these benefits?

3

Option to share additional personal data for benefits
for the sake of:

1 **Privacy**
1.1 People should always have a choice if and who to share which personal data with
4 **Market enablement**
4.2 D€ should be an opportunity for innovation
7 and collaboration, for European PSPs
7.1 **Convenience**
D€ should match benefits offered by current private payment methods.

or

One standard of low information sharing
for the sake of:

1 **Privacy**
1.3 Choosing privacy should not let users miss out on functionalities
6 **Trust**
6.4 D€ should not process personal data for commercial purposes
6.3 D€ should be a European privacy statement (creative session)

If people have difficulty acting according to their long-term privacy interests, to what extent is it ethical to frame privacy as an individual responsibility? Should privacy become a market choice in exchange for benefits? Or would that make privacy a luxury and should data protection instead be a public good?

Phase 2: Translating to Design

In the second phase, insights from the analysis are translated into app prototypes, to be used for user research with consumers and serve as inspiration for future design steps.

The extremes of the three tensions are combined into speculative prototypes, each representing that respective fictional, exaggerated approach to privacy. This is done to immerse the user in a payment scenario and confront with dilemmas regarding their privacy. This way, they can reflect on their behaviours and values in such a known, mundane interaction like paying.

To move from three tensions to high fidelity research artefacts, they all get a user journey consisting of an onboarding, payment and overview phase. Besides, they are further enriched with trust mechanism and familiarized through standard design patterns.

Then, each design direction's exploration of literature results in a design goal, which, after finding inspiration and going through design iterations, results in the final designs, showcased at the end of this phase.

Contents

2.1 Design approach

The design of interface prototypes serves two goals. On the one hand, they embody the value tensions and serve as research artefacts for the evaluation in phase 3, where I elicit the values around privacy for users when making an in-store payment. On the other hand, they serve as a form of ideation for the Digital Euro project, as hyperbolic concepts that broaden the possible design space for the design team to explore later on. Together with the insights from the user research about consumers' prefered “configuration” of privacy, these insights might inform the future design of a more moderate, realistic Digital Euro prototype.

2.1.1 Prototypes as research artefacts

The prototypes are designed with the aim of being research artefacts to assist in later user research. This approach is partly inspired by the work of (Alfrink, 2024), who used a constructive design research approach in his thesis. This uses the making of things as a primary vehicle for knowledge generation. During user testing, the aim is not to evaluate these prototypes themselves, rather, they are instruments for generating data about a phenomenon, in my case privacy in payments.

But how can a mundane interaction such as paying elicit these types of reflections? In a research on the Bristol Pound, a local, complementary currency in the city of Bristol to encourage local businesses, researchers found that the nature of this new currency helped elicit reflections on people behavior when using money. “Drawing on people’s experiences around the use of the £B—a different kind of currency—allowed for a more critical examination of taken-for-granted assumptions underlying how we do transactions and, more generally, money.” (Perry & Ferreira, 2017).

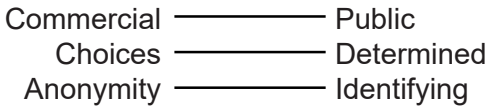
Similarly, by designing for the extremes of the value tensions, exaggerated approaches to privacy, users are confronted with critique and speculation. They showcase possible future scenarios and corresponding consequences (Auger, 2013). Through usage, users are forced to position themselves and examine their own behavior and thoughts around privacy in payments.

2.1.2 Broadening the design space.

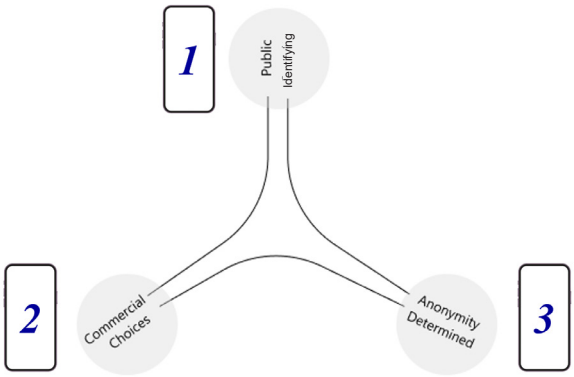
Also, the extreme prototypes might serve to broaden the design space for D€. In design research around the repairability of household appliances, (Vooren, 2024) translated her conceptual framework about product attachment into a design space by filling it with speculative prototypes that embodied various attachment perspectives from theory. This way, she emphasized the endless possibilities of embodiment and stretched the idea of what a sandwich maker could be. Similarly, the hyperbolic nature of these prototypes aim to serve as inspiration for future design steps done by the D€ project team at the ECB.

2.1.3 Comparable journeys

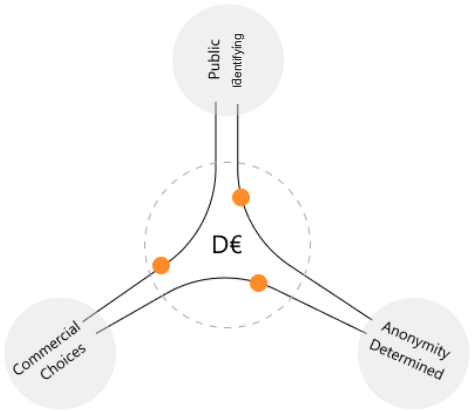
In order to keep the user journeys short and comparable, all payment apps consist of roughly three phases: Onboarding, Payment and Overview. These phases correspond with research by (Perry & Ferreira, 2017) on Moneywork: the interactional work when paying with money. They identify three phases: Pre-transaction, at-transaction and post-transaction. Pre-transaction involves preparation and alignment: assigning funds, deciding where to spend. At-transaction involves readying the payment device and the central act: making the payment. Post-transaction involves the disengagement and closure through sharing and housekeeping of money.



Tensions found in the values hierarchy



Tensions extremes are embodied in three prototypes



Users' preferred configuration of tensions provides new design space for D€

Figure 9: Overview of how the tensions translate into the prototypes and serve the research

Although the phases do not have clear boundaries, the acknowledgement that a payment is more than holding somethign against a terminal enriches the interaction.

By first slowly introducing the prototype's privacy approach and setting up preferences, the user prepares for the central moment: the payment, which only lasts shortly. Afterwards, the user can reflect on their earlier actions and choices by seeing the consequences of their decision in the overview, which is a natural transition to the interview.

In these journeys, the apps pose certain unusual dilemmas or situations that support asking evaluative quesitons to the user: is this all right or not all right according to their values? For example, when users arrive at a choice menu for which institution to log in with: the ECB, commercial banks or Apple, they are asked to evaluate which party they rather trust with their personal data. They justify their choices with their values.

2.1.4 Standard design patterns

To immerse users in the usage of the apps, a certain level of familiarity was needed. High fidelity prototypes were created by drawing inspiration from common design patterns in

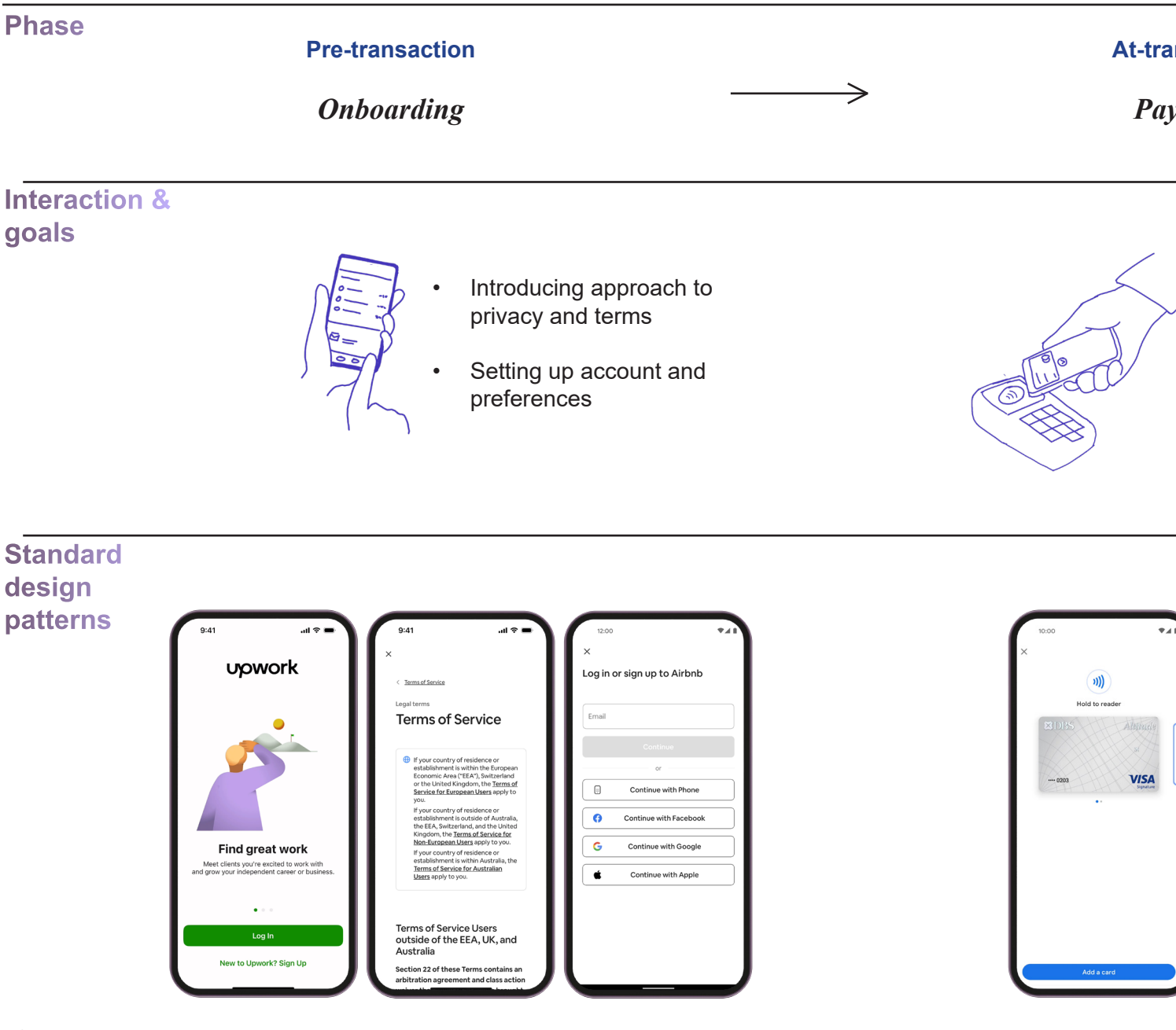


Figure 9: Overview the user journey

(payment) apps around onboarding, payment interactions, warnings, progress indicators and overview pages. Some examples are given in figure 9.

2.1.4 Trust

Furthermore, creating high fidelity interface designs based on just two value tension extremes is challenging. To enrich the apps, I consulted various literature on trust and design inspirations, to inform what a payment app with that privacy approach could look like. This results in a Design Goal and interaction qualities as a basis for design.

nsaction

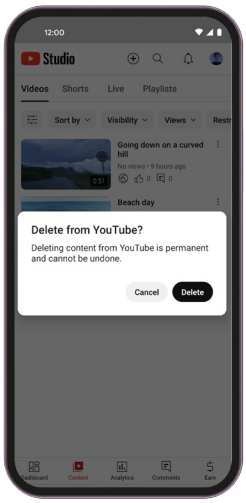
yment

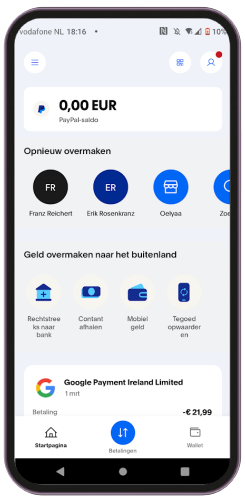
Post-transaction

Overview

- Central interaction
- Agreeing the exchange
- Enacting payment using terminal

- Viewing consequences
- Imagining long-term use
- "Housekeeping" of money and data





2.2 Design directions 1: Public & Identifying

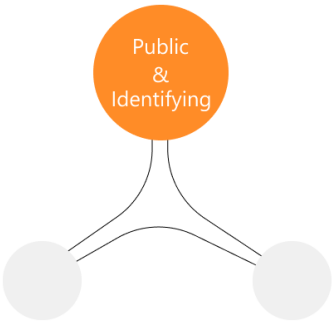


Figure 10: Tension extremes for this design

This design direction represents the following extremes:

- A means of payment fully facilitated by a public party
- A means of payment where one is fully identified towards the intermediary.

And magnifies the following norms and design requirements:

- 6.3 D€ should be a European privacy statement and a contribution to a stronger Europe.
- 3.2 People should have the option to pay digitally with public means of payment.
- 2.1.1 As part of "Know Your Customer" regulations, users have to identify before using D€

4.2.1 From tension to design

The following inspirations and literature were consulted to move from the value tensions extreme to a payment app prototype:

A European identity

While the European Central Bank would be a logical public party associated with facilitating a fully publicly facilitated payment app, their relative unfamiliarity among people made me instead use the European Union as a central party.

This is done, because this familiarity might contribute to trust. As (Riegelsberger et al., 2005) describes, people's past experiences with a certain party influence whether someone trust future interactions with that same party. To leverage this, parties should maintain a stable identity, so users can associate them with positive past experiences that reinforce trust. However, this might also be the case for negative experiences. Therefore it is important to carefully consider associations that come with branding D€ with a European character or introducing a new brand.

Since this prototype aims to fully associate users' experience with a public institution facilitating it, the European Union logo and colors will be prominently displayed

Aligned interests

Beyond visual design, (Riegelsberger et al., 2005) points out that building group identity can help users to believe in shared norms to users, and act accordingly. Conversely, when users see that a the payment system follows integrity, benevolence and internalized norms in their acting, the need for additional trust signals decreases.

Therefore, this prototype will approach the user as part of the collective and talk from the perspective of "us".

Shared European goals

Taking this alignment one step further, Teicher et al. (2006) mentions that having common goals and even shared responsibilities might increase trust in relations. Since collective policy goals in the end serve the interest of the people, such a public payment app dependent on individual consumer uptake might as well directly communicate its raison deter.

Therefore, this prototype will connect the ECB's interests with the interest of the user.

According to research by (Kahneman & Knetsch, 1992), contributing to public goals in consumption choices, can give people a feeling of moral satisfaction and create "warm glow" feelings. This also happens when consumers buy sustainable products, which also raises their enjoyment of the product according to (Tezer & Bodur, 2020).

Therefore, this prototype will stimulate users to contribute to public European goals.

Full identification

Entrusting one's personal data to a public party matches well with the tension extreme of maximum identification, where proving

one's citizenship to the government is as "known" as it gets. This topic touches upon the work of design agency Koos, now working on the development of a Dutch national identification wallet. During a visit to their studio, they shared a finding from their user testing: People blindly share all their data with parties after logging in with their DigiD, the Dutch e-identity service. Because of such high trust and associations with safety, people thought their data sharing behavior was fully protected by government regulations.

Inspired by this example, this prototype will let people identify themselves using their DigiD, fully identifying themselves into a public payment environment.

Design Goal

Combining the tensions and the abovementioned theory, this prototype approaches privacy as contextual integrity (Nissenbaum, 2004): creating a new privacy context of "payments *in Europe*", where it tries to set new norms for appropriate information flows when making a payment, and tries to stimulate users to follow these norms. This results in the following design goal:

Let users build trust in privacy by providing a fully public, European payment app that urges users to follow its norms and shared goals for personal data sharing, creating a collective identity. Let users verify themselves as "part of the group" through DigiD.

Interaction qualities

The following interaction qualities have been chosen for this prototype:

- **Paternalistic**
- **Normative**
- **Community-building**

Figure 11: Perception of the intermediary

The intermediary is experienced as a central, normative party, trying to get users to follow their lead.

European visual identity
A clear inspiration for the public branding was the European flag and it's colors, communication also currently used by the ECB to "sell" the public nature to consumers (European Central Bank, 2025)

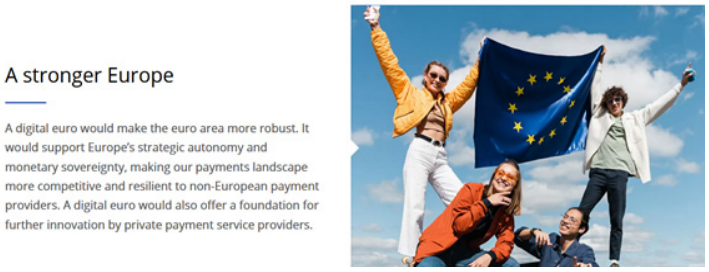


Figure 12: Contributing to Europe as advertisement for Digital Euro

Pushy app design
For design inspiration for urging people to follow your advice , I looked at Duolingo, a popular language learning app with an owl mascot "Duo" motivating users to do their daily lesson. Over time, Duo has become notorious in pop culture for passive aggressively pushing users to come back to the app. By notification and emails not shying away from a pushy or disappointed tone, Duo stalks its users, (which has now become a running joke). After they eventually do their lesson, users get rewarded by increasing their ranking compared to other users, a mechanism which also served as inspiration for my design.

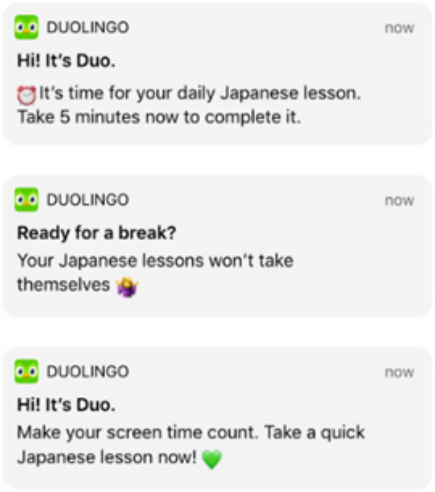


Figure 13: Pushy reminders of Duolingo

Persuasive choice menus
Another tactic is giving people the illusion of choice through designing suggestive interactions. These can be found in interface design of cookies, where big, green "accept" tempt users to click the pop up away and get it over with, while the reject links is smaller or even hidden away in a second menu layer after general titles such as "more information".

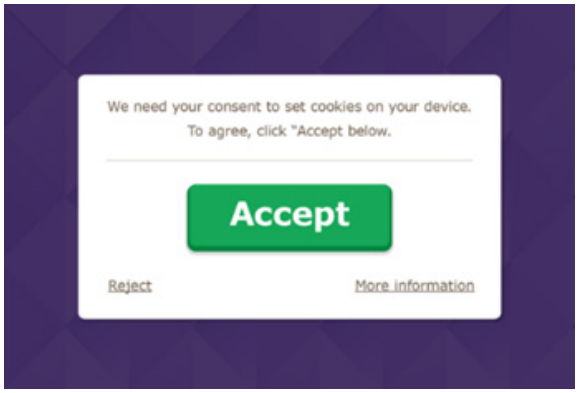


Figure 14: Persuasive button design

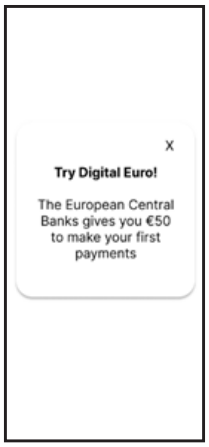
Iterations

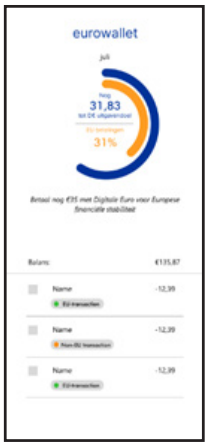
Some of the iterations of the interface design are shown with considerations behind them. Many ideas were discarded after the diverging phase to converge to a focused 3 step journey for the user research.

Biometric identification

Biometric identification was considered as a form for ultimate identification, however discarded for testing purposes

Empty overview and starting funds from EU





It was considered letting users arrive at an empty homepage after onboarding, as usually is the case. To prevent confusion and give an impression of longer usage, I chose for a “filled” overview page at the end was.

As part of setting up the app, I considered adding a step of funding. In this case, the ECB would give the user some starting credit, giving a feeling of “winning them for the cause”.

Collective goals and inviting friends

To further motivate users to become part of the collective, notifications and a separate page tracking the collective goals were created. Here, the latest (curated) European news would be shared and the amount of D€ users displayed. Users would be asked to invite others as a direct form of community-building.

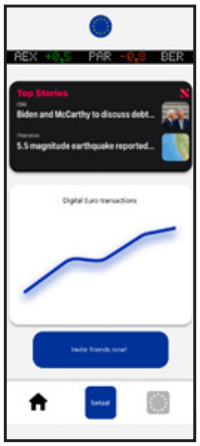


Figure 15: Overview of iterations

2.3 The EU prototype

1.1.1 Introduction of EU involvement

Onboarding starts with a GIF showing the benefit of this prototype: supporting Europe with your payments.

Goal:
It aligns the individual's interest with the interest of the collective, creating a feeling of shared goals.

Flag emphasizes European, public identity.

User is framed as part of the collective.

1.1.2 EU loading screen

A loading screen features a rotating EU logo as a loading animation and communicates the name and slogan to the user.

Goal:
Introduce the app's visual identity and reinforce group identity and shared norms.

Colors and stars emphasize European identity.

Slogan aligns goals of the user with the EU.

1.1.3 Log in with DigiD service

Users have to select their region and log in with their national electronic identity service

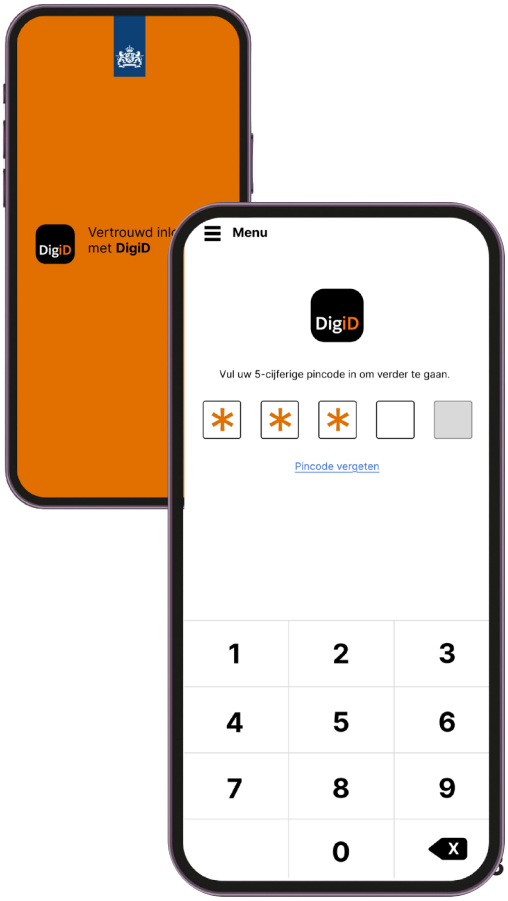
Question:
“Is it okay or not okay to log in with DigiD in your payments environment?”

Goal:
Build trust through a secure, familiar identification.

1.1.4 DigiD app mockup login

Users are redirected to a mock-up DigiD app, where they can “log in” and connect their citizenship to the payment app.

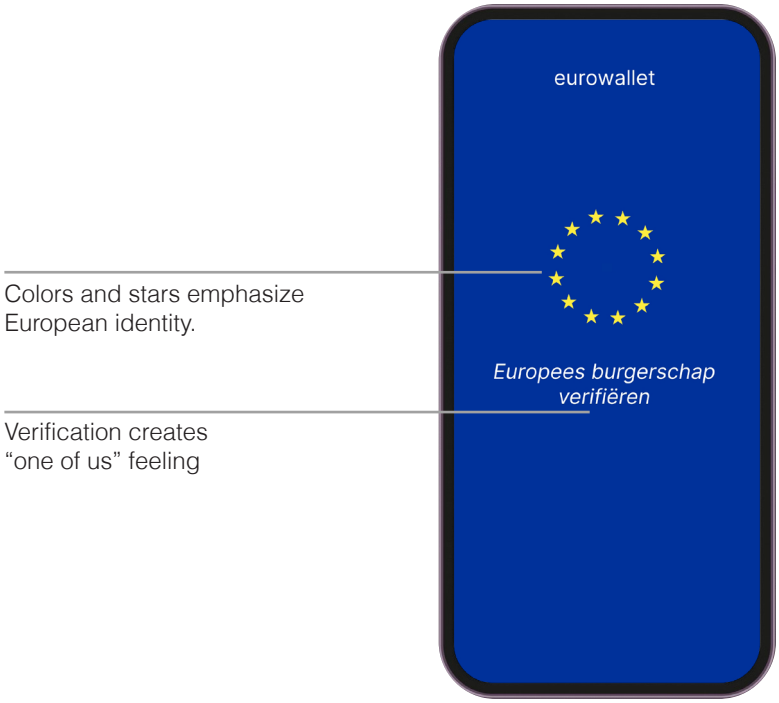
Goal:
Immerse the user in the scenario by making the identification feel real.



1.1.5 Verification page

Users arrives in the loading screen, verifying whether they are a European citizen.

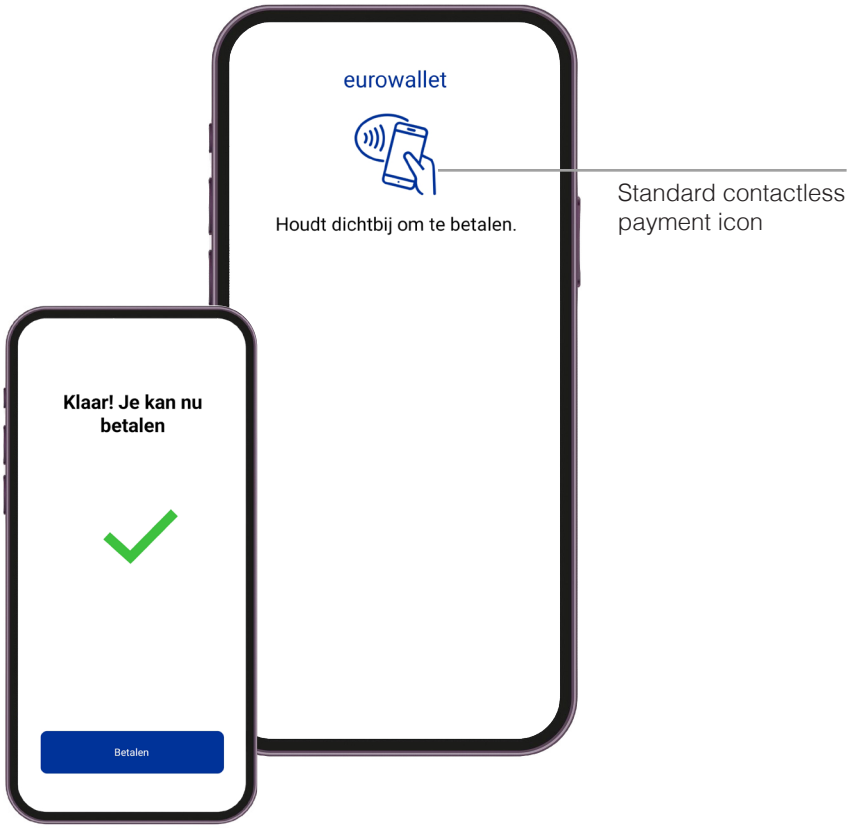
Goal:
Emphasizing the European identity and the user's inclusion in the collective.

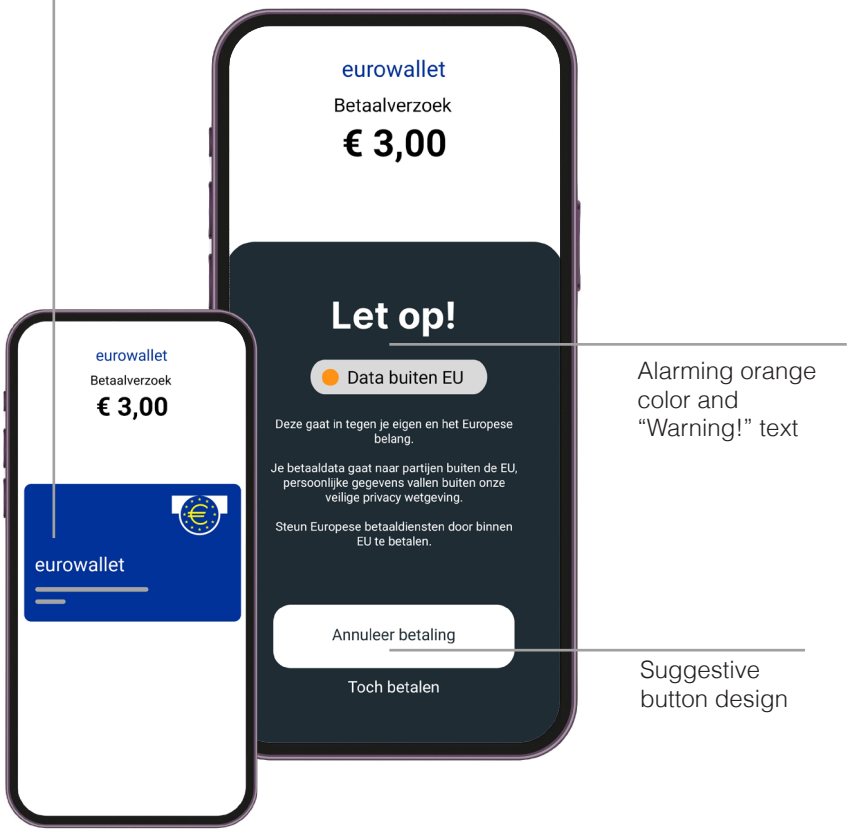


1.1.6 Finish and ready to pay

The onboarding phase is closed with a standard confirmation and contactless payment instruction. The user can now pay.

Goal
Guide user to payment phase.





The user is presented with a virtual payment card. When holding the phone against the terminal for payment, a warning interrupts the transaction.

The user is warned that their personal data might leave the EU and its legislation, due to the involvement of a non-European intermediary, such as Mastercard. It is emphasized that this goes against their own and Europe's interest. They then get the choice to cancel or continue paying.

Question:
"Is it okay or not okay to get such a warning from the EU when trying to pay?" (and would you follow the advice?")

Goal:
Pushing new norms around paying in Europe.

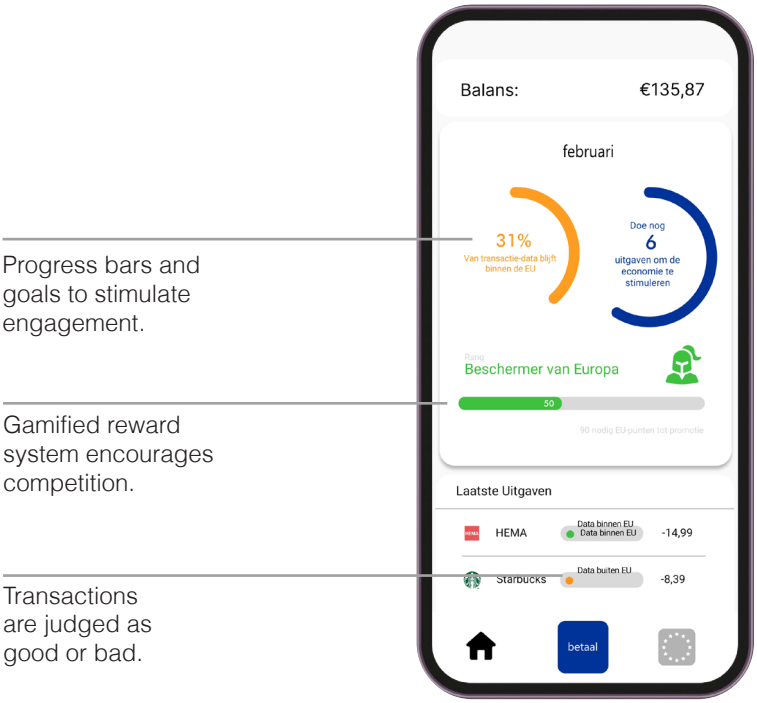
Aligning of European and individual interests.

1.1 European goals in payment overview

After making a payment, users arrive at the homepage, where they are confronted with three progress bars indicating their progress in keeping personal data within Europe, contributing to the European economy and partaking in a reward system. Besides, standard information such as a latest transactions and account balance are shown. widget

Question:
"Is it okay or not okay for such European public goals to be motivated in your payment overview?"

Goal:
Creating a shared responsibility for public goals through persuasive design choices.



2.4 Design directions 2: Anonymous & Determined

This design direction represents the following extremes:

- A means of payment with a determined standard of information sharing without choice.
- A means of payment providing full anonymity.

And magnifies the following design requirements:

- 6.1.1 A D€ app as a uniform, entry point with a standard user experience to interact with PSP.
- 1.2.1 Offline functionality: Transaction data remains on user's device in offline D€
- 1.5.1 Users should have maximum privacy as a default setting
- 1.3.1 Users should have no option for voluntary additional personal data sharing
- 6.5 No unrealistic promises about D€ should be communicated

4.3.1 From tension to design

Familiarity to Cash
The ECB often refers to the Digital Euro as "digital cash", an analogy which is supported by trust theory by Luhmann (1979). He states that "familiarity is a prerequisite of trust because it creates a framework and understanding of the environment and the trusted party within which the expectations of trust can be explicated.".

Considering the hyperbolic design approach, it might be interesting to fully leverage this familiarity and literally copy cash interactions to a digital payment app. This might build trust, since users know what to expect from handling the money. Besides, they might transfer cash characteristics, such as anonymity, to digital payments, when those payment interaction becomes familiar and cash-like.

This prototype use skeuomorphism, a familiarity to physical cash, to build trust and elicit associations with anonymity.

Tangible interaction
According to Riegelsberger (2005) and (Wang & Emurian, 2005), physical assets

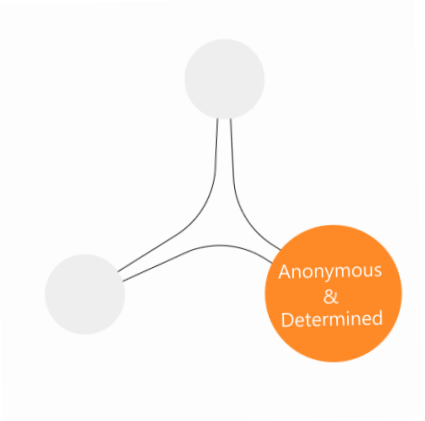


Figure 16: Tension extremes for this design

or material elements help signal that the interaction takes place in an institutional web. Taking this materiality to an extreme, the similarities to cash need to go beyond visual design. By designing interactions that convey similar tangibility of physical interactions, using haptics and gravity simulations, the cash-likeness and locality of the money might be further conveyed to user. The aim is to let users create a mental model that, this depicted money is stored inside their phone like a wallet.

Also through typical cash-like interactions, the physicality can be conveyed. This can be done for instance by letting users hand over separate digital bills and coins, approaching a similar "pain of payment" to cash, and by letting them stack bills for counting, similar to classic envelope budgeting (Hingh, 2023).

This prototype mimic physical usage of bills and coins by copying their haptics, physics and how we handle them.

Symptomatic anonymity
As mentioned before, symptoms are stronger signals than symbols. By proving anonymity rather than preaching it, users might trust the app more easily. This can be done by never letting the user identify before usage, just like cash or anonymous gift cards, the app shows a symptom of its anonymity. Users never shared their personal information, so they know the app will not be able to collect it.

This prototype never asks users to log in into the system. They're warned upfront that

they're on their own now.

Absence of information as proof
Although not a symptom, not providing information or functionality might "prove" to users that the required personal data also is not collected. For instance, by not showing a balance or transaction history, the system tries to convince users that no insights are gathered by collecting data from money and transactions in the app.

Besides, this absence of information would also mean an absence of communicating risks, which corresponds with theory by Luhmann (1979), stating that absence of negative signals might increase signal.

Any form of aggregated information is not shown to the user

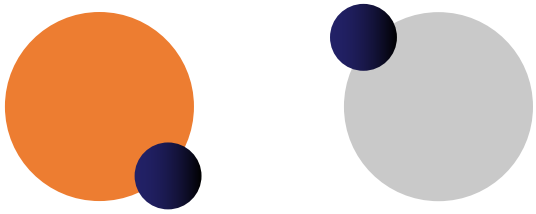
Design Goal

Combining the tensions and the abovementioned theory, this prototype approaches privacy as seclusion (source), away from commercial parties or institutions. This results in the following design goal:

"To let users build trust in privacy by giving them a simple offline payment method, secluded from third parties or settings that request attention, that conveys its locality and anonymity by copying many familiar characteristics from cash to mobile payments."

Interaction qualities:
- **Secluded**
- **Simple**
- **Tangible**

Inspiration



The intermediary is experienced as an absent party, that is no longer involved after handing over the payment instrument.

Figure 17: Perception of the intermediary

Skeuomorphism
This principle of “retaining ornamental design cues, necessary in the original design, on derivative objects” is called skeuomorphism, and is often used to “make something new feel familiar in an effort to speed understanding and acclimation.”. This design approach became famous from early iPhone UI designs, where e-books where placed a wooden shelve and the dictation app interface depicted a retro microphone. As people have grown accustomed to digital interfaces, and original objects are no longer used by new generations, the need for skeuomorphism fades, making their ornamental designs look kitsch (Worstall, 2012). Using this mechanism to create familiarity might create different reactions based on people’s preferred payment methods and digital literacy.

Figure 18: Skeuomorphic Apple designs

Albert Heijn skeuomorphic receipts
In their app, supermarket Albert Heijn allows users to save their receipts, which are visualized like physical receipts. This could be a way of contributing to the cashlike interaction outside of the cash itself, also it could be a way of emphasizing a different way of seeing insights. Letting users actively engage with their overview, while also showing the absence of aggregation of data.

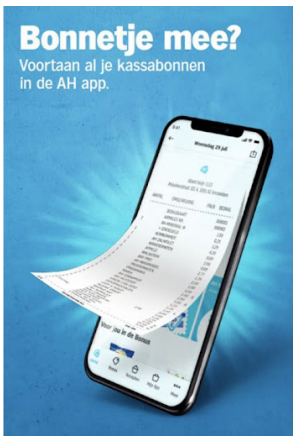


Figure 19: Skeuomorphic receipts

Apple slider
As an inspiration for making a definitive statement, adding more weight on the decision to move into a local payment environment, I was inspired by the dragging power switch for Apple devices, Costing more effort, and having a physical effect: the device turns off.

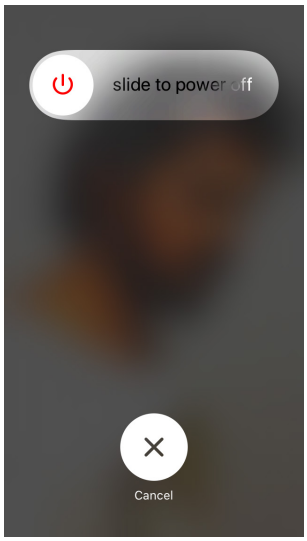


Figure 20: Apple power slider

Iterations

Some of the iterations of the interface design are shown with considerations behind them. Many ideas were discarded after the diverging phase to converge to a focused 3 step journey for the user research.

Handling digital cash

Several mechanisms were tried out for mimicking holding money, such as making a fan out of banknotes when you tap the stack.

Wallet appearances

Different wallet appearances were tried out, ones with a more distinct European character, and ones with more humor, for instance by applying an empty wallet metaphor through a fly and a button.

Communicating financial insight

At first, I considered textually communicating more information in the wallet, to improve usabiltity. However, with the focus on embodying the extremes of the value tensions, this would decrease the feeling of cash-likeness. Therefore it was left out of the design.

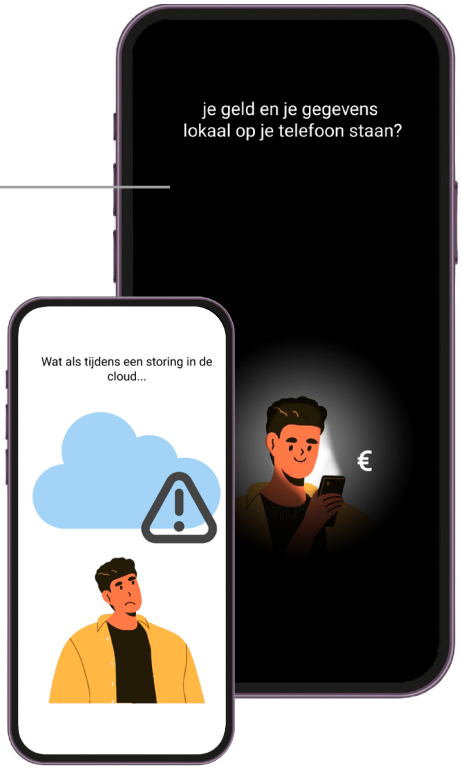
Figure 21: Overview of iterations

2.5 The cash-like prototype

1.1.2 Introduction of local offline money

Onboarding starts with a GIF showing the benefit of this prototype: being able to pay offline during outages

Goal:
Introduce novel functionality through a quick scenario.



Absence of cloud and darkness emphasize offline functionality.

1.2 Agreeing to locality and anonymity

Standard “terms of use” layout.

Slider to add weight to irreversible decision.

Users are presented with the terms of use: Full anonymity towards intermediary parties, but locality and thus the risk of losing money. They confirm that they understand the consequences and agree by dragging the slider.

Question:
“Is it okay or not okay to have full anonymity in exchange for the risk of locality?”

Goal:
Make it feel like a point of no return, after which users will truly be on their own.

1.3 Receiving your wallet

Users receive their wallet, which pops onto the screen after agreeing to the terms. By tapping the clip, the wallet opens.

Goal:
Create mental model of locality through skeuomorphism.

Show symptom of anonymity by never having to log in.

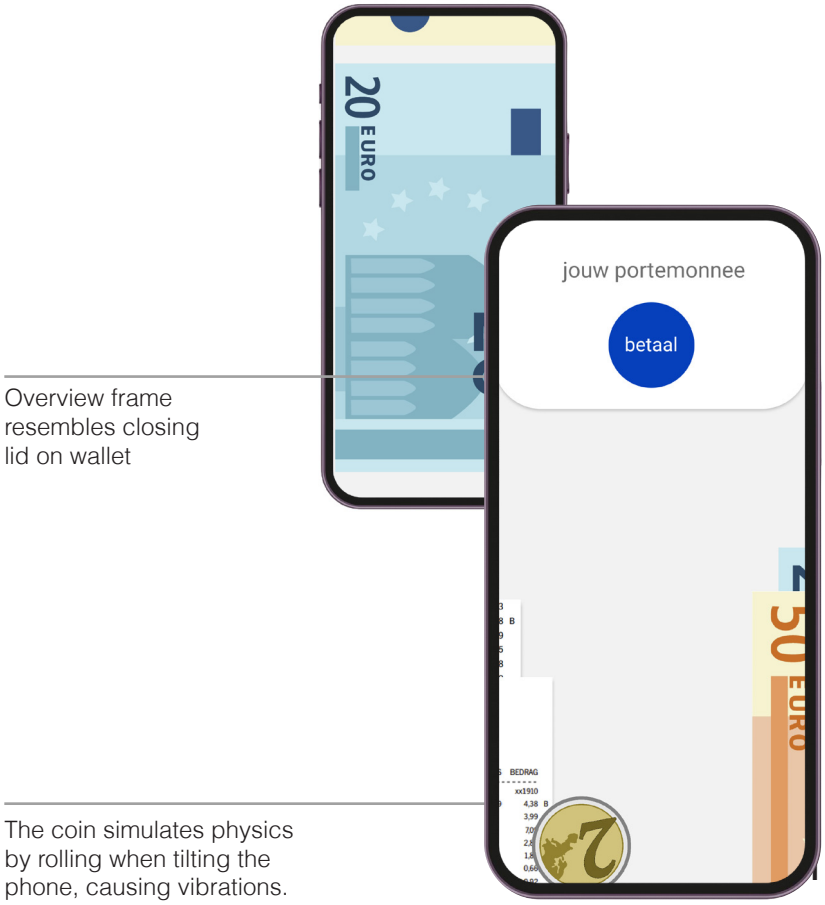
1.4 Depositing cash into the wallet.

After opening the wallet, the wallet gets funded with cash. Banknotes and receipts enter the screen and coins fall down, after which all objects sort themselves. Then the payment button and “your wallet” appears on top.

Question:
“Is it okay or not okay that your money looks and behaves like cash?”

Goal:
Convey anonymity through a similarity to cash.

Convey locality of money through physical similarity.



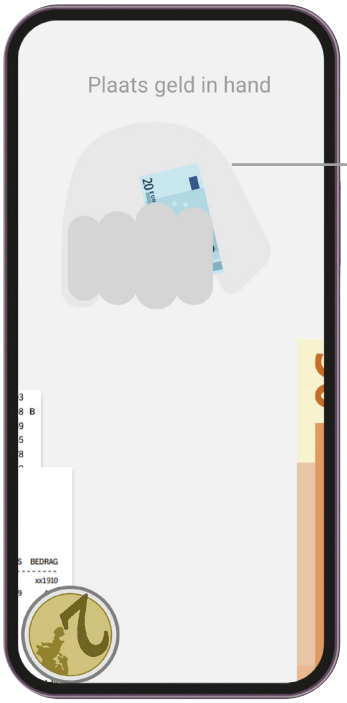
1.5 Making a payment

When tapping “betaal” (pay), or holding the phone next to the terminal, a hand appears, resembling the payee. By dragging the money in the hand, the user transfers the money and the hand takes it away.

After making a payment, the change and a receipt come in the screen from above, similar to funding.

Goal:
Convey similarity to cash by resembling physical handling and pain of payment.

Banknotes become smaller, to resemble moving it away from you.



Hand closes when taking the money.

When tapping the receipt, users can inspect and possibly dispose their receipts.

Goal:
Convey locality by giving option to dispose.
Convey no collection of data by limiting aggregated insights.

Throwing away triggers animation of throwing a wad in the bin.

2.6 Design directions 3: Control & commercial

This design direction represents the following extremes:

- A means of payment fully facilitated by a commercial party
- A means of payment where one can fully decide which data to share and not to share

And magnifying the following design requirements:

4.1.1 PSPs manages user accounts, conducts safety checks and offers D€ in their app

4.2.1 PSPs can provide value added services through their apps

1.1.1 Users should have a choice to share personal data for value-added services or partaking in loyalty programmes.

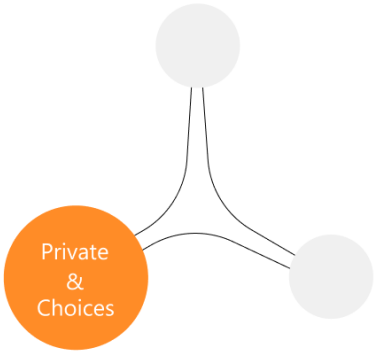


Figure 22: Tension extremes for this design

From tension to design

Making choices beforehand
Friedman (2000) mentions informed consent as one of the ways of creating trust online. Instead of the system's creator, users themselves should determine whether to consent or decline to online interactions, after being informed on potential harm and benefits. However, whether people choose to decline or consent might also depend on the timing. According to the privacy paradox, people's intentions differ from actual behavior around data sharing practices (Pötsch, 2009). When researching to what extent people would like to make choices in data sharing, it is interesting to let them reflect on this discrepancy by presenting choices in different moments.

This prototype lets users select data sharing options at different moments in their journey.

Selling data for money
Designing an environment that gives users full choice and maximum engagement with commercial parties logically frames them as rational agents, able to make optimal choices when given proper objective information, corresponding with classical economic theory. In research by (Bijlsma et al., 2021), users are presented with such a choice. They receive a personal data sharing request in exchange for financial compensation, being informed on relevant dimensions such as the receiving party, type of data, amount of compensation and whether the data will be anonymized. By presenting users with such choices, quantifying the value of personal data and offering direct financial compensation, the system views them as equal commercial parties, both operating in the market.

As mentioned in the value tension, empowering consumers in making active choices over data sharing practices aligns with developments such as such as PSD2 and the EU data act aim create one single European data market for a protected exchange of personal data (EDPS, 2024).

This prototype lets users choose to sell their data for financial compensation as the ultimate form of choice.

External advice
When needing objective information to make a choice, audits by external parties are quickly mentioned. This also came up during the creative session. One institution guaranteeing the trustworthiness of another. A link to other institutions can be communicated through affiliations (Riegelsberger 2005), such as brands, trust seals or testimonials. An example of this

are external audits by other, independent organizations.

The resulting privacy certificates or labels can be seen as trust symbols according to (Riegelsberger et al., 2005), signals that we assigned a meaning to. “Symbols can be protected by either making them very costly or by sanctioning their misuse.” “trustees need to invest in emitting them and in getting them known.”. Also company logos can be considered trust symbols.

This prototype will feature external advice from a third party

---

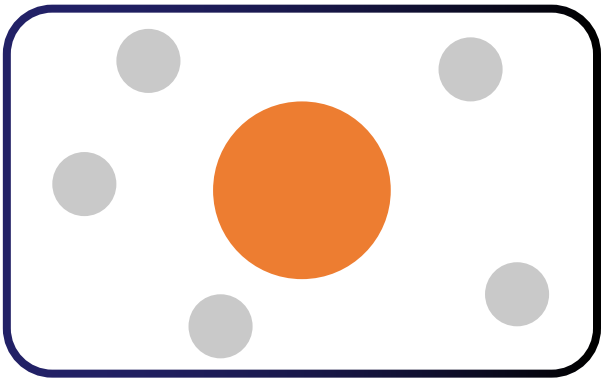
Design Goal

Combining the tensions and the abovementioned theory, this prototype approaches privacy as autonomy (source) by avoiding interfering or judging their deicisions. This results in the following design goal:

“Let users build trust in privacy by giving them control over which personal data is shared with whom. The system facilitates this without judgment and approaches them as rational actors, providing them with choices, objective information, and options to contest.”

Interaction qualities:

Rational
Precise
Informing



The intermediary is experienced as a facilitating party, creating a place for users to be in control over which data they share with whom.

Figure 23: Perception of the intermediary

wallet design

In the research by Teuschel et al. (2023), various designs for self-sovereign identity wallets are researched with different ways of communicating data sharing and privacy risks. Their selectable design featured a list of data types with buttons for deciding to share or not. This interactive page with a higher granularity of choice than a simple “accept” button would suit this prototype well. Also the structure inspired me, since their research featured a data sharing request (before), alert (during) and dashboard (after) for raising privacy awareness, which corresponds with my journey structure and the privacy paradox’s intent vs. usage.

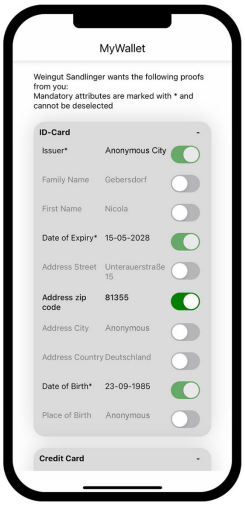


Figure 24: Selectable design of privacy wallet

Speculative selling data

This speculative design short film envisioned a future where consumers selling their personal data is ubiquitous, carrying a futuristic phone to capture their daily lives and sell their data to the highest bidder through constant micro auctions (Broeck, 2017).

Figure 25: Speculative data selling short film

Data sharing in payments research

The research by Bijlsma et al. (2021) identified several categories of parties that benefit from collecting users’ personal data, and several categories of data that are deemed valuable. In order to start a rich conversation about the influence of types of parties and datas on users’ choice, and present sufficient choice without having to research actual and realistic data streams and parties, these same general categories were used in the prototypes, leaving out a few to keep the prototype manageable within time.

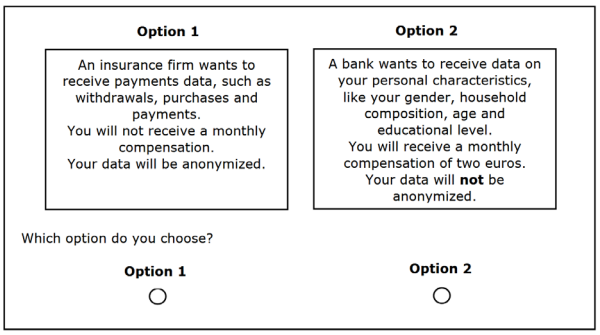


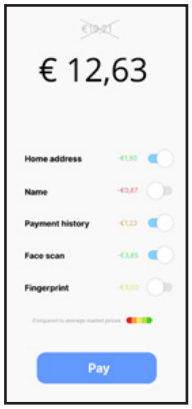
Figure 26: Vignettes presented in the research

Iterations

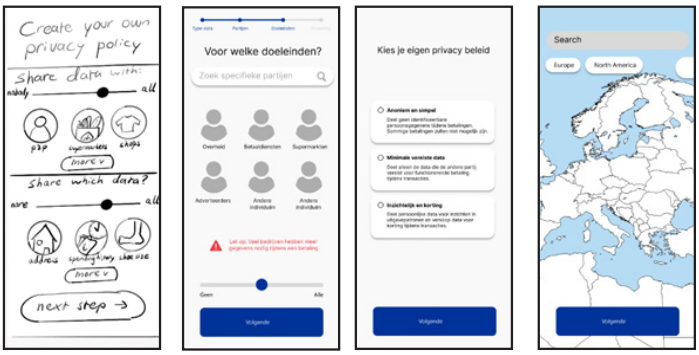
Some of the iterations of the interface design are shown with considerations behind them. Many ideas were discarded after the diverging phase to converge to a focused 3 step journey for the user research.

Overwhelming the user with information

The first iterations of the configurable prototype focused providing as much information as possible through external audit symbols and a dashboard. However, this raised the question whether designing for extreme supply of objective information means automatically designing for information overload. Interface design is about structuring the system's information for users to understand and engage with. However, properly providing this much information requires more extensive, narrowed design research, which was not the approach for this project. Therefore I decided to provide less information.



Exploring all dimensions of privacy choices



Designing the privacy policy was challenging, due to its many dimensions and contexts. Ideally, all kinds of factors such as types of parties, types of data, geographical location, retention time could be configured by the user to test to what extent they would like to choose. However, due to prototyping limitations, a more standard categorized approach was chosen. While choosing between 3 profiles was considered, this would present too little choice.

Inspecting shared data per party

Another envisioned functionality of the design was to inspect which data was shared with which individual parties, providing options for withdrawing consent. However, this was deemed to much for the short evaluations during the research, therefore a more general overview was provided.

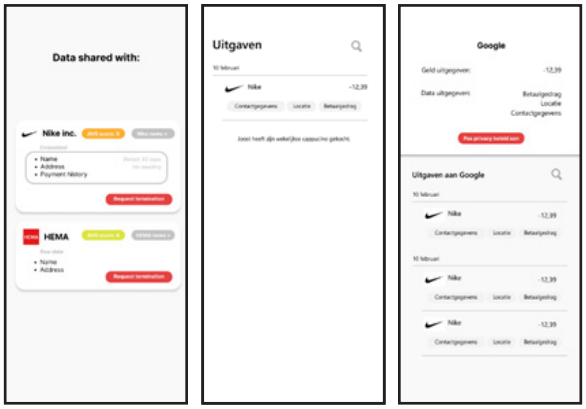


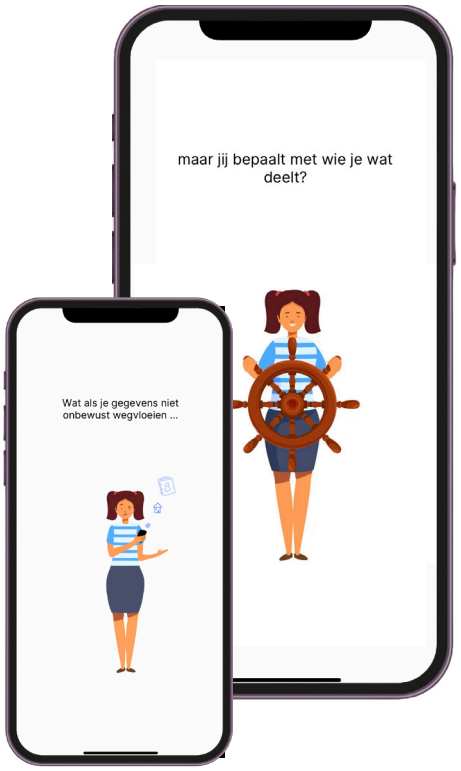
Figure 27: Overview of iterations

2.7 The configurable prototype

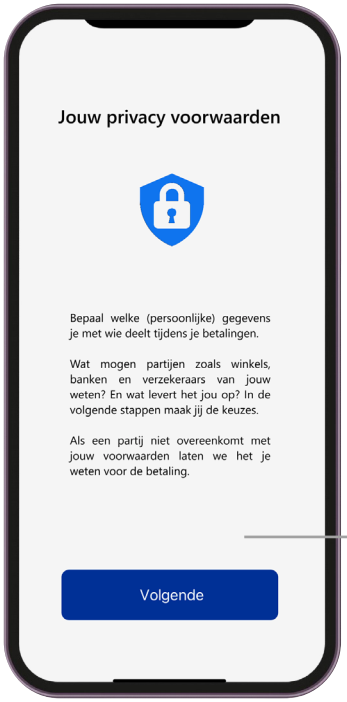
1.1.3 Introduction of possibility to be in control

Onboarding starts with a GIF showing the benefit of this prototype: being able to consciously determine what to share with whom.

Goal:
Prime users for paying attention during onboarding phase.



1.7 Explanation of privacy policy

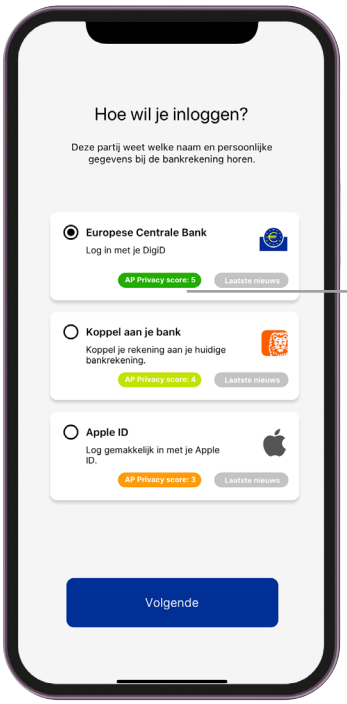


Standard onboarding layout with text and “next” button.

An explanation of the following privacy policy is given, stating that users can choose themselves.

Goal:
Inform the user about novel functionality of composing own privacy policy.

1.5 Choose a party to log in with



Privacy scores as a symbol signalling trustworthiness.

Users first get to choose which institution to log in with: The ECB with DigiD, connect to their current bank, or with Apple through their Apple ID. Each option has an external privacy rating and a “latest news” feature.

Question:
“Is it okay or not okay to connect your payment app with the ECB/ING/ Apple?”

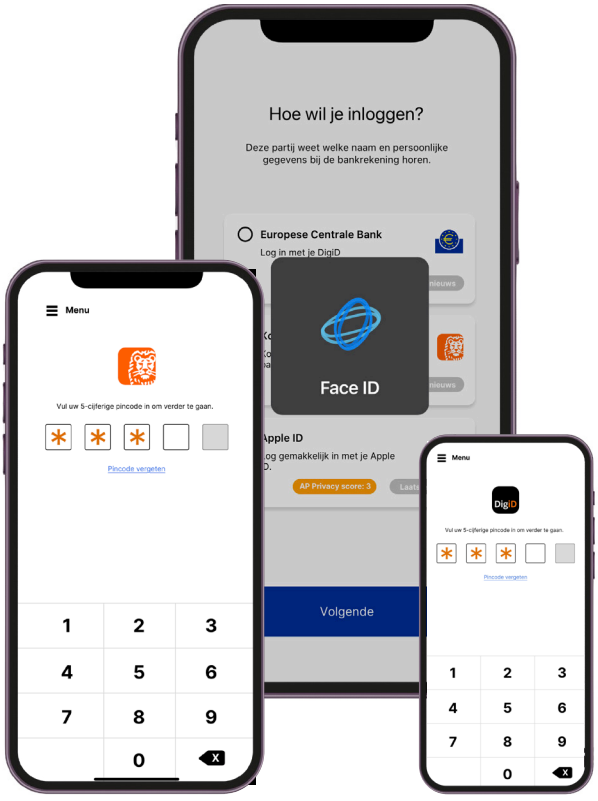
Goal:
Give users a choice to engage with the party they trust most

Objectively inform the users about their choice.

1.8 Log in through mock-up log in

After choosing a party, users are redirected to an “external” mock-up log in page.

Goal:
Immerse the user in the scenario by making the identification feel real.



1.9 Setting up customized privacy policy

After logging, in users can select which data to share with which parties when paying. In exchange they receive a monthly financial compensation. By selecting various data, they see their compensation change.

Question:
"Is it okay or not okay to get the choice to sell personal data for direct financial compensation?"

Goal:
Provide users autonomy by letting them choose which data to share and not to share.

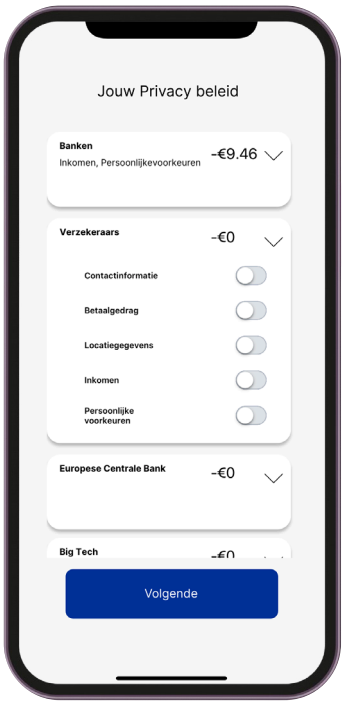
Approaching users as rational commercial agents.

Receipt layout is used to emphasize the transactional nature of the data sharing.

Overview of composed privacy policy

Users see an overview of their composed privacy policy and have the ability to make adjustments.

Goal:
Let users reflect on their choices by presenting a full picture.



1.1.7 Finish and ready to pay

The onboarding phase is closed with a standard confirmation and contactless payment instruction. The user can now pay.

Goal:
Guide user to payment phase.

Standard contactless payment icon

1.2.2 Better deal for data

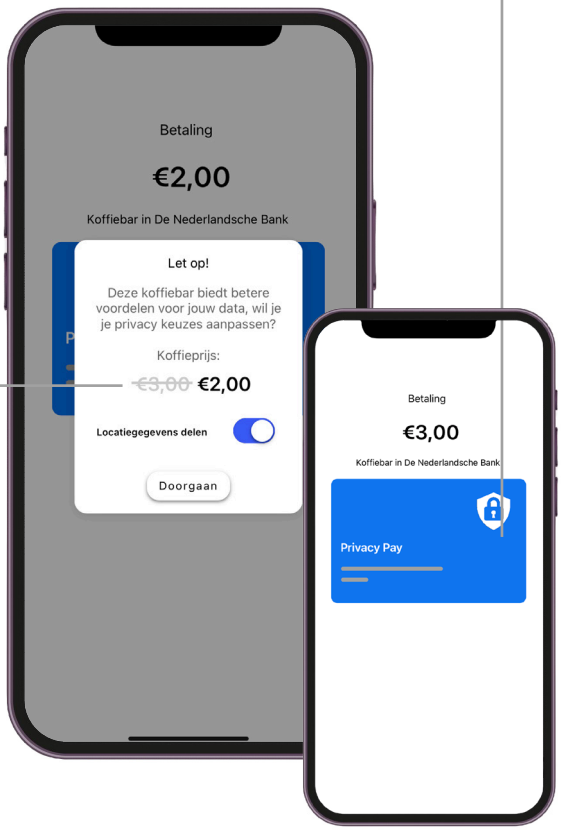
The user is presented with a virtual payment card. When holding the phone against the terminal for payment, a notification interrupts the transaction.

The store offers a better deal for the user's data than other parties in the category "stores". With this new information, the user might want to reconsider their choice. When sharing their location data, the price drops from 3 to 2 euros.

Question
"Is it okay or not okay to get such a warning to sell data right before making a payment?"

Goal:
Let users reflect on their opinion on having a choice in different moments

Familiar payment interaction with skeuomorphic card design, Like Google Pay.



Price changing when selecting data to spark curiosity

After making a payment, users arrive at the homepage, where they are confronted with an overview showing the shared data during their latest transactions. Subsequently, the conclusions that the party can draw from this are communicated. Underneath they get the option to change their privacy policy. Besides, standard information such as account balance and spending insights are shown.

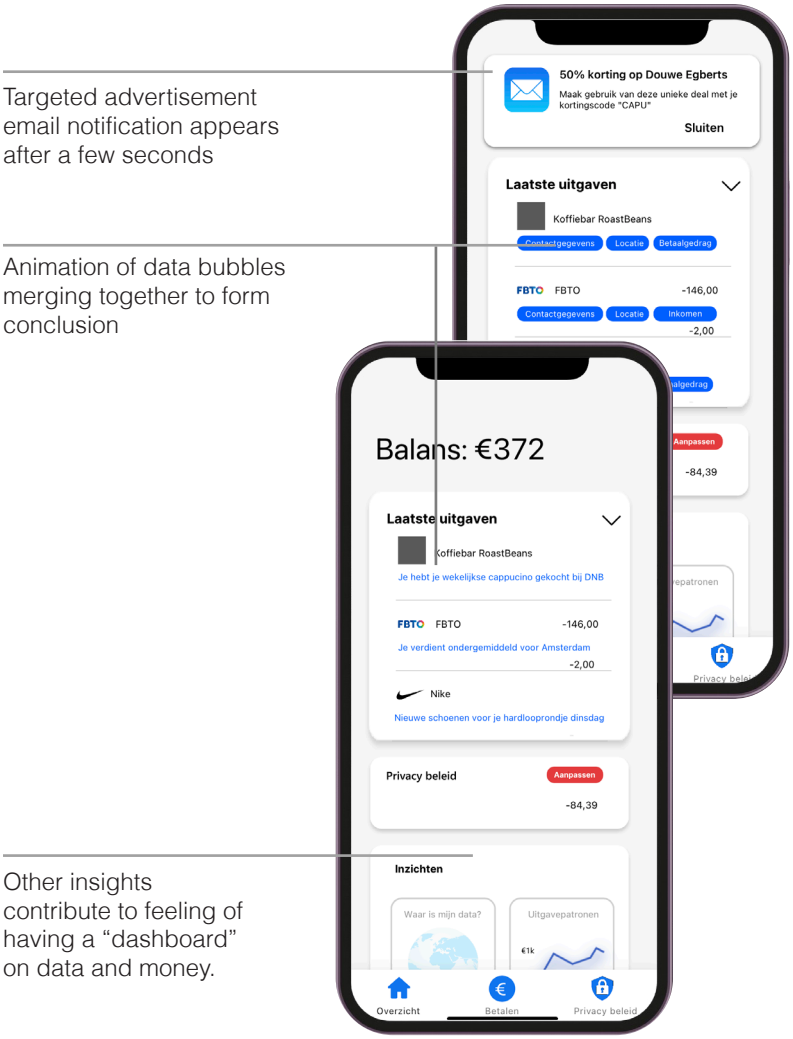
After a few seconds, the user receives a personalized advertisement, based on their choice of beverage at the coffee bar.

Question:
"Is it okay or not okay to choose to share data to this extent?"

Goal:
Let users reflect on their opinion on having a choice by presenting the consequences and giving the option to change their privacy policy.

Provide users with an option to withdraw consent after seeing the consequences of data sharing

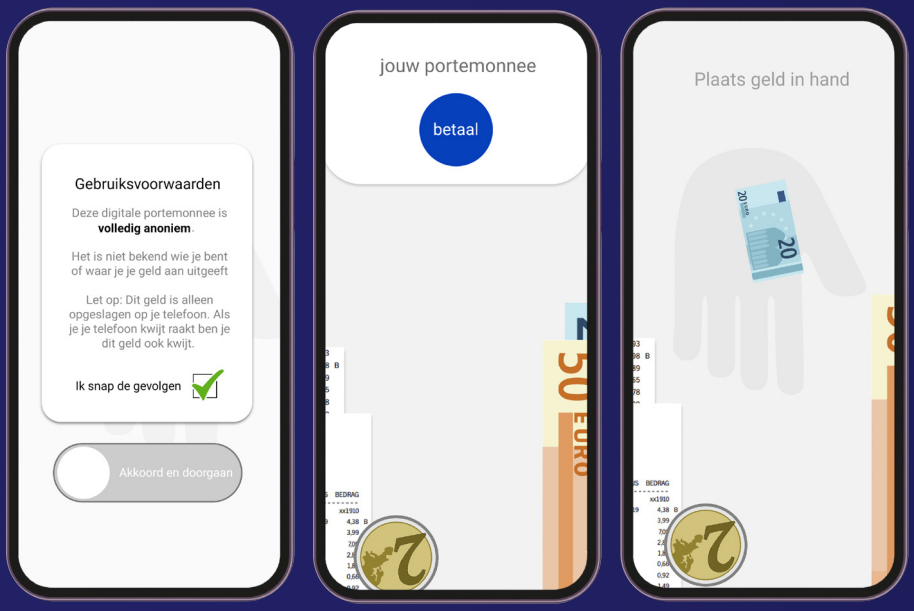
Show which knowledge can be elicited from sharing data types.



The cash-like prototype

"Let users build trust in privacy by giving them a simple offline payment method, secluded from third parties or settings that request attention, that conveys its locality and anonymity by copying many familiar characteristics from cash to mobile payments."

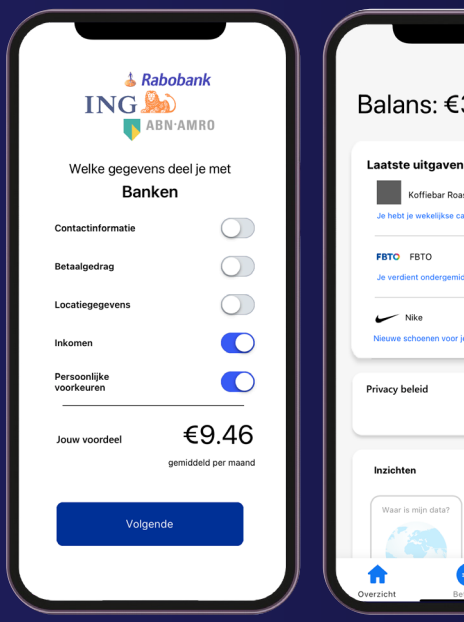
Secluded **Simple** **Tangible**



The configurable prototype

"Let users build trust in privacy by g personal data is shared with whom. without judgment and approaches t them with choices, objective inform

Rational **Precise**

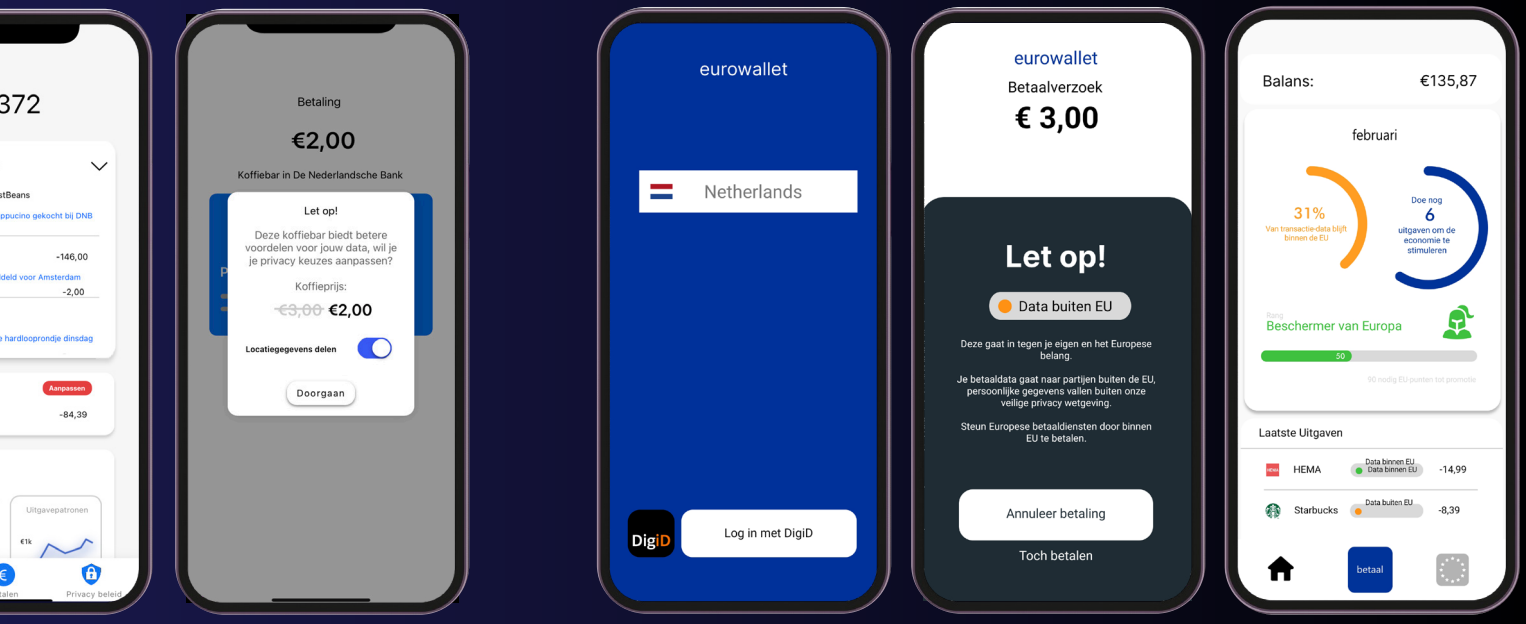


iving them control over which
The system facilitates this
hem as rational actors, providing
ation, and options to contest.”

The EU prototype

Let users build trust in privacy by providing a fully public, European payment app that urges users to follow its norms and shared goals for personal data sharing, creating a collective identity. Let users verify themselves as "part of the group" through DigiD.

Informing **Paternalistic** **Normative** **Community-building**



Phase 3: Evaluation

In this phase, I set up and conduct user research to discover consumers' values around privacy in payment. First, the research setup is explained, using both traditional usability testing elements and interview techniques from Value Sensitive Design. With this approach, two research sessions were conducted, in-depth interviews where participants evaluate all prototypes and an in-context user test where participants enact a payment in a coffee bar.

The results from the research are communicated in various ways. First the distribution of different values as reasoning in the different prototypes is shown, then a vocabulary of values is given, showing how users talked about privacy. Then, various types of participants are identified and introduced through personas. To contextualize these values, a description of answers per design screen is given. Next, the reactions to the tensions are communicated, after which I reflect on the ambiguity of values.

In the end, this results in a comparison with the design requirements from the value hierarchy after which design recommendations are given.

Contents

3.1 Research setup

Goals

The goal of the user tests are twofold:

1. Elicit values, norms around privacy of consumers in the context of in-store payments.

2. Discover how users would like a new payment method to approach privacy, structured according to the value tensions identified in the value hierarchy.

3.2 Eliciting values instead of testing usability

For the test, I used a protocol resembling a pluralistic walkthrough (Bias, R.G., 1994), where user and developer discuss the prototype together. The test consisted of three tasks: 1.) Set up the app in the onboarding screens, 2.) Make a payment, 3.) Look at the overview of your spending. Unlike stricter usability inspections, I assisted the participants in a conversational manner as they performed the tasks. Beforehand, I asked them to think aloud, sharing their thoughts as they interacted with the prototype.

However the goal of this user test is not to find usability issues, but rather to elicit participants' values. Where usability inspections aim to answer questions such as "Does the user understand which button to press to turn on the vacuum cleaner?", my prototypes, as explained in the Design section, are meant to 1.) immerse participants in the interaction of payment, 2.) support interview questions by posing dilemmas and 3.) give various value scenarios for them to consider. This way the prototype testing serve as vehicles for generating knowledge, supporting the interview questions about values, rather than being designs to be tested.

Value sensitive design interview structure

Therefore, I used the following interview structure from the Value Sensitive Design methodology (Friedman et al., 2009) , for both tests:

1. Ask participants' general response to the situation

2. Ask participants to evaluate the situation (e.g. "Is it all right, or not all right that this happens?"), with a justification ("why?"). This is where their norms and values are elicited.

3. Lastly, present participants with a value tension, and ask them which perspective they agree with most (e.g. "Some people like X about the system for Y reason. Other people like A about the system for B reason. Are your views more similar to one person or the other? Why?".) (Friedman et al., 2017).

4. To let participants concretely assess the importance of a value, present them with scalable dimensions of the situation (e.g. "For public records, . . . how comfortable would you be with searching public records by state? By city? By zip code? By neighborhood name? By home address? By last name only? By first and last name?") (Munson et al., 2011.)

5.2 Two evaluation sessions

The prototypes were evaluated during two user tests. The first test consisted of a semi-structured interview about values while the participants used all prototypes. The second test was at a coffee bar, where participants "bought" a coffee with one of the prototypes and answered questions in a survey. A comparison between the two sessions can be found in table 1.

Organizing two distinct sessions had various benefits. Most importantly, the sessions complemented each other by eliciting values in different ways. The interviews gave participants more time to reflect and compare the various prototypes in a conversational manner, while the coffee bar session placed participant in a real payment context, introducing contextual factors that might influence the type of values elicited. Also, this setup allowed for comparing the values of both groups of participants: a mixed group of consumers against an audience of (mostly) DNB employees. This somewhat corresponds with the main research questions of this project.

Research setup

To immerse users in a payment scenario, a mock up payment terminal was made, that interacted with the interface designs. To let the app and terminal communicate with each other, all interfaces were designed in the prototyping tool Protopie, that allows designers to send messages between digital prototypes on multiple phones on the same network.

To make the terminal interactive, I inserted a phone inside the terminal and let it display a standard payment initiation interface. Once a user held the payment app on the terminal, the hidden phone's proximity sensor would be triggered,

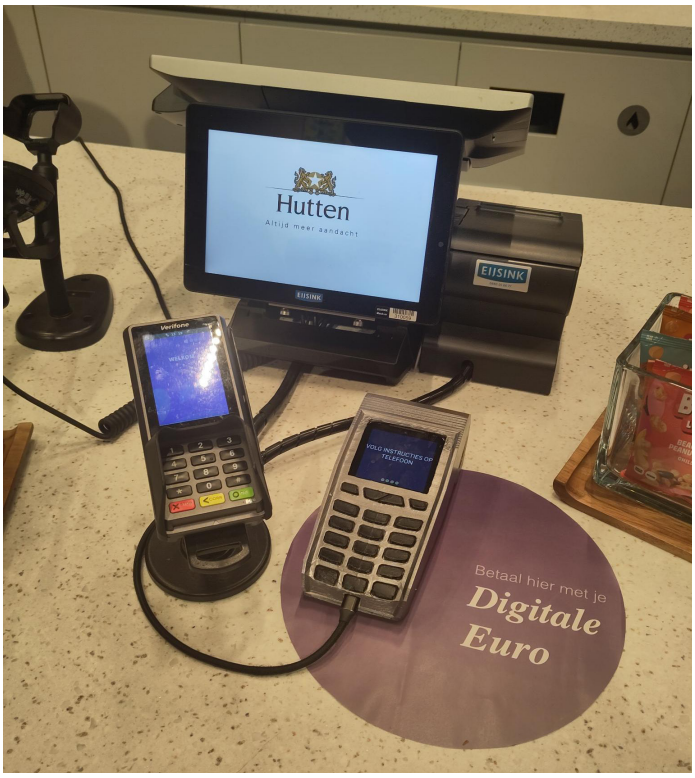


Figure 27: Terminal prototype (right) used to enact payments at the coffee bar

	Interviews	**Coffee bar**
Goal	Conversation about values	In-context evaluation, show-case
Introduced as	New payment method	Digital Euro
Context	Meeting room, controlled setting	In-context, coffee bar
Type of evaluation	Walkthrough	Usage
Participants	10, balanced sample in terms of gender, age and payment preferences (card, cash, mobile)	22, Mostly DNB employees and office guests.
Questions	Interview	Survey

Table 1: Comparison of the two research sessions

initiating the payment flow on both devices.

5.2.1 Interview sessions in Delft

The interview sessions were held in Delft at the faculty of Industrial Design Engineering. Through recruitment agency UserSense, a sample of 10 participants was recruited, balanced in terms of age (18-35, 35-65, 65+), gender, and payment preferences (card, cash, mobile). During two days, they participated in 30 minute interview sessions, following the steps outlined below.

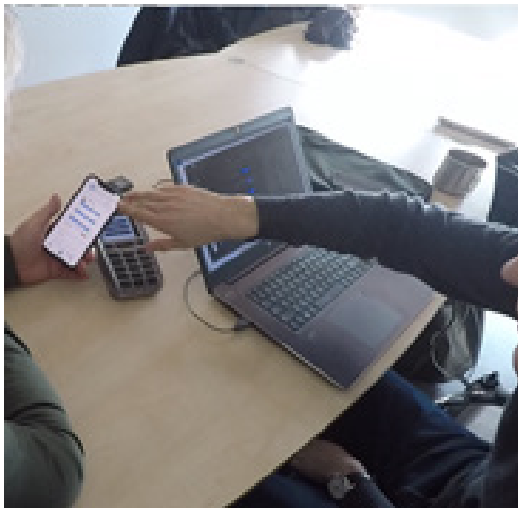
1. Introduction
Introduced as "new payment methods" for a graduation internship at DNB.

2. Evaluating apps
Participants test all three prototypes in random order. In a conversational manner, they discussed about their evaluations of dilemmas in the apps and their value justifications behind it. While often reacting automatically (e.g. "That's not okay"), the following value-eliciting questions were asked when they only talked about usability:

1. General: "What do you notice?"
2. Evaluative: "What do ***you*** think about that?"
3. Justification: "Why?"

3. General reflection
To let the users reflect on the interfaces, they were given printouts of the journeys (figure 28) and asked which prototype they preferred and what they liked and did not like about each.

4. Value tensions
During the interview afterwards, participants were presented with the three axes, based on the value tensions from phase 1. Then, I asked how a new payment app should approach privacy, and let them position themselves on each axis. By scaling dimensions of the design (e.g. "Would you never want to identify? Only once? Each time?") they specified their position into concrete design requirements.



1. Participant uses the prototypes while thinking aloud.

2. Participants compare the journeys of the three prototypes.

3. Participant reflects on their preferred approach to privacy on an axis.

Figure 28: Steps of the in-depth interviews

5.2.2 Coffee bar research in Amsterdam

The coffee bar research was held at the coffee bar in the entry hall of the DNB office in Amsterdam. Although a public space, due to construction works mostly DNB employees participated in the session. Together with facility

1. Introduction

- Standing next to a poster and the three prototypes, I invited visitors in the public hall to participate in my research for my graduation project. The apps were explicitly introduced as D€.
- Based on the animated introduction pages, presenting the unique benefit per prototype, participants had to select which one they deemed most interesting for trying out. For an equal distribution among prototypes, this choice would be left out in the later evaluations.

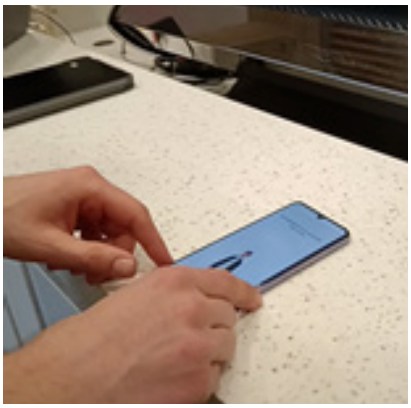
2. Evaluation

- Similar to the interviews, the participants evaluated the onboarding and overview phase together with the researcher in a conversational manner.
- However, for the payment phase a purchase at the coffee bar was enacted, sending the participants with the app to stand in line for the barista. When it was their turn, they would order a coffee and pay at the mockup terminal, encountering the novel payment interactions, warnings or discounts that the prototypes provided.

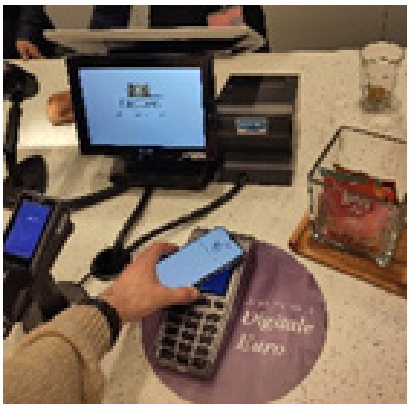
3. Survey

- After evaluating and testing the app, participants were asked to fill in the survey on an iPad.
- Here, they were first asked for a general reaction and asked to rate privacy.
- Then, the dilemmas from the prototype were presented, asking how comfortable they felt around each situation.
- Finally, they were presented with the three axes, based on the value tensions. They were asked how a new payment app should approach privacy, and 5 design descriptions were proposed along each axis.

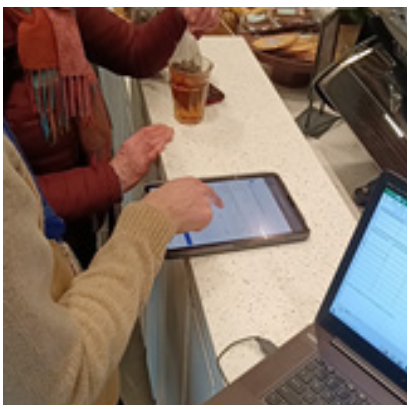
1. Participants choose a prototype to evaluate



2. Participants test onboarding and overview phases with researcher



3. In between, participants enact a purchase by themselves



4. Participant assesses the value tensions in the survey.

Figure 29: Steps of coffee bar session

management and the baristas, the research was prepared and communicated.

Facing the entrance, I displayed the three prototypes underneath a poster offering people free coffee in exchange for participation. Unlike the interview sessions in Delft, the apps were labeled as “Digital Euro” prototypes, since most participants would be familiar with the project and the research session also served as a showcase for my graduation project and the Digital Euro project as a whole.

5.3 Data analysis

Afterwards, the data was analyzed using codes inspired by a value-oriented coding manual by(Friedman et al., 2005). Like the interview structure, I first coded the participants’ responses based on the evaluations of the situation (Y/N), and then added justifications with a value and a corresponding norm. If they referred to a specific design element, this was also included in the code. (Besides that, general codes were added for participant characteristics and the prototype and screens they were using). This allowed for clearly identifying and grouping participants’ values and norms.

Context		Participant				Response								
Prototype	Page	n	Age rang	Gender	Payment pref.	Question	Party	Type of data	Evaluation	Value	Norm / explanati	Design aspect	Statement card	Data
control	Which party log in?	1	18-35	f	Card	Log in with	x	x	**Not codable**	1	1.11	Privacy score	User associates label with **privacy safety**	Kan zien hoe veilig bepaalde dingen zijn qua privacy
control	Which party log in?	1	18-35	f	Card	1.Other	x	x	**Not codable**	x	0.23	Privacy score	Green color is associated with higher score	Weet niet wat AP ps is, maar neem aan hogere score is beter aan kleur te zien
control	Which party log in?	1	18-35	f	Card	Log in with	Bank	x	**Y**	**1**	1.14		User chooses to connect with bank since they **already have** all the personal data	Ik zou toch voor de bankrekening zijn, omdat zij al die persoonlijke gegevens hebben
control	Which party log in?	1	18-35	f	Card	Log in with	Apple ID	x	**N**	1	1.54	x	User would choose to connect to a party that **already has** her personal data	Aan een Apple ID zou ik het minder snel koppelen, gebruik zelf geen apple. Ik zou iets kiezen dat het al weet.
control	Which party log in?	1	18-35	f	Card	1.Other	x	x	**Not codable**	x	0.13	Privacy score	AP not associated with Autoriteit Persoonsgegevens	Weet niet wat AP ps is, maar neem aan hogere score is beter aan kleur te zien
control	Which party log in?	1	18-35	f	Card	3.Action							User logs in through **Bank**	
control	Which party log in?	2	35-65	f	Cash	1.Other	x	x	**Not codable**	x	0.20	x	User thinks they have to choose ECB because of	Ik heb geen Apple product, geen ervaring met ECB, maar dat moet ik
control	Which party log in?	2	35-65	f	Cash	Log in with	ECB	x	**N**	1	1.16	x	ECB is unknown	Natuurlijk aan je bank, want geen flauw idee wat ECB is, heb geen rekening bij die bank. Geen ervaring met ECB.

Figure 30: Screenshot of the data analysis structure inspired by Value Sensitive Design coding manual.

3.2 Insights

After conducting both user tests and analyzing the results, insight emerged on the participants' values and norms around privacy in paying and their preferred approach for new payment methods. At the same time, feedback was collected on the designs, providing recommendations for future design steps. In this section, the insights are discussed in several ways. First, an overview is given of participants' values and norms and how they differed per prototype and participant. Then, to situate these values and norms, the evaluations and justifications per prototype page are explained. After that, the preferred configurations are discussed and finally overarching patterns on discussing values are drawn.

5.4.1 Values and norms around privacy while paying

In figure 30, participants' value justifications are categorized per prototype and given evaluation.

For instance, the left bar includes all the negative evaluations of situations encountered in the cash-like prototype, with the proportion of values mentioned as justification visualized in different colors.

The cash-like prototype was most often appreciated for enjoyment of interaction, and sometimes for privacy in the form of anonymity and convenience of interactions derived from cash. However, also rejected out of safety concerns of losing money, and the lack of convenience due to unnecessary interactions. The configurable prototype was often appreciated for offering financial gain for sharing data, and the autonomy and informed consent of being able to choose this beforehand. It was rejected due to the financial compensations not aligning with participants worldview (universalism and autonomy), finding it a violation of privacy or giving a sense of false autonomy . In the EU prototype, the EU identity and DigiD log in options were often positively associated with safety, but rejected due to indifference about the European cause.

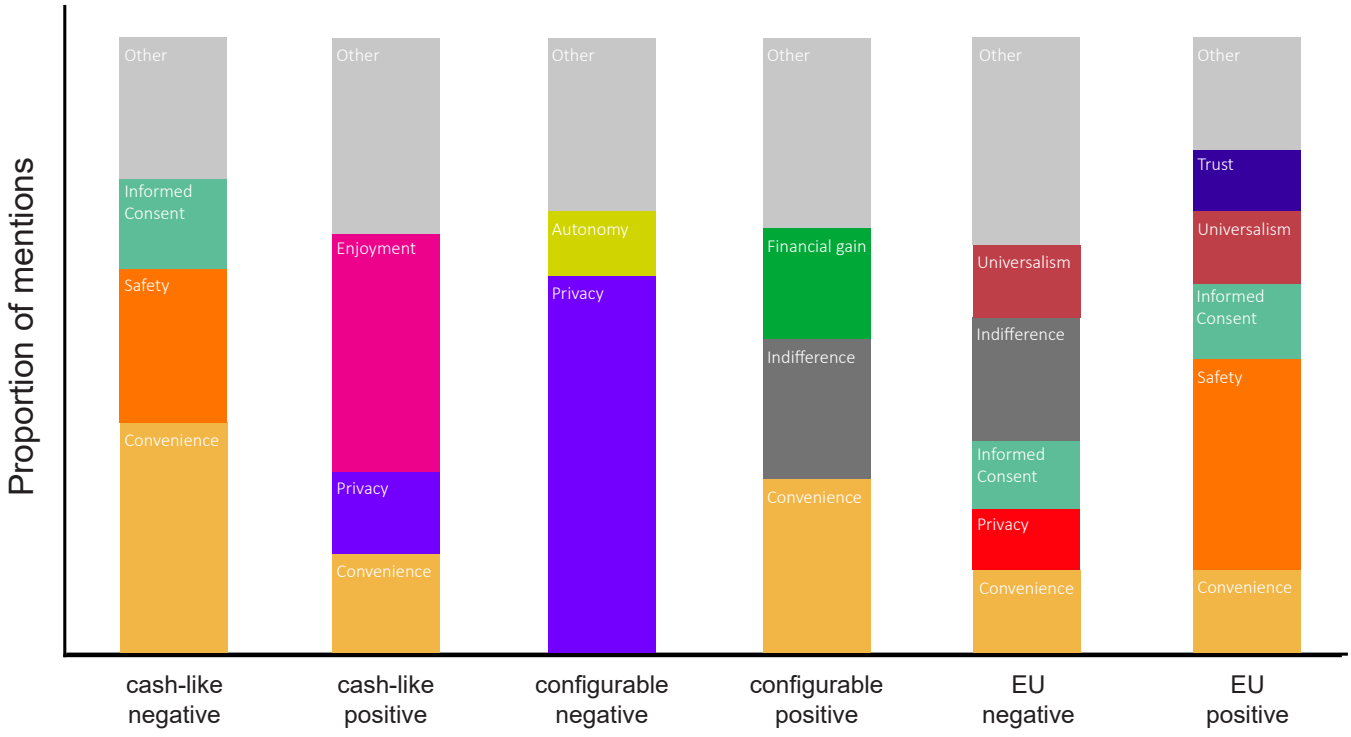


Figure 30: Values used as justification for the negative and positive evaluations within each prototypes

3.2.1 A vocabulary of values

Below, the various justifications and their usage in the prototypes are further explained in a hierarchical list, serving as a “vocabulary” of values and norms around privacy in payments.

Privacy (95)

Privacy refers to an appeal based on a preference to limit the extent of information sharing with another party.

It includes possible dimensions such as the type of information, type of receiving party and their purpose with the information (e.g. “I don’t know why insurers would want to know my income”), and the type of limiting action (e.g. “The goal of the app should be to not collect my data”).

**Being designed around different approaches to privacy, this value felt relevant in almost every prototype page. However, in this category, all norms and explanations are purely for the sake of limiting information , or feeling private. When privacy was an instrumental value for reaching autonomy, or safety, the justifications are coded underneath those values.*

Since the configurable prototype faces participants with choices about these dimensions, they often referred to them in their answers. (“I would not share income and payment behavior.”). Interestingly, users evaluated similar situations with different norms. For some, not knowing the purpose for sharing a certain type of data caused rejection (e.g. “Why would they need to know my personal preferences?”), while others saw this as a reason to share and receive compensation (e.g. "I would share my location, because they can't really do much with it.")

While considering which parties to share with, some participants were uncomfortable with one party knowing too much about them (e.g. ““Everything is connected to Google already. For my payments I would rather choose a bank.”), while others wanted to prevent sharing data with too many parties (e.g. “I would share it with a party that already has my data.”)

In the EU prototype, privacy was sometimes mentioned during negative evaluations of logging in with DigiD, since participants worried about payment data and government data being connected . Interestingly, some participants felt more uncomfortable about the payment party getting access (“All my unique personal data is there… why would they need access?”), while others worried about the government getting access (e.g. “ But then it’s connected to the government… not comfortable when they know my payment data.”). However, DigiD was often also evaluated positively as a convenient and safe log in method.

In the cash-like prototype, participants sometimes mentioned privacy as an appreciation of the system’s anonymity. However, possibly due to the novel interface and absence of privacy information after the opening statement, participants mostly emphasized convenience and enjoyment in their evaluations.

Trust (21)

Trust refers to an appeal based on a general feeling that a party or system that you’re depending on acts in your interest, based on signals that you gathered.

It includes trust based on familiar parties (quote), familiar design patterns, and reputations of parties.

**Since trust is often an instrumental value, only reactions about unspecified trust are grouped under this value. E.g. trusting the safety measures of the EU, was coded underneath the value of safety.*

Also, trust was mentioned by participants when other factors for making a judgment of reliability did not suffice. For instance, during the coffee bar research, some participants were overwhelmed by privacy information (quote) and expressed a longing for just simple cash, their current payment preference.

On the other hand, relying on trust also helps saving time. For instance, at first users, without reading, quickly clicked through the terms of service (e.g. “Standard terms of service, looks trustworthy.”).

Trust was also mentioned when talking about the reputations of other parties, with especially Big Tech companies and Insurers having a bad, or untrustworthy reputation (e.g. “Apple is a big tech company without values”) (e.g.“Insurers are not the best companies.”), while users’ own bank accounts felt familiar and thus, trusted (e.g. “I would connect with my bank account, that feels trusted.”). Sometimes, users pointed to an external source for their trust, being inside the prototype (e.g. “The privacy score is the highest, so I choose the ECB.”) or something they heard before (e.g. “I’m hesitant about Big Tech, maybe that’s because of the media.”).

Convenience (85)

Convenience refers to an appeal based on performing tasks efficiently towards preferred outcomes , without spending unnecessary time or (cognitive) energy.

It includes usability ("tapping once should be enough."), sticking to the known (e.g. "I don't need it, I already have other ways of paying."), sharing data for improved service or personalized experiences (e.g. "When I look on Facebook, I want them to offer the right things.")

Although the tests did not focus on evaluating usability, participants were asked to use the apps to immerse themselves in a payment scenario. Understandably, they highlighted usability issues when something was unclear, or could be more efficient in their opinion (e.g. "I shouldn't have to do too many actions to pay.")

While some participants were willing to give up some convenience for increased privacy (e.g. "I can also do this manually, so I'll turn it off ."), other participants stated that it should be at least as convenient as current options (e.g. "It should be seamless, also with my smart watch."). According to them, addressing normative values such as privacy, safety and universalism should not hinder usability ("Apple is so over-secured, that's very annoying."). This happened when information or decisions interrupting the user flow (e.g. "I don't want to receive this warning every time."), or when restricted data sharing practices limited services.

In the configurable prototype, participants perceived sharing personal data as a possibility for getting improved services, which was greatly appreciated. However, in the cash-like prototype, convenience was more about usability. With an interface that differed so much from a known, standard payment app, some deemed it unnecessarily complex (e.g. "That's complicated, I don't see how much money I have directly "), while others appreciated some novel features as welcome new functionalities (e.g. "A receipt on paper is so annoying, having it online is nice").

Safety (51)

Safety refers to an appeal based on the desire to be and feel free from (the possibility of) harm

It includes misuse of personal data ("What if there's a cyber attack and people have my data…"), safety of the collective ("Privacy legislation is only helping criminals"), financial fraud ("That you know that all payments are legit, and not double."), physically losing money ("That's very risky, losing your money when you lose your phone.") and associations with safety ("I would trust a safe institution like the government.")

In the EU prototype, participants mostly talked about safety as associations of trust with DigiD and the communications by the EU (e.g. "I think the EU has very good rules for data safety."). Being about a carefulness for personal data, this aligned with privacy. However, in the cash-like prototype, safety was mentioned as a reason to reject the payment app, being aimed at the possibility of losing local money , and running the risk of fraudulent activity in an anonymous system (e.g. To me, preventing fraudulent payments is most important.").

Informed consent (43)

Informed consent refers to an appeal based on being informed about an issue before making a decision.

It includes clarity ("What does 'contact details' mean?"), timeliness and placement ("This should be communicated beforehand."), covering all relevant dimensions ("For all payments? And Can I withdraw consent?") and perceived truthfulness ("I have to put money on it somehow, so it can't be anonymous.")

Since they were meant as immersive conversation starters (and due to being developed so quickly), the prototypes' textual contents miss information on instructing first time use, and more precise details explaining the data sharing practices. Therefore, often participants stated they needed more information before being able to make a decision. ("I don't know enough about this, what does it ask of me?")

Besides the contents, the timing of the information was often also deemed unsuitable for participants (e.g. "I want a one time 'agree' or 'don't agree', not every time"). When receiving a warning during a payment, or getting certain information in their homepage, they would prefer getting instructions beforehand during onboarding.

In the EU prototype, some participants considered the warning during payment as

welcome safety advice, proper information. Others however, deemed its suggestive nature a violation of their autonomy, with the EU deciding what is good and bad , without them seeing the harm in their own actions. (e.g. “Good to get a warning message, I appreciate this way of communicating .”)

In the configurable prototype, many participants appreciated being able to make choices over data sharing (“Clear that I know which data I share, currently that’s hidden in the terms of service.”).

Again, some people used their own knowledge and mental models of data streams, supply chains etc. to judge the truthfulness of the information statements, causing some to question whether things such as digital anonymity, or geographically separated data streams were actually technically or legislatively possible. (e.g. “If I buy a Tesla it’s an American brand, made in China with parts from Europe. That doesn’t work ”)

Financial gain (35)

Financial gain refers to an appeal based on deriving financial gain from a situation.

It includes gaining direct compensation (“For 5 euros I would not care, but for 10 or 20 euros it would start to become interesting.”), discounts in the future (“Now AH and Jumbo will send me discounts, that’s great!”) and long term savings by changing behavior (e.g. “Swiping bills makes me more aware of what I spend.”).

Being presented as a trade-off with privacy, people being able to sell their data, this tension is clearly visible in people’s reasoning for accepting or rejecting the configurable prototype (e.g. “22 euros, that’s a nice addition to my pension.”). Financial gain in this context was described as unethical and discriminatory, a perverse stimulus for people who could use the money, while wealthier users could afford privacy. Others emphasized their strengthened position as a user: Data sharing practices happen anyway, at least now they receive something in return. (“At least now I get something in return.”)

Universalism (29)

Universalism refers to an appeal based on an opinion about what’s best for the well being of the collective or society.

Universalism was not deemed relevant in all prototypes. Being a value about the collective, it was not mentioned in the cash prototype, which presents itself as an environment secluded from third parties and collective causes.

In the EU prototype, many rejected contributing to European goals, deeming it a hassle (e.g. “Maybe this is for people who occupy the A12, but I think it’s a hassle.”). The ones that seemed more positive, wanted to contribute without having to put effort into it. Participants stated that it was not their role (e.g. “Good that NL is part of EU, but I don’t want to actively improve or maintain it myself”). Others misaligned and had other ideas what was best for the collective (e.g. “Why would Europe be better than America per se? If they did bad things, then I would understand it”) . Some however, recognized a growing geopolitical threat, making the goals at least more understandable (e.g. “In this political climate, it makes keep data within a geographic area”). Maybe this shift in the political landscape might make these universalist/ideological ideas more tangible, since individual risk gets closer.

While using the configurable prototype, universalism was used as reasoning on data sharing practices, considering fair choice (e.g. “Putting a price tag on personal data is unethical, makes me not want to share.”), purposes (e.g. “Insurance should be the same for everyone”), parties (e.g. “(red. ECB) is ethical compared to insurers and banks, I would anonymously share payment data for statistics.”) and broader ideology (e.g. “Free market creates improvements and innovations, more than if you would leave everything to the EU.”).

Enjoyment (25)

Refers to an appeal based on deriving pleasure from an interaction or situation.

Enjoyment was mentioned when wanting gratification of consumption desires (e.g. “But I really crave that coffee… so I’ll pay anyway”) and when interacting with design elements within the payment app interface, such as handling the bills and coins in the cash-like prototype (e.g. “I could play with that euro coin all day”), or engaging in reward systems in the EU prototype (e.g. “Fun little extra, like a game.”). Although visibly amused when evaluating, participants also deemed this enjoyment a volatile, short term experience (e.g. “That’s fun, but not for long and will bore quickly .”). In a context of money

and data, between considering long term risks of privacy and safety, and being efficient by saving time and money, enjoyment of a payment app, regarded as a tool rated on functionality, enjoyment seemed less relevant.

Autonomy (24)

An appeal based on a desire to be (or feel) free from interference, or dependency.

It includes independence in decisions , actions, thoughts and being free from temptations (e.g. "I feel tempted to say yes.")

Autonomy is valued most in the configurable prototype with positive evaluations as an appreciation of being able to choose which data to share with which parties (e.g. "Good to have insight. Normally you know it, but you don't really see it."). Negative evaluations partly came from this same perspective of rejecting to share data with certain parties within the app (e.g. "Insurers will judge you on your behavior. That changes things."), but also from the notion that sharing for compensation presents some false autonomy, with people being tempted by the short term financial benefits while not seeing long term risks (e.g. "People don't think about the long term consequences of this euro discount on a coffee.")

In the EU prototype, participants felt that autonomy was harmed when the system was telling them what to do, or how to spend their money. For autonomy, they required a neutrality of the payment app (e.g. "A payment app should be neutral and show me how much money I have, but not stimulate me to spend it."). Finally, one participant associated the cash prototype with autonomy, since the user takes full responsibility (e.g. "Anonymity is nice, because it means I am responsible.").

Social expectations (12)

Social expectations refer to an appeal based on general norms agreed upon in society

It includes both legislative rules (quote), and unspoken social norms (quote).

This was used when guiltily rejecting the playfulness of the cash-like design (e.g. "Of course money shouldn't be a game, but this is fun."). During the EU prototype, the expectation of citizens contributing to societal goals, was rejected by referring to current standards (e.g. "I already pay taxes, what do they expect of me?"). For the configurable prototype, selling money for data was justified by referring to other practices where data was sold for money (e.g. "I currently share payment data with Trade Republic and get money for that as well (red. loyalty program)."

Well being (10)

Well being refers to an appeal based on the desire to mentally feel good or comfortable.

It includes rejecting based on something "not feeling right" or being unsettling. Also, uncomfortable or confronting truths were shared.

Well being was used as a justification for rejecting to share sensitive data with certain parties, such as income. It seemed to be a justification for when user could not specify why they were refusing to share, fell back on a general feeling or impression of (e.g. "Why? I don't know, it doesn't feel right.").

Well being was also used as a reaction to insight into data sharing practices, when users were shocked by being confronted by how much other companies knew (e.g. "This is starting to get scary."), which they sometimes recognized was still good to know (e.g. "It's confronting to see, but good since currently I have no idea."), or rather would not know (e.g. "You don't want to know because you realize it's too late.")

Indifference (60)

An appeal based on not caring about a situation

It includes misalignment with one's values (e.g. "Uhm, I don't have a problem with that."), lack of risk perception (e.g. "I don't see how this goes against my own interest"), a lack of agency over the question (e.g. "This data (red. location) is freely available anyway.")or earlier implied consent (e.g. "Supermarkets already know what I'm buying").

Indifference was closely related to direct benefits such as convenience and financial gain, with participants who were indifferent about other values often making a choice based on those values instead. In the configurable prototype, participants often sold their data for a "might as well" mentality (e.g. "I already use 5 payment services, they can have it all."). The indifference

was often caused by a feeling of a lack of agency. Without specifying details, participants hinted at various mental models of how their personals data was handled, such as 1.) Behind the screens, personal data flows freely between parties (e.g. “Probably my bank already shares it with them (red. ECB)”), 2.) Parties can easily acquire someone’s personal data if they want to (e.g. “I don’t care anymore, if they really want it they’ll find a way to get it.”), or 3.) By having used one of these parties’ services before, one implied consent for sharing their data (e.g. “I already have a loyalty account with this, so I assume they know it already.”).

In the EU prototype, participants often ignored the warning and goals presented in the overview, since they felt indifferent about the universalism. This did not align with their worldview (e.g. “You’re the richest economy in the world! You don’t need me.”) or did not feel close in any way (“I don’t care about the ECB, it doesn’t hit close to home.”).

Conclusions

In reasoning about privacy, participants often considered multiple dimensions such as data type and type of party, but sometimes weighed them differently to come to different conclusions. They often relied on trust to make a quick judgment through familiarity or reputation.

While not the focus of the test, convenience was mentioned second most, with users desiring a similar level to current options as a requirement, without too many privacy and safety warnings. In the cash-like prototype, concerns for safety were often expressed, labeling the risk of fraud or losing money higher than the gain of anonymity, while the EU had a safe reputation. Getting a choice beforehand in the configurable prototype was appreciated due to informed consent, although when not knowing all dimensions of data sharing, it was often also a reason for uncertainty. Financial gain was divisive: greatly appreciated by some, deemed unethical by others, clashing with universalism. Universalism was only deemed interesting when convenience and informed consent were satisfied. Otherwise it was mentioned as misalignment with European goals, or written of as something for “others”. The cash-like prototype was often deemed enjoyable, although others deemed this value inappropriate or volatile in a payments context. Autonomy was appreciated when having a choice in the configurable prototype, but felt violated by the EU app suggestions. Confronting information about ubiquitous data sharing sometimes violated well being.

However, indifference was also often shown, due to a lack of agency over data flows, a feeling that everything was known already, or that users implied their consent by earlier using a certain service before. This often resulted in users choosing for convenience or financial gain.

3.2.2 Participants reasoning with normative values vs. pragmatic values

Although clear categories of values and norms were found in participants' reasoning, comparing their answers across the prototypes resulted in few patterns. Due to a widely oriented, yet small sample of participants testing 3 prototypes, few similarities between their characters were found. However, when grouping normative values representing long term benefits (privacy, safety, autonomy), and pragmatic values offering direct benefits (convenience, financial), a clear distinction appears. It shows three participants highly valuing normative values, four more moderately and three mostly valuing pragmatic values.

Participant 8, 9 and 10 were more moderate, often valuing convenience over normative values. Participant 2, 4, 5 and 6 showed a higher interested in financial incentives besides also valuing convenience. Coincidentally, this grouping hints at a relation with age, as shown in figure 32. Although the sample size is too small, this might be an interesting starting point for future research.

To give an impression of what participants' different motivations look like, personas per group are provided. Although the representativeness of personas based on a single participant is low, I hope these personas can enrich the vocabulary of values by sketching an image of how different people reason differently about privacy.

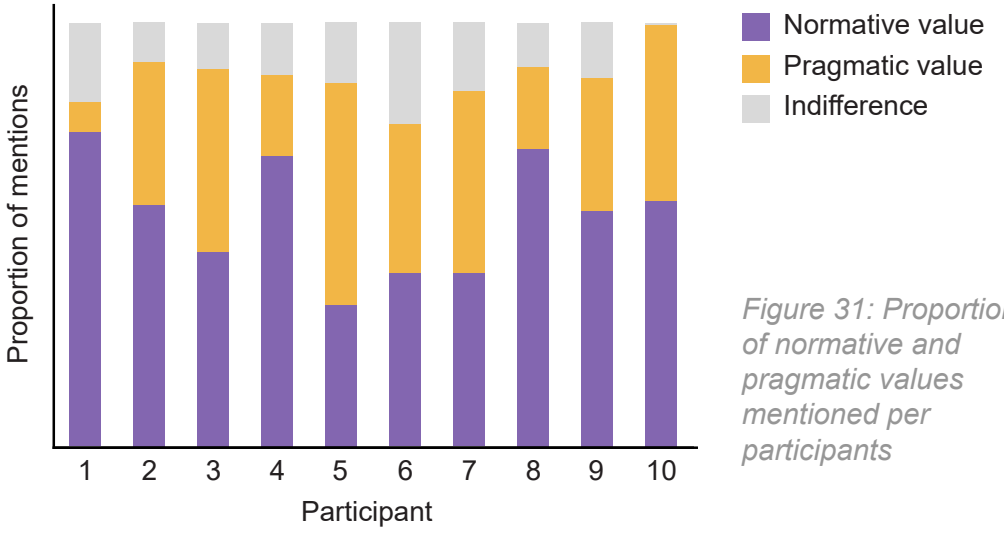


Figure 31: Proportions of normative and pragmatic values mentioned per participants

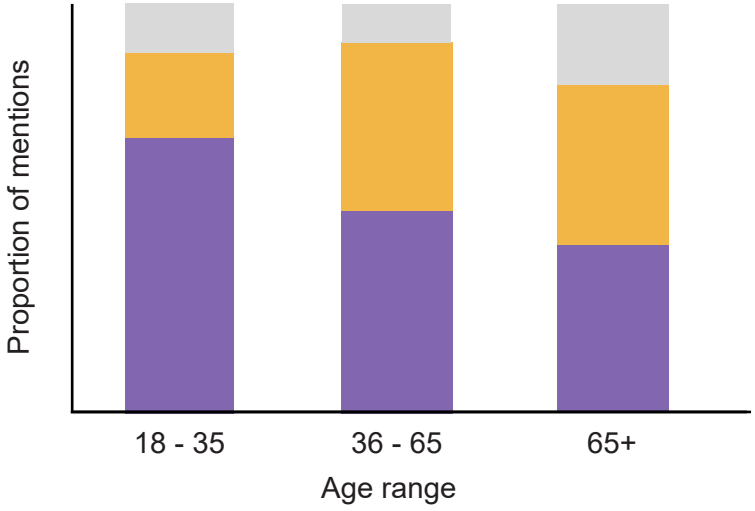


Figure 32: Proportions of normative and pragmatic values mentioned per age group

Reasoning with normative values

Participant 1, 3 and 7 (all women aged 18-35) respectively highly valued autonomy, safety and privacy, preferring the corresponding configurable, European and cash-like prototypes. They sketch an image of a user group who, instead of receiving more money or convenience, value long term values, and might be interested in a new payment method satisfying those values. However, the specific emphasis on which value is most important, might differ quite a bit.

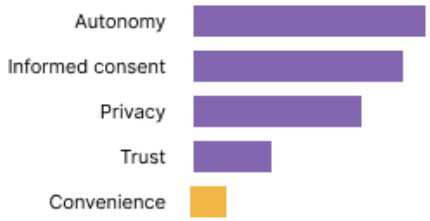
Lost hopes of autonomy

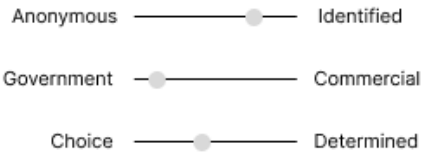
This user mostly values **autonomy** and **informed** consent. She wants to be in **control** by knowing and making choices over where her personal data and money flow. When the system tells her how to share and spend, she heavily resists.

However, when realizing she has no agency over a situation, she gives up hope on autonomy. This results in **cynic resignation**: feeling **powerless** to the thought that her data is **freely available to anyone**, indifferent over which data she shares. In her preferred payment app. She wants a neutral, objective app, offered by a trusted government rather than a commercial party. In this app, she can choose between legally fixed data sharing options about which data parties can collect.

"I would like to have more influence on how I share my data, but I know that is just not the way things work currently..."

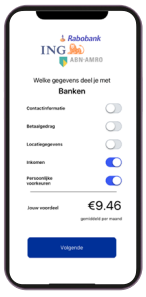
Female
18-35
Prefers to pay by card





Prefers:
Configurable

"I control what I share or not"

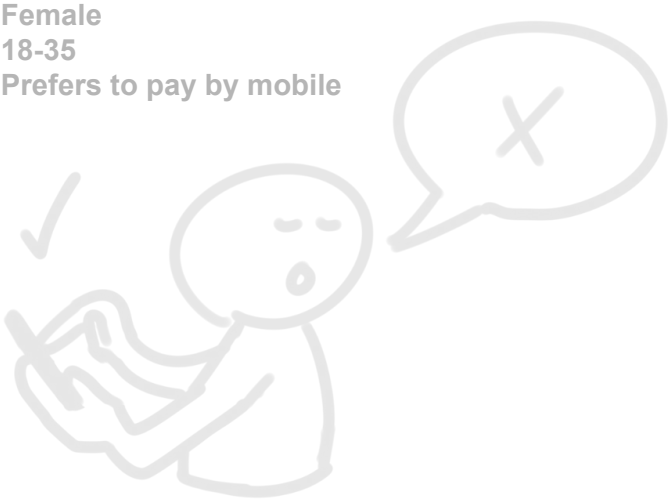


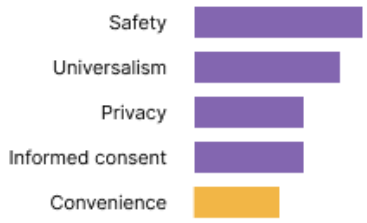
Protected from own dissonance

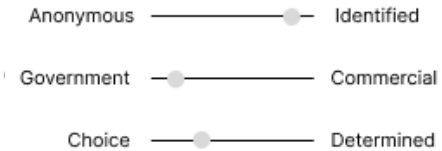
This user mostly values **safety** and **universalism**. On the one hand she has **strong opinions** about these values: Big tech are unethical companies, the EU is very trustworthy regarding privacy regulation and safety communication, selling data for money is a highly unethical practice. On the other hand, when using the app, she recognizes that she **acts against her values**, preferring mostly convenience as she skips information pages and warnings. She would rather look away from confronting insights about privacy, while also admitting that it is good to know. She would like the cash-like interface, to create awareness of her spending. This suggests that she seeks a **safe payment environment** that aligns with her values, which then **allows her to disengage** from them.

"I appreciate the warning, but I would still pay, I don't know why."

Female
18-35
Prefers to pay by mobile







Prefers:
EU

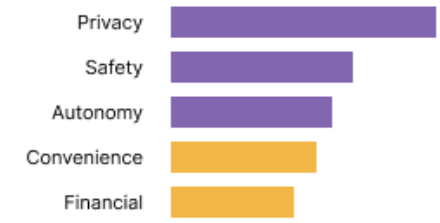
"I would choose EU for privacy"

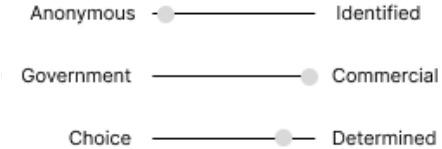
Female
18-35
Prefers to pay cash

Desiring true anonymity

This user mostly values **privacy**. Due to work experience in an accounting office, she is hesitant to share her personal data with institutions such as banks or the government, suspecting they might **use it against her**. However, sharing data with commercial parties is less of a problem, since they have nothing to confront her with, and she feels **unaffected by targeted advertisements**. Her preferred app is the cash-like prototype, although the similar interactions are not convincing to her. Rather, the fact that she **never has to identify** herself, and can deposit cash money on the account, ensures true anonymity to her.

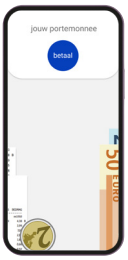
"I like anonymity, because I'm responsible."





Prefers:
Cash-like

"Because I can remain anonymous."



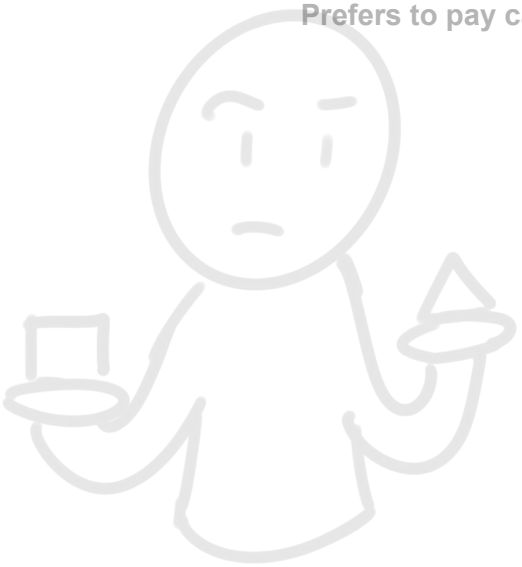
In-between: Balancing convenience and privacy

The following participants balanced normative and pragmatic values, being in between the two extreme groups. One the one hand, when limiting data sharing, they valued privacy intrinsically, without referring to an underlying value such as the normative group. On the other hand, they were often motivated by convenience, without being tempted by financial stimuli such as the pragmatic group.

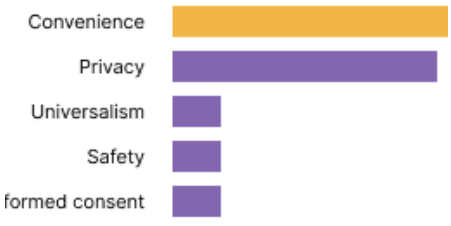
Rationally weighing options

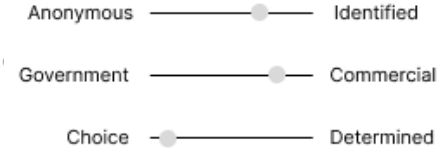
Male
36-65
Prefers to pay cash

This user mostly values **convenience** and **privacy**. He approaches sharing personal data in a **transactional** manner. When informed objectively about all relevant dimensions, he might share if it gives him personalized offers and content. When information **does not align with his mental model** of the system behind the screens, he is **skeptical**. For instance, in preventing criminality, the cash-like prototype is deemed a big step backwards compared to cloud based solutions, with the interface also unnecessarily hindering usability. He believes that commercial payment methods with maximum choice bring the most innovation, and that the EU should only have a regulatory role, but not offer a payment method.



"What makes Europe better per se than America?"





Prefers:
Configurable

Pragmatic values

These participants mainly reasoned out of pragmatic values, direct benefits such as increased convenience and financial gain.

Convenience and direct benefits

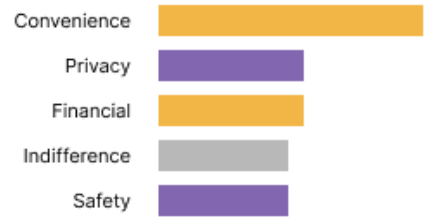
This user mostly values **convenience**. The ability to share data in exchange for compensation is highly valued as a nice addition to his income. Besides, he hopes to get personalized deals, online content and convenience.

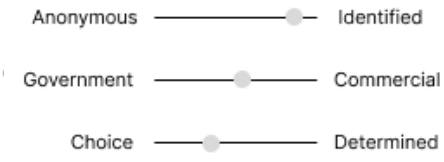
He often feels indifferent to privacy, since he shared his data with so many parties, he thinks they know everything already. Besides, he has nothing to hide, and why would it matter these last 15 years that he roams the earth? His children might care more about such idealistic things, he does not want the hassle, it should not hinder usability. Admitted, this might change when the political landscape continues to change, but for now there is no added value.

For grandkids however, it might be nice to have a pocket money environment, secluded from the real financial world. But for him, his preferred app focused on convenience and offering the best direct benefits.

Male
65+
Prefers to pay by card

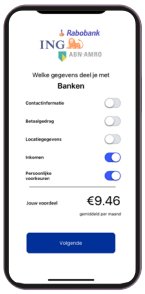
"I don't care whether Beijing knows that I'm getting a coffee"





Prefers:
Configurable

"This one is the most profitable, most in line with my lifestyle"



Conclusion

Participants of the research can be categorized in three groups, those reasoning most out of long term normative values, such as privacy, autonomy and safety, those reasoning most out of direct pragmatic benefits, such as convenience and financial gain, and a group in between.

Within the normative group, there were different desires. Firstly, a longing for autonomy and a feeling of powerlessness, in need of a hopeful message. Secondly, wanting a payment environment in accordance with opinions, even when you act against them. Thirdly, wanting true anonymity, by never having to identify.

Within the middle group, besides combination of other personas, a transactional attitude was shown, with skepticism about wrong information. The pragmatic group showed indifference about values such as privacy, since everything was already known, they might as well collect the benefits of data sharing then.

3.2.3 Insights per design page

To situate the abovementioned values and norms mentioned by the various personas, the evaluations and justifications per prototype page are explained. For every page, the accompanying dilemma is mentioned on top, under which the proportion of positive and negative evaluations are elaborated through the values used as justifications. The positive and negative evaluations that refer to design elements are shown as annotation next to the design. Besides, I show a distinction between responses from the interviews and the survey. Finally, specific design recommendations are given at the bottom. Figure 33 serves as a reading guide for this section.

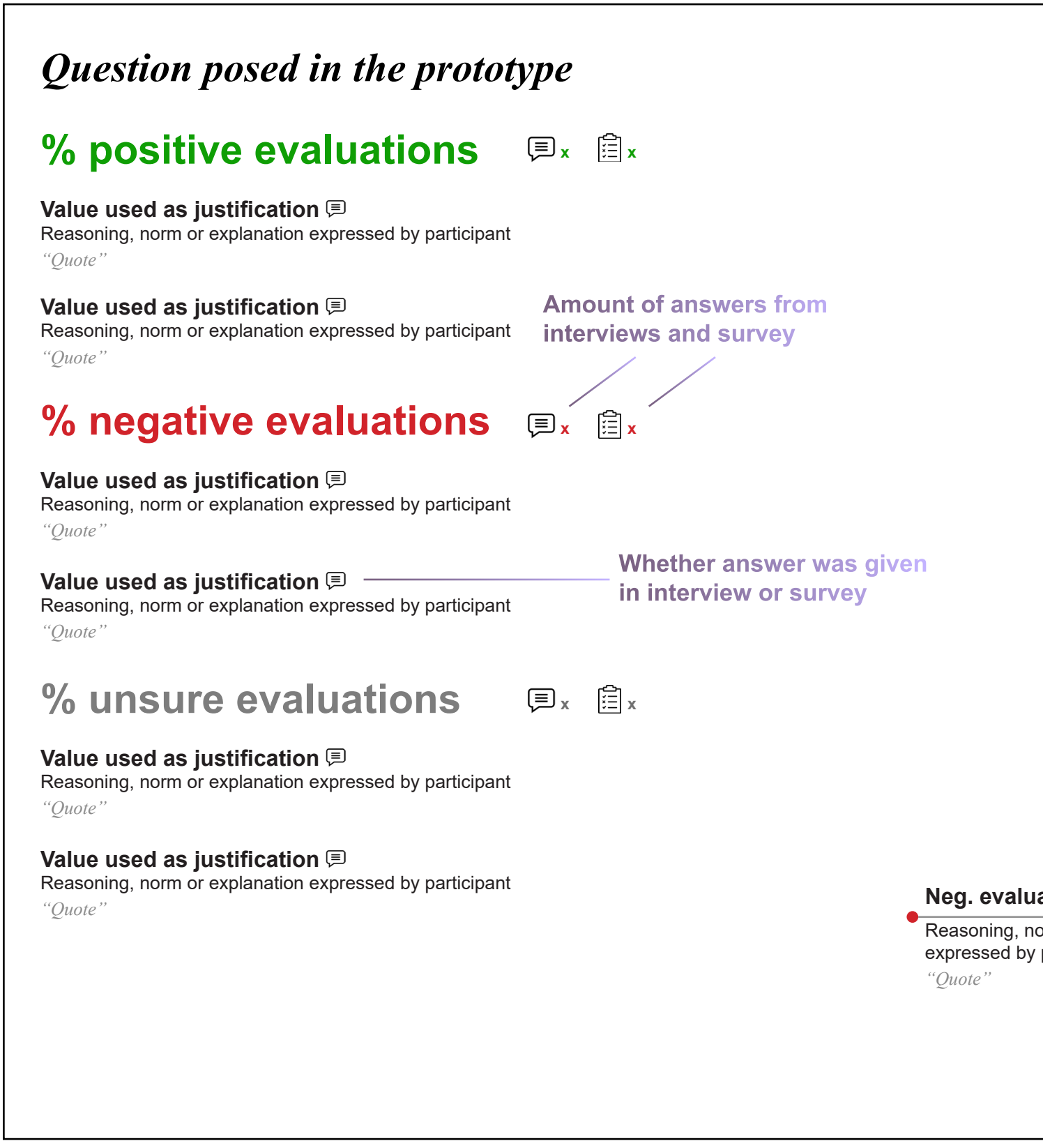
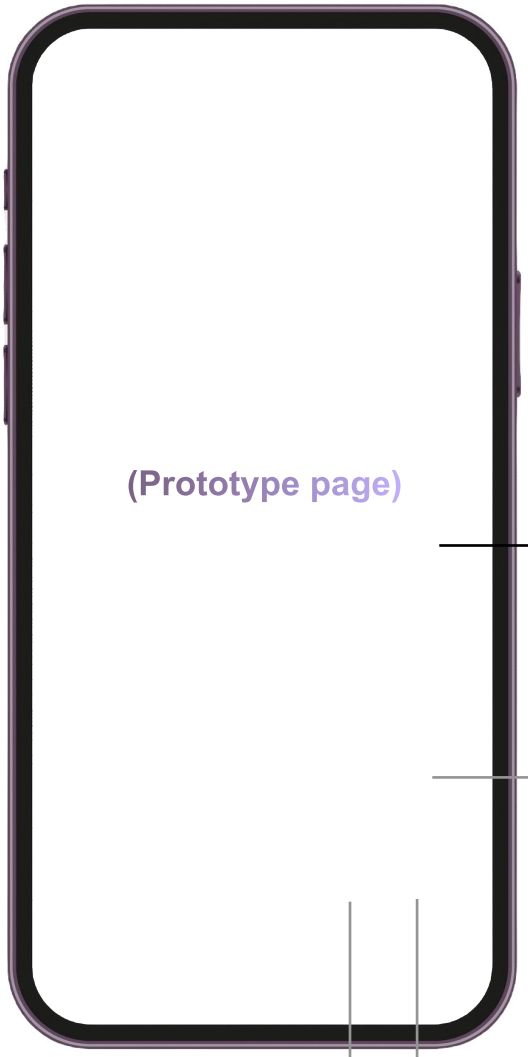


Figure 33: Layout of the insights per prototype page



Other remarks on the design

Further explanation

Unsure evaluation of design element

Reasoning, norm or explanation
expressed by participant

"Quote"

ation of design element

rm or explanation
participant

Pos. evaluation of design element

Reasoning, norm or explanation
expressed by participant

"Quote"

Design recommendations

- Specific design recommendations for this prototype page.

What do you think about

Logging in with your national identity management platform?

50% Positive

4 4

Safety
DigiD was strongly associated with safety.
"Well this is logical safety-wise right?"

Trust
Users trusted DigiD based on previous experiences.
"Also the case with insurances and the bank."

Lack of agency
Users did not mind government data and payment data being connected, since they thought this is already the case.
"They can then see my taxes, but that's the case already anyway."

Convenience
Users deemed it convenient to be able to log in with a known system.
"Ah DigiD, that's convenient."

31% Negative

4 1

Privacy
Connecting data from government and payment app feels like a violation of privacy, since they don't want either party to see the other data.
"All my unique personal data is there… why would they need access?"

Autonomy
Bringing all data to the government, users feared controlling tendencies
"So they also check whether I'm an EU citizen… so that's quite a bit of control."

19% Unsure

2 1

Trust
User feels unsure about connecting DigiD to an unknown party.
"I would be more hesitant: Can I trust this party?"

Convenience
Users stressed that they did not want too many steps for logging in
"Every time DigiD?" "Don't want too many steps for logging in."

Familiar design pattern conveys norma

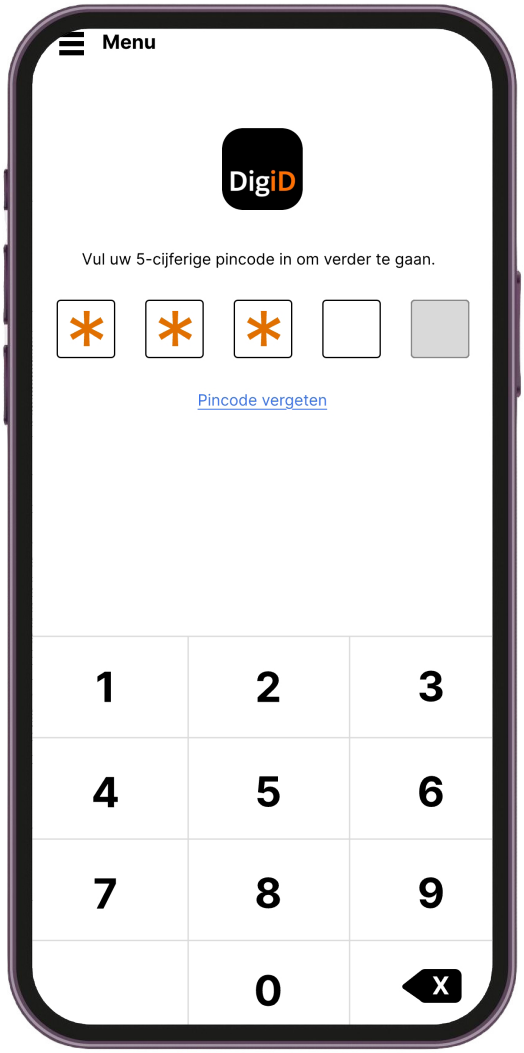
Using standard design patterns, such as the log in button for DigiD in an onboarding process gave m users the impression that this was a normal featur while banking apps usually do not require logging with DigiD.

"I also used this for the bank" (bit later) "Wait actuall sent a copy of my passport."

? (DigiD)

European visual design is deemed exaggerated.

"Well this is a bit too much of a European thought."



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Design recommendations

- For those appreciating DigiD with safety and convenience, consider making it an option. But do not enforce it, for distrusting users.
- Give a mental model for DigiD, emphasize that only a citizen service number is shared.
- Tone down the European visual design and do not include the confirmation of being a citizen.

What do you think about

Receiving a privacy warning from the EU?

33% Positive

5 0

Safety
User trusts communications and laws by the EU Explanation
"I've heard the EU is good at privacy laws and data stuff"

Informed consent
User appreciate the notification since it lets them make an informed decision.
"Good to get such a notification and be made aware."

40% Negative

4 2

Indifference
User does not care if foreign parties know their payment behavior
"I don't care if Beijing knows that I'm getting a coffee"

User feels data is being stored anyway regardless of geographical separation.
"My data is being registered anyway, inside or outside of Europe does not matter."

Informed consent
User thinks this is too difficult for most users to understand
"This is too difficult for normal people to understand."

User needs more information to make a judgment
"I would still pay because I don't know what type of data it is."

Based on their knowledge of data flows and supply chains, users question the effectiveness or legitimacy of such a warning.
"This is just Google, they already use all of our data anyway"

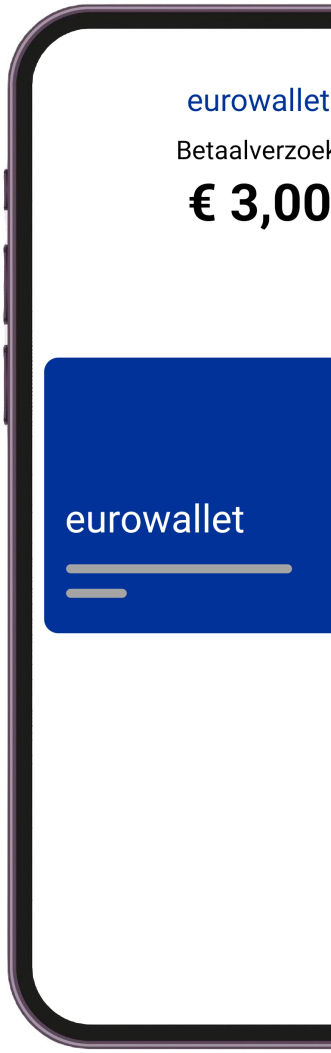
Convenience
User thinks the warning hinders usability and wants to be informed once beforehand, not every time while paying.
"It needs to be communicated beforehand: Agree or not agree. Not during every payment."

Autonomy
User does not want be told what to think or do.
"Less control, because the EU has already decided what's safe or not."

27% Unsure

1 3

Info
User
obje
alarm
"It's
phish
just a



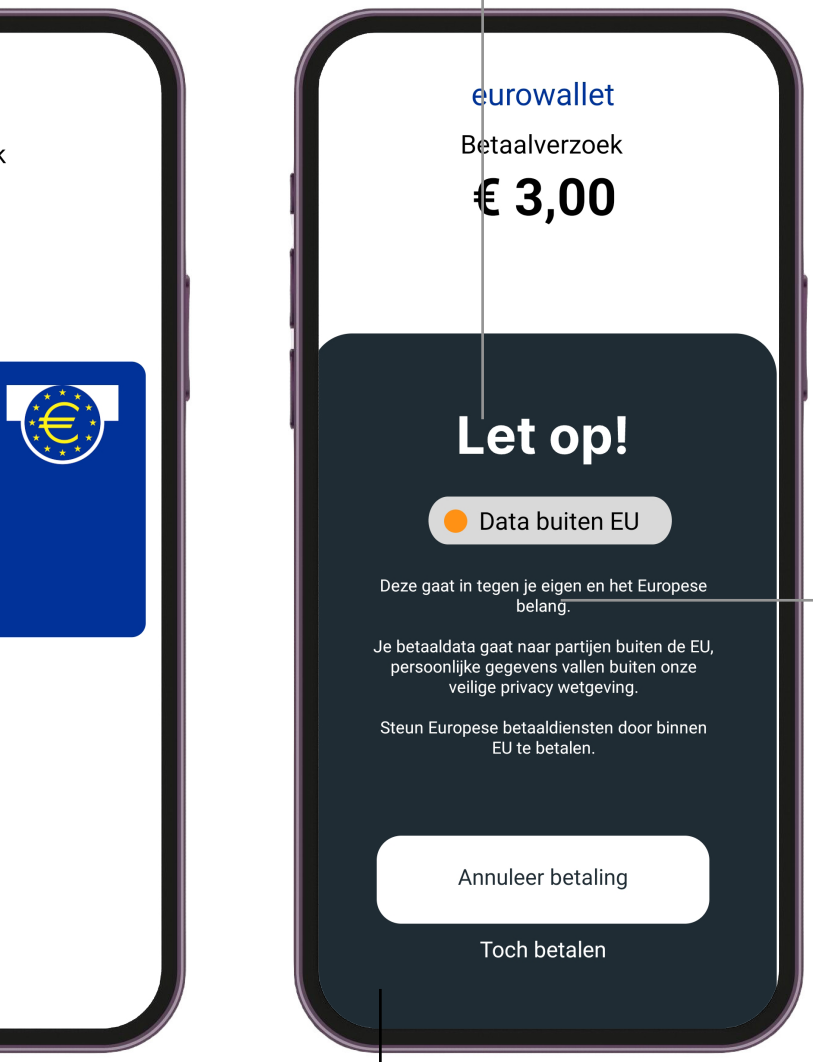
Alarming design creates urgenc for normalized practices

Using alarming design patterns, such as p notifications, orange alarms, "Warning!" t suggestive button design might create a s over practices that are normalized, such a data flowing to other countries (e.g. during card payments, flowing to Mastercard and This "shocking" design layer might cause your suggestions, but might also make th once they realize it's a normalized practic

ormed consent

rs should be informed in an
ctive way, not mislead by
ming design.

*Alarm! Alarm! Like "Don't click on
ing links". It scares people, but it's
payment with Mastercard.*



Indifference

User does not see the harm in sharing data when buying a coffee

"Why is buying a coffee against my own interest?"

y

oop up
ext and
sense of urgency
as payments
g in-store debit
d Visa).
users to follow
em feel mislead
e.

Design recommendations

- High trust is fragile. To not break it, but clearly decide and communicate what counts as risk and what does not. Communicate this upfront already.
- Communicate objectively and in the interest of the user.
- Make European involvement an optional feature, since it was appreciated by some, possibly more due to rising geopolitical tension. Give the opportunity to turn on or off these types of warnings.

Would you

> *Follow the advice of the warning?*

33% Positive

2 1

Privacy
If the user feels there is an accessible, privacy respecting alternative, users switch payment method

"Let's cancel this, I can just pay with my regular card"

40% Negative

7 3

Indifference
User does not care about the warning.

"Good to be informed, however I would still pay. I don't know why"

Convenience
Having found and committed to a purchase already, user does not want to cancel a payment now.

"Now that I've found my product, I just want to pay".

Safety
User experiences the app as a safe government environment that protects her actions regardless of her choices.

"I would still pay with it, because it's offered by the government".

Informed consent
User needs more data to assess the threat

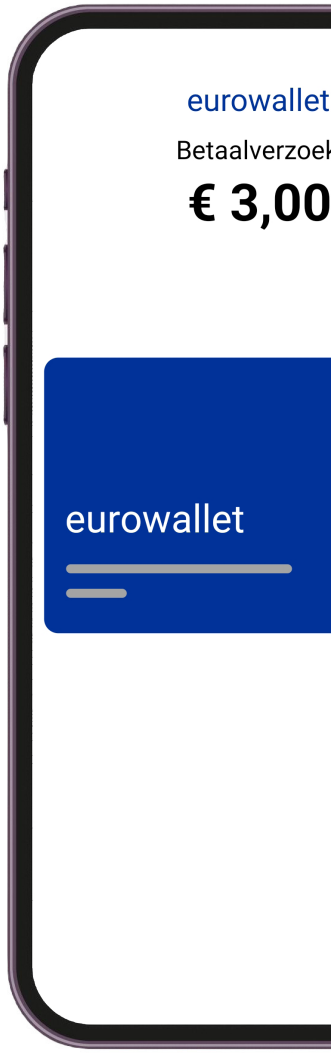
"I would pay because it's unclear which data it is about."

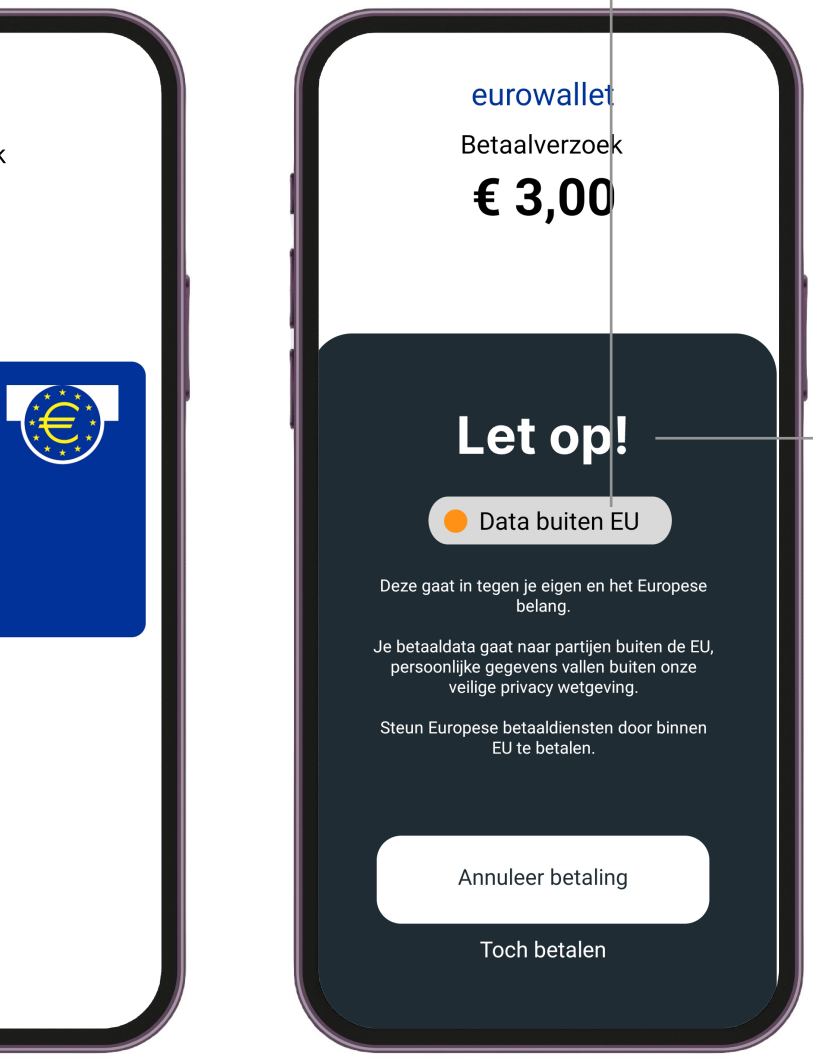
Enjoyment
User values gratification of desires more than the presented privacy risk.

"But I really crave coffee… so I'll pay anyway."

27% Unsure

1





Safety

Giving personal data to parties outside of the EU is deemed less safe.

"When it's outside of the EU you don't have control over it anymore, you don't know what can happen"

External sanctions

User doubts whether the warning presents any legal consequences

"Wait, am I acting against the law? Then I would not do it. Otherwise I would just pay."

Design recommendations

- High trust is fragile. To not break it, but clearly decide and communicate what counts as risk and what does not. Communicate this upfront already.
- Communicate objectively and in the interest of the user.
- Make European involvement an optional feature, since it was appreciated by some, possibly more due to rising geopolitical tension. Give the opportunity to turn on or off these types of warnings.

What do you think about

European goals in your homepage?

20% Positive

0 3

Universalism
Users recognize shifting political relation with the US

"With München and Trump I understand that people would want to support Europe."

73% Negative

10 1

Indifference
Other people might have ideologies, but the user does not bother

"Maybe this is for people who occupy the A12, but I think it's a hassle."

User does not care whether their data is in- or outside of Europe

"I would not care about data inside or outside, it doesn't hit close to home."

Universalism
User does not see why their support is needed.

"You guys are the richest economy in the world, what do you need me for?"

Social expectations
User thinks it's not their role to contribute to Europe in that way

"I already pay taxes, what do they expect of me?"

Informed consent
User wants to be informed what they are actually supporting

"I don't really understand this…"

Based on their knowledge of data flows and supply chains, users question the effectiveness or legitimacy of such a warning.

"If I buy an American car, it's manufactured in China with parts from Europe. how would that work?"

Trust
Information overload causes the user to fall back on what they trust and can physically see

"Too much information for me. When I trust it, that's enough for me. Outside of EU I don't mind. I trust the physical place, that's enough"

7% Unsure

0 1

Universalism
User would support European companies if she would be informed correctly.

"If I was informed beforehand what is European and what not, and I knew where the money was going ,then I would consider supporting"

Privacy
User thinks the goals make
reflect on their data sharing

*"So 69% is leaving Europe, th
really make me happy…"*

Informed consent
User thinks the importance
consumer's contribution to
is greatly exaggerated.

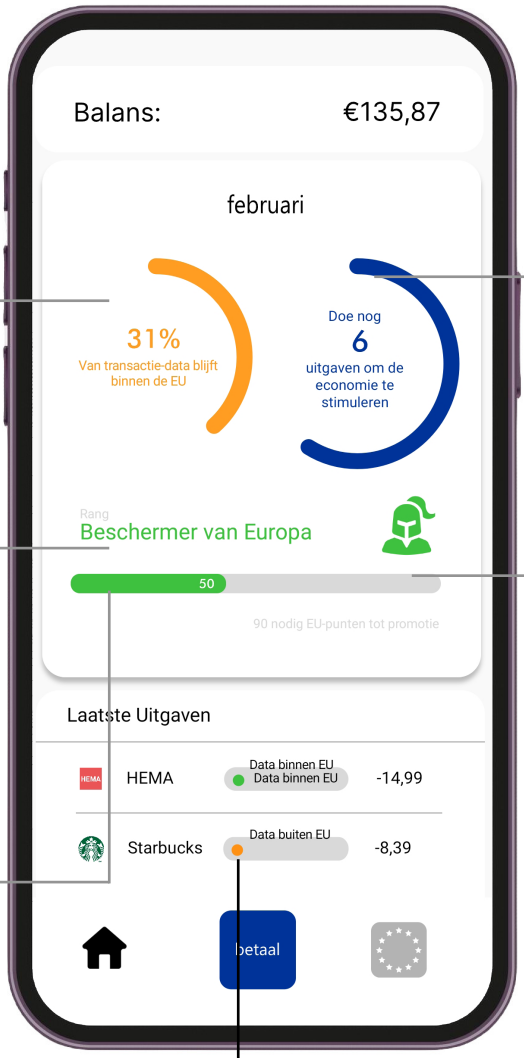
"Defender of Europe? That's

Financial
User thinks that without fina
incentive, these reward sys
easily bore

*"What if I could get a nice bo
achieving 6 payments? Just li
bank. That would be nice"*

Triggered by orange
Users feel triggered by the
color, thinking she needs to
urgent action.

"Wait do I have to block my c



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Autonomy

User thinks a payment app should be neutral, instead of stimulating to spend money in certain ways.

"This is stupid (6 payments goal), because I myself decide what to do with my money."

Enjoyment

Reward systems are deemed fun competitive elements

"Fun little extra, like a game."

Design recommendations

- Do not enforce such goals, but do offer optional insights for those interested

Having anonymity and local money?

27% Positive

3 1

Privacy
Users value anonymity
"Anonymity, that's nice."

60% Negative

6 3

Safety
Users find the risk of losing your phone too big for the anonymity it brings
"That would be scary… I lost my phone before with all my photos on it, I learned from that."

User finds it more important to prevent criminal activity.
"In the end it's all about preventing fraud. That's more important to me."

Indifference
User does not care about privacy, since they feel they share everything already
"Looking at what I'm already sharing, I wouldn't care so much"

Convenience
User would prefer cash as a backup
"Another security is having a few hundred euros in cash at home, this is redundant."

13% Unsure

1 1

Safety
Because of risk of losing, users would adjust their behavior.
"If I like it? Hmmm yes and no. Because of the risk I would put maximally 50 euros on it."

Trust
Design pattern terms of servic
trustworthy, standard
"Terms of service is a standard th
looks trustworthy"

Informed consent
User does not believe the stat
to be technically true
"Digital currency should be base
decentralization, this is false priv

Terms of service are ea
Users did not read them, had
to go back and read.
"I actually never read this"

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vacy"

Informed consent

User does not believe the statement to be regulatory true

"Digital anonymous money doesn't exist, it has to be traceable."

sily skipped

to ask

Design recommendations

- Present local money as a funtion "on the side", in which little money is stored just in case. Relatively to your the value of one's phone, losing 50 euros is not a big deal.
- Emphasize such a definitive statement of risk more strongly than using a standard terms of service form.
- Clearly state who is behind the app and provide more information about how such a novel system could work.

What do you think about

A similarity to cash?

27% Positive

3 1

60% Negative

5 4

Convenience

The interface does not give enough insight in financial status

"I want to be able to see how much I have on top"

The app does not provide enough added value compared to regular cash

"If you like cash, you'll just use real cash"

Privacy

User thinks app still registers the activities

"Who sees this? The app maker collects my data, but does not know

13% Unsure

2 0

Convenience

Paying and handling money is unnecessary complex.

"This feels like a step backwards, tapping once should be enough."

Financial gain

Handling banknotes instead of tapping "pay" makes user more aware of their financial situation.

"If I have to swipe all these banknotes, I become more aware of what I spend"

Enjoyment

The user thinks interacting with the interface is fun and light hearted"

"I could play with that euro coin all day"

Enjoyment

The enjoyment of interacting with the interface is deemed short lived

"Looks nice, funny. But doesn't add that much practically"

Trust

To some users the interface felt like using cash

"I get the feeling I put it on the table in front of me"

Trust

Some users rejected the the interface because it did not feel like real cash.

"You still have to hold your phone next to it, this is no physical money. Cash needs to be physical."

Privacy

User thinks only they can see their receipts

Who sees this? "Only I see this"

Design recommendations

- Maintain enough similarity to cash to maintain users' "separate wallet" mental model, but improve insights, efficiency and seriousness to match current mobile payment apps.
- Maintain cash's unique handling, which helps to raise pain of payment, creates awareness on spending and allows for intuitive budgeting.

What do you think about

Logging in through your bank?

88% Positive

9 6

Convenience
Connecting with their banks is deemed easiest
"Connecting with my bank is the most direct line to my money"

Trust
User is already a customer there
"My own bank account, I trust that"

Privacy
User chooses bank because they don't want to share their data with extra parties.

6% Negative

1 0

6% Unsure

1 0

Trust
User trusts the advice of a third party certificate
"The privacy score is the highest, so I choose the ECB."

What do you think about

Logging in with the ECB?

22% Positive

1 1

Safety
User associates DigiD with safety
"DigiD is the most safe way to log in"

67% Negative

4 2

Privacy
User would not want to connect their payment data with the government
"Hmm but that's connected to the government. Not sure if I'm comfortable with them knowing my payment data."

Trust
User does not know what the ECB is
"No idea what the ECB is."

11% Unsure

1 0

What do you think about

Logging in with Apple ID?

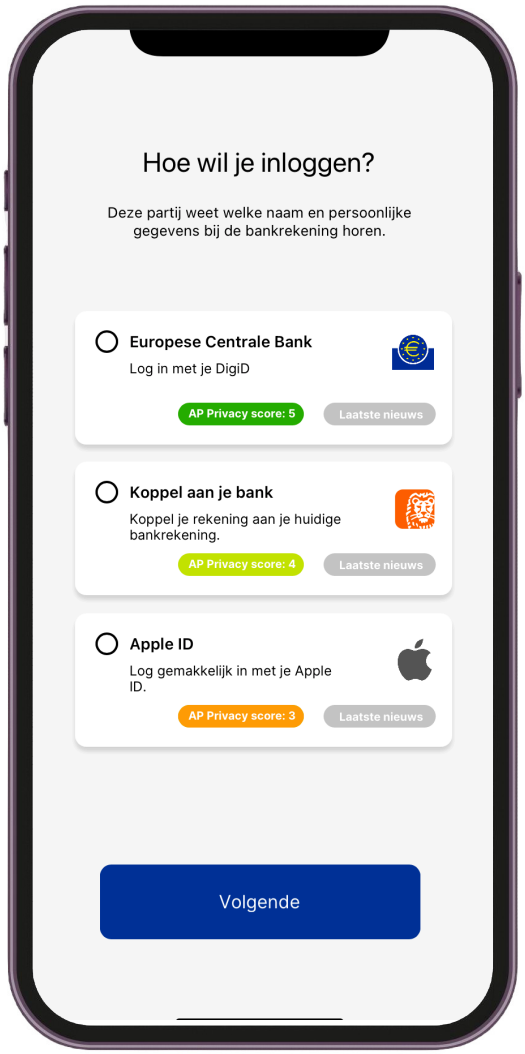
36% Positive 2 2

55% Negative 5 1

Trust
User is currently not using Apple.
"I don't use Apple. I would choose something that already knows my data."

Universalism
User thinks Apple has a bad reputation.
"Apple is a big tech company without ethical values."

9% Unsure 1 0



Design recommendations

- Provide an option to log in with current bank, since this is preferred by far most participants.
- Improve the publicity of the ECB, or let a more known party serve as a public intermediary.
- Besides the security of the phone lock, do not include Big Techs

What do you think about

Being able to choose which data to sell to which party?

69% Positive

7 4

Autonomy
User appreciates to have an active choice in things that are usually hidden

"Normally you just press 'Accept', now you can see what's happening"

Financial
User likes being able to sell their personal data for some extra income

"If you have a low income, this could be a nice benefit"

Lack of Agency
User appreciates getting compensation for something they feel they have no control over

"Normally my data just flows everywhere without noticing it, at least now I get something in return."

19% Negative

1 2

Universalism
User deems it unethical/discriminatory to let people sell their personal data.

"Taking advantage of students with a low income. Then I'd look back in 10 years and have regrets"

User thinks the digital euro should not have any commercial aspects like this

"But why? Digital euro should just be a payment method without anything commercial."

Well being
User finds it confronting to know which data she is currently sharing with other parties

"I'm unaware of which data I now share, I'd rather not know…"

Informed consent
User needs more details on types of data and purposes for data sharing.

"I would like to know what they do with it. Marketing? Statistics?"

Privacy
User associates anonymity with "being in control" instead of sharing data.

"I would turn off everything, because this still shares data."

12% Unsure

2 0

Tiredness of c
Participants took l
sharing their data
stores. This might
choice after facing
time

(rushed) "And stores
nothing!"

hoice

ess time to consider
with the final category of
be due to a tiredness of
the same menu for a fifth

s also get everything /

Design recommendations

- Provide people with a choice for value-added services upfront, but do not offer financial compensation, since this creates commercial associations and is heavily rejected by some users.
- Use a standardized, interactive button - benefit structure that triggers users to engage with the data sharing proposal. However, do not provide too many choices due to tiredness of choice, in this case not more than 4 pages.
- Put all options on “reject” as the default option, protecting people who are used to rushing through these menus.

Do participants actually

> *Share their data with companies?*

Positive

Indifference

Implied consent: User is fine with sharing, since they already use the service and thus think they shared data.

"Now that I think about it, I already shared this with Albert Heijn because I have an account there."

User does not care since they also shared with other companies

"I already use 5 payment services. They can have all my data, I don't care."

User is okay with sharing since they feel a general lack of agency over their data.

"I would want to say no to everything, but that's unrealistic."

Convenience

It is worth sharing data for getting improved service

"This way I get more offers, information and events on Facebook."

It is worth sharing data when it is deemed necessary for a functioning service.

"But I can't pay without contact information right?"

Universalism

It is good to help the government by sharing data for statistics

"Maybe they want to know it for statistics."

Financial

It is worth sharing data if it gives you personalized offers and lets you save money.

"If I can use it to get a better offer for a mortgage and then withdraw consent, that would be great"

Safety

Sharing data with a party can help them improve safety.

"Sharing location can help the bank protect me when there are suspicious payments abroad."

Negative

Trust

You should not share data with unknown parties

"ECB, no Idea. I wouldn't want to share anything. Why do they need information? Who are they? Where?"

Do not share data with parties with a bad reputation

"I'm hesitant about Big Tech, maybe that's because of the media."

Autonomy

You should not share data when it can be used against you later.

"Insurers will judge you on your behavior. That changes things."

Privacy
It is uncomfortable that one party knows too much about you.
"Do you want banks having so much information about you? Is that positive in the long term?"

Some information is too sensitive to share.
"Some things should just be kept secret, like your name, address, where you work."

Do not share when your data might be used for commercial or bad purposes.
"If it's only for commercial purposes, I would turn it off."

Do not share when the purpose of data sharing is unknown.
"Why would an insurer need to know hwere I buy my coffee"

Financial
User deems the compensation too low to share their data.
"For 4 euros it's not worth it to share my data."

Unsure

Informed consent
User needs more information about the purposes of data sharing to make a decision.
"What will they do with that? Marketing? Insights?"

Anonymous data
If personal data could be anonymized, user would be more comfortable with sharing it.
"Anonymous data would be a lot more comfortable, but how is it guaranteed?"

Design recommendations

- Clearly communicate all dimensions (why, what exactly etc.) to users so they are informed before consenting.
-
- Provide mental models of how personal data actually flows, which parties are involved and for which purposes it is used.
- Try to give a hopeful message, that better privacy can be achieved.

What do you think about

Receiving a better offer right before paying?

57% Positive

6 2

Financial

Users appreciate being able to get discounts by sharing their data

"Discount! Great, that's nice"

29% Negative

1 3

Social expectations

User thinks people should just pay the listed price

"I don't want to share. I don't want discount. I should just pay the price of the product."

Universalism

User thinks the notification takes advantage of people's financial situation

"This feels like a Black Mirror (red. dystopian Netflix show) episode, very ethically interesting..."

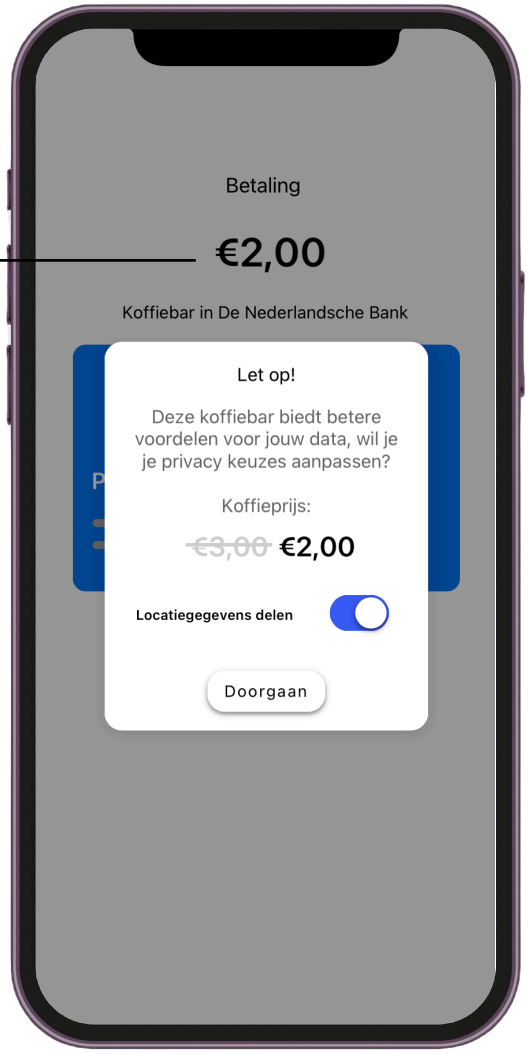
14% Unsure

2 0

Hurried at the check-out

User feels like she has to make
faster due to the check out setti

a decision
ng.



Design recommendations

- Do not give such suggestions at the moment of transaction, since this is deemed overly commercial and creates rejection of users.

What do you think about

Seeing in your overview what companies know of you?

46% Positive

4 2

Autonomy
User appreciate getting insight in data sharing practices, although it might be confronting

"Quite confronting, but good to see, since I have currently have no idea."

Indifference
User feels indifferent since they think companies know everything already.

"I let go of that these days, if they want to know something they'll find a way to get it."

31% Negative

3 1

Indifference
User would not be interested in seeing which data they shared with latest transactions.

"I don't really care, did not notice it. Would scroll past it quickly."

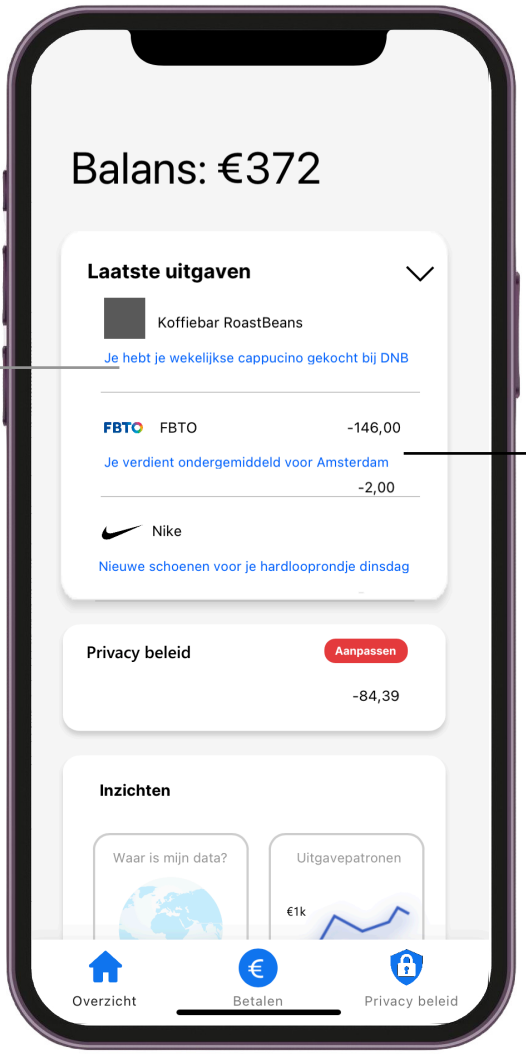
Privacy
User feels like the ap
them instead of the c

*"It learns too much abo
predicting my behavior.
that."*

23% Unsure

1 2

p is tracking
ompanies
ut me, starts
I don't want



Others understood the intention

Some participants correctly understood the sentences as data shared with the party.

"So these companies know that? They know my income?"

Design recommendations

- View privacy as an active endeavor by providing a quick option to withdraw consent for value added services, since some participants regretted their actions when realizing what they shared.
- Data "bubbles" gave clarity on shared data, while the predictive sentences, were deemed confusing or creepy.

What do you think about

Directly receiving targeted advertisements?

83% Positive

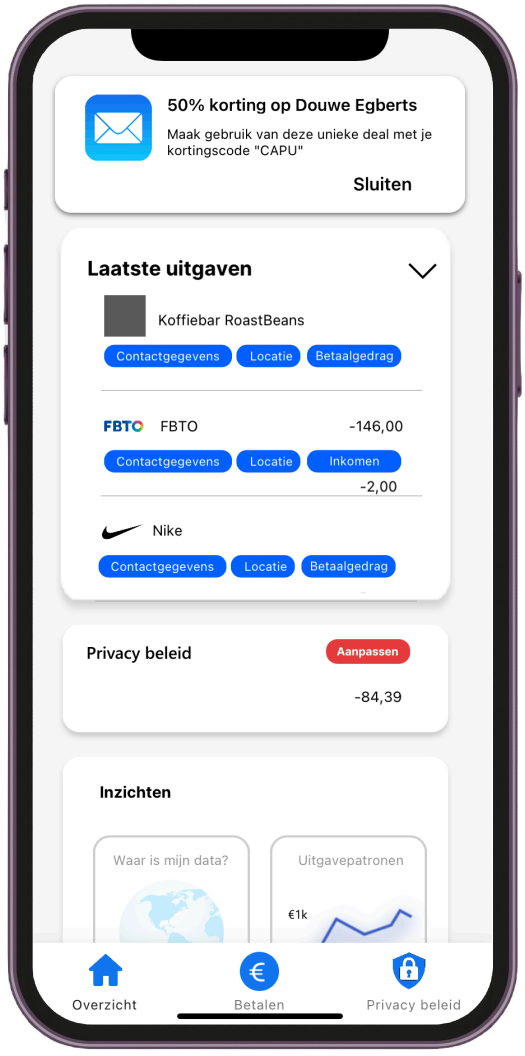
5 0

Financial
Users appreciate getting a personalized advertisement.
"I would use that discount. Not sure how it relates to privacy"

17% Negative

1 0

Privacy
Targeted ad feels like a privacy violation.
"This notification shows that everyone knows it.. feels like a violation of privacy."



3.2.4 configurations on axes

In this section, the preferred configurations of the value tensions are visualized for the interview sessions and the survey results. As described in the research setup section, both session had a different structure for determining the participants' configurations, with the interview sessions being more open and conversational, and the survey presenting participants with predefined options. To compare both results, the preferences of the interview session were roughly grouped into design requirements on one scale, resembling the survey results. However, they did not match entirely.

On the one hand it might be an oversimplification to place multidimensional concepts about privacy on extremes of a one dimensional scale and fill it with de-contextualized design features. On the other hand, it provided a direct way of voicing some design wishes and gave an interesting contrast with the participants' answers while using the apps.

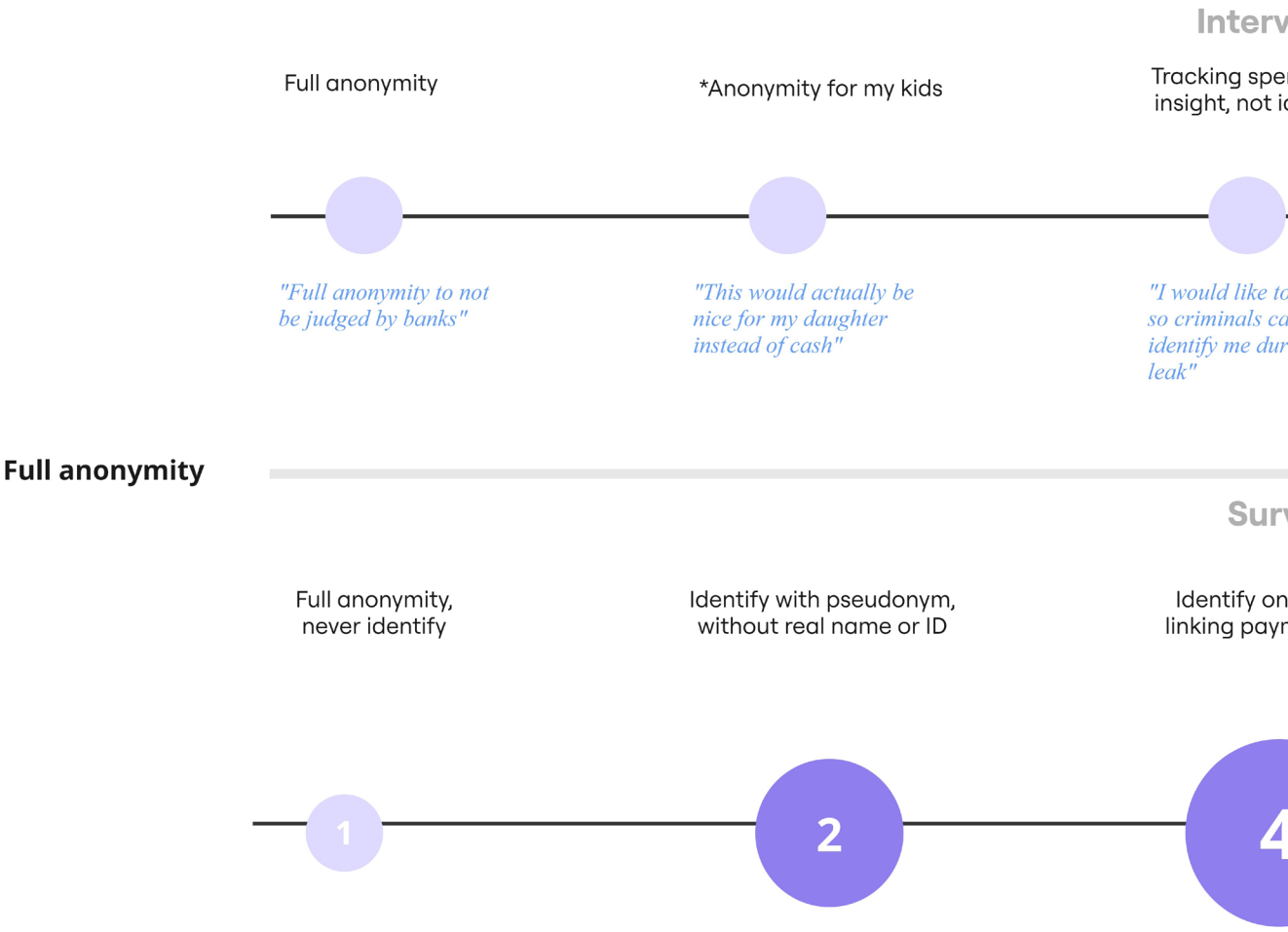
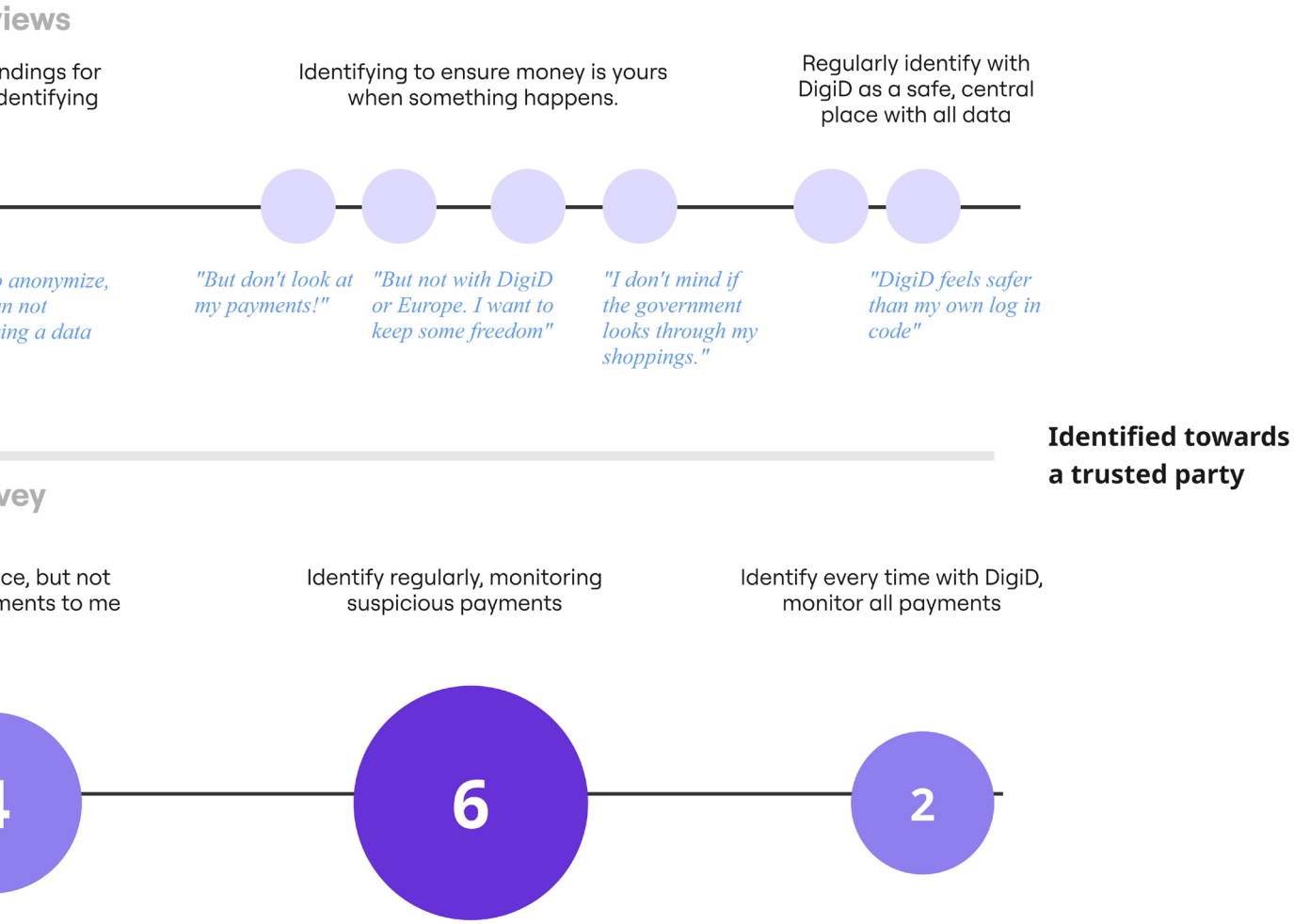


Figure 34: Participants prefered positioning ont the anonymity- identficiation tension axis for both sessions

Anonymity – Identifying

Figure 34 shows that most participants preferred being identified while paying. From the survey this result was framed as being similar to current payments. In the interview sessions, the suggestions participants made pointed in the same direction, with many people wanting to identify to ensure a claim to their money in case something would happen. Some expressed fondness of DigiD as extra safety, or a carelessness of governmental monitoring, while others preferred to identify towards banks instead of government. Few wanted full anonymity. With one participant wanting this as an app for her child, secluded from the “real” payment parties, like cash pocket money



Government – commercial

Figure 35 shows that the preferences between engaging with government and commercial parties were a bit spread out from the interviews. The prototype evaluations showed that participants rather chose based on familiarity, connecting with their current bank or with DigiD. The few more ideologically engaged participants from the interviews were at the extreme of this scale ends. In the middle some participants expressed indifference. For the survey, participants chose for public parties. Since the prototypes were presented as a Digital Euro, probably associations were triggered with the accompanying policy goals, institutions and situated the app between current payment options.

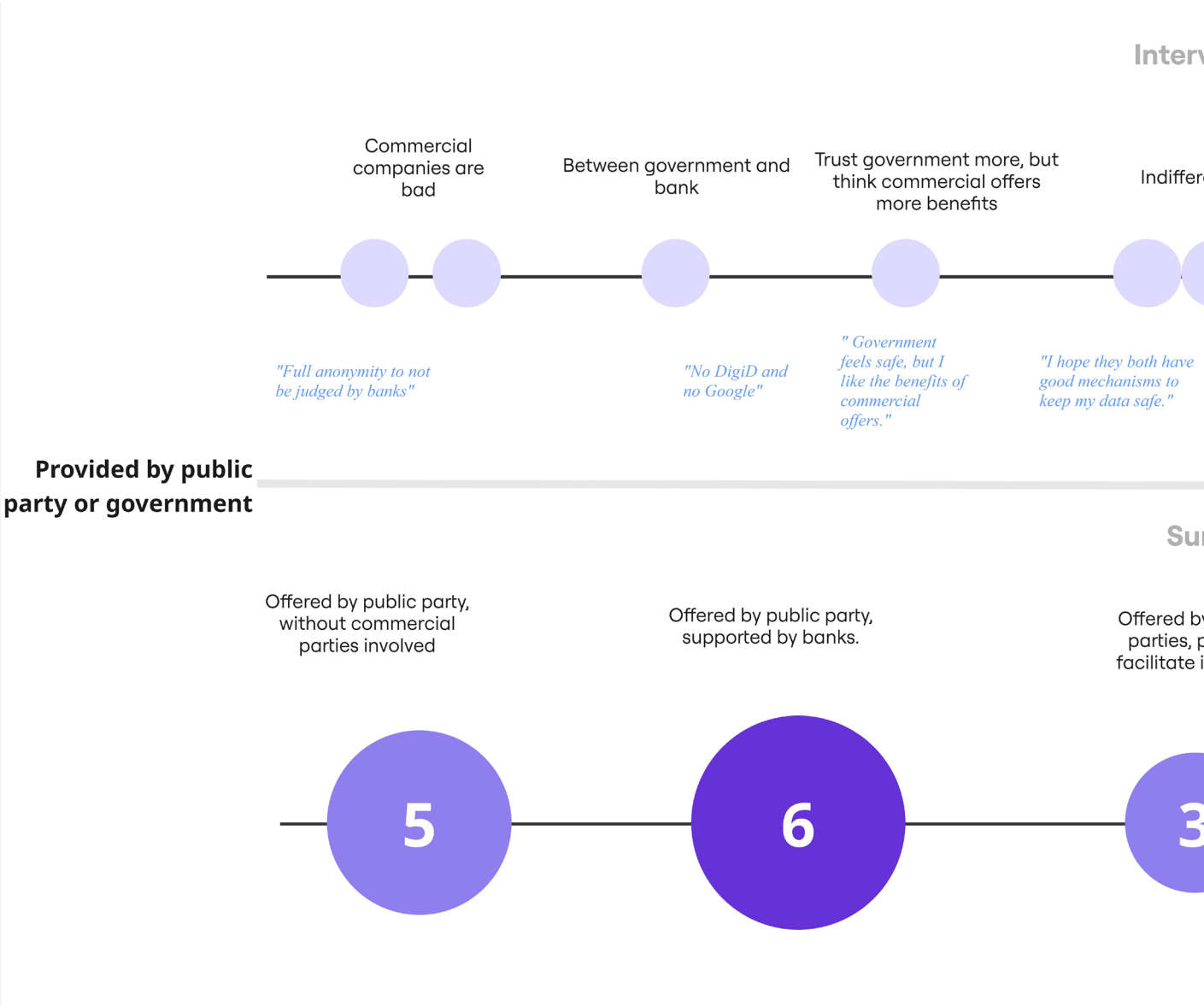
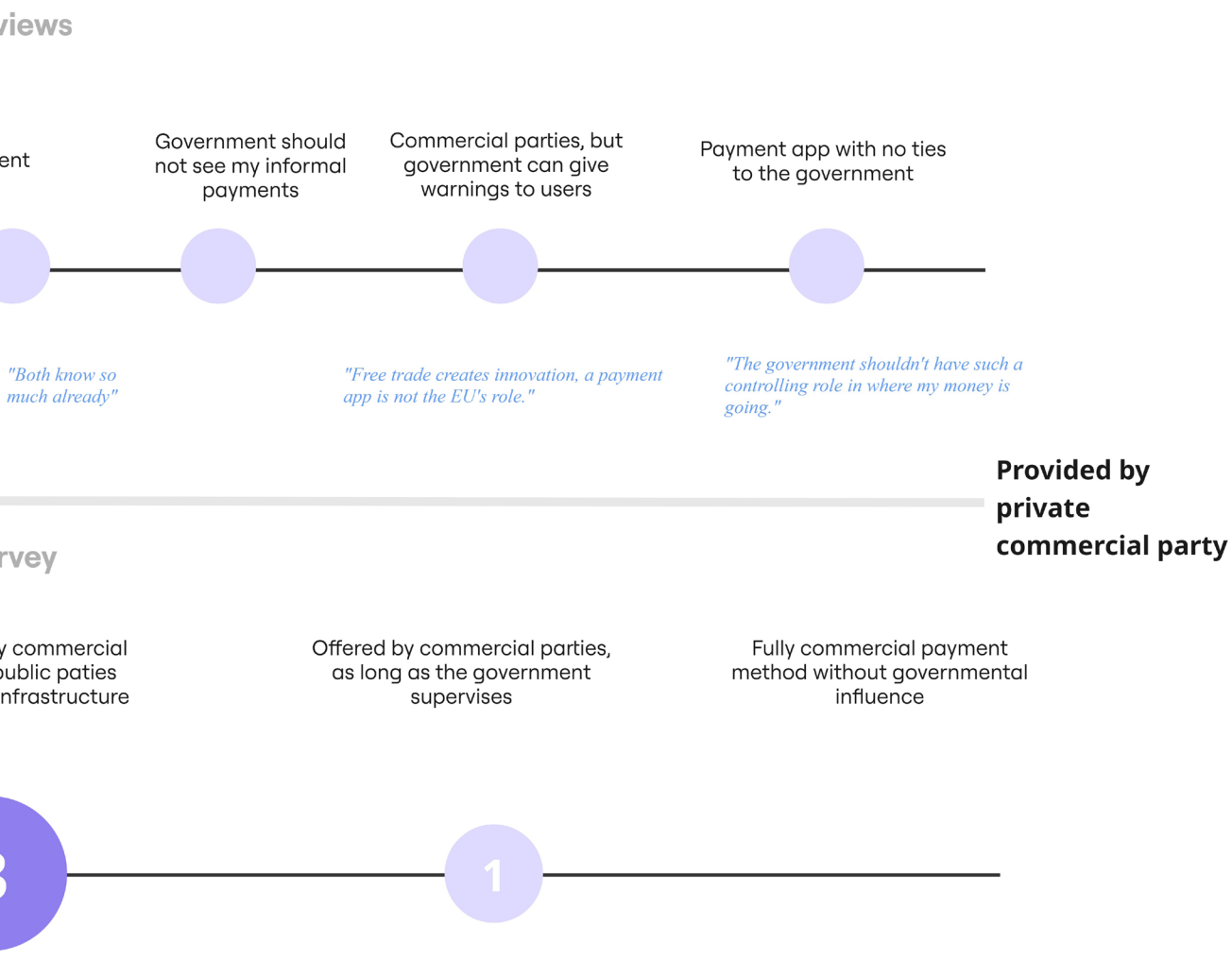


Figure 35: Participants prefered positioning ont the public - private tension axis for both sessions


views
ent
Government should not see my informal payments
Commercial parties, but government can give warnings to users
Payment app with no ties to the government
"Both know so much already"
"Free trade creates innovation, a payment app is not the EU's role."
"The government shouldn't have such a controlling role in where my money is going."
Provided by private commercial party
rvey
y commercial
ublic paties
nfrastructure
Offered by commercial parties, as long as the government supervises
Fully commercial payment method without governmental influence
3
1

Choice – Determined

Figure 36 shows that interview participants expressed a slight preference for actively choosing which data to share, with most of them preferring to choose beforehand between companies, privacy categories, or having the option to make small adjustments to a standard default. Contrastingly, survey respondents heavily preferred one standard for maximum privacy. This difference might be partly explained by a different phrasing of the scale's extremes for each session, since "determined" might have less positive associations than "Maximum privacy default for everyone, without having a choice.", which already assumed a definition of privacy that drawing one line provides maximum privacy. Again, also the phrasing of "Digital Euro" might have created associations with the simplicity of cash for survey respondents, while "new payment method" was more neutral for interview participants.

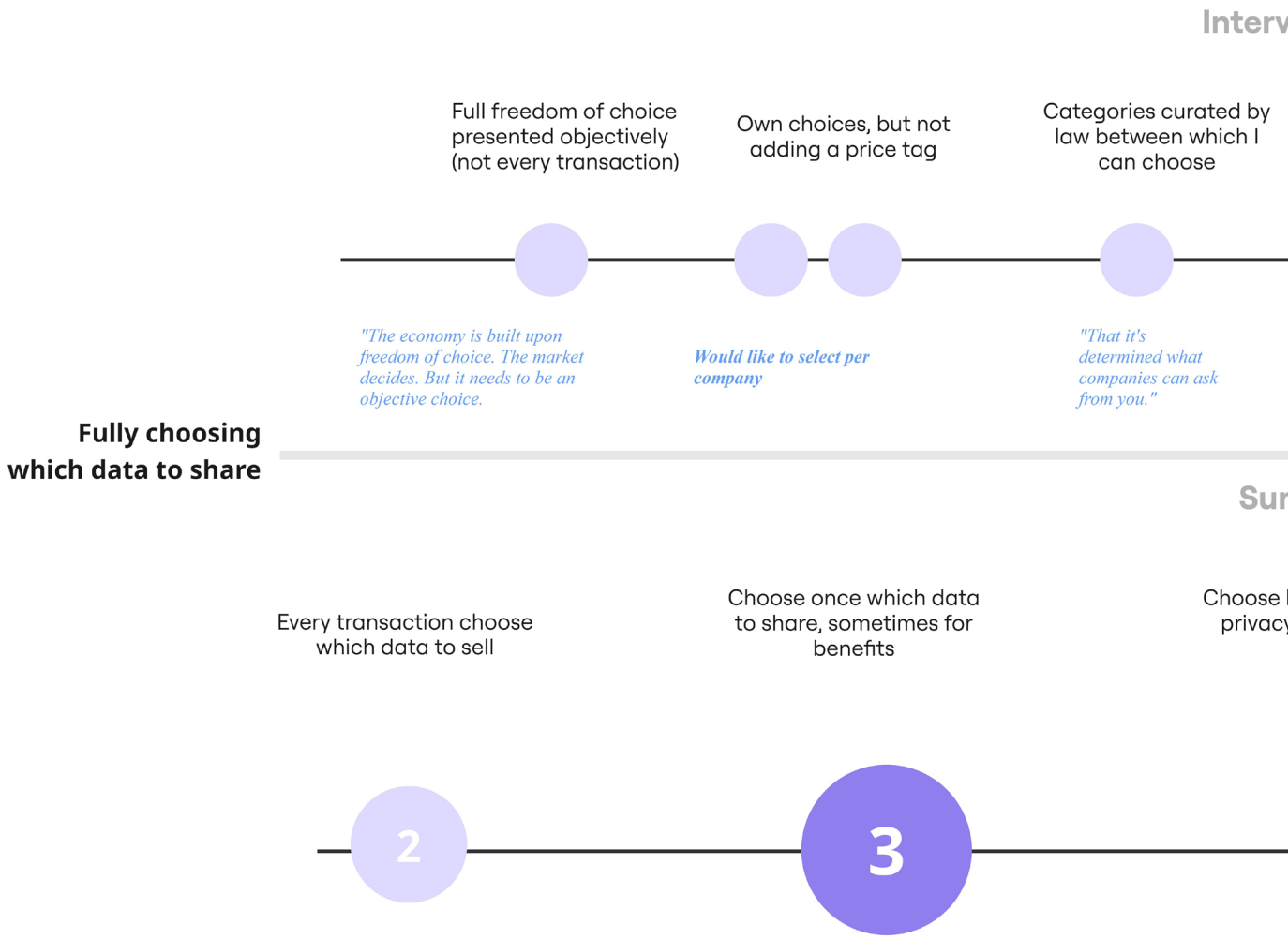
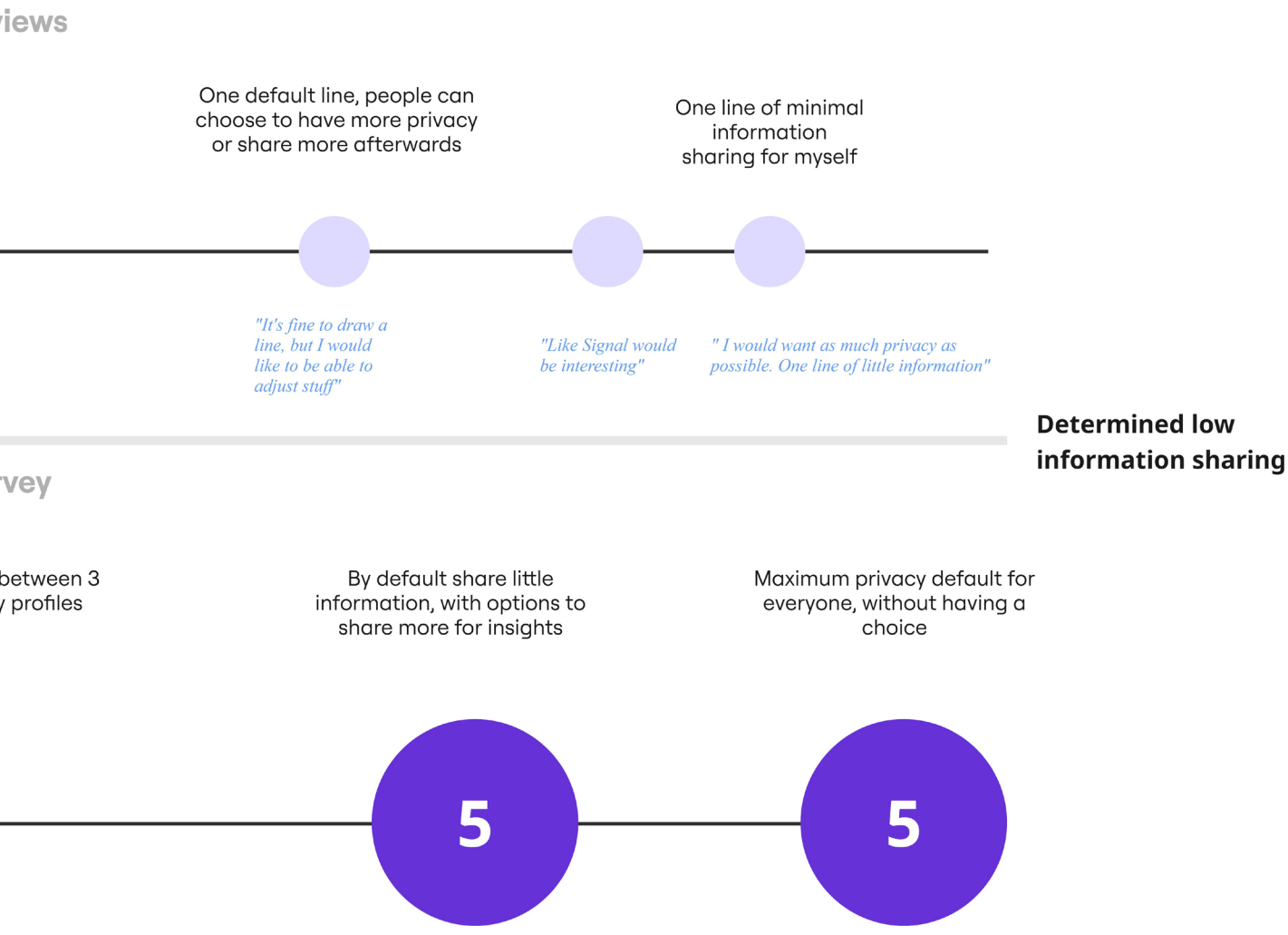


Figure 36: Participants prefered positioning ont the choice - determined tension axis for both sessions



Conclusion

Most participants would like to be identified towards an intermediary when paying, to ensure a claim on their money were something to happen. While many participants trusted the government, a choice of which party to engage with was mostly based on familiarity, rather than the party being public or private. Having a choice was greatly appreciated during the interviews, but not during the coffee bar research, possibly due to framing it as “New payment method” vs. “Digital Euro”.

3.2.5 Values are ambiguous

Design influencing people's values

Since participants were faced with prototypes differing both in functionalities of the system, and the design of the interface, it is interesting to see which aspect influenced which values. Looking at the section above, where various design elements are described, it appeared that certain design patterns served as a layer that amplified, or dampened the users' reacti ons to the app.

Already, the high fidelity of the prototypes probably created an expectation of a realistic system behind the app . However, specific standard design patterns exposed participants deeming novel functionalities "business as usual". For instance, when logging in through DigiD, some users reacted: "Oh that's very normal, I also did that with my current bank.", only to realize later: "Wait, no. I sent a copy of my passport.". Using the familiar DigiD logo and button design conveyed a sense of normalcy to the unusual property of connecting DigiD to your bank. When some participants noticed this, they slowly started questioning this system property.

On the other side, design patterns could also evoke an alarming reaction to practices considered standard normally. When participants received the "data outside of Europe" warning in the EU prototype, some were alarmed by "Warning!" title, or the orange notification. It caused some participants to be shocked and cancel the payment (One participant to her husband: "No don't do it honey, let's just pay another way alright?) while others examined the notification, and then voiced disagreement over presenting a normal practice as highly risky (quote).

Contextual factors

Another factor was the research set up itself. While the interviews happened as a one-on-one conversation in a meeting room, the coffee bar research took place in an office hall, with people having limited time to participate. Here, some participants experienced an information overload about the European goals in the overview "this is too much information, I would just use cash." or with the "data outside Europe" warning "quote", which showcases how contextual factors play a role in making privacy decisions.

Values are ambiguous

The research showed that values are ambiguous, and that people do not always know what they actually find important, or how they will behave in certain situations.

When presented with a similar issue twice, participant sometimes reasoned with conflicting values. For instance, when logging in with DigiD, participant 2 voiced concern over a government connection to payment data "But then it's connected to gov… not nice if they know payment data.", while when later positioning herself on the axes, she did not care about this issue (Can the government look into your groceries? "I wouldn't mind I think."). Similarly, participant 5 voiced concern about government seeing payment data, but later expressed: "DigiD, great system! All my data together at one place.". It is unclear what caused this difference in opinion. On the one hand they might have gotten used to the idea due to repeated exposure during the evaluation, on the other hand the difference between evaluating usage and assessing a one-dimensional scale might have elicit different opinions.

When weighing which parties to share data with, participants strongly voiced their aversion to Apple, calling it an "unethical big tech company" or "untrustworthy American party". However, later when facing convenience issues, their opinions seemed to have shifted: "Apple is also so over-secured, super annoying." and "I would prefer to log in with an iris scan.", suddenly not caring for Apple's data policies.

Other participants seemed easier during the privacy policy, but later took a firm stance against data sharing. When considering to share their location with stores in exchange for personalized advertisements, one participant actively consented while setting up her privacy policy. Later, when receiving the same option while paying for a coffee, she reacted outraged: "No! My husband can't even follow my location, why would a coffee bar do that??"

Sometimes participants changed their minds while using the prototype. One participant rejected the cash-like prototype while first evaluating it (On local money: "That doesn't really sit well with me."), but later in the review, she slowly changed her mind ("Actually, I think I would use it! Quite useful when there's an outage and I really like that it looks like cash.").

Conclusion

Design often served as a magnifying layer, sometimes exaggerating normalized interactions through alarming design such as warnings, sometimes normalizing unusual interactions by using standard design patterns.

Surroundings also played a role. During the coffee bar research, contextual factors of a busy hall, seemed to lower the amount of information some participants were able to process, rejecting the situation and relying on familiar things.

Values are not static. Participants expressed conflicting values, acted against their values while using the app, or consciously changed their values during the research.

3.3 Discussion

Factors influencing results

During the user testing, the different professional backgrounds of participants might have influenced their responses. For instance, one participant previously worked at Visa, deeming the warning about their involvement in the EU prototype an overreaction based on her experiences. Another participant worked for an accountancy office and explained that it made her distrusting of financial institutions.

The different methods for positioning participant on the scales in the interviews and coffee bar research might have caused them to respond differently. With the empty scales during the interviews, it was difficult to compare their positionings. Only from their further explanation afterwards they could be positioned compared to each other. However, they had the possibility to think of their own design requirements, while during the coffee bar session, the answers were provided for participants, which confined their responses.

Although the feeling of a lack of agency was confirmed in other researches, users might have been somewhat primed due to the onboarding GIF which stated: “What if your data would not flow away unconsciously.”. Possibly a consequence of my own assumptions towards data sharing.

Comparing insights to other D€ user research

Comparing the insights to the previous user research about D€ (Kantar, 2022), some insights match, confirming their validity, while others differ, requiring more research.

Similar to my research, they found the same general lack of agency due to a feeling of ubiquitous tracking, digital private transactions being impossible and users stating that they have “nothing to hide”. These insight was also confirmed in research on privacy in identity wallets by Teuschel et al. (2023). Besides, in both researches, privacy was deemed something that other people worry about, resembling the third person effect: as long as there are no personal experiences, the risks are ascribed to others (Debatin et al., 2009).

Another similarity was that participants also stated that privacy should not hinder convenience by adding extra steps or by limiting insights into financial status. Also, participants expressed skepticism on how offline money would work. Coming from focus group research, these similar insights serve as a certain triangulation for my findings.

Both the study by Kantar and the research on identity wallets confirmed that people prefer designs with selectable choices, providing a greater sense of control and comfort when sharing data.

However, there were also differences. The research found that higher privacy was more valued by older participants than younger ones, opposite from this study, where younger participants expressed more normative values than elderly. This difference might be explained by the high adoption of online services and internet banking in the Netherlands (CBS, 2020) compared to the Europe wide sample of Kantar. Elderly might be more used to technology, lowering perceived risks towards privacy.

Another difference concerned the aversion against data being used for personalized advertisements. “None of them were attracted to the idea of discounts in shops in return for using low privacy modes”. This differed from my research where half of participant were very willing to sell their data, although some deemed this unethical. This might be due to the interactive interface presenting the benefit directly, while the risks are more abstract, while Kantar’s research used only conceptual descriptions and scenarios. Compared with the ECB’s survey on a Digital Euro, where participants ranked privacy the highest among abstract product features, it can be noticed that privacy becomes less important when they are more immersed in usage of the app.

Their evaluation of design features with Dutch participants showed similar results as mine. With participants appreciating offline as a “money jar”, but many being thrown off by the risk of losing offline balance. Besides, associations with illegal activity and limited insights were mentioned as downsides. Also wanting extra information on privacy and security of the app.

A study on factors in adoption of CBDC, the public non-profit nature of a central bank was mentioned as a main reason. This was not necessarily reflected in my research, where most

users opted to engage with their current bank. However, this might be explained again with the difference between talking about high level concepts or encountering them in usage. Also, instead of a general central bank, I chose for the EU as a public institution, a more politicized institution, and let them push their public goals through the app, which might have created associations of an underlying agenda, similar to commercial companies.

Value ambiguiity compared to literature

The dissonance of some participants acting against their own values while using the app corresponds with findings from the identity wallet research. Also here, participants found privacy important, preferred privacy-aware designs and appreciated indicators when deciding, but still easily shared their data for increased convenience.

Specifically participants skipping through the terms of use page corresponds with findings by Jones and Soltren (2005) about Facebook users' awareness of its privacy policies, with eighty-nine percent admitting not having read them. Similarly, Govani and Pashley (2005) found that after being educated about how to change privacy settings, most students still neglect doing this, resembling my research's participants rejecting the warning in the EU prototype.

Usage causes adoption

During the testing, few participants changed their mind while using the apps. For instance, one participant rejected the idea of the cash-like prototype, but accepted it after more usage and reflection. This corresponds with the identity wallets research, where participants stating: "In the second round, I had more trust in the app". Also Debating et al. (2009) find that the routinization of Facebook usage has lead to a more lax attitude towards possible privacy intrusions by users.

Relying on trust

The finding of participants relying on trust through familiarity, corresponds with the familiarty heuristic, described as a mental shortcut especially prevalent during high cognitive load (Park & Lessig, 1981), described as bounded rationality in literature on the privacy paradox (Pötschz, 2009). .

As Knijnenburg et al., 2017) describes in his critique of the rational privacy calculus, this heuristic is one of the "departures from rationality" among others, such as the "educated guess" heuristic, similar to participants deciding based on their simplified faulty mental models.

These departures happen because deciding about privacy is anticipatory, meaning that the user does not know what the risks will be, and contextualized , which means that this differs per situation. This makes it so difficult properly inform users and expect them to make a rational choice.

The fact that privacy is often framed as a weighed choice, comes from the research style which is retrospective and holistic, instead of focusing on individual choices. This possibly allows participants to form "post hoc rationalizations" of their behavior in the moment.

Conclusion of insights

The user research provided insights on how various user types reason about privacy in payments. It helped create a "vocabulary" of values and norms that helps to structure how users of a mobile payment app could talk about their values in relation to system and interface design properties. In here, three groups of users were identified, those reasoning with normative values, with direct pragmatic values and those in between. Then, per designed screen, the evaluations were communicated, so users' comments could be linked to specific situations. After, the users' preferred configurations of the axes are shown. Finally, reflections on the ambiguous nature of values were shared. All these various types of insights lead to the following main takeaways:

1. Values differed greatly among participants, with a main division between users valuing normative, long term values such as autonomy, privacy or safety and others valuing pragmatic values, direct benefit such as increased convenience and financial gain.

2. Often, participants felt a lack of agency about data sharing practices. They expressed faulty mental models that their personal data flows freely between parties, that they already implied consent by engaging with a party earlier. This lead to indifference or a sort of cynic resignation.

3. Few participants were interested in anonymity, since most deemed the safety risk of losing local money not worth it.

4. People's values are not static, but rather conflict, change over time, or are not enacted through usage. Some respondents were aware of this and longed for an environment that allowed this dissonance or one where the user could sit down for reflection.

5. Rather than preferring a public or private party, participants relied on trust to make a judgment about intermediaries. Based on familiarity, they tended to engage with their own bank, and avoid unknown parties such as the ECB. Based on reputations, they labeled Big Tech as "unethical", but labeled the EU as "safe".

6. Convenience was deemed a core requirement, with many participants wanting to be as convenient as current options, before accepting intangible values such as privacy, safety or universalism. When hindering a user flow or crowding an overview, these normative values were often rejected.

7. All users appreciated making choices about data sharing during onboarding, although they were divided over the appropriateness of direct financial compensation: some deemed it unethical, others felt empowered.

9. Participants preferred to be informed beforehand, about all relevant dimensions regarding data sharing, before making a decision. When new features or warnings popped up during payment or in the overview, this was deemed unexpected and a hinderance of usability.

10. Participants showed indifference about engaging with European public goals, because they did not see it as their role, had a different worldview, needed more information or simply did not want to be bothered. (Payments seemed an individual environment. Not part of group)

11. The few wanting anonymity wanted to be secluded from financial institutions , for themselves or for their kids. One participant only believed this anonymity when she would never have to log in.

12. The design and the environment influenced people's reactions. Sometimes, alarming design made people scared for normalized practices, while other times, using standardized design elements obscured abnormal system properties. When people found this out, they felt misled. Also contextual factors played a role, in the busy environment, people had a lower threshold for thinking, thus relying more on trust.

4.1 Comparison to Values Hierarchy

The insights from the user research compare to the design requirements around privacy from the values hierarchy in the following way:

1.2.1 Local offline functionality for anonymity

Most participants had little desire for cash-like anonymity through an offline functionality, if that functionality brings the risk of losing money when a phone is lost. However, some users would adapt their behavior and use it for smaller amounts.

4.1.1 Access through PSP apps

When given the choice, most participants wished to log into a payment app through their current bank out of familiarity, convenience and proximity to their funds.

1.3.1 & 1.1.1 Giving a choice or giving no choice

All participants valued having choices in data sharing, although showed dissonance between their choices and later behavior, possibly changing their minds.

2.1.1 Identification before usage

Almost all users would like to identify to ensure a claim on their money. While one participant thought any identification violated anonymity, another thought anonymity might as well happen in the cloud.

1.1.1, 4.2.1 choice and value added services by psps

Half of the participants gladly shared data for benefits, being financial gain, value added services, or expected improved service. However, some deemed financial compensation unethical and discriminatory.

6.3 D€ as a contribution to a stronger Europe

The European identity of the app was deemed over the top, and the shared public goals faced resistance, due to misaligning worldviews, indifference or disagreement over consumers' roles in them. However, participants recognized that their opinion might change when European autonomy is further threatened in current geopolitical developments. However, some did value familiar safety functionalities, such as European warnings or logging in with DigiD.

6.1.1 Uniform, recognizable app, like cash

While cash-like interface was deemed inconvenient and did not create privacy associations, it did facilitate the mental model of "separated space" and some cash characteristics, such as the different awareness of spending, were appreciated by some.

1.4.1 ECB can't see your data

Users' shared simplified mental models due to their inability to control data streams. They thought that once personal data was shared with a party, it flows freely to other parties once they make any connection. (Besides, the label of public or private did not matter, rather whether it was a familiar party)

6.5 No false promises should be communicated

Some participants reacted negatively to the cash-like prototype, stating that it did not resemble and that they rather use regular cash.

4.2 Design Recommendations

Based on the insights of the user testing, and the comparison with the current values hierarchy, the following design recommendations are suggested:

1. Build on the wallet analogy to serve different users

In the research, the values of participants differed quite strongly. Also, participants understood the cash-like wallet as a separate payment space.

To design a cohesive payment app for all, a the wallet analogy could serve as a logical umbrella for different functionalities of the app, building on the digital card wallets used in payment apps as well. This way, a clear distinction between online (card) and offline money (cash) can be made.

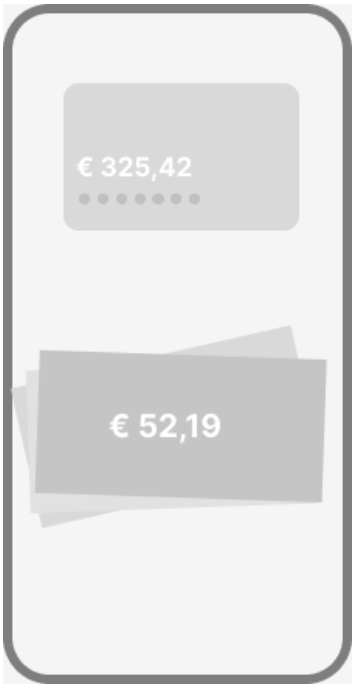


Figure 37: Sketch of D€ app using the wallet analogy of card and cash for online and offline.

2. Provide a convenient public alternative to big tech

Convenience proved to be the most important value for users, with them requiring a level of usability similar to current options. Also, they preferred to engage with their current bank for convenience, familiarity and closest link to their funds. However, Big Tech companies had a bad reputation among many participants.
By framing Digital Euro as a mobile payment app like Google pay and Apple pay, users are provided with a convenient alternative to Big Tech companies. Besides, this would fit with the wallet analogy, as if the user puts a bank card in their wallet.

This would work through an automatic waterfall functionality, with no money being stored in online Digital Euro accounts, meaning less usage of public money than currently envisioned. Possibly, users could open a fully public online Digital Euro account as well as an additional card in their wallet.

3. Provide secluded anonymity

Few participants wished for high anonymity, an environment secluded from financial institutions. For one participant, this seclusion needed to be “proven” by never connecting it to her identity in any way.

Create an offline Digital Euro where users do not have to identify before using it, as a symptom for full anonymity. This would fit the analogy, as if the user puts cash in their wallet.

Figure 38: Sketch of D€ app providing an anonymous environment before identification.

(The feasibility of this would need to be further researched with regards to safety and AML/KYC practices. However, certain spending and holding limits could be applied, similar to anonymous giftcards, for example €100 euros. And periodic online reconciliation to ensure validity of funds. Exceptions AML can be considered)

4. European warnings as a value added service

Although many participants felt indifferent about the communications from the EU prototype, some participants valued its privacy warnings. Few participants were okay with supporting Europe when informed properly and not hindered in convenience. Furthermore, some recognized that they might care more when geopolitical threats increase.

Offer the European engagements, whether they are warnings, insights or goals, as value-added services, just like spending insights are currently offered.

5. Provide a standardized, accessible way of communicating privacy dimensions

Participants often mentioned that they did not have enough overview over all possible dimensions of data sharing practices, such as type of data, type of party and their purpose with the data.

For value-added services by PSPs Digital Euro could create a standardized, accessible design language for communicating these dimensions, like a visual summary supporting the text. For instance, these can be icons for every dimension, presented next to the text. This information could be shown in the D€ app, but possibly also enforced for PSPs apps.

6. View privacy as an ongoing, active dashboard, rather than a passive statement.

Some participants expressed conflicting values, or acted against their values when using the app. Another participant expressed that he would need “a moment to reflect” and then might make different choices about data sharing.

By viewing privacy and data sharing choices as an ongoing process, instead of a one time consent, the system can accommodate for users’ changing values. Besides a choice upfront, a

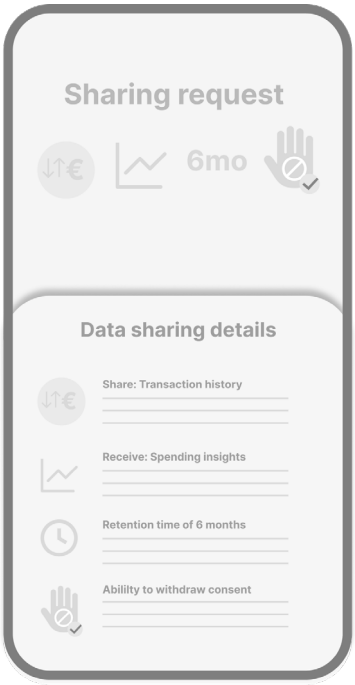


Figure 39: Sketch of D€ app showing various dimensions of data sharing in a visual summary.

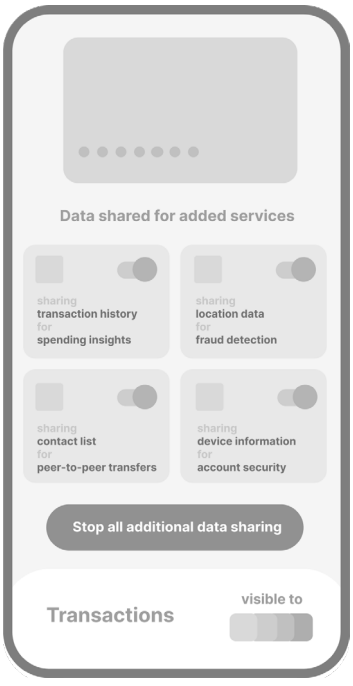


Figure 40: Sketch of D€ app with a privacy dashboard allowin users to withdraw consent later on.

privacy dashboard in the D€ app can show which data is shared for external value-added services. This could involve an option to withdraw consent and send stimulate periodic reflection moments or provide summaries to keep awareness alive.

7. Create mental models and a hopeful message

Many participants showed indifference about data sharing, due to feeling a lack of agency. Thinking that their data would be freely flowing between parties, available for any party wanting it.

By using visual design to create new mental models on how user data flows between parties, users get more insight of what happens behind the screens. Besides, a hopeful message can be sent, telling users that they can have more control over their personal data. Possibly this comes in combination with aforementioned privacy reflection moments.

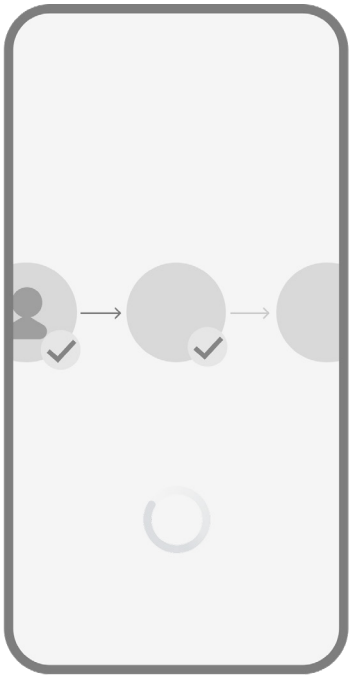


Figure 41: Sketch of D€ app helping users build correct mental models by showing data flows during a transaction.

Research recommendations

Regarding recommendations for future research, it might be interesting to further apply research through design methods to research other values, such as resilience. Also here, discrepancies between people's statements and actions might come up. For instance, instead privacy violations, emergency situations could be enacted to immerse users and investigate how they relate to this when paying.

Also it could be beneficial to further investigate people's mental models from payment systems and data flows. Since Digital Euro's distinctive characteristics mainly happen behind the screens. Can users be further informed about this in an accessible way? And how would that affect their perception of the Digital Euro? Research by Mai & Pfeffer (2020), asking participants to draw their mental models of crypto currencies could serve as inspiration.

Furthermore, this project and other user research showed that different insights are found when presenting "a new payment method" or a "Digital Euro". Therefore, it might be valuable to not research Digital Euro in isolation, but test where and how to place it in people's current payment context, exploring the effects of its image and its relation to other payment methods.

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Appendix 1: Original project brief

Introduction

Describe the context of your project here; What is the domain in which your project takes place? Who are the main stakeholders and what interests are at stake? Describe the opportunities (and limitations) in this domain to better serve the stakeholder interests. (max 250 words)

For the past years, the usage of cash money has been steadily declining, while on the other hand, digital payments through commercial parties, using predominantly American payment systems, are increasing. (De Nederlandsche Bank, 2022) These digital payments are increasingly facilitated by companies such as Google and Apple. This increases our payment system's dependency on these commercial parties, puts our data in hands of parties outside of the EU, and limits the anchoring role of public money and the ECB.

In order to maintain this role of public money and consumer's privacy and anonymity associated with cash in this digital transition, while promoting financial inclusion, the ECB is researching the possible issuance of a Digital Euro, a central bank digital currency (CBDC): an electronic equivalent to cash, as an addition to current payment methods (European Central Bank, 2023). It is envisioned as a modernized, digital version of cash, available both online and offline. Unlike digital money at commercial banks, it is a direct claim to the ECB and, unlike crypto currencies, it is centralised.

Introducing such a new payment method would have consequences on many levels, from which the ones directly involving the user are most relevant for a designer. European consumers are a major, fragmented stakeholder group, whose acceptance of a digital euro depends on the satisfaction of privacy, security and usability needs (ECB, 2021). Can a Digital Euro provide enough added value to people for them to adopt this new payment method?

Last year, the ECB has engaged in a 2-year preparation phase to further investigate the possible design, technical workings and legal framework of a Digital Euro. As one of the central banks in the eurozone, DNB collaborates closely on the research and is involved in the decision-making process.

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Problem Definition

What problem do you want to solve in the context described in the introduction, and within the available time frame of 100 working days? (= Master Graduation Project of 30 EC). What opportunities do you see to create added value for the described stakeholders? Substantiate your choice.
(max 200 words)

Currently, user research (Kantar Public, 2022) has been done, which identified various user groups and accompanying boundaries and possibilities regarding payment behaviour and wishes for a digital euro.

Although this is useful information from which interesting tensions showing underlying mechanisms, (e.g. about trust and safety) can be drawn, no designs have been evaluated with users yet.

Letting people interact with designed prototypes can elicit latent information or behaviour that is not revealed during classic interviewing methods. People *do* different things than they *say*. By evaluating designs of a digital euro through scenarios, it is possible to gain a deeper understanding of their needs, wishes and actual payment behaviour. This layer of knowledge is currently missing.

Also, not only is this a problem of discovering usage patterns, but there's another layer of communicating such a new concept to people for them to make it understandable. Proposing designs can also help demystify a digital euro and make this abstract concept more concrete.

Assignment

This is the most important part of the project brief because it will give a clear direction of what you are heading for. Formulate an assignment to yourself regarding what you expect to deliver as result at the end of your project. (1 sentence) As you graduate as an industrial design engineer, your assignment will start with a verb (Design/Investigate/Validate/Create), and you may use the ***green text format****:*

Iteratively design and evaluate speculative Digital Euro prototypes to investigate and represent the needs, wishes and payment behaviour of various user group in the Netherlands.

Then explain your project approach to carrying out your graduation project and what research and design methods you plan to use to generate your design solution (max 150 words)

In this graduation project I will conduct user research following a research through design approach, for which I will make research artifacts representing various ways of (digital) payment. With these artifacts, design research methods (e.g. interviews, roleplay using scenarios) are performed to gather insights. Based on these insights, multiple speculative interactive prototypes are designed for specific user groups. These specific prototypes are then evaluated through (explorative) UX research methods. Based on all insights, recommendations and design suggestions are given in a report.

Motivation and personal ambitions

Explain why you wish to start this project, what competencies you want to prove or develop (e.g. competencies acquired in your MSc programme, electives, extra-curricular activities or other).

Optionally, describe whether you have some personal learning ambitions which you explicitly want to address in this project, on top of the learning objectives of the Graduation Project itself. You might think of e.g. acquiring in depth knowledge on a specific subject, broadening your competencies or experimenting with a specific tool or methodology. Personal learning ambitions are limited to a maximum number of five.
(200 words max)

Over the past years as a Design for Interaction student I have greatly improved my research and interactive prototyping skills. In this project I hope to display these skills and further improve them. By conducting research through design, I hope to have a meaningful contribution to the digital euro project and offer user perspectives that are currently missing. I hope to be a researcher by performing design.

Also, the iterative approach I aim to follow stems from a believe and realization that it's good for my assumptions and personal frame of reference, embodied in a design, to be confronted with reality as soon as possible. Proposing designs helps me concretise abstract thoughts and in learn more about the problem

Another learning ambition is to communicate the value of (research through) design in an organisation that is not used to that approach.I look forward to experience and reflect on designing for the financial sector and working in-house in an environment so different from the IDE faculty and small scale design studios.

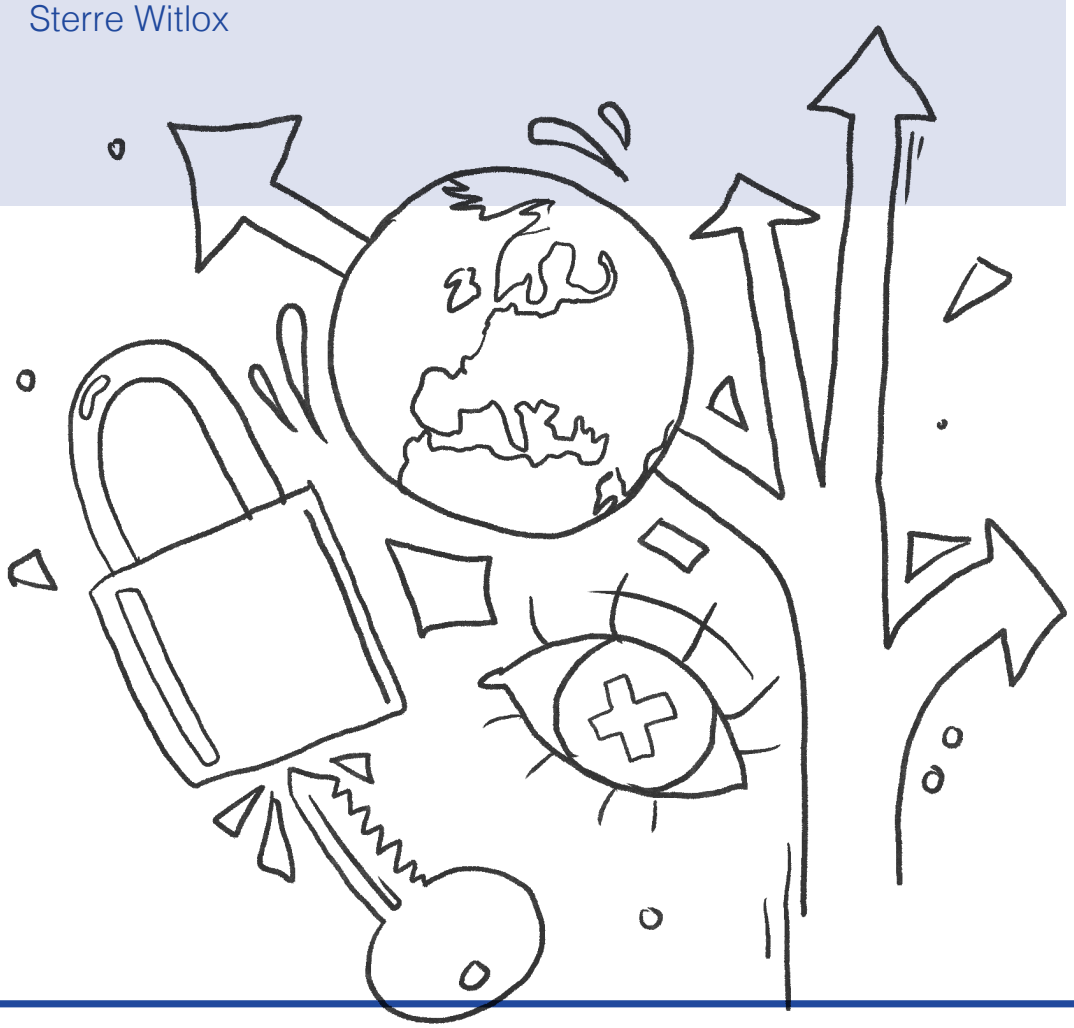
VOORBEREIDING CREATIEVE SESSIE D€

"Menselijke waarden en het ontwerp van de digitale euro."

Sessie: donderdag 22 november 15:00

Joost van Baar

Sterre Witlox



Welkom!

Met dit boekje nodigen we je uit om de komende dagen te reflecteren op enkele waarden in jouw dagelijks leven, als voorbereiding voor de sessie van donderdag.

Bij DNB zijn we gewend aan een economische definitie van waarde, maar in deze opdracht kijken we naar menselijke waarden.

Menselijke waarden zijn:
1. De dingen die mensen of groepen belangrijk vinden in het leven
2. Overtuigingen die specifieke situaties overstijgen

Waarden kunnen op verschillende manieren worden ingevuld. We gebruiken onze waarden als een lens om naar de wereld te kijken en maken er keuzes mee. Zo kan de waarde van vrijheid onder andere worden geïnterpreteerd als: “Ik mag gaan en staan waar ik wil” of “Ik kan zeggen wat ik denk”. Je kan vrijheid ervaren in relatie tot andere mensen of objecten: Vrijheid ervaren omdat je kinderen het uit huis zijn, omdat je op Facebook je ongezouten mening kan delen of omdat je in je auto het land kan rondscheuren.

De komende dagen hebben we enkele vragen voor je. Probeer ze na werk in te vullen, om even uit je rol als DNB’er te stappen. Voel je vrij om je antwoorden te schrijven, tekenen of op een andere manier te documenteren. Voel je niet verplicht dingen te delen die je liever voor jezelf houdt. Veel succes en tot donderdag!

Groetjes,
Joost en Sterre

MAANDAG

1. PRIVACY: Wanneer en waarom is het voor jou belangrijk om iets voor jezelf te houden? Kun je een situatie bedenken waarin privacy voor jou belangrijk is?

Schrijf of teken je antwoord

2. VEILIGHEID: Wat betekent veiligheid voor jou? Kun je een moment beschrijven waarop je je veilig voelde? Waardoor kreeg je dat gevoel?

Schrijf of teken je antwoord

DINSDAG

3. RESILIENCE: Als er iets onverwachts of moeilijks gebeurt, wat helpt jou dan om sterk te blijven of door te gaan? Kun je een voorbeeld geven?

Schrijf of teken je antwoord

WOENSDAG

4. COLLECTIEF BELANG: Wat was een moment dat je voor een collectief belang koos, in plaats van je eigen behoefte te vervullen? Waarom deed je dat?

Schrijf of teken je antwoord

5. Welke waarde is voor jou het meest belangrijk? Kijk rond in je huis: Welk object speelde een rol tijdens een gebeurtenis die aan deze waarde gekoppeld is?

Neem donderdag (een foto van) dit object, en dit ingevulde boekje mee naar de sessie.

Appendix 3: Session plan

Sectie	Tijd		Wat?	Doel	Fase + stap	A
	Van	Tot				
Problem finding	15:00	15:30				
	15:00	15:10	Introductie	Doel en planning sessie uitleggen.	Planning op flipover laten zien Doel van de sessie delen CF Regels/mindset delen Informed consent	*S* *k* *W* *te*
	15:10	15:20	Rondje objecten uitleggen (= icebreaker)	Ontdekken hoe er verschillend naar waarden word gekeken.	Zet objecten op tafel en cluster per waarde. Vraag mensen om uitleg. *Contrasteer*	C *In* *m* *g* *H* *w* *D*
	15:20	15:30	(Opsplitsen) Een waarde kiezen	Ontdekken welke waarde er het belangrijkst wordt gevonden door D€ team.	"Hoe kunnen we mensen een gevoel van (privacy/veiligheid/resilience/collectief belang) geven tijdens het betalen met een offline D€ in een winkel?" 1. Wat vind DNB het belangrijkst? 2. Welke value het meest is meegenomen?	*N* *Ik* *g* *b* *E* *w*
Idea finding	15:30	16:15				
	15:30	15:35	Energizer	Creatief en outside the box laten denken	Benoem nog 1 keer de regels Associatie spel zoals: - five steps associatie - paperclip	
	15:35	15:45	Brainwriting	Ideeën opschrijven individueel. Vel ronddraaien. Uiteindelijk een beetje bespreken.	Benoem de mechanismen als ze vast zitten. Schrijf voor ze mee op post its. Motiveer om zelf te laten opschrijven. Motiveer ze om zoveel ideeën / zoveel vellen vol te schrijven. Hang op de muur	

cties facilitators	Materialen	Iedereen/Groepjes/alleen	TO DO	Notities
chaaltje snacks, kan water (koffie unnen ze zelf halen). *Velkom, leg je object maar neer op afel.*	Flipover planning Informed consent formulieren voor opname.	Iedereen	Planning opgeschreven op flipover Post it op tafel per waarde	
bjecten geclusterd. Vraag uitleg. *nteressant hoe er op verschillende manieren naar deze waarde wordt ekeken.* *Hier de vraag stellen: Hoe definiëren we privacy in de context van de Digitale Euro?*	Meegebracht object	Iedereen	Zelf toilettas meenemen. Als routine element voor resilience.	
Nu splitsen we de groep op: *k zie dat deze waarde het meest gekozen is. Vinden jullie deze het belangrijkst?* *En wat vind DNB als belangrijkste waarde van de D€?*		Groepjes		
	Prikkelend object. Bal om rond te gooien. bijv. "Wat kan je allemaal met een paperclip?" Hoe komen we van DNB naar kaasschaaf in 5 stappen.	Groepjes?		
	Journey POS offline	Groepjes	Mechanismen voor mezelf duidelijk hebben	Wat is het verschil met een normale brainstorm? Hoe linken we de technische kennis (wat er gedaan wordt) aan de communicatie?

Sectie	Tijd		Wat?	Doel	Fase + stap	Acti
	Van	Tot				
	15:45	15:55	Metafoor bedenken	Bedenk andere context waar eenzelfde mechanisme werkt.	Laat zelf denken en bied metaforen aan op tafel Breng tot niveau van sociale interactie + object Mee eens? Wat vind je zelf een goede metafoor?	
	15:55	16:05	Metafoor brainstorm	Ideeën bedenken voor metafoor context	Meerdere metaforen als de tijd het toelaat	
	16:05	16:15	Force-fitten	Ideeën vertalen naar D€ context	Kies een post it, en vertaal het naar de D€	
BREAK	16:15	16:20				
	16:15	16:20	Kleine pauze	(Bespreek met Sterre hoe het gaat)		
Solution finding	16:20	17:00				
	16:20	16:30	Cluster en kiezen (kan in duo's?)	Tot 1 idee komen	Cluster ze in groepen, en kies eentje voor het uiteindelijke ontwerp.	
	16:30	16:40	Uitwerken en poster maken. Elevator pitch	Elevator pitch voorbereiden.	Geef poster layout (titel, tekening van stappen, hoe krijgt dat gevoel?)	*Con*
	16:40	17:00	Presentaties + discussie	Presentaties van concept posters	Allemaal ophangen aan muur in 1 ruimte Presentatie en discussie met beide brillen op. Refereer naar persoonlijke waarden. Wat vind je hiervan als persoon? En wat vind je hier vanuit je professionele rol als DNBer, stel je zou hier specifiek aan werken? En is dit gevoel geven terecht? Is dit technisch mogelijk?	*Deel begi aan dit c*
	17:00	17:00	Uitloop & discussie			
Borrel	17:00	18:00				
	17:00	18:00	Borrel (bij Blooker)			

es facilitators	Materialen	Iedereen/Groepjes/alleen	TO DO	Notities
	Flipover in het midden van een vel	Groepjes	**Metaforen** Deur aan deur verkoper. Wegwerkzaamheden op de snelweg. Backpack inpakken voor een hike. Whatsapp groep met de buurt.	
	Flipover, post its, rondom metafoor	Groepjes		
		Groepjes		
		Groepjes		
creet, wat ziet de gebruiker?	Flipover voor poster	Groepjes		
nemer 1, jij had het in het n over resilience als houvast wat je al kent. Hoe kijk je naar oncept?		Iedereen	Bedenk enkele vragen om te stellen	(Geef sommigen de DNB bril en anderen de persoonlijke) (De mensen die die waarde het belangrijkst vonden?)
		Iedereen		