

Bachelor Project

The Digital Transformation of the Euro

How are central bank digital currencies developed as multi-sided platforms through iterative processes of stakeholder conflict?

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Abstract

This thesis examines how central bank digital currencies are developed as multi-sided platforms through iterative processes of stakeholder conflict. More specifically, the paper examines the case of the European Central Bank's digital euro project, viewing the digital euro as a multi-sided platform and its development as a series of dialectical cycles of conflict. This case study applies document analysis, where the main documents were identified as the ECB's official design status reports, which were systematically analysed to identify significant shifts in design choices. The contribution of this paper is presenting a model that describes the process of how central bank digital currencies are developed as multi-sided platforms. That is, the process is conceptualised into stages, where the design phase narrows the design space leading to the legislative phase, which imposes regulatory substitutions. Ultimately, the study highlights that public CBDCs cannot be developed for maximising economic network effects as commercial platforms are. Instead, their design reflects a balancing act across persistent tensions.

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1 Introduction

More than half of the global population is using less cash every year (Khiaonarong & Humphrey, 2023). Instead, they choose to rely on digital payment solutions, often made available by international payment service providers (PSPs). In the EU, 61% of all card payments are processed by foreign PSPs (European Central Bank [ECB], 2025b). As that number increases, and cash use declines, the threat towards the EU’s strategic autonomy in payments increases. Simultaneously, other types of digital currencies developed by private organisations, such as Bitcoin and Ethereum, are gaining traction, with the cryptocurrency market reaching a capitalisation of USD 3.9 trillion in 2024 (Gate Research, 2025). Seen by these developments, it becomes apparent that traditional cash-based currencies are becoming less and less viable for central banks to rely on in retaining control over their respective economies.

Therefore, to combat this, central banks around the world are exploring digital alternatives to traditional cash, commonly known as central bank digital currencies (CBDCs). A survey carried out by the Bank for International Settlements (BIS) in 2020 (Boar & Wehrli, 2021) indicated that 86% of all central banks have in some way explored the concept of CBDCs. Among these, one of the most prominent CBDC initiatives is led by the European Central Bank (ECB) with the digital euro project. According to the ECB (n.d.-a) “The digital euro would be a digital form of cash, issued by the central bank and available to everyone in the euro area”.

Yet, beyond its role as digital cash, it can also be considered an entirely new type of currency in the euro area. Essentially all digital currencies and payment media function as multi-sided platforms, creating value “primarily by enabling direct interactions between two (or more) distinct types of affiliated customers” (Hagiu & Wright, 2011). The digital euro is no exception. However, while a majority of multi-sided platforms are developed commercially by private companies with very few restrictions aside from the prevailing law, CBDCs are developed by central banks facing heavy constraints from monetary policy considerations, a multitude of stakeholders with differing interests, and various political pressures. Traditional literature on multi-sided platform development would, therefore, not be sufficient in understanding how the development of a CBDC works.

Meanwhile, understanding how the development process of a CBDC is increasingly important, especially considering the decreasing use of traditional cash-based currencies, and the number of central banks that are currently advancing their own CBDC initiatives. By understanding the development process, the impact of policy trade-offs, governance structures, and stakeholder dynamics on the outcome of the projects in terms of adoption dynamics and platform design can be illuminated (Kazan & Damsgaard, 2013).

Hence, this paper examines the ECB’s journey in developing the digital euro as a case study in multi-sided platform design for digital currencies. Using a dialectical process model, the emergence of different designs for the digital euro is analysed through the lens of platform economics. In doing this, the paper aims to answer the question of how CBDCs are developed as multi-sided platforms through iterative processes of stakeholder conflict.

2 Theoretical Framework

The theoretical framework we present here integrates two different theory threads, which gives the paper its analytical power. The dialectical process theory enables us to understand the temporal dimension. That is, how the digital euro as a project has progressed and developed through cycles of conflict. This lens helps us uncover the process as conflict resolution between different stakeholders.

However, dialectical process theory does not help us to explain the content of the analysis. For that, we use platform theory to characterise the content of the snapshots of designs in the temporal timeline space. Platform theory is applied on each dialectical cycle to describe and characterise the designs choices within each cycle and argue from these standpoints, whether synthesis has moved on to design closer to the conditions necessary for critical network effects.

Therefore, the two branches of theory complement each other. Dialectical process theory answers the question of how design evolves. Platform theory answers the question of what is at stake in each conflict. Together, they allow the analysis not only to narrate the development of the digital euro, but to evaluate each turn in that development against a coherent set of platform criteria.

2.1 Dialectical Process Theory

It has become apparent that the demand for digital payments is outgrowing the demand for traditional cash-based payments (Khiaonarong & Humphrey, 2023). Therefore, many monetary jurisdictions are exploring CBDCs as a means of addressing this demand. However, many stakeholders of such CBDC projects have conflicting opinions on how the final product should look. Banks commonly fear that CBDC initiatives would cause disintermediation and endanger the fractional reserve banking model (European Banking Federation [EBF], 2022). Potential users of the platform, however, fear that a digital alternative to cash would compromise on user privacy (ECB, 2021). Simultaneously, regulatory bodies desire anti money laundering (AML) and combating financing of terrorism (CFT) functionality. All these opinions on what a CBDC, such as the digital euro, should be, shapes the development process through conflict. Dialectical process theory explains the phenomenon of how processes evolve through conflict (Van de Ven & Poole, 1995). Hence, it will be used as a basis for analysing the development of the digital euro.

Conflict is a resolution of tension between contraries (Simmel, 1904). Where two contrary views exist, conflict serves as a mechanism for overcoming dualism and producing new forms of unity. In much the same way, conflict serves as a driver for social change (Coser, 1957), where everything from norms and ideas to technological and economic development evolves through conflict. This is because conflict requires new and creative innovations through mutual adjustment to be resolved. Hence, if not for conflict, habitual relations, resistance of change, and excessive harmony in opinions would lead to stagnation stifling innovation, and thereby also stifling societal development (Coser, 1957).

This notion of conflict as a driver of change in society is equally applicable in an organisational context, where conflict drives organisational processes. The dialectical view of organisations encompasses four foundational principles: social construction/production, totality, contradiction, and praxis. Out of these four principles, contradiction, entailing the existence of inconsistencies and incompatible interests giving rise to conflict, is one of the primary drivers of processes in organisations, as it activates the search for new social arrangements (Benson, 1977). Van de Ven and Poole (1995) elaborate on this by introducing the dialectical motor of change, which argues that “conflicts emerge between

entities espousing opposing thesis and antithesis that collide to produce a synthesis, which in time becomes the thesis for the next cycle of a dialectical progression” (pp. 520–521).

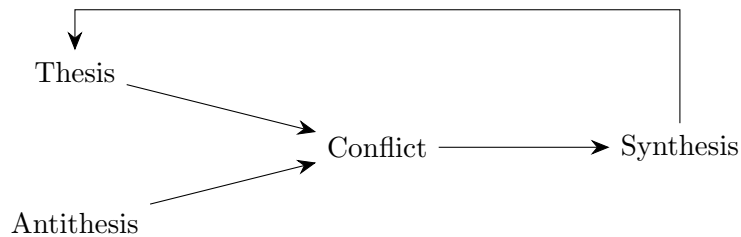


Figure 1: Dialectical motor of change (Van de Ven & Poole, 1995)

This cycle is illustrated by Figure 1. The progression of it continues indefinitely, but the length of cycles may vary depending on the maturity of the organisation it is applied to. Effectively, it is the balance of power between the opposing entities behind the thesis and the antithesis that affects the stability and rate of change in processes which impact cycle length (Van de Ven & Poole, 1995). Furthermore, the entity of the antithesis may be either internal or external, entailing that change may stem from both inside and outside conflict.

Seen by this, it is evident that the development of the digital euro can be viewed as a dialectical process. The ECB presents a design proposal, representing a thesis. The proposal is met by criticism from various stakeholders, both internal and external, with conflicting opinions, representing an antithesis. This conflict between the design proposal and the various conflicting stakeholder opinions becomes the baseline for a new design proposal, representing a synthesis which, in turn, becomes the new thesis, initiating another cycle. This process continues until the power between the stakeholders in favour of a design proposal (a thesis) is greater than the power of those against it (an antithesis).

For the purpose of this paper, we identify published documents from the ECB or related EU institutions containing design propositions for the digital euro as thesis or synthesis papers. Stakeholder input that meaningfully impacts the design propositions or specific features within them is considered antitheses. In analysing the development process of the digital euro, we view it through a dialectical lens where, in a cyclical fashion, the conflict between the thesis and antithesis results in a synthesis.

2.2 Platform Theory

Rochet and Tirole in their paper “Two-sided markets: a progress report” argue that two-sided markets (or multi-sided markets) are not simply markets where there are two (or multiple) sides interacting with each other. In that way, one could characterise any market as two-sided as any interaction has sender and receiver or, in economic transaction, buyer and seller. They note instead that “a market is two-sided if the platform can affect the volume of transactions by charging more to one side of the market and reducing the price paid by the other side by an equal amount” (Rochet & Tirole, 2006, pp. 664–665). This means that the price structure is non-neutral and both sides must be attracted.

Rochet and Tirole in their earlier paper “An Economic Analysis of the Determination of Interchange Fees in Payment Card Systems” describe payment systems as two-sided markets. Payment card systems necessarily involve two sides: cardholders and merchants. However, as noted, this is not enough for it to be classified as a two-sided market. It is nevertheless a two-sided market, because it is clear that cardholders benefit holding a card only if more and more merchants accept the card

and vice versa and merchants benefit if cardholders actually use their cards frequently. These effects encompass membership and usage externalities, respectively. (Rochet & Tirole, 2003, pp. 71–72)

In a similar vein, Tan in the paper “Central Bank Digital Currency Adoption: A Two-Sided Model” shows that not only are payment systems two-sided markets, but central bank digital currencies (CBDCs) exhibit the chicken and egg problem: the fact that more households adopt a payment instrument if more firms accept it and vice versa, meaning incentivising both sides to adopt and use the system is of great significance (Tan, 2023, p. 2). The model developed by Tan also shows that “[h]ouseholds are more likely to adopt CBDC if it is low cost, provides an attractive savings vehicle, reduces the cost of remittances, improves the efficiency of government payments, and (if accepted by merchants) offers a valuable means of payment” and “[f]irms are more likely to accept CBDC if the fixed cost and variable fees are low, if there are tax exemptions or subsidies for transactions made in CBDC, and if households who prefer to make payments with CBDC make up a large share of revenue” (Tan, 2023, p. 37). Great adoption of CBDC provides financial inclusion and formalisation, yet risks of disintermediation of banks and card payment systems, highlighting crucial trade-off of designing CBDC for adoption. (Tan, 2023, p. 37)

More specifically, on how to overcome the chicken and egg problem and design payment platforms, Kazan and Damsgaard have done a lot of work on it. In one of their earlier papers, Kazan and Damsgaard developed a framework to analyse digital payment as multi-sided platforms by synthesising related work and existing literature on viable mobile payment platforms. In it, they describe one way to look at the digital payment ecosystem, shown in Figure 2.

We adopt Kazan and Damsgaard’s definition of multi-sided platform (MSP) as “an organisation that creates value primarily by enabling direct interactions between two (or more) distinct types of affiliated customers” (Kazan & Damsgaard, 2013, p. 5). From the definition, the purpose of an MSP is to enable and coordinate the direct interactions of platform users in a secure way, providing both architecture and set of rules for it. (Kazan & Damsgaard, 2013, p. 5)

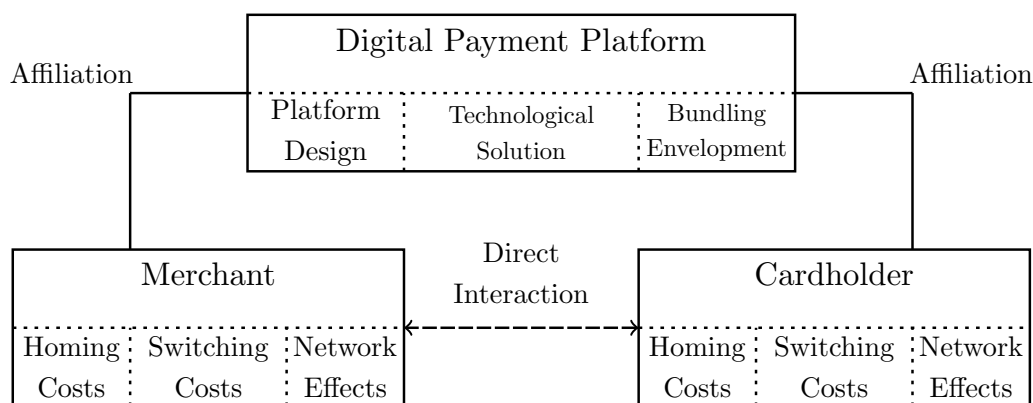


Figure 2: Digital Payment Ecosystem by Kazan and Damsgaard (2013)

Kazan and Damsgaard consider seven criteria for characterising a contemporary payment system as a multi-sided platform. The criteria of a MSP are direct interaction, network effects, homing costs, switching costs, bundling & envelopment, platform design and technological solution. Together, these criteria capture both the platform-side design choices that determine how a payment system is built and governed, and the user-facing dynamics that determine whether it achieves adoption.

First of all, the direct interaction is the key aspect of MSP. The MSP must enable a direct relationship in the contract design. This means that the contract is not with the platform but with another customer enabled by the platform (Kazan & Damsgaard, 2013, p. 5). Without such a relationship, the platform contradicts its own *raison d'être*, as the platform is constitutive of bringing together two different customer sides.

For the user-facing dynamics, network effects are the most fundamental to multi-sided platforms. Network effects are a defining phenomenon of multi-sided platforms - it is where the value of a product to a user increases as number of other users grows (Katz & Shapiro, 1985). The network effect can be dissected to further same-side network effects and cross-side network effects. In addition, the network effect can be positive or negative. This means that e.g. a negative same-side network effect means that more users on the one side of the platform decrease the value of that side of the platform. Therefore, to nurture the platform, most platform providers subsidise one side (called subsidy side) to ensure that network effects can kick in after certain threshold. (Kazan & Damsgaard, 2013, p. 6)

Two other user-facing aspects of successful MSP considerations are homing costs and switching costs. Homing costs are user costs associated with being associated with the platform. This includes adoption, investment, operation, and opportunity costs. It has mainly three components: upfront, on-going, and exit costs. Switching costs are user costs that occur when the user switches the platform. High switching costs create a lock-in effect of the platform for users. (Kazan & Damsgaard, 2013, p. 6)

In Kazan and Damsgaard's later paper "Towards a Market Entry Framework for Digital Payment Platforms", they expand on the platform-side dynamics. Namely, they examine how are digital payment platforms designed and configured to create conditions for platform envelopment and put to test expanded platform-side framework of platform design and technological solution. As they note, while user-facing dynamics such as network effects, homing costs, and switching costs are essential to the viability of any payment platform, the design logic of the platform itself and its corresponding instruments determines the conditions under which those dynamics can emerge (Kazan & Damsgaard, 2016).

In their paper "Towards a Market Entry Framework for Digital Payment Platforms", they present the following framework, see Figure 3. As one can see this aligns with their earlier criteria from platform-side: Bundling and envelopment, platform design and technological solution.

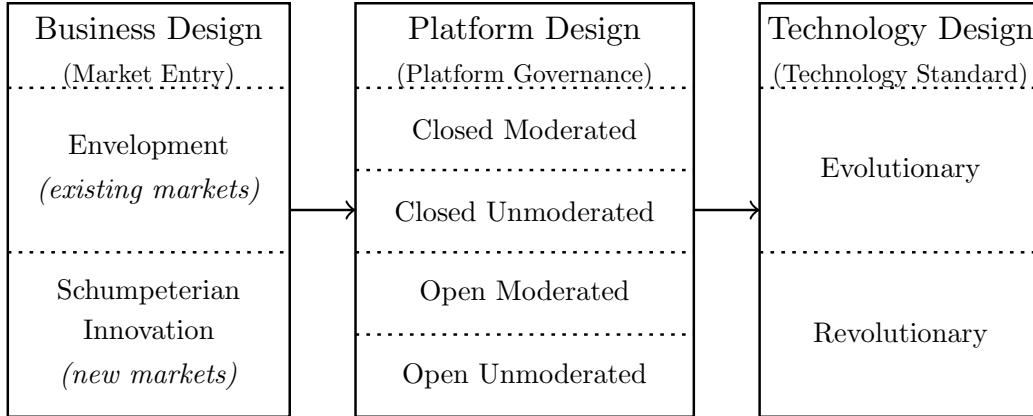


Figure 3: Digital Payment Platform: Eight Different Design Configurations Options by Kazan and Damsgaard (2016)

Bundling and envelopment refers to the fact that platform can enveloped by an insurgent, which may facilitate same relationships but is superior in other ways, e.g. by engaging in bundling. Bundling refers to a versioning in which multiple products are offered as a package. (Kazan & Damsgaard, 2013, p. 6)

Platform design plays an important role for platform strategies and complementary products. Platform design is about openness of the system: both in terms of platform development and platform usage/service distribution (Iyer & Henderson, 2010; Kazan & Damsgaard, 2013, 2014, 2016). The configuration for these dimensions determines the feasibility of different strategies (Kazan & Damsgaard, 2013, pp. 6–7). Indeed, Kazan et al. in later paper “Disentangling Digital Platform Competition: The Case of UK Mobile Payment Platforms” consider different strategies, where they more specifically consider platform development as a component of value creation architecture and service distribution as a component of value distribution architecture (Kazan et al., 2018). More specifically, platform development is about whether a platform is developed internally or co-developed with third parties. A closed development approach means the platform owner exercises monopolistic control over how the platform advances, while an open approach involves third parties in co-development. The service distribution, defined as the degree of control a platform exercises over how third-party services reach users, can be classified as moderated and unmoderated. The moderated service distribution approach enables payment platforms to exercise control on third party service distribution, while the unmoderated approach gives freedom to external entities to distribute without platform approval. (Kazan & Damsgaard, 2016, p. 767)

The last criterion for MSP is technological solution as contemporary MSP is fundamentally digital. The technological solution refers to how technology enables the control of customer relationships, also known as customer ownership. Hardware plays a significant role in customer ownership. Kazan and Damsgaard separate the hardware strategy into two: evolutionary products are products that upgrade previous technology that offers compatibility between older and newer technologies, and revolutionary technology is of different design, offering better performance but not backward compatibility (Kazan

& Damsgaard, 2013, p. 7). Findings are that mostly multi-sided payment platforms leverage on evolutionary payment instruments in order to bridge users from core to adjacent platform markets, strengthening market position in their core markets (Kazan & Damsgaard, 2014, p. 12; Kazan & Damsgaard, 2016, p. 779).

As Kazan and Damsgaard note, the usefulness of the frameworks comes from its ability to accommodate technological developments, identify, and assess the efficacy of payment systems as MSPs (Kazan & Damsgaard, 2013, p. 12; Kazan & Damsgaard, 2016). Thus, it serves as theoretical foundation for and framework for our analysis to conceptualise digital euro as MSP.

In this paper, we integrate the 2013 and 2016 frameworks into a unified analytical lens. Platform design and technology design, as elaborated by Kazan and Damsgaard (2016), describe *what* the ECB is designing at each stage of the development process. Network effects, homing costs, and switching costs, as characterised by Kazan and Damsgaard (2013), provide the evaluative criteria for assessing *whether* these design choices support or hinder the adoption of the digital euro.

In summary, the theoretical framework of this paper integrates three components. Dialectical process theory provides the process lens that structures how the development of the digital euro unfolds through cycles of conflict and revision. The multi-sided platform literature, particularly Rochet and Tirole (2003) and Tan (2023), establishes why network effects are the critical success factor for any payment platform, including CBDCs. The combined framework of Kazan and Damsgaard (2013) and Kazan and Damsgaard (2016) provides the content lens: platform design and technology design describe the architectural choices being made, while network effects, homing costs, and switching costs serve as the criteria for evaluating those choices. Together, these components enable the paper to trace how the digital euro’s design has evolved, what design choices are being made, and what implications those choices have for the emergence of network effects necessary for broad adoption.

3 Methodology

3.1 Target Group and Relevance of Study

This study examines how the digital euro project has unfolded. Specifically, it uncovers the design options explored by the ECB and the negotiations surrounding them, where stakeholder conflicts produce compromise solutions that shape the emerging design of the digital euro. The ECB does not position the digital euro as Schumpeterian creative destruction or Christensen’s disruptive innovation, but rather as public infrastructure for a sovereign European digital payment system — as ECB Executive Board member Cipollone has put it, comparable to a “public rail network” where “the infrastructure is public but private companies can use these tracks to reach any destination in Europe” (Cipollone, 2026). Yet, while the digital euro aims not to displace existing payment solutions, it must still achieve adoption, and in doing so it inevitably reshapes the European payment landscape.

The findings of this paper are primarily relevant for actors in the European payment landscape, both those who are actively involved in the negotiation process and those who are monitoring its outcome. This includes policymakers, regulators, commercial banks, payment service providers, as well as researchers and other professionals following the development of the digital euro project.

Beyond the European context, the paper aims to contribute to the existing literature on CBDC development. By mapping the development process and exposing the design dilemmas that arise

during negotiations, the paper offers a replicable analytical approach that other central banks may draw on when evaluating their own digital currency design choices. In particular, the paper introduces a conceptual model for CBDC development which may hold relevance for other monetary jurisdictions developing CBDCs. As any central bank digital currency project influences not only domestic economic affairs but also, through global financial integration, the broader international monetary landscape, the insights derived from the digital euro case also holds relevance beyond Europe.

3.2 Research Philosophy

This paper adopts an interpretivist research philosophy, which assumes a complex, socially constructed worldview where the world continuously evolves through processes, experiences and practices (Saunders et al., 2023). The goal of this paper is to explore how CBDCs are developed as multi-sided platforms through qualitative analysis of the development of the digital euro. In doing this, the development is viewed as a continuous process that is driven by conflict between stakeholder opinions. Hence, it aligns well with the interpretivist view of how phenomena emerge through the context of the parties involved (Saunders et al., 2023). Furthermore, as an in-depth understanding of how the development process shapes platform design is prioritised, rather than predictive accuracy and generalisability in how all CBDCs are developed, interpretivism provides a suitable philosophical foundation for the analysis.

The approach taken to theory development is abductive, entailing a continuous movement between theory and data (Saunders et al., 2023). Rather than purely inducing theory from data or deducing a hypothesis using data, theory is used as a lens to interpret the observed developments of the digital euro’s design and simultaneously refine the understanding of why choices are made, and how these impact platform dynamics. In doing this, a case study of the development of the digital euro serves as the primary research method.

3.3 The Case Study

The primary research method of this paper is the case study. A case study approach enables in-depth examination of a contemporary phenomenon in its real-life context, making it suitable for analysing complex digital transformation processes such as the digital transformation of the euro. In this paper, the case examined is the development process of the digital euro.

A case study can be defined as “an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context” (Yin, 2014). This definition emphasises the importance of context, which is particularly important when studying the development of CBDCs as the context of the central bank in question is what shapes the final product. The designs and development pathways explored for CBDCs may differ depending on the central bank undertaking the project and its political and social environment. Some central banks would, for instance, prioritise privacy, while others may view privacy as an obstacle for anti-money laundering features. Pure theory alone is, hence, insufficient as it fails to consider the context in which the CBDC is developed. Therefore, a case study approach is especially relevant when analysing how CBDCs are developed.

Concerns regarding generalisability do, however, often arise when relying on a single case, as the empirical observations are limited to that one specific case (Yin, 2014). The development journey of the digital euro project may, for example, not fully correspond with other CBDC projects as

their context may differ. However, Yin (2014) outlines that case studies are not intended to be generalisable to populations, that is, every CBDC project, but rather analytically generalisable to theoretical propositions. The purpose of this study is therefore not to be generalisable across all CBDC projects, but to use the digital euro as a theoretically informative case for understanding how a CBDC is developed as a multi-sided platform.

Generalisability across other CBDC initiatives is therefore limited, yet the insights derived from the digital euro case remain theoretically valuable. Many central banks face similar challenges as the ECB when developing and designing CBDCs for their economic areas, which means that the findings of this paper may still hold relevance beyond the European context.

3.4 Data

3.4.1 Data Sources

As Figure 6 shows, the digital euro project has not yet come to fruition and there are no behavioural or transactional data related to it. Nevertheless, the ECB has produced extensive documentation throughout the project’s development, exploring different design options and soliciting feedback from stakeholders. These documents constitute the empirical foundation of this paper, and given the nature of the research question, this qualitative secondary data source is sufficient. As a public institution, the ECB communicates the progress of the project transparently, and its official publications represent the most authoritative and relevant account of the design choices under consideration.

The foundation of the analysis is the Report on a digital euro” published by the ECB in October 2020 (ECB, 2020), which outlines the initial design options considered by the ECB. Subsequent documents trace how these designs were challenged and revised through stakeholder feedback and further investigation. These include the three progress reports on the investigation phase (ECB, 2022a; ECB, 2022d; ECB, 2023c), and the European Commission’s legislative proposal for the digital euro (European Commission, 2023b). To capture stakeholder responses, the analysis also draws on documents from the public consultations (ECB, 2021), the European Banking Federation (EBF, 2022; EBF, 2023), the Economic Governance and EMU Scrutiny Unit (EGOV) of the European Parliament (Niepelt, 2023; Grünewald, 2023; Mooij, 2023), the Euro Retail Payments Board (ECB, 2022e; ECB, 2023b), and the ongoing legislative responses to the Commission Proposal (Navarrete Rojas, 2025; Council of the European Union, 2025; PricewaterhouseCoopers, 2025). The full list of documents to dialectical positions is given in Appendix B in Table 5.

The search covered the ECB news and publications database, EUR-Lex, search engines, and academic databases. The search was limited to documents published after 2 October 2020, as this marks the point at which the ECB formally launched the digital euro project. Keywords included “digital euro”, “CBDC”, “digital euro AND proposal”, “ECB AND digital euro”, and “development of digital euro”. Documents were included if they contained official design proposals, design revisions, or stakeholder opinions likely to have influenced the development process, such as formal responses to public consultations or criticisms of legislative proposals. Documents were excluded if they were speculative in nature or unlikely to have had a bearing on the actual development process.

3.4.2 Data Analysis

The analysis proceeded in four steps, applied iteratively as new documents were added to the corpus. The flow is illustrated in Figure 4.

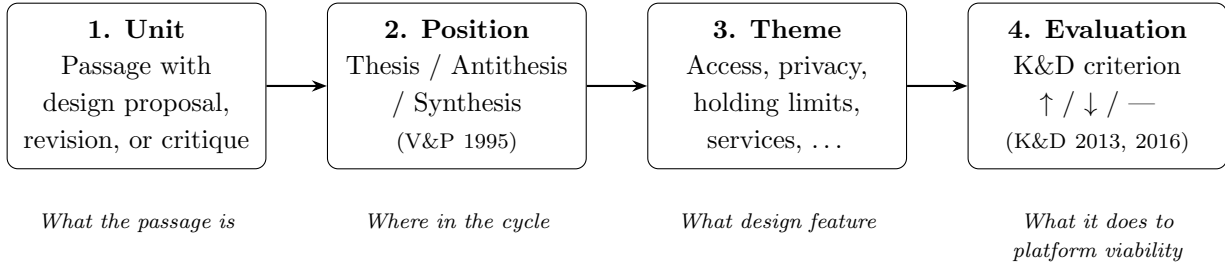


Figure 4: An example of the coding procedure

Firstly, each document was read chronologically by publication date, situating each text against the documents that preceded it. Within each document, the unit of analysis was any passage containing a design proposal, a revision to a previously established design, or a stakeholder critique challenging an existing proposal. Sentences advancing the same underlying argument were grouped into a single passage to avoid fragmenting coherent positions.

Each passage was assigned to a dialectical cycle and classified as thesis (an ECB or Commission design proposal), antithesis (a stakeholder critique), or synthesis (a revised proposal incorporating prior critique), following Van de Ven and Poole’s dialectical motor of change.

Within each cycle, passages were grouped by the design feature they addressed — access, privacy, transfer mechanism, holding limits, services, distribution, and so on. These categories were derived partly from the recurring structure of the ECB’s own progress reports and partly from the design dimensions identified in the theoretical framework.

Finally, each grouped passage was considered against the platform criteria from Kazan and Damsgaard (Kazan & Damsgaard, 2013; Kazan & Damsgaard, 2016), these are network effects, homing costs, switching costs, platform design, and technological solution to assess what the design choice implied for the digital euro’s viability as a multi-sided platform. Where a design choice increased or decreased the success of the platform, this was recorded with a directional marker (↑, ↓), or left undirected (—) where the choice was descriptive but not yet evaluable. The full record of coded passages is provided in Appendix A in Table 4.

This all followed the principles of qualitative content analysis as described by Krippendorff (2019), who defines content analysis as a research technique for making replicable and valid inferences from texts to the contexts of their use. Concretely, the procedure combined what Bowen (2009) describes as content analysis — the identification and categorisation of relevant passages — with thematic analysis, the grouping of those passages by recurring themes to recognise patterns across the data. Document analysis is well-suited to this research design: Bowen (2009) highlights its applicability where new primary data collection is not feasible, which is precisely the case for a prospective project such as the digital euro, and notes that official institutional publications carry the exactness and stability necessary for systematic inference.

3.5 Delimitations

This paper differentiates between delimitations and limitations, where delimitations are choices made to establish boundaries for the analysis, and limitations may be viewed as shortcomings of the paper that limit the generalisability and conclusions that may be drawn from the findings. Limitations will be discussed in the discussion and contributions section and will outline areas where further research is needed. The delimitations made have been deemed necessary to focus the scope of the research, and will result in limitations for both generalisability and conclusions drawn.

Firstly, this paper is delimited to examining the development process of the digital euro specifically, rather than the development process of CBDCs in general. Although analysing the development of other CBDC initiatives in parallel may offer a greater understanding and a more generalisable outcome on how new CBDCs are developed as multi-sided platforms, doing so would increase the scope beyond what is feasible within this paper. Focusing exclusively on the digital euro allows for a deeper exploration of the tensions between varying stakeholder interests that shape its development, and eventually, its resulting final product.

Secondly, the analysis of the development process is delimited to the theoretical lenses applied. This entails that the analysis approaches the development of the digital euro through a dialectical process perspective (Van de Ven & Poole, 1995), emphasising tensions, contradictions and conflict that propel the initiative forward. Equally, the digital euro is conceptually treated as a multi-sided platform, and the development of it is analysed as such. Other perspectives such as macroeconomic implications or monetary policy implications fall outside the scope of the analysis and may only be touched upon insofar as they affect the design or the trajectory of the development process.

Thirdly, this paper relies only on publicly available data, including publicly accessible documents, official reports, and official statements. Internal policy discussions within the Eurosystem are not included, as they are not generally accessible. This may limit the depth of insight into internal conflicts and decision rationale behind the different designs pursued during the development process. However, the ECB, alongside other stakeholders, provides extensive lists of publications and other related documentation to the development process of the digital euro (ECB, n.d.-d). Hence, publicly available data is deemed sufficient to form conclusions surrounding how the digital euro is developed as a multi-sided platform.

Finally, the analysis focusses primarily on the ECB and Eurosystem-level documentation, processes, and stakeholder engagement. While data from other sources than the ECB, such as reports from stakeholders, may be used for the analysis, they will only be analysed in how they impact the ECB's development of the digital euro. Furthermore, the study covers only the period from the initial investigation phase, starting with the "Report on a digital euro" (ECB, 2020), and forward. Earlier discussions on CBDCs fall outside the scope of this paper.

4 Background

4.1 Central Bank Digital Currencies

Central Bank Digital Currency (CBDC) is a term that may refer to a wide range of concepts; however, according to the BIS "a CBDC is digital form of central bank money that is different from balances in traditional reserve or settlement accounts" (Bank for International Settlements [BIS], 2018, p. 3).

To clarify this definition, the “money flower” (Figure 5), a taxonomy of money introduced by Bech and Garratt (2017), can be used. This taxonomy relies on four key properties: “issuer (central bank or other); form (digital or physical); accessibility (widely or restricted); and technology (token- or account-based)” (BIS, 2018, p. 4) to categorise different types of money. All CBDCs share two of these properties: the issuer is a central bank and the form is digital. Meanwhile, the other properties may vary based on the intended use of the CBDC.

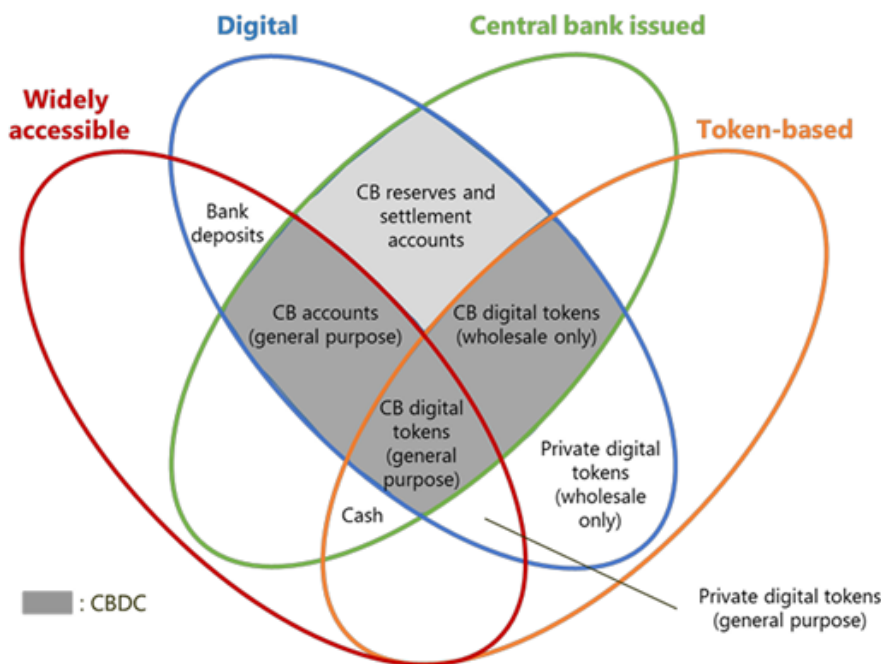


Figure 5: The money flower (BIS, 2018)

This definition of a CBDC allows for a wide range of different CBDC designs with varying feature sets for varying uses. Hence, central banks may issue CBDCs for a wide range of reasons which include as monetary policy tools, to support digitalisation, to compete with private alternatives for digital currencies, to address a decline in the use of cash, for cross-border payments and strengthening of a currency or for cost efficiency or environmental reasons (Auer et al., 2023). Currently there are 108 active CBDC projects across the globe (Kumar et al., 2025), indicating that a majority of central banks recognise CBDCs as a possible future for money, including the ECB with its digital euro initiative.

4.2 The European Central Bank

The organisation behind the development of the digital euro is primarily the European Central Bank (ECB) which serve as the core of the Eurosystem. More specifically, the Eurosystem’s High-Level Task Force on Digital Euro, who report directly to ECB’s governing council, is the primary body steering the digital euro project (ECB, n.d.-b). Understanding the organisational design and structure of the ECB and this task force would therefore be advantageous in understanding how the development of the digital euro works, and why certain design decisions are taken that may not be favoured in other platform development projects.

Using Mintzberg (1980)’s Structure in 5’s, the basic configuration of ECB’s organisation can be de-

terminated, which would yield insight into why and how the organisation operates as it does. Mintzberg outlines five basic configurations of organisations: “Simple Structure, Machine Bureaucracy, Professional Bureaucracy, Divisionalized Form, and Adhocracy” (Mintzberg, 1980, p. 322). The ECB encompasses elements from many of these configurations. Most prominent of them is the professional bureaucracy with highly specialised employees that often are extensively trained, and grouping on a functional basis with large sized operating units. This is reflected in ECB’s organisational chart, where large sized departments containing highly specialised employees are grouped by function, such as economics, monetary policy, communication et cetera (ECB, n.d.-c). However, several elements from machine bureaucracy are also present, particularly the high formalisation of procedures and centralised decision making. While each employee has a certain degree of autonomy, strategic decision-making is centred in the Governing Council formulating monetary policy and overseeing major initiatives such as the digital euro. The Executive Board is responsible for implementation and operational management in accordance with the Governing Council’s guidelines (Muñoz & Valls, 2016). Furthermore, the ECB’s operations are strictly governed by several internal guidelines, procedures, and treaties such as the Treaty on the Functioning of the European Union (European Union, 2012), and the Statute of the ESCB and ECB (ECB, 2011). In short, while the ECB’s operating core is very much structured as a professional bureaucracy with skilled, mostly autonomous employees, its strategic apex where most high-level decision making takes place is most closely aligned with a machine bureaucracy.

In innovation based projects such as the digital euro project, temporary adhocracies may, however, also be used to structure the organisation. Adhocracies are characterised by an organic structure with little formalisation of behaviour, coordination through mutual adjustment, and a broad mixtures of staff, operating experts and managers grouped by function, but deployed in smaller teams for project work (Mintzberg, 1980). The digital euro project is, as mentioned, steered by the Eurosystem’s High-Level Task Force on Digital Euro. This task force is comprised of high-level representatives from the ECB and national central banks (NCBs) within the Eurosystem, as well as observers from the ECB and the European Commission (ECB, 2024). For experimentation, research, and development, the task force issues various committees, boards, and groups that are more or less adhocatically organised, such as the Digital Euro Rulebook Development Group (ECB, 2025a). These committees, boards, and groups usually comprise of experts and professionals from various related fields, and coordinate through mutual adjustment via joint decision making. The Digital Euro Rulebook Development Group, for example, comprises of professionals and experts from both the public and private sector, they develop proposals based on broad consensus, and they rely on “workstreams” that are “expected to work agile and fast-moving” (ECB, 2025a).

The ECB’s basic organisational configuration being a professional bureaucracy with a strong influence of machine bureaucratic elements, combined with more or less adhocatic ways of organising in the digital euro project, has several implications for which designs are explored and pursued during the development of the digital euro. While adhocatic project teams allow for the exploration of cutting-edge technologies and features that push the boundaries of what a digital euro could become, the machine bureaucratic regulatory layers may disfavour them in pursuance of stability, risk aversion, and legal compliance. The core professional bureaucracy configuration of the ECB entails that many highly skilled and highly specialised professionals with a focus on monetary policy will be involved in the digital euro project. Hence, monetary policy and financial stability may at times be prioritised over other aspects such as competitiveness with other payment platforms, adoption dynamics, and

end-user experience. These conflicting interests result in compromises and new solutions that, together with external input, drive the development of the digital euro forward.

4.3 Digital Euro

The digital euro is predominantly designed to meet the changing needs of people, businesses and the economy, thus going hand in hand with the digitalisation of broader European society (ECB, 2023a). Yet, it is increasingly obvious that sovereignty of Europe and strengthening the euro’s position in the world are of utmost importance. As ECB President Lagarde has put it, “the digital euro is not just a means of payment; it is also a political statement concerning the sovereignty of Europe.” (Chhangani & Pastorelli, 2026)

The first step of digital euro laid groundwork for the project with “the Eurosystem’s report on a digital euro” in October 2020 (Panetta, 2021). The start of the digital euro project began more seriously with launching investigation phase in October 2021, which lasted 2 years. The next phase, preparation phase began November 2023 and ended October 2025. On 29th of October 2025, the Governing Council of the ECB decided to move on to the next phase, which is implementation phase, building necessary capacity required. This phase is expected to last about 26 months (Banco de Portugal, 2023).

In the current year of 2026, it is expected that European legislators provide a legal basis for the ECB on the establishment of the digital euro. A pilot test will be carried out, starting at the end of 2027. If everything goes as planned, then ECB aims for 2029 as potential first issuance of digital euro. Figure 6 exhibits the whole project timeline. (Banco de Portugal, 2023; ECB, 2025c)

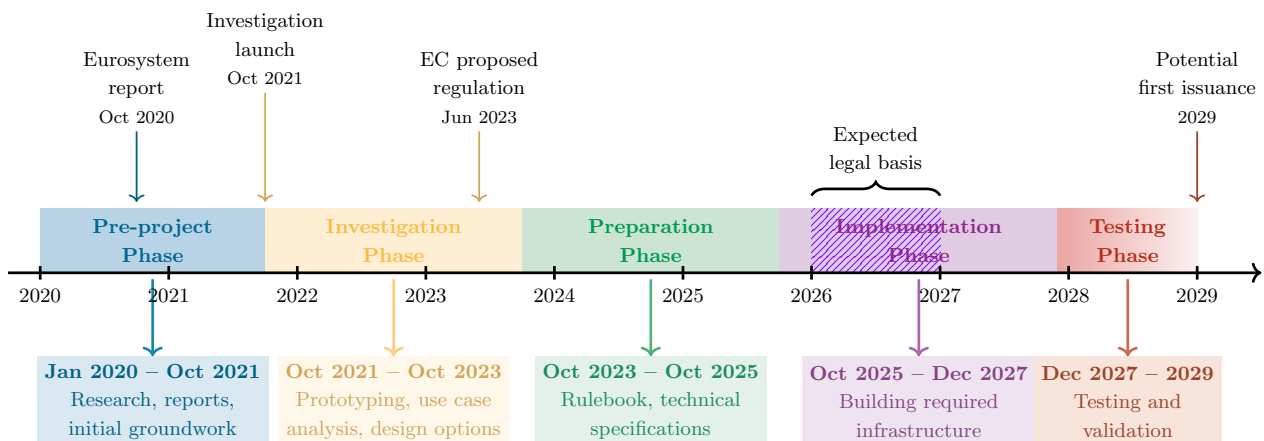


Figure 6: Digital euro project timeline

4.4 Explored Designs

During the development of the digital euro, several different designs have been explored. Table 1 gives overview of the entire digital euro design evolution. The report on a digital euro (ECB, 2020) laid the foundation for these designs and outlined several possible feasible design options for a digital euro. Additionally, five core principles for the digital euro were outlined: (1.) convertibility at par, (2.) it is a liability of the Eurosystem, (3.) it is a European solution accessible on equal terms in

all euro area countries, (4.) market neutrality, meaning it should not crowd out private alternatives, and (5.) it needs to be trusted by end users from the start and over time. Complementing these principles, five general requirements were outlined: (1.) ability to control the amount in circulation, (2.) cooperation with market participants, (3.) compliance with the regulatory framework, (4.) safety and efficiency in the fulfilment of the Eurosystem’s goals, and (5.) easy accessibility throughout the euro area. Finally, seven different scenarios or reasons for issuing a digital euro were outlined: (1.) supporting digitalisation, (2.) tackling the decline in cash acceptance, (3.) limiting the uptake of other forms of money that are not denominated in euro or not appropriately supervised, (4.) monetary policy considerations, (5.) creating a back-up system to improve the overall resilience of the payment system, (6.) cost savings, or (7.) environmental reasons. Based on these core principles, general requirements, and various scenarios for issuing a digital euro, the design and development process for the digital euro ensued.

The first specified design choices for the digital euro can be identified in the first progress report on the investigation phase of the digital euro, where all design options are approved by the governing council (ECB, 2022a). This design established the digital euro as “an electronic means of payment for retail payments, issued by the central bank and accessible to everyone in the euro area” (ECB, 2022a, p. 2). It is designed primarily for tackling the decline in cash, preserving public money, and improving the resilience of the Eurosystem, and should be usable in both physical stores and e-commerce applications, as well as for peer-to-peer transactions and government payments. The primary transfer mechanism for the digital euro is, in this design, online and validated by a third party. Offline functionality with peer-to-peer validation should exist as an alternative option but may not be available at launch. Regarding privacy, the digital euro should offer a similar level of privacy as current private sector solutions, with a potential for increased privacy for low-value and/or low-risk payments. Full privacy is not considered as a viable option for financial stability and anti-money laundering (AML) considerations. Furthermore, this design relies on holding limits and remuneration-based tools to curb its use as an investment, so as not to destabilise banks by moving funds away from them. Specific lower limits could also be placed on offline holdings to minimise risks of illicit use. For transactions made above the holding limit, or where funds held are too low, a waterfall mechanism would transfer funds from a linked bank account into digital euro.

This design is iterated and elaborated on in the next design for the digital euro, which can be found in the second progress report on the investigation phase, where all design options are yet again approved by the governing council (ECB, 2022d). In comparison to the prior design, most elements remain the same, except for the waterfall mechanism, which is complemented with a reverse waterfall mechanism, meaning that funds are automatically transferred from a linked bank account when the balance in the digital euro account is insufficient. A higher standard for privacy is also introduced where only supervised intermediaries would be able to access end user data and no user data would reach the Eurosystem. Mostly though, instead of revision of prior established design features, this design introduces a division of responsibilities between the Eurosystem and supervised intermediaries. According to this division, the Eurosystem would be responsible for the issuance of new currency as well as settlement of transactions and certain post-settlement activities. Meanwhile, the intermediaries would be responsible for all end user facing roles, including management of digital euro accounts or wallets, provision and management of payment instruments, transaction initiation, authentication, validation, post settlement, and funding and defunding activities, as well as the full front-end user

experience. This means that the front-end experience would vary depending on which intermediary is distributing the digital euro in a specific area; therefore, the distribution of the digital euro is done through a scheme meant to ensure that there are no payment barriers no matter which intermediary is responsible. Furthermore, this design also established that the digital euro would be available around the clock, and that funding and defunding of offline funds would require a temporary network connection. Funding and defunding could either be done automatically via a linked bank account or manually.

The third progress report on the investigation phase of the digital euro (ECB, 2023c) further iterates and elaborates on the design for a digital euro, still with all design options approved by the governing council. In comparison to the design outlined in the second progress report, this design entails that the Eurosystem will develop a front-end user interface for the digital euro which would exist in parallel with the user interfaces developed by the intermediaries. The user would be able to freely choose which front-end experience to use. Intermediaries would also need to meet certain scheme access criteria to be able to distribute the digital euro. Otherwise, this design introduces features related to access and the form factor of the digital euro. Regarding access, this design outlines that the focus of access would be residents, merchants and governments of the euro area. Those outside the euro area would be able to access the digital euro via payment service providers (PSPs) within the euro area, or in subsequent releases, through agreements between authorities in the outside jurisdiction and the ECB. Regarding the form factor of the digital euro, users would gain access to it via an onboarding process set up by the intermediaries that works in a similar way as setting up any other payment account with them. Users would then be able to make transactions using either QR codes or NFC technology. Cross-currency functionality could also be introduced at a later stage, and only where there are mutual interests with other monetary jurisdictions. The specific features a user would be able to access would depend on the intermediary, as the scheme differentiates between core services required by all intermediaries, optional services that intermediaries would be able to choose whether or not to offer, and value-added services developed by the intermediaries themselves. Furthermore, the digital euro would support conditional payments, but would not work as programmable money, as it should always be fully fungible.

The last full design that may be identified can be found in the “Proposal for a Regulation of The European Parliament and of The Council on the Establishment of The Digital Euro” (European Commission, 2023b). This design mostly encompasses the features outlined in the prior designs but includes a few amendments and clarifications. Firstly, the digital euro should be granted legal tender status, meaning that it must be accepted if offered as payment of debts. Secondly, all PSPs authorised in the EU may act as intermediaries and providers of the digital euro granted that they abide by the digital euro rulebook. The fee they may charge merchants will also be regulated, and cannot exceed the costs incurred by providing the service and a reasonable margin of profit, not exceeding that of comparable payment methods. If PSPs outside the euro area should be able to provide the digital euro, an agreement between the authorities of that specific monetary jurisdiction and the ECB is required. Thirdly, the design must facilitate use by the general public, which includes the financially excluded, people with disabilities or functional limitations, and people with limited digital skills. This also means that the digital euro should be available both online and offline as of first issuance. Users would also be able to onboard using either regular onboarding processes offered by the PSPs or through the European Digital Identity Wallet. Compatibility with private payment solutions would also, to the

greatest extent possible, be ensured. Lastly, privacy should be ensured using state-of-the-art security and privacy preserving measures including pseudonymisation and encryption. Only the PSPs would have access to data on funding and defunding connected to the identity of a user. This data could be transmitted to Financial Intelligence Units upon request as an AML and financial stability measure.

Table 1: Overview of Digital Euro Design Evolution

Category	Thesis 1 (ECB, 2020)	Thesis 2 (ECB, 2022a)	Thesis 3 (ECB, 2022d)	Thesis 4 (ECB, 2023c)	Thesis 5 (European Commission, 2023b)
Changes to prior design features		<ul style="list-style-type: none"> • More specific design 	<ul style="list-style-type: none"> • Improved privacy • Reverse waterfall alongside waterfall 	<ul style="list-style-type: none"> • Eurosystem provides parallel front-end experience • Scheme access criteria for PSPs 	<ul style="list-style-type: none"> • All authorised PSPs in the EU may act as intermediaries • Both online and offline as of first issuance • Onboarding through PSP or European Digital Identity Wallet • Improved privacy • Clarification on accessibility
New features introduced	<ul style="list-style-type: none"> • Wide range of possible designs • Core principles • General design requirements • Varying reasons for issuance 	<ul style="list-style-type: none"> • Clear definition • Decided on reason for issuance • Online first, but offline version coming • Privacy = current solutions • Holding limits • Waterfall functionalities 	<ul style="list-style-type: none"> • Division of responsibilities: Eurosystem / Intermediaries • Intermediary provides front-end experience • 24/7 availability • Manual or automatic funding / defunding • Distribution through scheme 	<ul style="list-style-type: none"> • Definitions of access • Onboarding similar to PSPs' current processes • QR codes and NFC • Core, optional, and value-added services • Conditional payments • Limited cross currency functionality 	<ul style="list-style-type: none"> • Legal tender status • Fee caps • Compatibility with private payment solutions

5 Findings

5.1 Cycle 1

5.1.1 Thesis: ECB Report on a Digital Euro

The report begins by explaining that Eurosystem needs riskless central bank money in the digital age, the Governing Council of the ECB started working on the project of the digital euro, which would not replace cash, but would be introduced alongside it. (ECB, 2020, p. 2)

The report is broad in a sense that it is the first piece of document by ECB that explores possible designs to fulfil the core principles and scenario-based requirements of the ECB. The report therefore presents wide-open design space of different and multiple options with nothing decided by the ECB and its Governing Council.

5.1.1.1 Access

For access, users of digital euro can access it directly or through supervised intermediaries. Notably, the report notes that an intermediated access is preferred, because it cooperates with existing partners and solutions. However, it is noted that it has to align with principle 5 of end-user trust all the way through. (ECB, 2020, pp. 26–27).

In addition to how the digital euro is accessed, the ECB has considered access in terms of who can use the digital euro. This means varying designs in terms of restrictions placed on the use of the currency (ECB, 2020). In this context, restrictions are understood as intentionally placed by ECB’s design choice, and are here analysed as two options within one design feature: unrestricted, where access would be global, and restricted, where access would be limited to eurozone residents, merchants, and governments initially (ECB, 2020, p. 29). Ultimately, access is about end-user facing aspects of Kazan and Damsgaard’s framework, i.e. these choice affect both homing and switching costs and eventually play a significant role in network effect (Kazan & Damsgaard, 2013).

5.1.1.2 Privacy

User privacy is the product of negotiation between public interest and individual rights (ECB, 2020, p. 27). If upfront verification was not established, then any subsequent transaction would be effectively private. This is in contradiction to current regulation on electronic payments (money laundering and terrorist financing); therefore, full anonymity is rejected in the report.

As verification is done when user accesses the first digital euro services, privacy can still be granted, as the report puts. For example, offline transaction stays between the transaction partners and selective privacy is noted as an option without registering the identities of transaction parties in case of low-value transactions. Similar to the access conditions, privacy is also about end-user facing aspects, having direct effect on end-user’s homing costs, which determine also network effects (Kazan & Damsgaard, 2013).

5.1.1.3 Limiting or disincentivising the large-scale use of a digital euro as an investment

To limit the potential disruption to the financial system from large inflows into the digital euro, several tools are proposed. First, individual accounts could be subject to holding limits, with users

required to verify their identity during onboarding to ensure that the total amount of digital euro in circulation remains within a defined range. Second, a tiered interest rate system could be introduced, whereby balances above certain thresholds receive less favourable rates, thereby discouraging excessive accumulation of the digital euro. Furthermore, differentiated thresholds and remuneration schemes could be applied across user groups, such as residents, non-residents, and corporate entities, taking into account financial stability concerns, the low interest rate environment, and potential trade-offs with features like offline payments. (ECB, 2020, p. 28)

5.1.1.4 Transfer mechanism

For transfer mechanism, the report notes that either account-based system or bearer instrument system can be used. An account-based system follows majority of current payment systems, where third party would validate the sufficient funds and update the balances accordingly. A bearer-type system would settle the transaction without any third-party or intermediary. That is also how cash works, where only payer and payee verify the interaction (ECB, 2020, pp. 29–30). This relates to platform design in Kazan and Damsgaard’s framework, where how much role third parties and complementors can play within the whole ecosystem (Kazan & Damsgaard, 2013).

5.1.1.5 Payment device

The report highlights that a digital euro can be accessed as a web service or through actual physical objects, such as payment cards. The report notes that web would allow flexibility in terms of device usage (computers, smart wearables, phones), yet requires internet connection, while physical objects would require compatibility between devices and offer offline functionality. They suggest that integration of the two could be the way, which would require synchronisations between the two. On top of that, offline payment devices would require heavy certifications and security compliances (as is the case with cash with holograms and watermarks) as these have to be tamper- and hacking-proof (ECB, 2020, p. 30). According to Kazan and Damsgaard, this is clearly a technological solution, that ECB has to consider, whether the eventual solution is evolutionary or revolutionary (Kazan & Damsgaard, 2013).

5.1.1.6 Availability and usability offline

The offline solution, in particular, is argued to have to be linked to the online solution (ECB, 2020, p. 32). This is due to the fact that payment devices would have to be pre-funded. Also, as it is not connected to online services, central bank would be unable to apply remuneration to digital euro stored offline. On top of that, offline euro would most likely not be able to support novel features such as conditional payments. (ECB, 2020, p. 31)

5.1.1.7 Remuneration

The report notes that the digital euro may be remunerated for monetary policy reasons, but also to uphold financial stability avoiding digital euro as investment instrument. The digital euro may be remunerated in fixed or variable rate. With fixed rate of 0%, it would behave just as cash. For variable rate, the report suggests pegging the remuneration rate of the digital euro to one of the ECB’s interest rates, fixing the spread. They, however, note that the spread, of course, can also be altered

when necessary, indicating it being a highly flexible variable. On top of that, the report highlights the possibility of tiered remuneration, with different interest rates for different conditions (e.g. holding amounts). This remuneration dilemma is homing costs for users (Kazan & Damsgaard, 2013).

5.1.1.8 Legal tender

Report notes that legal tender feature is desirable to have (ECB, 2020, p. 33). They note that without it, payees would have to do cost-benefit analysis whether to adopt and accept payments through this particular ecosystem. If the legal tender feature were to be required, then in practice, this means that it should be usable everywhere at any time in the Eurozone. On top of that, the issue of the legal tender feature for online transactions is brought up - this would mean that one would have to have the opportunity to pay with the digital euro in e-commerce, for example.

5.1.2 Antithesis: Stakeholder Responses and Public Consultation

As “Eurosysteem report on the public consultation on a digital euro” in its foreword says, this report is public consultation with stakeholders that directly follows and is based on the “Report on a Digital Euro” (ECB, 2021, p. 2). On top of that, it will be clear input to the ECB’s Governing Council in its decision on investigation phase. Therefore, it clearly had an impact on the designs ECB is working with. Here, we present the main points of this report.

It should be noted that the sample of respondents was not representative of the euro area population: 94% identified as citizens and 6% as professionals, 87% of citizen respondents were male, and nearly half of all responses came from Germany alone (ECB, 2021, p. 2). While the ECB acknowledges this bias, the breadth and depth of responses still provided valuable input that demonstrably shaped subsequent design decisions.

5.1.2.1 Privacy

Privacy was indicated as the most important feature of the digital euro within the public consultation report. Therefore, this is the main antithesis and highlights one of the conflict points to come. Namely, 43% of citizens, with whom the ECB consulted ranked privacy as the single most important feature, while security landed second far behind with 18%, usability across the euro area third with 11%, the absence of additional costs fourth with 9% and offline use fifth with 8% (ECB, 2021, p. 10). In addition, a third of professionals rank privacy first, with merchants and other companies ranking it even higher than citizens (ECB, 2021, p. 12).

This was also highlighted in response, when respondents were confronted with choosing between offline solution focused on privacy, online solution focused on innovation, and combination of two. That is, 53% of citizens opted for the offline privacy-focused model, while only 13% preferred the online option and 34% favoured a combination (ECB, 2021, p. 14). This is clearly opposite of ECB’s opinion, which considered privacy as one of many issues.

From the perspective of platform theory, the consultation showed that privacy is not merely a feature preference but an important condition for adoption. As Kazan and Damsgaard (2013) note, network effects only emerge once a sufficient number of users on both sides of the platform adopt the system. If privacy concerns constitute a barrier to adoption, they effectively function as homing costs, costs that one has to bear in terms of loss of privacy. The strength of the privacy demand

thus indicated that any design failing to offer privacy comparable to existing payment solutions would struggle to achieve the adoption necessary for the digital euro to function as a viable multi-sided platform. Still, despite this strong preference, fewer than one in ten citizens supported full anonymity, and most accepted some form of identification to avoid illicit activities (ECB, 2021, p. 18).

5.1.2.2 Services

Respondents consider that digital euro should be integrated with existing solutions and that intermediaries should be licensed and overseen to ensure that users are protected from the misuse of data and privacy. (ECB, 2021, p. 3) Specifically, 73% of citizen respondents see a role for intermediaries, with a clear preference for their involvement in introducing innovative services and ensuring integration with existing payment solutions. (ECB, 2021, p. 19)

5.1.2.3 Tools to control the amount of digital euro in circulation

The consultation reveals divided views in terms of limiting digital euro usage. While approximately half of citizen respondents and a similar share of professionals supported some form of limitation, about a third of citizens and nearly half of merchants rejected any tools restricting the amount of digital euro in circulation (ECB, 2021, p. 25). Where controls were accepted, respondents insisted that the first tier or holding limit be large enough for normal retail payment needs, and automatic transfer of excess holdings to a linked bank account was the preferred overflow mechanism, though with strong demands for user consent (ECB, 2021, pp. 25–26).

5.1.2.4 Technology

Half of the citizen respondents said that they see blockchain as the best solution preventing counterfeiting. What the report also notes surprisingly is that citizens mention blockchain far more than professional people in the sector. (ECB, 2021, pp. 21–22) What is also even more notable is that people are much more open to blockchain than ECB, as the ECB rejected blockchain completely in “Report on a Digital Euro”. From perspective of Kazan and Damsgaard, this indicates that here respondents are much open to revolutionary technological solution than ECB, which opted to evolutionary solution in their report. This highlights that there is a direct tension with the ECB’s preference for evolutionary approaches that build on existing payment infrastructure.

5.1.2.5 Cross-Border Use

A majority of respondents see that the use of digital euro should be allowed in cross-border use. It is noted that it would strengthen position of euro as international currency, apart from obvious benefit of using currency in broader transaction cases. Only one in ten says that they personally do not see any benefits of cross-border use. Professionals are also in favour of cross-border currency use, but acknowledge more that some limits probably have to be placed to counter some risks and challenges. (ECB, 2021, p. 27)

This broad support for unrestricted cross-border use challenged potential ECB caution around macro-financial risks and signalled stakeholder expectations for a platform with wide geographic reach - which, in network effects terms, would enlarge the potential user base on both sides and strengthen conditions for adoption.

5.1.3 Synthesis: 1st Progress Report

The report on the progress of digital euro investigation phase starts defining the digital euro along with its main use cases, before moving on to the foundational design options, considered and relevant so far. Before, considering transfer mechanism, privacy and tools of control of digital euro that ECB made progress on the first report, the important use cases were highlighted in the report and here we will also briefly establish them. The Governing Council of ECB tells that they focus on future trends of such as physical stores being biggest market segment for digital payments, with e-commerce growing in size. Therefore, main use cases of digital euro are payments in e-commerce, physical stores as well as person-to-person payments. They also incorporate payments between governments and individuals as important use case. These were laid out in the first report as priority of use cases for which the new digital currency were to be developed, at least in the first and initial launch. (ECB, 2022a, pp. 4–5)

5.1.3.1 Transfer mechanism

With transfer mechanism, ECB refers to general logic of how payment gets transferred from the payer to the payee. In the “Progress on the investigation phase of a digital euro”, the Governing Council of ECB rejected peer-to-peer validation of online payments, labelling it as “experimental [...] unlikely to be ready for the first release.” (ECB, 2022a, p. 6). The Governing Council considered the pursuit of an online third-party validated solution as broadest set of high-level use cases, thus as part of first digital euro release.

On top of that, it concluded that “offline peer-to-peer validated solutions should be developed” (ECB, 2022a, p. 6). However, it is clear that this is of second priority after third-party validation of online payments as they cast doubts on technical feasibility, legislative frameworks and security risk tolerance. Nevertheless, it remains part of the design space that needs further assessment. This also addresses the antithesis of public consultation report, where privacy and cash-like features were valued, indicating that the ECB goes on with a certain compromise: offline is kept to satisfy stakeholder demands, but deprioritised to satisfy the ECB’s preference for proven technology as stakeholders were much more open to blockchain-based revolutionary technology (ECB, 2021; Kazan & Damsgaard, 2014, 2016).

From the platform theory perspective, in terms of Kazan and Damsgaard’s framework, these transfer mechanism choices pertain to technological solution criteria, as it is ultimately how customer relationships with both merchants and cardholders (payers and payees) are managed. On top of that, as observed, peer-to-peer is newer in terms of technology, which is why a central ledger is preferred and online peer-to-peer solution is considered “experimental” or not serious alternative, reflecting that Governing Council also consciously or subconsciously leans towards evolutionary path, not coming up with entirely new way of payment, but evolutionising the current digital payment ecosystem to have digital currency equivalent of euro as legal tender. They followed the suit of general practice of evolutionising, instead of revolutionizing, especially as findings are that most multi-sided payment platforms leverage on evolutionary payment instruments in order to enter existing markets and take over the parts of them (Kazan & Damsgaard, 2014, p. 12; Kazan & Damsgaard, 2016, p. 779). One could even argue that the peer-to-peer offline solution, trying to mimic physical cash, is also evolutionary, from Kazan and Damsgaard’s technological solution point of view, as it does not require third party and requires proximity for payment. A revolutionary way to go would have involved using

a distributed ledger, online peer-to-peer solution, but as noted, this was not pursued.

It is worth noting that Governing Council of ECB did not reject though peer-to-peer offline version, as stakeholder response of public consultation highlighted, that people require offline means of payment, if they were to use digital euro. This highlights that ECB has to compromise with these stakeholders and kept this design options open, in order to ensure that digital euro as alternative to physical cash, becomes a success.

5.1.3.2 Privacy

As they note it in the report, “[p]rivacy is one of the most important design features of a digital euro, and designing a digital euro that respects the right to privacy is required by law.” (ECB, 2022a, p. 6). As public consultation showed, 43% of people engaged with ranked it as number one in the list of concerns, far beyond others (ECB, 2021). This highlights that here they have taken into account “Eurosysteem report on the public consultation on a digital euro” and its findings that the biggest concern is privacy.

Nevertheless, the report rejects outright the full privacy option, as it is unviable from their perspective. They provide two reasons for this. Firstly, it would enable illicit purposes and secondly, and perhaps more importantly, they would have less control of financial stability as it would make it impossible to limit the use of digital euro as a form of investment. (ECB, 2022a, p. 6)

As a baseline, digital euro would provide same level of privacy as the current private sector solutions. This means that on onboarding, one would have to verify oneself and intermediaries can process data for Anti-Money Laundering (AML) and Countering the Financing of Terrorism (CFT) compliance and other relevant provisions under the EU law. (ECB, 2022a, p. 7) Though, they considered privacy also as a quality that should be upheld as much as possible, claiming that ECB works on trying to minimise the “Eurosysteem’s involvement in the processing of users’ data” (ECB, 2022a, p. 8) Therefore, they highlight improvements in privacy such as going beyond the baseline, such as cash-like features and selective privacy. More specifically, selective privacy would mean that low-risk and low-value payments could remain hidden from intermediary scrutiny and offline privacy would mean that transaction would stay only between payee and payer. Nevertheless, both still would require upfront onboarding verification of the user and holdings.

From the standpoint of Kazan and Damsgaard, privacy by default seems to make sense as it is clear that less concerns with privacy users have, the more they will adopt and actually use it, playing into crucial network effects (Kazan & Damsgaard, 2013; Rochet & Tirole, 2003). They cleverly play into starting with the baseline status quo privacy at the minimum, while pursuing even more privacy alternatives, trying to come up with superior offering in this regard. Yet, what is also clear is that by framing digital euro as “exactly like cash, just in a digital version”, yet not offering that level of privacy is a short-coming and the will of the ECB (European Commission, 2023a). This highlights also the contradiction and conflict of user interests and needs and ECB’s interests and needs, where ECB tries to compromise from both sides.

5.1.3.3 Tools to control the amount of digital euro in circulation

As the goal is not to disrupt, but to provide an alternative to the other existing payment options, they observe that monetary and financial stability, as one of their mandates (European Union, 2012),

must be held. Therefore, these risks have to be minimised in advance and by design (ECB, 2022a, p. 9). Therefore, it is noted that options about remuneration and holding limits are important part of the design. The Governing Council of ECB remained open in the report on specificities as they acknowledge that the issuance of and use of digital euro is too far into future that it is impossible to anticipate the actual economic and societal conditions. Nevertheless, The Governing Council approved both offline and online digital euro holdings and to enforce it, they retained possibility of “waterfall” mechanism.

These control tools can be grouped under creating homing costs, based on Kazan and Damsgaard’s framework. It may seem at first look contradictory to the theory of platforms to increase homing costs, but this is not a surprise as they want to avoid getting money out of financial institutions and banks, which would essentially paralyse money markets, especially European money market, where funding comes primarily from banks, not asset markets (La Porta et al., 1997).

5.1.4 Summary of Cycle 1

Figure 7 summarises the core of the first dialectical cycle. As seen in the Figure 7, the core lies in privacy. Of course, there are other elements part of the cycle, for that see summarizing cross-cycle synthesis Table 3.

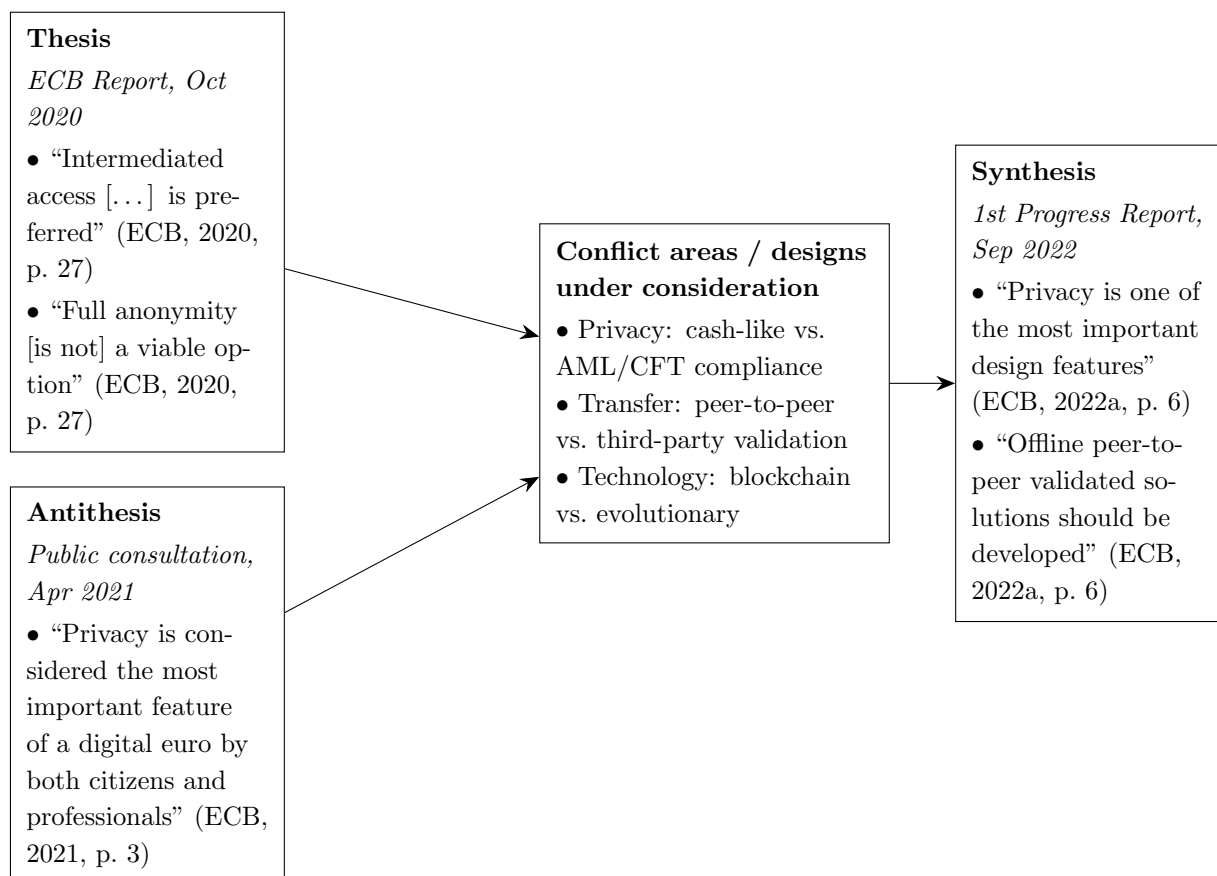


Figure 7: Cycle 1 summary

5.2 Cycle 2

5.2.1 Antithesis: EGOV, EBF, Consultation Report

The first progress report on the investigation phase of the digital euro addressed many design considerations for the digital euro; however, the designs proposed were not without critique. Primarily, this critique regarded the privacy model proposed for the digital euro. “Are users only protected against infringements of the right to privacy (if at all), or are they also protected against discretionary restrictions on transferring or withdrawing their funds?” (Niepelt, 2023, p. 10), or in other words, would someone be able to stop a user from using their money as they desire? A report from the Economic Governance and EMU Scrutiny Unit (EGOV) of the European Parliament (Niepelt, 2023), while published after the second progress report, summarises many of the criticisms directed at the first progress report. One commonly raised concern, according to this report, is vagueness in whether users would need to register directly with the Eurosystem in addition to a bank to be able to use the digital euro, and if so, to what degree data would be accessible to the Eurosystem. If the Eurosystem itself were to have any ability to access end user data, concerns regarding their ability to make a credible claim not to access this data arise. Credibility in such a claim would be essential for the digital euro to succeed, especially considering that privacy was indicated as the number one most important feature of a digital euro in The ECB’s public consultation on the digital euro (ECB, 2021).

Failure to address these privacy concerns would reduce the probability of launching the digital euro as a successful platform. Giving up a certain degree of privacy would constitute an implicit homing cost of using the platform (Kazan & Damsgaard, 2013). This is especially true if using the digital euro is intended as a replacement for cash. Considering the importance of privacy for the key audience of the digital euro, it is likely that negative cross-side network effects (Kazan & Damsgaard, 2013) emerge if concerns are left unaddressed. If users in the cardholder side choose not to use the digital euro due to privacy concerns, fewer merchants and intermediaries would be incentivised to support the platform, which in turn would decrease the value in using the platform for cardholders, further decreasing the number of users.

Other than privacy concerns, “[a] few [stakeholders] suggest that the waterfall from digital euro to commercial bank money holdings should also work in the opposite direction, giving users the opportunity to replenish their digital euro account or wallet automatically when they make a payment” (ECB, 2021). Introducing this functionality would decrease homing costs for the platform (Kazan & Damsgaard, 2013), as users would not need to manually fund or defund their digital euro wallet making it more convenient to use. Without this feature, users of the digital euro would have to keep track of their digital euro wallet in parallel with their regular bank account, which could result in people simply not using the digital euro as they forget to fund their digital euro accounts. This holds especially true due to the proposed holding limits on the digital euro.

Minor criticism against the first progress report of the investigation phase was also raised regarding the vagueness of the design options proposed (Niepelt, 2023). The transfer mechanisms were for instance not explained in much detail. Three were mentioned, and two were favoured, but the objectives for selecting them, and any potential trade-offs were unclear (Niepelt, 2023). Hence, more clarity in what each design options entail, why they are pursued, and what the potential trade-offs may be, would be desirable.

Regarding the design proposed for holding limits and remuneration based tools to curb the use of

the digital euro as an investment, different stakeholders hold different views. The European Banking Federation (EBF) argues for a hard cap on digital euro holdings to prevent mass outflow of bank deposits during times of financial crisis, as it may result in the collapse of banks (EBF, 2022). Meanwhile, EGOV questions how holding limits may affect demand of the digital euro, and if banks necessarily need to finance themselves through deposit (Niepelt, 2023). They instead argue that banks could finance loans through central bank loans that are funded by digital euro holdings. Furthermore, they highlight that holding limits may cause shadow exchange rates that “would provide incentives to circumvent the cap and might unleash other destabilising forces, which we may not anticipate now” (Niepelt, 2023, p. 12). From a platform perspective, holding limits would entail higher homing costs (Kazan & Damsgaard, 2013), as holders would need to manage a digital euro account in addition to existing bank accounts and potential cash holdings, which could make it more difficult for them to manage their money.

Finally, a need for design features not touched upon in the first progress report on the investigation phase can be identified. Such features include a clear division of responsibilities between intermediaries and the Eurosystem, a settlement model, a design for funding and defunding a digital euro account or wallet, and a distribution model. The EBF has expressed concerns regarding cyclical and structural disintermediation as a result of the digital euro (EBF, 2022). They have also expressed the need for a sustainable business model for the provision of the digital euro through banks as intermediaries. Without a sustainable business model for the intermediaries, the emergence of network effects could suffer as fewer intermediaries would offer digital euro services. It has also been shown that a preference exists for intermediaries holding certain roles such as “introducing innovative services and efficiency-seeking solutions in general, as well ensuring appropriate interfacing with current payments and providing information about the use of digital euro.” (ECB, 2021). Furthermore, professionals of related industries including tech and banking have argued that “intermediaries’ involvement in user on-boarding, including identification, authentication and authorisation, would ensure resilience across the entire ecosystem, give greater security to the safekeeping of a digital euro and mitigate operational risks.” (ECB, 2021).

5.2.2 Synthesis: 2nd Progress Report

The second progress report on the investigation phase of the digital euro (ECB, 2022d) addressed many of these concerns, but not all. Some improvement and clarification in the privacy question were provided, and a reverse waterfall mechanism was introduced to complement the existing waterfall mechanism. Design features regarding division of responsibilities between the Eurosystem and the intermediaries, the settlement model, funding and defunding, and distribution were also introduced. However, some vagueness in the design features was still there. Equally, no further comment on the holding limit introduced in the first progress report on the investigation phase (ECB, 2022a) was made; hence, it can be presumed to remain unchanged.

5.2.2.1 Privacy

Regarding privacy, a clear line was drawn for the level of access the Eurosystem would have to end-user data. “The Eurosystem would not be able to infer how much digital euro any individual end user holds nor to infer end users’ payment patterns” (ECB, 2022d, p. 1). Any other end-user data access

to the Eurosystem should be kept as minimal as possible whilst still allowing it to perform its tasks. This means that the Eurosystem, in all likelihood, would be able to make a credible claim not to access user data. However, questions regarding the intermediaries' level of data access, and whether discretionary restrictions could be exercised by the intermediaries, remain unaddressed.

This improvement in privacy, while not big, may slightly decrease the homing costs in the form of privacy that is given up, and decrease the risk of negative cross-side network effects emerging because of users refusing adoption (Kazan & Damsgaard, 2013). Still, more can be done to mitigate the risk further. If a level of privacy higher than that of similar alternatives, such as traditional credit or debit cards, is offered, positive cross-side network effects may instead emerge. Cardholders would then prefer making payments in digital euro, which increases the incentives for intermediaries and merchants to support it. The switching costs of the digital euro would also increase, as switching from it would entail giving up more privacy than already is being given up.

5.2.2.2 Roles of intermediaries

In terms of division of responsibilities, all end-user facing roles would be the responsibility of the intermediaries. This includes offering services such as “opening accounts or wallets, payment instruments and onboarding and offboarding, encompassing know-your-customer and anti-money laundering checks” (ECB, 2022d, p. 5). Further, the front-end user experience would be provided by the intermediaries, which include physical payment devices or interfaces, as well as the online experience. Transaction management would also be a responsibility of the intermediaries including initiation, validation and post-settlement activities. The digital euro would, however, be a liability of the Eurosystem meaning that it would be recorded on the Eurosystem's balance sheet, and the Eurosystem would be liable for any errors in settlement of transactions. Therefore, the responsibilities of the Eurosystem include settlement of transactions as well as issuance (ECB, 2022d). Table 2 illustrates which responsibilities fall on which party.

This addresses the concern for cyclical and structural disintermediation in the payment market (EBF, 2022). However, a sustainable business model around these responsibilities has yet to be established. Although, relying on the intermediaries to this extent decreases the homing costs of the platform, as the interfaces built for the digital euro are likely to resemble current banking interfaces. Therefore, assuming the potential users already have bank accounts with one of the intermediaries, opening a digital euro account should be familiar and straight-forward.

5.2.2.3 Settlement model

Settlement of transactions, which is defined as “the completion of a payment transaction with the aim of irrevocably discharging all payment obligations between a payer and payee through the transfer of funds” (ECB, 2022d, p. 6), would, in its entirety, be a responsibility of the Eurosystem. It encompasses two steps: checking that the payer has sufficient funds, and recording (or bookkeeping) the transaction. For the online digital euro solution, this could be done directly by the ECB, but for the offline digital euro, settlement would have to be done directly in hardware devices possessed by the user. It is not yet decided whether the digital euro should rely on a traditional centralised ledger technology, or distributed ledger technology, or a hybrid approach. However, the choice of technology should follow the desired functionality.

Table 2: Division of Responsibilities Between Intermediaries and the Eurosystem (ECB, 2022d)

Category	Intermediaries	Eurosystem
User management	<ul style="list-style-type: none"> • Management of digital euro accounts/wallets • Provision and management of payment instruments 	<ul style="list-style-type: none"> • Management of supervised intermediaries
Transaction management	<ul style="list-style-type: none"> • Transaction initiation • Authentication • Validation • Post-settlement 	<ul style="list-style-type: none"> • Settlement • Post-settlement
Liquidity management	<ul style="list-style-type: none"> • Funding and defunding 	<ul style="list-style-type: none"> • Issuance and redemption

5.2.2.4 Funding & defunding

Funding and defunding, or in other words making deposits or withdrawals from a digital euro account or wallet, should be as seamless as possible (ECB, 2022d). While intermediaries are responsible for funding and defunding activities, a common baseline for functionalities to offer will be set to ensure seamlessness no matter which intermediary is responsible. Conversion should be available both from and to private money stored in bank accounts or in cash. If desired by the user, a waterfall mechanism could be activated that automatically transfers funds exceeding the holding limit to a linked bank account. As suggested, this mechanism is accompanied by a reverse waterfall mechanism that automatically transfers funds to the digital euro account or wallet when its funds are insufficient to complete a payment. Ensuring smooth and seamless funding and defunding would decrease the implicit homing costs of the platform, as usage of it becomes simpler (Kazan & Damsgaard, 2013).

5.2.2.5 Distribution

The distribution of the digital euro would rely on a scheme establishing “a set of common rules, standards and procedures that supervised intermediaries would need to adhere to” (ECB, 2022d, p. 10). This scheme would ensure that the digital euro is available on equal terms to all citizens of the euro area, irrespective of intermediary or country. The scheme would also ensure access to people with no, or limited, digital access, whilst still fostering innovation in the payments market.

Ensuring full cross-compatibility across the euro area, as well as ensuring that as many people as possible, no matter digital literacy or access, can use the digital euro, significantly increases the potential network effects (Kazan & Damsgaard, 2013). Cross-compatibility across the euro area means a larger network with significantly more potential connections compared to if the use of the digital euro would be regional or intermediary limited. In addition, ensuring accessibility allows more users to adopt the digital euro, which in turn yields more possible connections.

5.2.3 Summary of Cycle 2

Figure 8 summarises the main points of the second dialectical cycle in the development of the digital euro, where privacy and intermediary roles were two reoccurring themes. Naturally, other aspects such as holding limits and remuneration were also significant in the cycle.

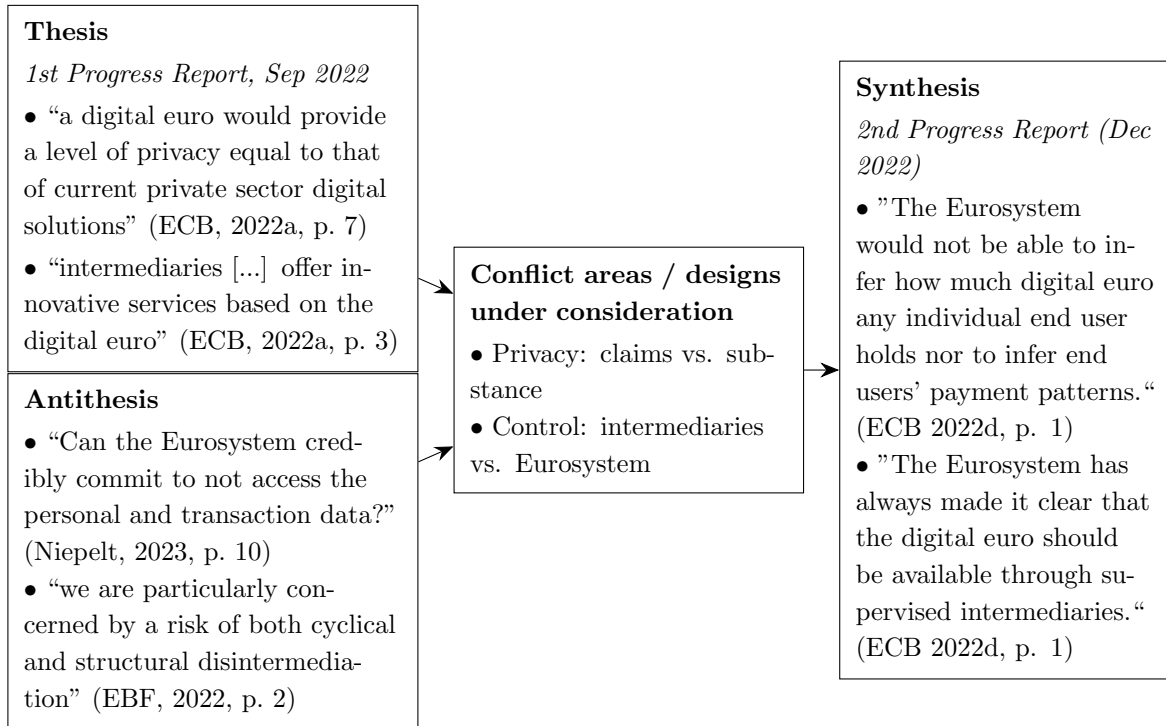


Figure 8: Cycle 2 summary

5.3 Cycle 3

5.3.1 Antithesis: ERPB Response

The previous documents addressed many designs and their considerations, yet stakeholders, such as Euro Retail Payments Board (ERPB) pushed forward on a few details to get more clarity and completeness on the project. These pushes were, in particular, in services, access and actual application.

5.3.1.1 Application

At this point, the digital euro was to be accessed only through intermediaries. However, Bureau Européen des Unions de Consommateurs (BEUC) directly and explicitly called for “the development of a digital euro app by the Eurosystem and would like to see this app as part of the core services offered to consumers” (ECB, 2023b, p. 7). Even more directly and going further, it called for that it should be the sole app “which all intermediaries are then obliged to use” (ECB, 2022e, p. 10). This was argued so that the interfaces developed by PSPs might not promote the digital euro enough.

While not directly calling for an application by Eurosystem, AGE Platform Europe called for to “ensure a harmonised end-user experience including in cross border situations across the EA” and EuroCommerce called for “harmonised journey from a customer and merchant point of view” (ECB,

2023b, pp. 2, 49). These together indicate at least a push toward a centralisation and harmonisation by Eurosystem.

In terms of Kazan and Damsgaard, fragmented experience and no Eurosystem app would mean that homing costs and switching costs would likely be bigger as there is no standardised approach to digital euro and it would also leave out some user base, e.g. those who do not have commercial bank account to link their digital euro account as noted by BEUC (ECB, 2022e, p. 10). Ultimately, this results in smaller network effects, likely dominated by a few central intermediaries. A Eurosystem-provided app would mitigate this by ensuring a consistent entry point, “[e]nsuring a strong digital euro branding and recognisability in the market, favouring word-of-mouth marketing and network effects” (ECB, 2022b).

5.3.1.2 Services

Mirroring on centralisation and harmonisation, services were also pushed further. While the second progress report distinguished responsibilities between intermediaries and the ECB, it did not describe exactly which services are mandatory for all intermediaries and which would be voluntary.

BEUC stated that core services should be all such services which “consumers use for daily payments, this includes paying in shops and online, initiating and receiving credit transfers, charging (digital) euros on their payment instrument, consulting the level of funds on their accounts, direct debits and standing orders. This list of core services corresponds to the features of a basic payment account and should be offered free of charge to consumers.” (ECB, 2023b, p. 6)

EBF, however, noted that core services cannot be equated with for free and that the economically sustainable model should be addressed (ECB, 2023b, p. 20). They argued also that the reverse waterfall and offline transactions should not be part of the core service bundle for intermediaries as these would incur big costs to these intermediaries. On top of that, the reverse waterfall is not part of other payment systems, therefore it should be rather treated as value-added service as such. (ECB, 2023b, pp. 20–21)

European Savings and Retail Banks Group (ESBG) went even further with defining the core service of a digital euro to be only this: “to be the digital image of cash”. This means manual funding and defunding can be considered as a core service. However, any automation of monetary transactions should be considered value-added service (ECB, 2023b, p. 38). As such, there is a clear conflict within the system.

5.3.1.3 Access

The previous documentation did not report exactly what are rules for digital euro account holding. More specifically, on how many accounts an individual can hold.

European Payment Institutions Federation (EPIF) proposed in the technical session against implementing the one-account limit. Their concern was that with one-account limit, the digital euro account would almost exclusively be opened at existing PSPs where the user holds their main commercial bank account. That would mean that other financial sector players, such as payment institutions or e-money institutions would not be operating on an equal level playing field (ECB, 2023b, p. 31). European Third Party Providers Association (ETPPA) went even further, arguing that the single-account restriction combined with fixed holding limits would launch the digital euro “on the

wrong foot”, meaning public would dislike being limited by holding limits and even more so bounded to one regulated intermediary (ECB, 2023b, p. 42)

However, other stakeholders supported and agreed on the measure to restriction the number of accounts in order to have it as a tool to control the amount of digital euros in circulation. For example, European Association of Co-operative Banks (EACB) concurred that single account per individual would be simplest to implement and this restriction is crucial to “control the amount of digital euro in circulation and to preserve the financial stability of banks” (ECB, 2023b, p. 10). This brings forth and highlights the tension within the ERPB group and ECB.

From the standpoint of Kazan and Damsgaard’s framework, this tension and disagreement capture a core tension in multi-sided platform design. On one hand, mandatory core services ensure coherent and consistent end-user experience, lowering switching costs between PSPs. However, if core services are more loose, then from platform design perspective, it is more open to attracting intermediaries to building their own services, which would foster competition and choice, which eventually attract diverse groups of end-user to use the digital euro, increasing network effects. (Kazan & Damsgaard, 2013, 2016) Synthesis would have to strike a balance, between these two extremes and the stakeholder groups, leading us to ECB’s third progress report.

5.3.2 Synthesis: 3rd Progress Report

The third report on the progress of digital euro investigation phase follows the previous reports and introduces features that were not discussed in first two reports.

5.3.2.1 Access

The report establishes that access to the digital euro is first and foremost for Eurozone residents, merchants and governments. However, those with euro area payment service provider (PSP) could also get access. European Economic Area (EEA) members and other countries wanting the access could also be included as part of later releases. However, they are fully aware that this dimension will most certainly be established through the legislative process. While this may not signal conflict between ECB and EU since ECB is part of EU and its mandate, it nevertheless foreshadows internal friction of the project, foreshadowing the possible antithesis. (ECB, 2023c)

Regarding onboarding, the Governing Council of the ECB considers that only the existing procedures for opening payment accounts should be used when a person opens a digital euro account.

Interestingly, when it comes to the number of accounts and holding limits, they envision that merchants could open multiple digital euro accounts, while each would have holding limit of 0€, meaning effectively the digital euro account functions only as channel between payers digital euro account and merchants bank account. When it comes to individuals, the digital euro account would be limited, which would mean that there is no reconciliations of holdings happening between accounts between different PSPs. However, individuals should be able to switch easily from one PSP to another simply by retaining their digital euro account identifier, thereby ensuring portability. It is important thus to note that these rules establish control for number of digital euros in circulation. (ECB, 2023c)

These are tied into Kazan and Damsgaard’s multiple criteria. First and foremost, access is about platform design. More specifically, platform design of regulating access to Eurozone economic actors is safe and obvious choice as this encompasses main market for digital euro. Of course, service

distribution to end-users happens through intermediaries, which have to fulfil certain conditions, indicating moderated access in this front. Moderated access is also mandated by onboarding as noted and moderation is even taken to the level of holdings and number of accounts, to ensure control over the circulation of the digital euro. (Kazan & Damsgaard, 2013, 2016)

Secondly, switching costs between PSPs are intended to be as low as possible in order to reduce lock-in effects and promote greater competition among PSPs providing services to both merchants and individuals. (Kazan & Damsgaard, 2013, 2016)

5.3.2.2 Distribution

Digital euro should be distributed only by trusted parties, and the ECB believes that PSPs, as defined in PSD2, are the ones who should and have capacities to distribute them. In PSD2, PSPs are defined as “legal persons that are authorised to provide payment services” (European Parliament and Council of the European Union, 2015). Therefore, according to PSD2 Article 4(11), the following PSPs would be able to distribute the digital euro: credit institutions, electronic money institutions and payment institutions. This decision was made as they have capacities and duties such as to offer “digital euro accounts and payment services and provide front-end solutions, are subject to anti-money laundering/countering the finance of terrorism, are solvent under the relevant insolvency law, demonstrate operational readiness and risk control, and are licensed and authorised by an appropriate competent authority and compliant with all applicable legislation” (ECB, 2023c, p. 7)

End users can access the digital euro through applications provided by these PSPs or directly through an application provided by the Eurosystem. These two options allow Eurosystem to provide “harmonised entry point” offering basic functionalities, while PSP provided integrated applications would retain existing banking applications and attract individuals by providing extra value-added services. This dual approach offers individuals greater choice, either through independent basic access to digital euro or commercial intermediaries (ECB, 2023c, p. 8)

On top of that, the actual payment happening for in-store (point-of-sale) use case, QR code and NFC technology are seen as path forward. They note that QR code provides an easier, simpler and more innovative solution than NFC, as QR code does not require fancy technology, involves less standards, is easier to develop and can have innovational value-added layers, such as a data layer. However, NFC is not foreign to EU customers and therefore building on NFC is the way to “facilitate the development of a convenient offline payment method by introducing a physical card for the digital euro”, fostering financial inclusion. (ECB, 2023c, p. 8)

Distribution of digital euro by trusted, supervised PSPs says it all - not everyone can distribute it and therefore from the standpoint of Kazan and Damsgaard’s platform design, it is moderated service distribution. For the NFC and QR code solutions for in-store/point-of-sale payments, the ECB relies heavily on existing technologies, exhibiting evolutionary technology approach according to Kazan and Damsgaard (Kazan & Damsgaard, 2013)

5.3.2.3 Services

The ECB considers that all PSPs distributing the digital euro to end users must fulfil basic core services, while there can be optional and value-added services built alongside the core in order to foster competition and innovation. (ECB, 2023c, p. 9)

When it comes down to the core functionalities, these are both offline and online basic user journeys. These include opening and closing the digital euro account, payment instrument management (provision and maintenance), linking the digital euro account to the bank payment account, user life cycle management processes, funding and defunding, waterfall and reverse waterfall, authentication, refunds and dispute/exception management. (ECB, 2023c, p. 10)

Optional functionality are left to the market, such as splitting the bill feature among others (ECB, 2023c, p. 10). Conditional payments are also part of functionalities that supervised entities can develop. Cross-currency functionalities are also noted as part of potential solution, after core features have released. The ECB also notes that it expects the core list and optional services to evolve over time as market sees new opportunities and develops them. (ECB, 2023c, pp. 10–12)

This clear distinction between must-have features and openness on the PSP side to develop other features indicates their clever approach on platform design. In particular, platform development is told to be open. It is open, as the ECB exposes its API and SDK to enable integration and the development of new features, which could further evolve and potentially alter the core source code structure (ECB, 2022c). (Kazan & Damsgaard, 2016)

5.3.3 Summary of Cycle 3

Figure 9 summarises the core of the third dialectical cycle. The core here lies in the services provided by PSPs and users’ access to these services.

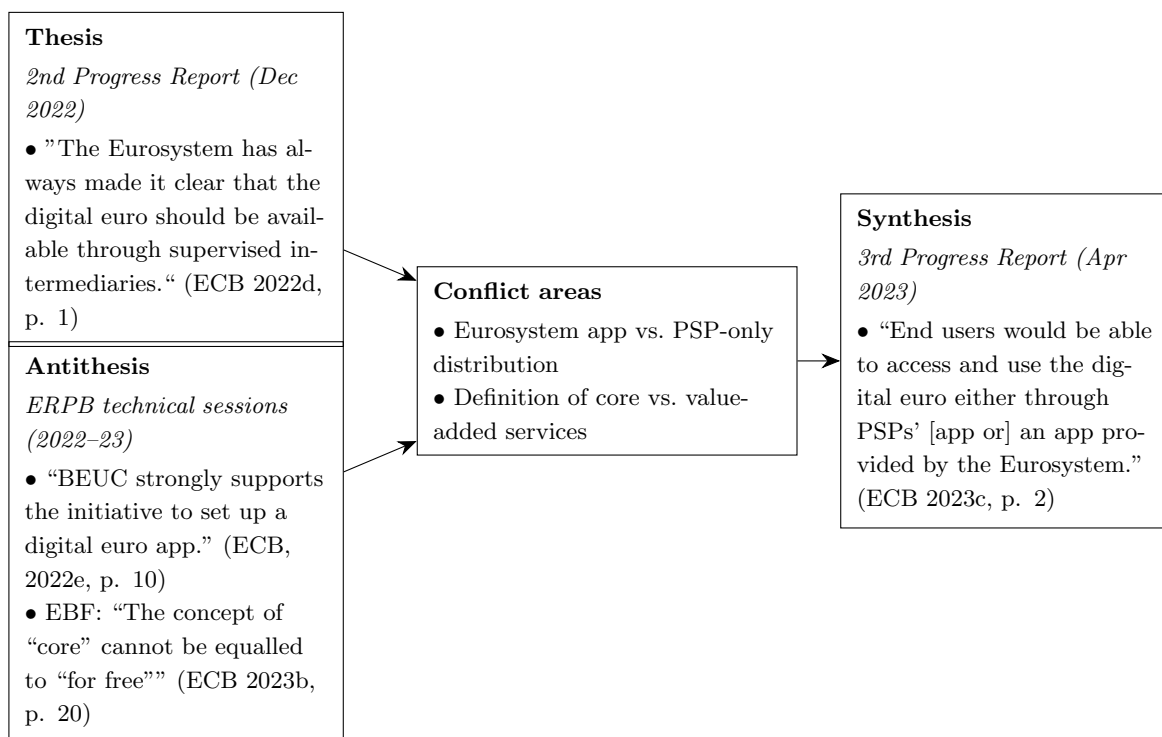


Figure 9: Cycle 3 summary

5.4 Cycle 4

5.4.1 Antithesis: EGOV, EBF, Market Research Outcome Report

The first three progress reports essentially outline all design features for a digital euro; however, many of these features, or design approaches, are still contested or lack clarification. One such feature is privacy, where stakeholders hold differing views on the privacy measures described. Since the conceptualisation of the digital euro, it has been evident that privacy is seen as the most important feature for end users (ECB, 2021). To address this, the ECB has claimed that they would neither be able to infer the digital euro holding of an individual nor infer their payment patterns. Yet, they would still be in charge of settlement activities, which, according to Mooij (2023) in a report published by EGOV, means that they would need to verify that the number of digital euro held is sufficient to complete a transaction, and need to verify and record the transaction. Seen by this, to a certain degree, the ECB could both infer digital euro holdings and payment patterns. Simultaneously, in a market research outcome report from the ECB (2023d), it is indicated that technology exists that would allow a higher level of privacy than proposed for the settlement of transactions, that ensures that “[t]he Eurosystem will not see or store users’ private information” (ECB, 2023d, p. 3).

Other stakeholders, however, express concerns that the proposed level of privacy is too high. The EBF expresses the need to balance “design choices to safeguard privacy and enable the fulfilment of compliance requirements (KYC, AML /CFT) while allowing intermediaries to process customers’ payment data based on customers’ consent to provide value-added services” (EBF, 2023, p. 4). To successfully provide and develop innovative value-added services, they view a higher level of data access as instrumental. Equally, as the intermediaries would be primarily responsible for AML and CFT checks, the EBF expresses that the goal of privacy should not compromise the ability to successfully carry out these checks.

Improving privacy and relying on technology that would guarantee that privacy, increases consumer trust which is necessary for successful market entry (Kazan & Damsgaard, 2016). Equally, guaranteeing strong privacy decreases the homing costs of the platform in the form of personal data given up (Kazan & Damsgaard, 2013). However, if the intermediaries are unable to, or only at high cost or difficulty able to, fulfil their AML and CFT tasks required to support the digital euro, fewer intermediaries could offer it. This would decrease cross-side network effects, as intermediaries are required for users to be able to adopt the digital euro in the first place (Kazan & Damsgaard, 2013). Furthermore, by limiting the ability to develop value-added services, potential reasons to use the digital euro decreases.

Other than privacy, the business model for the intermediaries is another design feature that is severely lacking in clarity. So far, there has not been any mention of how intermediaries would benefit or profit from offering digital euro services (Grünewald, 2023). The EBF states that they foresee “a robust business model so as to incentivize intermediaries to provide services and innovate based on the digital euro” (EBF, 2023, p. 4). Simultaneously though, the ECB would not want the digital euro to be any more expensive than current payment options for neither merchants nor consumers. Grünewald (2023) in a report published by EGOV suggests that one option would be to oblige intermediaries to provide basic digital euro services; however, that would likely not be appreciated by them.

Furthermore, the introduction of a first-party digital euro app provided directly by the ECB would entail direct competition with the intermediaries (Mooij, 2023). This would, in a sense, hurt their

business models as consumers now could choose to interact with digital euro services directly through the ECB, thus disincentivising development of their own user experiences. EBF (2023) expresses that it is important that the digital euro creates value for users and the economy without crowding out payment services provided by the private sector.

Without a lucrative business model, no intermediaries would be incentivised to support the digital euro. This would mean that no network effects could form, as users are reliant on the intermediaries to access the digital euro. Forcing intermediaries to support the digital euro would likely lead to it being deprioritised compared to other payment options, thus leaving it behind other options in terms of support. Further, if the ECB chooses to compete directly with the intermediaries, incentives further decrease for creating full user experiences. This would all make market entry difficult, as the ability to piggyback on the intermediaries existing customer bases and infrastructure is diminished (Kazan & Damsgaard, 2016).

Other design features facing criticism or lacking clarity include inclusion, legal tender status, the threshold on holding limits, and an overall vagueness in the progress reports. Firstly, Mooij (2023) argues that the first three progress reports have focused too much on economic inclusion, whereas the real risk of exclusion lies in the digital divide. The part of the European population that is unbanked is relatively small and declining; however, large parts of the European population lack basic digital skills, meaning that they are at high risk of being excluded from the use of a digital euro (Mooij, 2023). Secondly, first introduced in the “report on a digital euro” (ECB, 2020) was the question of whether a digital euro should hold legal tender status, i.e., whether merchants or other entities should be legally obliged to accept it as payment. In the report, legal tender status was described as a “desirable feature”, and, according to Mooij (2023), it is very much possible to issue the digital euro as such. Still, it is important that measures are put in place so as it does not lead to the disappearance of cash, as cash would still be an important fallback system (Mooij, 2023). Legal tender status would also drastically lower barriers to market entry, solve the chicken and egg problem, and, in a sense, bypass the need for the emergence of cross-side network effects, as one side would be forced to support it whether beneficial for them or not (Kazan & Damsgaard, 2013, 2016). Thirdly, concerns have been raised regarding the proposed holding limits being too restrictive, thus hindering usability (Grünewald, 2023). Grünewald (2023) argues that with too restrictive holding limits, end users would practically be forced to rely on a commercial bank account in parallel. Finally, the criticism regarding the overall vagueness of the progress reports still holds merit (Niepelt, 2023).

5.4.2 Synthesis: Commission Proposal

In June 2023, the European Commission released a “Proposal for a regulation of the European Parliament and of The Council on the establishment of the digital euro” (European Commission, 2023b). This proposal contained a full detailed design proposal for the digital euro, building on what was uncovered during the investigation phase of the development, and incorporating the feedback received throughout the phase.

5.4.2.1 Privacy

The proposal (European Commission, 2023b) describes higher standards for privacy and procession of user data than previously expressed. Intermediaries would have the primary responsibility for data

processing and should only process data for the purposes of enforcing limits and verifying if users have digital euro accounts with other PSPs, funding and defunding, online payment transactions, registration of offline wallets, compliance with union sanctions, and AML and CFT tasks. Seen by this, the intermediaries would not be able to process additional user data for the purpose of value-added services. Additionally, the proposal highlights that the offline digital euro should be available as of first issuance, and the only data processed for offline holdings would be in relation to funding and defunding, as that is deemed sufficient for AML and CFT. Furthermore, all intermediaries would be required to implement “technical and organisational measures including state-of-the-art security and privacy-preserving measures to ensure that any data communicated to the European Central Bank and the national central banks or to providers of support services do not directly identify individual digital euro users” (European Commission, 2023b, p. 56).

The ECB and NCBs would also, to a limited extent, process user data for the purposes of provision of settlement architecture, settlement of online transactions, safeguarding the integrity and security of the digital euro settlement infrastructure, supporting PSP’s verification of whether users already hold digital euro with other PSPs, and in exceptional circumstances, aiding PSPs in migrating digital euro accounts from one PSP to another (European Commission, 2023b). In doing this, “appropriate technical and organisational measures including state-of-the-art security and privacy-preserving measures” (European Commission, 2023b, p. 57) should support the processing of the user data, as to ensure that the ECB or NCBs cannot directly identify individual digital euro users.

This degree of privacy outlined in the proposal is sufficient for intermediaries to be able to fulfil their AML and CFT tasks, however, restricts them in developing and providing value-added services. This could disincentivise them in providing support for the digital euro, which in turn decreases the incentives for end users to adopt the digital euro. In effect, this limitation limits the effectiveness of the piggyback strategy employed for market entry (Kazan & Damsgaard, 2016).

More privacy is, however, generally considered good by end users (ECB, 2021). Therefore, in theory, a higher level of privacy should increase end user demand, which through positive cross-side network effects incentivises intermediaries to provide the best possible support for the digital euro, assuming there is a viable business model tied to it (Kazan & Damsgaard, 2013). Yet, the level of privacy offered is still less than that of traditional cash, meaning that the homing costs of using the digital euro in terms of privacy are still higher than those of cash (Kazan & Damsgaard, 2013).

5.4.2.2 Legal tender status

The proposal confirms that the digital euro should be issued with legal tender status (European Commission, 2023b). This entails “its mandatory acceptance, at full face value, with the power to discharge from a payment obligation” (European Commission, 2023b, p. 43), and that it is convertible with euro banknotes and coins at par. The legal tender status is applicable for both the online and the offline version of the digital euro.

Granting the digital euro legal tender status effectively solves the chicken and egg problem of the platform, as merchants are forced to accept, or support, payments made using the digital euro (Kazan & Damsgaard, 2016). As all merchants would support digital euro payments, incentives rise and homing cost decreases for the use of the digital euro by consumers, as they do not need to worry about whether the digital euro is accepted by a specific merchant or not. The legal tender status also significantly decreases the barriers for market entry, as adoption efforts only need to be focused on

one side of the platform, namely the consumers. This, of course, is only insofar as intermediaries are available and willing to distribute the digital euro.

5.4.2.3 Intermediary business model

To ensure that intermediaries are willing to distribute the digital euro and offer digital euro services, an outline of a business model for the intermediaries was introduced. This business model entails that the intermediaries can charge merchants a service charge per transaction or other value added service provided. This charge, however, cannot exceed the cost of providing the service including a reasonable margin of profit or fees charged for comparable digital means of payment (European Commission, 2023b). Furthermore, the intermediaries may not charge any fees to natural persons for the provision of the basic digital euro services; however, they could charge for services provided beyond the basic digital euro services. They would also not be able to charge merchants for funding or defunding of digital euro holdings.

This business model strikes a balance between ensuring the digital euro's affordability to use by consumers and merchants alike and providing incentives for the intermediaries to support and develop features for the digital euro. By capping the fee placed on merchants to that of comparable payment options, it can be ensured that they do not disfavour it compared to other payment options. Simultaneously, allowing intermediaries to charge for, and thereby profit from, additional services beyond the basic digital euro services would incentivise them to prioritise and develop an extensive catalogue of digital euro services. Additionally, it would incentivise them to market these services to be able to increase their profits, which in turn enhances the digital euro's ability to piggyback on the intermediaries existing customer bases and marketing efforts (Kazan & Damsgaard, 2016).

5.4.2.4 Accessibility

The proposal clearly stipulates that the digital euro should have “usage and service features that are simple and easy to handle, including for persons with disabilities, functional limitations or limited digital skills, and older persons” (European Commission, 2023b, p. 51). However, how this will work in practice remains unclear. Additionally, the proposal states that it should be possible for multiple users to access a digital euro account. This would allow other people to assist those with disabilities or limited digital skills in using or setting up digital euro accounts. The digital euro should also be, to the extent possible, interoperable with current standards in the payment market, and be integrated with European Digital Identity Wallets. This interoperability ensures that the learning curve for users becomes easier assuming they already are familiar with other payment options or use a European Digital Identity Wallet.

Ensuring accessibility for as many euro area citizens as possible is vital for the success of the platform. As the user count grows, same-side, or direct, network effects increase as digital euro payments could now be made between more people (Kazan & Damsgaard, 2013). Cross-side (indirect) network effects would also increase: as demand for digital euro services rises, more intermediaries would be incentivised to support it. Merchants, if not required to accept it by legal tender status, would also be more incentivised to support it. Hence, it is important that the practical implementation of the accessibility aspect is solid.

5.4.2.5 Holding limits

No fixed holding limits are specified in the proposal, instead it outlines that holding limits should be put in place to safeguard financial stability whilst ensuring the usability and acceptance of the digital euro as a legal tender instrument (European Commission, 2023b). This approach allows the ECB to continually adjust the holding limit to ensure a balance between usability and financial stability.

5.4.3 Summary of Cycle 4

Figure 10 summarises some of the main points of cycle 4. It should, however, be noted that cycle 4 entails a large number of feature revisions and introductions not captured in the figure.

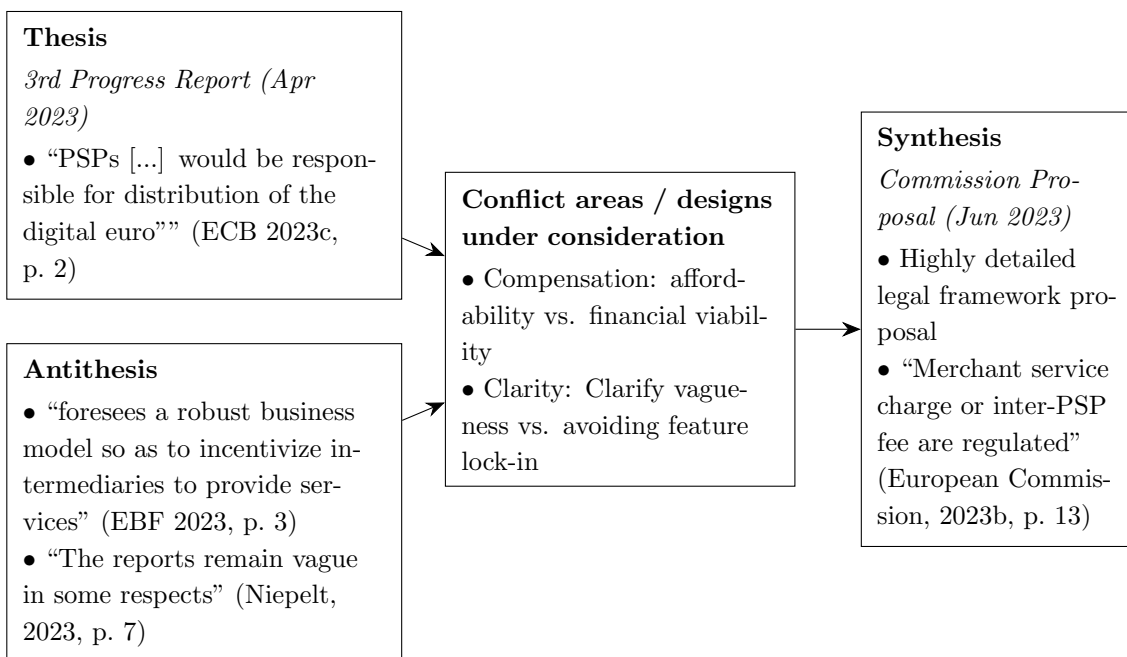


Figure 10: Cycle 4 summary

5.5 Cycle 5

5.5.1 Antithesis: Council, EP and Bank Responses

5.5.1.1 Scope

The Commission Proposal laid out in the articles that both online and offline versions were to be introduced from first issuance (European Commission, 2023b). However, Spanish MEP Fernando Navarrete Rojas’s draft on European Parliament’s position, amends the Commission proposal with going forward with offline euro only. The offline version was designed as a tokenised form of cash, enabling device-to-device payments settled without the ECB ledger, thereby replicating the privacy characteristics of physical cash, while keeping online digital euro in condition of the absence of real pan-European private sovereign retail payment solution (Navarrete Rojas, 2025, pp. 121, 164). This effectively conditioned the core of the Commission’s proposal on the failure of private market solutions. The Council’s negotiating position took the opposite stance, supporting the Commission’s original

design of a digital euro functioning both online and offline from the outset (Council of the European Union, 2025).

Navarrete has since withdrawn the position that the scope of the digital euro should be limited to offline use only. It has now been established that the online and offline solutions should function together as a single payment system. However, the following two sections, holding limits and compensation and fees, are still highly contested and debated areas where stakeholders, including the European Parliament, have to make up their minds. (Euronews, 2026)

From Kazan and Damsgaard's perspective, the offline-only approach would have lessened the scope, userbase and thus network effects massively, as e-commerce payments and peer-to-peer online transactions, which were imagined use cases the ECB has focused on, would have been excluded. This certainly would not have had the feared disruptive effect, because all online stablecoins and all remote payments would remain undisrupted and offline digital euro would just constitute a competitor to physical cash. On top of that, this offline-only would have deviated from the core of the digital euro project significantly. Also, what is interesting is that from Van de Ven and Poole's dialectical process theory perspective, an antithesis far from the institutional status quo could not withstand the power asymmetry.

5.5.1.2 Holding Limits

The Commission Proposal gave ECB broad options to set holding limits, treating it as a technical instrument that the central bank could tweak in response to evolving economic conditions. This follows ECB's line of keeping tools as open as possible, as the Governing Council admitted during the first investigation phase (ECB, 2022a).

However, European Parliament's position brought forward by Spanish MEP Fernando Navarrete Rojas shifts authority to the Commission, who ought to have control over the instruments to enforce holding limits. On top of that, any revision to these limits should be brought forward by a new and separate legislative proposal, instead of the Commission's own delegated acts, which do not require full legislative procedures. This reflects scepticism towards the ECB and highlights the banking sector's preferences towards hard-set safe-guard measures to protect current banking deposit landscapes. (Navarrete Rojas, 2025)

The Council itself goes the middle way. They want to allow the ECB to set these limits in the Council-defined boundaries (Council of the European Union, 2025). This would preserve the ECB's operational flexibility while introducing a political safeguard against limits being set so high as to threaten financial stability.

However, it is important to note that holding limits are still negotiated even within European Parliament, so even for that stakeholder of the antithesis, the position has not been fixed (TechCentral, 2026). This tension between all the proposals reflects the tension that has existed since the beginning of the project. Namely, how to strike a balance between financial stability and adoption - the fewer the limits (or the higher the specific holding caps), the better for adoption, meaning inflow of capital to digital euro and therefore outflow from all the other instruments, which banks have argued, e.g. in EBF response, threatens financial stability and in regard to ECB's own mandate (EBF, 2022; Kazan & Damsgaard, 2013).

5.5.1.3 Compensation & Fees

The Commission Proposal introduced fee caps for intermediaries, stating that the fees charged to merchants for digital euro services must not exceed the costs incurred in providing the service plus a reasonable margin, and may not exceed comparable payment methods (European Commission, 2023b, p. 47). However, the banking sector challenged whether this model would be viable. A cost study carried out by PwC, commissioned by the EBF, EACB, and ESBG, estimated that implementing the digital euro would cost an average of EUR 110 million per bank across the eurozone, amounting to up to EUR 30 billion in total (PricewaterhouseCoopers, 2025). These figures excluded offline functionality, multiple accounts, and ongoing running costs, meaning the actual costs could be even higher. Alongside the study, the banking sector stated that the project “as currently conceived [...] would not offer any recognizable added value for either consumers or businesses” (Bundesverband der Deutschen Volksbanken und Raiffeisenbanken, 2025).

The Council’s negotiating position attempted to address this tension by proposing a phased compensation regime: basic services would be free for consumers, while fees charged to merchants would be capped during a transitional period, after which cost-based pricing would apply (Council of the European Union, 2025). Nevertheless, the precise calibration for compensation structure remains one of the unresolved issues in the ongoing legislative negotiations (Euronews, 2026; TechCentral, 2026).

The compensation question has been a recurring source of conflict throughout the entire development process of the digital euro. From the EBF’s initial demand for a sustainable business model in Cycle 2, through the ERPB debates on core versus optional services in Cycle 3, to the PwC cost study in Cycle 5, intermediaries have consistently argued that without adequate compensation, they lack the incentive to distribute the digital euro. From the perspective of Kazan and Damsgaard’s framework, this represents a fundamental tension in multi-sided platform design: the platform requires intermediaries to reach users, but if the homing costs for intermediaries exceed the expected returns, fewer intermediaries will participate, weakening the supply-side conditions for both merchants and users to be able to adopt digital euro (Kazan & Damsgaard, 2013).

5.5.2 Summary of Cycle 5

Figure 11 summarises the core of the fifth dialectical cycle. While the core of the figure is about business and compensation model of the digital euro project, of course, there are other elements such as scope and holding limits that are part of conflicts as well (see cross-cycle synthesis Table 3).

5.6 Cross-Cycle Synthesis

Bringing everything together, the summary can be seen in Table 3. It can be seen that some design features were settled in single dialectical exchange, while some are persistent across the whole process.

We can see that several patterns emerge. Privacy, holding limits, and compensation are relevant across all cycles, with stakeholders engaging with it even after the decision is made. For other feature dimensions, these were settled at later stages through legal enforcement. This finding structures the discussion that follows.

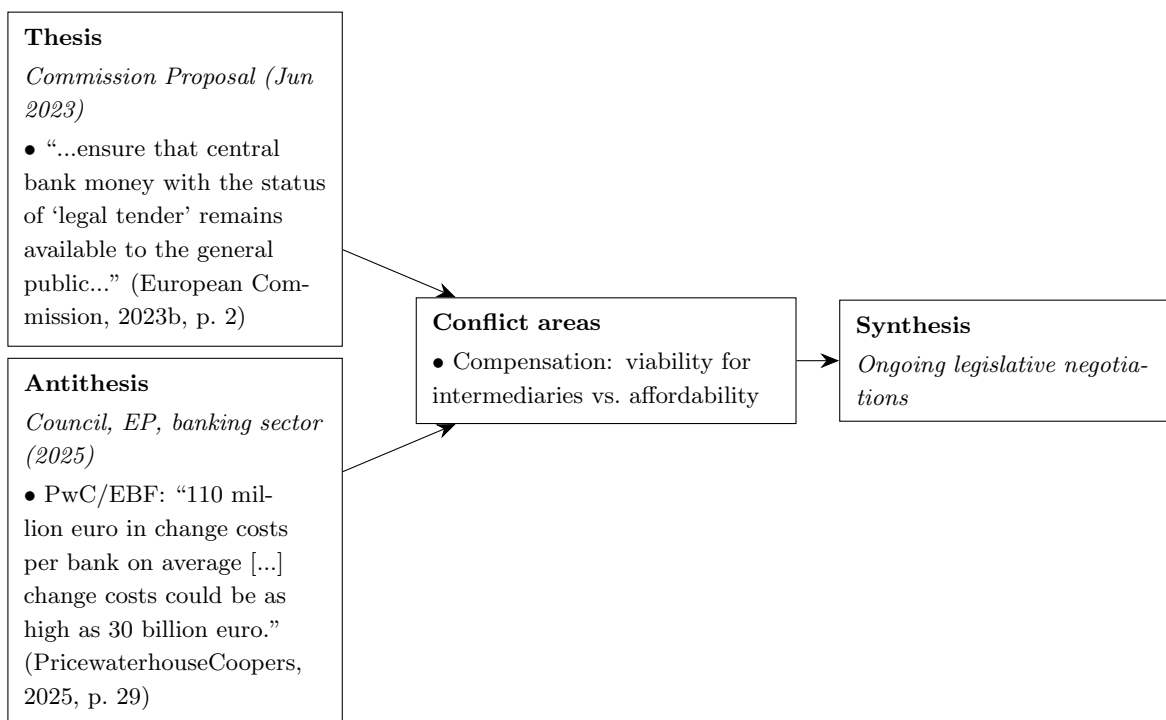


Figure 11: Cycle 5 summary

Table 3: Trajectory of design features across dialectical cycles.

Feature	C1 Thesis (ECB 2020)	C1 Anti. (Consult. 2021)	C2 Thesis (1st Prog. Sep'22)	C2 Anti. (EBF, EGOV)	C3 Thesis (2nd Prog. Dec'22)	C3 Anti. (ERPb)	C4 Thesis (3rd Prog. Apr'23)	C4 Anti. (EGOV, EBF)	C5 Thesis (Comm. Prop. Jun'23)	C5 Anti. (Council, EP, Banks)
Privacy	Full anonymity rejected; selective and offline privacy proposed	Most important feature; majority prefer offline privacy model	Baseline = private sector; selective and offline privacy beyond baseline	Eurosystem data access ambiguous	Eurosystem cannot infer holdings or patterns	—	—	EBF: privacy hinders value-added services	State-of-the- art measures; no value-added data processing	—
Holding limits	Limits, tiered remuneration proposed	Half support limits; first tier large enough for retail	Online and offline holdings approved; waterfall	EBF: hard cap; EGOV: shadow exchange rates	Reverse waterfall added	EPIF, ETPPA: oppose single- account; EACB: support	Single account; merchant accounts capped at 0€; portability	Grünewald: too restrictive	No fixed limit; ECB to balance stability and usability	Navarrete: Commission authority; Council: ECB within boundaries
Compensation & business model	—	—	—	EBF: sustainable business model needed	—	EBF: core \neq free; ESBG: only manual funding as core	—	EBF: robust business model; obligation vs. incentive	Fee caps for merchants; basic services free for natural persons	PwC: 110m €/per bank; Council: phased com- pensation
Roles of intermediaries	Intermediated access preferred	73% see role for interme- diaries	—	EBF: clear division of re- sponsibilities	All end-user roles to inter- mediaries; Eurosystem keeps issuance and settlement	BEUC: Eurosystem app; core vs. value-added dispute	Core, optional, Eurosystem app parallel to PSP apps	EBF: privacy limits constrain VAS	All authorised PSPs may distribute	—
Legal tender	Desirable feature	—	—	—	—	—	—	Mooij: feasible and desirable	Legal tender granted (Articles 7–8)	—

6 Discussion and Contributions

What can be observed from our findings is that, for the digital euro, and presumably also for other CBDC projects, the designs start off broad and gradually, through dialectical cycles, get narrowed down and become more specific. In this process of narrowing the design, distinct stages can be identified, starting with a design stage, followed by a legislative stage, and finally, though only theoretical considering that the digital euro has not yet progressed this far, ending with an issuance stage. Throughout each dialectical cycle of the development process, persistent tensions that never get resolved can be identified. These tensions make it difficult, or even impossible, to please each actor of the platform, resulting in compromises in the ability to organically foster the network effects necessary for the platform to succeed. Therefore, the central bank in charge of the development may rely on regulatory substitutions for common platform dynamics. For instance, the CBDC may be issued as legal tender, essentially forcing the merchant side to adopt it. This is all illustrated in Figure 12, which can be viewed as a model representing how CBDCs are developed as multi-sided platforms.

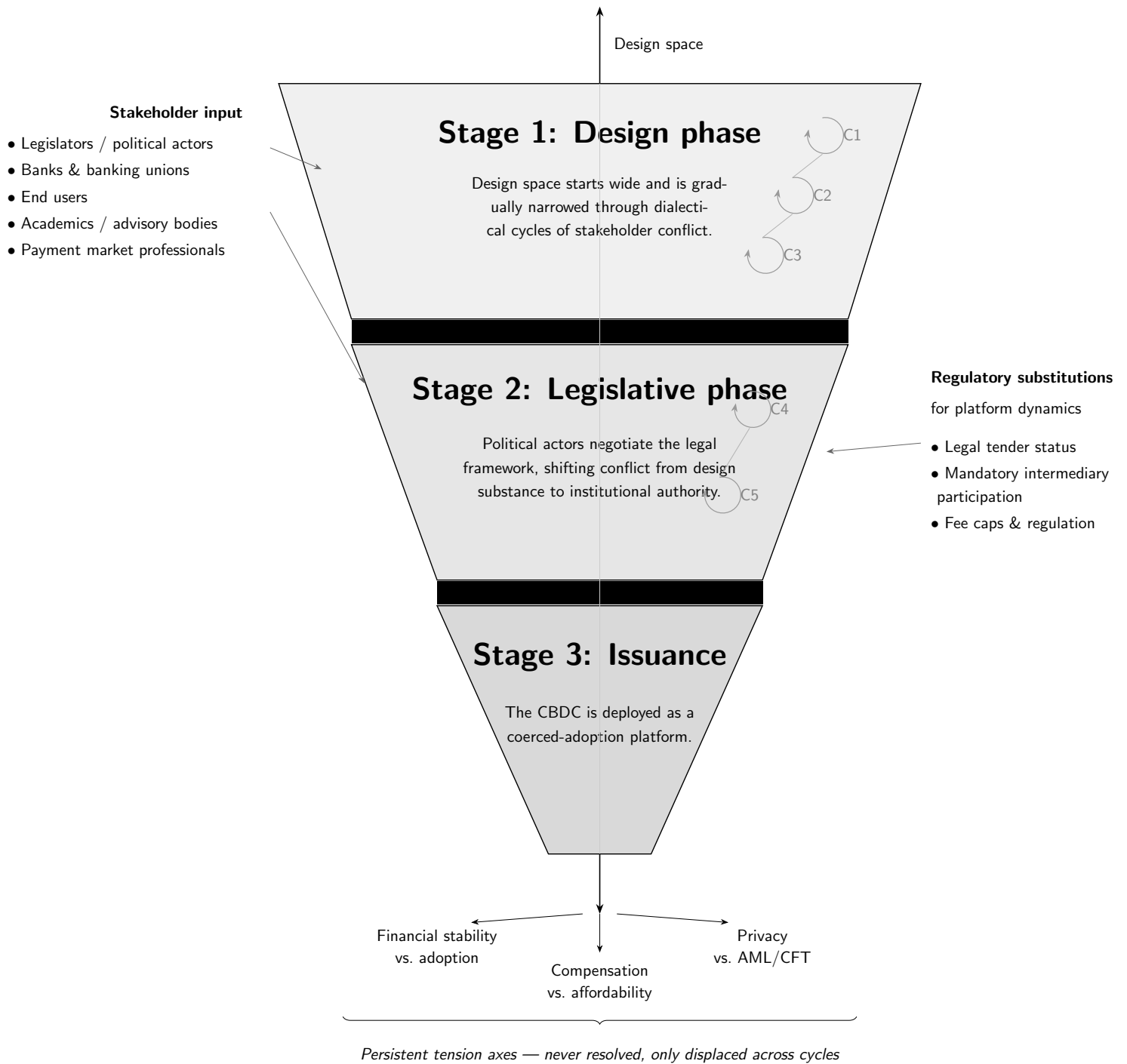


Figure 12: CBDC Development model

6.1 Stages

The stages of the development process of CBDCs identified include a design stage, a legislative stage, and finally, an issuance stage. The design stage starts broad with many design options still on the table and is generally narrowed down for each cycle as the designs presented become more specific. Once most design options have reached a consensus, the legislative phase ensues, during which the legal framework for the CBDC is negotiated. During this stage, substitutions for platform dynamics that

have been compromised are also implemented. Finally, once a proposed legal framework is adopted and passed as law, the CBDC moves on to the issuance stage, where it likely will be issued as a coerced-adoption platform as certain actors will be mandated to adopt it due to the regulatory substitutions implemented. As the development of the digital euro has not progressed to this stage yet, this stage should still be considered purely theoretical and could very well either be divided into multiple stages or even complemented with a post issuance stage.

Each stage, however, progresses through dialectical cycles of conflict. For the digital euro, this entailed three such cycles in the design stage, and two (thus far) in the legislative phase, yet the number of cycles for each stage would likely differ for other CBDC projects. Zooming in on one such cycle (see Figure 13), the process can be understood as the current thesis, represented by the latest design proposal issued by the central bank, being challenged by opposing positions on the design held by various stakeholders. Once these opposing views gain sufficient traction, conflict ensues by the prevailing thesis and the antithesis. The outcome of the conflict is ideally determined through which design offers the best overall platform dynamics, but stakeholder power dynamics often also plays an important role. The winning design, which often is a combination of the thesis and antithesis becomes a synthesis, which in turn becomes the thesis for the next cycle.

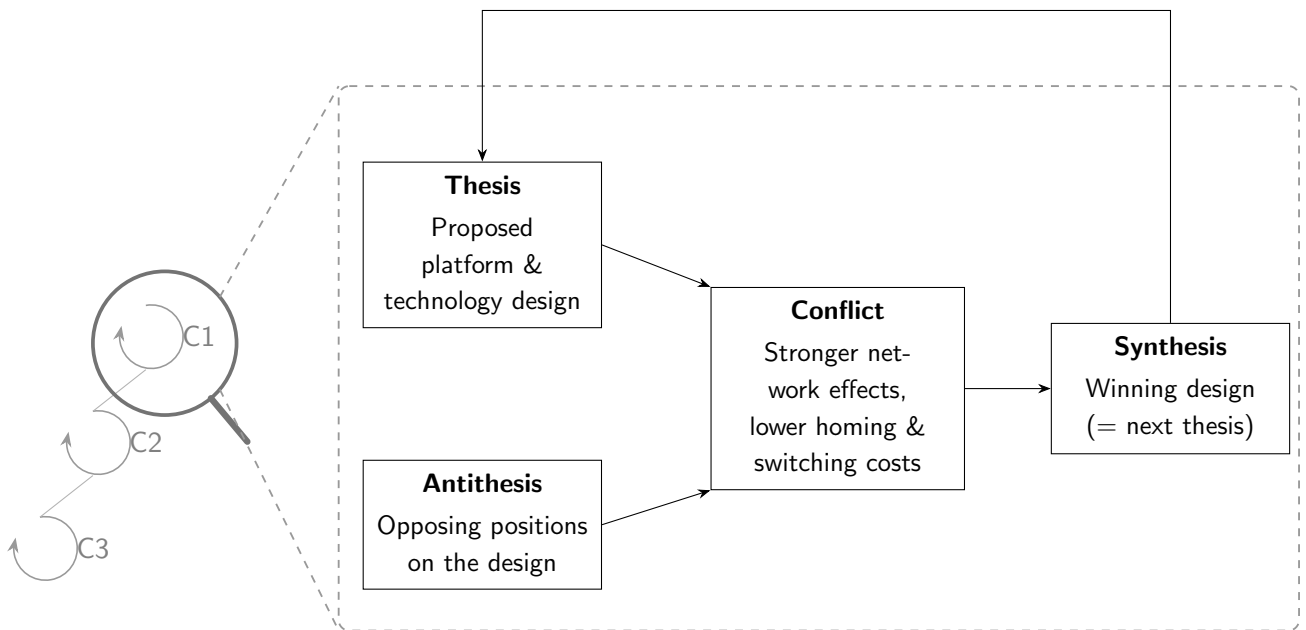


Figure 13: Per-cycle zoom-in

Of course, sometimes the line between stages may not be clear cut. Equally, sometimes the development may also need to circle back to the prior stage. For instance, if a legal framework cannot be agreed upon, maybe the design stage needs to be revisited. It could also be the case that the drafting of a legal framework begins as the design of the CBDC is still in its design phase, thus causing an overlap between the two stages.

6.2 Persistent Tensions

During the development process, persistent tensions between the different stakeholders can be identified. This is a result of the stakeholder objectives being fundamentally different, with, for instance, end

users seeking privacy whilst intermediaries seek the ability to fulfil AML and CFT checks, as well as profitable business models. Therefore, these tensions never get fully resolved during the development, rather merely displaced.

In the case of the digital euro, three persistent tension axes were identified. These being financial stability vs. adoption, compensation vs. affordability, and privacy vs. AML/CFT. However, in other monetary jurisdictions, it is likely that these tensions would be different. Convenience is, for example, often prioritised above privacy by end users which can be seen by the large-scale success of “Big Tech” companies such as Google and Meta (Acquisti et al., 2015).

No matter what tension axes are identified though, improving for one side will almost always result in increased homing costs or decreased positive network effect for the stakeholder on the opposing side. For instance, as holding limits are set to ensure financial stability and avoid disruption of the fractional reserve banking business model which many intermediaries rely on, the end user becomes less likely to adopt it as the use cases for it decrease. In other words, the homing costs for the end user increase. Equally, if no holding limit is set, end users would be more likely to adopt it, but the intermediaries may refuse to support it as it threatens their business model. Or in other words, their homing costs increase.

6.3 Regulatory Substitutions

Insofar as the tensions cannot be balanced, and compromises to platform dynamics have to be made, regulatory substitutions for these platform dynamics are used as tools to artificially ensure adoption and boost network effects. One such substitution is issuing as legal tender which substitutes organic merchant-side adoption and resolves the chicken-and-egg problem by mandate rather than by network effects. Other substitutions include, but are not limited to mandatory intermediary participation as a substitute for cross-side network cultivation, and fee caps that hinder intermediaries from charging excessively for provision of the CBDC, thereby ensuring that the homing costs for end users do not exceed a certain threshold.

6.4 Relevance of Contributions

The contributions as discussed above have implications for both the field literature and practitioners. For example, for CBDC literature, CBDCs cannot be seen as a technical optimisation problem. It is more of a dialectical negotiation where persistent tensions remain present and have to be balanced, not completely solved. For practical implications, other central banks that develop or aim to develop a successful CBDC, it means that this development process is about stakeholder management and that final viability rests on regulatory substitutions, not organic platform network effects. On top of that, while Kazan and Damsgaard’s framework criteria remain valid as evaluative lenses for the success of network effects, the ultimate success of the platform depends on decisions made by the developing party, and in the case of a public issuer, these decisions are enforced through regulation.

6.5 Limitations and Areas for Further Research

These findings and models introduced are, however, not without their limitations. Hence, further research is needed in several areas.

Firstly, this study is based on a single case, namely the development of the digital euro. This may limit the generalisability of the findings, as they have not yet been tested for other cases. Applying the model introduced to other cases, such as the development of the Swedish E-krona or the British digital pound (Kumar et al., 2025), may yield further insights and highlight aspects where the model fails to capture aspects of the development processes. Thus, further research is needed in testing the universality of the model for other CBDC cases.

Secondly, as the digital euro has not yet been issued, the third stage of the model introduced, i.e., the issuance stage, is purely theoretical. Various phenomena not considered in the analysis could possibly affect CBDC after issuance, including events such as end user protests or banking strikes. This could introduce the need for a post issuance stage where such further conflict is resolved. At this time, this can, however, not be empirically analysed; hence, the model needs to be followed up and reevaluated once the digital euro has been issued.

Thirdly, while the model emphasises stakeholder input as a key driver of the development through dialectical cycles of conflict, the power dynamics between these stakeholders are not considered. Differences in institutional authority and agenda-setting capacity between the stakeholders may significantly affect the development trajectory of CBDCs. Hence, through further research into the stakeholder dynamics during the development of CBDCs, the model could be complemented with a framework for identifying and analysing these dynamics and their impacts.

Overall, despite these limitations, the findings of this paper capture the core dynamics of how CBDCs are developed through iterative processes of stakeholder conflict. Simultaneously, the paper identifies how various design choices impact platform dynamics, and additionally, how compromised platform dynamics may be regulatorily substituted.

7 Conclusion

This paper, through a case study on the development of the digital euro, has explored how CBDCs are developed as multi-sided platforms through iterative processes of stakeholder conflicts. By integrating dialectical process theory with multi-sided platform theory, the paper has shown that the development of a CBDC is not a straightforward process, and that oftentimes, the goals of stakeholders may directly conflict with the traditional criteria for platform success. The development of CBDCs unfolds through continuous confrontation, compromise, and revision of designs among stakeholders with fundamentally different objectives, eventually synthesising in a final design.

The analysis reveals that this process can be understood as unfolding across three distinct analytical phases, namely a design phase, a legislative phase, and an issuance phase. In the design phase, the design space starts out wide and is gradually narrowed through dialectical processes of conflict. In the legislative phase, the focus of the conflict is shifted from design substance to institutional authority. Platform dynamics that have been compromised by the design features decided upon are regulatorily substituted by, for example, legal tender status, fee caps, or mandatory intermediary participation. In the final stage, the CBDC is deployed as a coerced-adoption platform, where some sides are obligated to adopt it.

Across these stages, persistent tension axes repeatedly shape the development trajectory. These axes can commonly be identified as financial stability vs. adoption, compensation vs. affordability, and privacy vs. AML/CFT but could differ depending on the CBDC context. These tensions will

never be resolved, rather only displaced across cycles, thereby making it difficult to naturally foster network effects.

Overall, the model developed in this paper captures the essence of how CBDCs are developed as multi-sided platforms, and may be applied in analysing the development processes of other CBDCs. However, as the digital euro has not yet been issued at the time of writing, the model could be revised in the future to increase accuracy beyond the legislative phase. Future research may focus on testing and expanding the model across multiple cases to improve generalisability, and in more depth, analyse the impact of the power dynamics between the stakeholders on the final design of a CBDC.

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A Coding Table

The following appendix presents the coding of passages from the analysed documents. Each row corresponds to one coded passage identified during the content analysis described in section 3.4.2. The same fundamental argument across sentences were grouped under the same passage grouping. Passages were classified along two dimensions, as mentioned in section 3.4.2: dialectical position of thesis, antithesis, or synthesis within each cycle, and a theme, combining the design feature being discussed with the Kazan and Damsgaard (2013, 2016) criterion through which it is evaluated. Moreover, a directional marker indicates whether the design of the passage plays a positive role (\uparrow) or negative role (\downarrow) for the success of the platform, a dash ($—$) marks passages that describe a design choice without yet evaluating it.

Table 4: Coding of analysed passages by cycle, dialectical position, and theme

Cycle / Position	Passage / phrase (source, page)	Theme (feature; K&D criterion; direction)
C1 — Thesis	“An intermediated access model is preferable as identified...” (ECB, 2020, p. 26)	Roles of intermediaries / Access; platform design (service distribution); \uparrow
C1 — Thesis	“Anonymity may have to be ruled out, not only because of legal obligations related to money laundering and terrorist financing...” (ECB, 2020, p. 27)	Privacy; homing costs; \downarrow
C1 — Thesis	“the Eurosystem might consider introducing tools to limit the use of a digital euro, in line with Requirements 8 and 13, and to prevent excessive shifts of commercial bank money into digital euro...”; “One option to be investigated would be to allow users to hold digital euro only up to an individual threshold at any given time” (ECB, 2020, p. 28)	Holding limits; homing costs; \downarrow
C1 — Thesis	“The Eurosystem may want to restrict the scope of individuals/entities that can access digital euro services...” (ECB, 2020, p. 29)	Access; network effects; \downarrow
C1 — Thesis	“The possibility of holding digital euro could be limited, for example, to residents in a certain jurisdiction (and possibly visitors for the time of their stay), or to retail users, etc....” (ECB, 2020, p. 29)	Access; network effects; \downarrow
C1 — Thesis	“A digital euro could be provided either through an account-based system or as a bearer instrument....” (ECB, 2020, p. 29)	Transfer mechanism; platform design; $—$
C1 — Thesis	“A digital euro could be provided as a web-based service and/or through dedicated physical devices such as smart cards...” (ECB, 2020, p. 30)	Payment device (access); technological design; $—$
C1 — Thesis	“An electronic payment that is not confirmed online – either through the network of users or in a central register – can still be considered final by relying on “trusted hardware” modules....” (ECB, 2020, p. 31)	Availability and usability offline (access); technological design; $—$

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Table 4 continued from previous page

Cycle / Position	Passage / paraphrase (source, page)	Theme (feature; K&D criterion; direction)
C1 — Thesis	“A digital euro may be remunerated for monetary policy reasons (Scenario 4), but also for financial stability and structural reasons, such as to lower demand for digital euro for investment purposes and to prevent the Eurosystem becoming a large investment intermediary...” (ECB, 2020, p. 32)	Remuneration (holding limits); homing costs; —
C1 — Thesis	“Legal tender status would be a desirable feature of the digital euro...” (ECB, 2020, p. 33)	Legal tender; network effects; —
C1 — Antithesis	“Privacy emerges as the key feature that a digital euro should offer, according to respondents to the public consultation. This is confirmed both...” (ECB, 2021, p. 11)	Privacy; homing costs, network effects; ↑
C1 — Antithesis	“Both citizens and professionals in the sample generally agree that the digital euro should be integrated into existing banking and payment solutions...” (ECB, 2021, p. 3)	Services; technology design (evolutionary); ↑
C1 — Antithesis	“Most citizen respondents specifically mention the need for either holding limits or tiered remuneration, or a combination of both, to control the amount of digital euro in circulation, while one in ten refer to spending limits...” (ECB, 2021, p. 25)	Holding limits; homing costs; ↓
C1 — Antithesis	“About a third of citizen respondents are against the introduction of any tools to restrict the amount of digital euro in circulation....” (ECB, 2021, p. 25)	Holding limits; homing costs; ↑
C1 — Antithesis	“Half of citizen respondents reply that using blockchain would be a solution...” (ECB, 2021, p. 21)	Technology; technological solution (revolutionary); ↓
C1 — Antithesis	“The majority of respondents among professionals are also of the opinion that use of a digital euro should not be limited abroad and they see several benefits from its cross-border use, also strengthening the role of the euro as an international means of payment....” (ECB, 2021, p. 27)	Cross-border use (access); network effects; ↑
C1 — Antithesis	“The vast majority of citizen respondents (73%) see a role for intermediaries, with a clear preference for their role in introducing innovative services and efficiency-seeking solutions in general, as well ensuring appropriate interfacing with current payments and providing information about the use of digital euro...” (ECB, 2021, p. 27)	Roles of intermediaries; platform design (open development); ↑
C1 — Synthesis	“The Governing Council approved further exploration by the Eurosystem of a digital euro solution in which transactions would be made online and would be validated by a third party (“online third-party validated solution”) [...] A potential peer-to-peer validated solution for online payments with no third party involved is a more experimental alternative.” (ECB, 2022a, p. 5)	Transfer mechanism; technological solution (evolutionary); ↑

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Table 4 continued from previous page

Cycle / Position	Passage / paraphrase (source, page)	Theme (feature; K&D criterion; direction)
C1 — Synthesis	“It has also been concluded that an offline peer-to-peer validated solution should be developed.....” (ECB, 2022a, p. 6)	Transfer mechanism; technological solution; ↑
C1 — Synthesis	“The development of a third-party validated solution for online payments should not be delayed in case the timely delivery of a peer-to-peer validated solution for offline payments proves to be unfeasible....” (ECB, 2022a, p. 6)	Transfer mechanism; technological solution; ↓
C1 — Synthesis	“Full anonymity is not considered a viable option from a public policy perspective....” (ECB, 2022a, p. 7)	Privacy; homing costs; ↓
C1 — Synthesis	“In a baseline scenario, compatible with the current regulatory framework, a digital euro would provide a level of privacy equal to that of current private sector digital solutions [...] The “selective privacy” option would allow greater privacy for low-value/lowrisk payments [...] As approved by the Governing Council, the Eurosystem is committed to provide for highest levels of privacy within the regulatory framework. ” (ECB, 2022a, pp. 7–8)	Privacy; homing costs; ↑
C1 — Synthesis	“One such tool could be the “waterfall” functionality, under which funds in excess of the digital euro holding limit would be transferred automatically to a linked commercial bank account. The “waterfall” tool has been approved by the Governing Council.” (ECB, 2022a, p. 10).	Holding limits; homing costs; ↑
C2 — Antithesis	“What is the proposed position regarding privacy vs censorship resistance: Are users only protected against infringements of the right to privacy (if at all), or are they also protected against discretionary restrictions on transferring or withdrawing their funds” (Niepelt, 2023, p. 10)	Privacy; homing costs; —
C2 — Antithesis	“The report remains vague regarding the question whether users would need to register with the Eurosystem and their private service provider before starting to use the digital euro, or only with the latter” (Niepelt, 2023, p. 10)	Privacy; homing costs; ↓
C2 — Antithesis	“Can the Eurosystem credibly commit to not access the personal and transaction data?” (Niepelt, 2023, p. 10)	Privacy; network effects, homing costs; ↑
C2 — Antithesis	“A few suggest that the waterfall from digital euro to commercial bank money holdings should also work in the opposite direction, giving users the opportunity to replenish their digital euro account or wallet automatically when they make a payment.” (ECB, 2021, p. 27)	Funding and defunding; homing costs; ↑
C2 — Antithesis	“The report sketches the two prioritised transfer mechanisms (online, validated by a third party; and offline, peer-to-peer validated) but does not provide much detail” (Niepelt, 2023, p. 10)	Transfer mechanism; technological solution; —

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Table 4 continued from previous page

Cycle / Position	Passage / paraphrase (source, page)	Theme (feature; K&D criterion; direction)
C2 — Antithesis	“We therefore urge to abandon the idea of a soft rate disincentive in favour of a hard cap which could be enshrined in a legislative framework, ensuring that it is robust and maintained even in times of financial stress.” (EBF, 2022, p. 3)	Holding limits; homing costs; ↓
C2 — Antithesis	“First, why is structural substitution of bank deposits undesirable? Do we know that the status-quo two-tier monetary architecture is ideal?” (Niepelt, 2023, p. 11)	Holding limits; homing costs; ↑
C2 — Antithesis	“The design of a sustainable business model is vital, as the economic costs of implementation might crowd-out existing market actors and prevent the creation of these innovative and competitive service offerings” (EBF, 2022, p. 2)	Business model; network effects; ↑
C2 — Antithesis	“Many professional respondents argue that intermediaries’ involvement in user on-boarding, including identification, authentication and authorisation, would ensure resilience across the entire ecosystem, give greater security to the safekeeping of a digital euro and mitigate operational risks.” (ECB, 2021, pp. 19–20)	Roles of intermediaries; network effects, homing costs; ↑
C2 — Synthesis	“The Eurosystem would not be able to infer how much digital euro any individual end user holds nor to infer end users’ payment patterns.” (ECB, 2022d, p. 1)	Privacy; network effects, homing costs, switching costs; ↑
C2 — Synthesis	“Their responsibilities would include offering user-facing services, such as opening accounts or wallets, payment instruments and onboarding and offboarding, encompassing know-your-customer and anti-money laundering checks. They would also provide devices or interfaces to pay with a digital euro in physical stores, online or person-to-person.” (ECB, 2022d, p. 5)	Roles of intermediaries; network effects, homing costs; ↑
C2 — Synthesis	“For an online digital euro solution, Eurosystem central banks would perform the settlement tasks, including the recording and associated verification tasks.” (ECB, 2022d, p. 6)	Settlement; platform design; —
C2 — Synthesis	“A seamless funding and defunding experience is essential to support the successful uptake of the digital euro; the ease with which such functionalities could be used would significantly affect end users’ willingness to adopt a digital euro and to use it over time.” (ECB, 2022d, p. 8)	Funding and defunding; homing costs; ↑
C2 — Synthesis	“Similarly, at the discretion of the end user, a reverse waterfall functionality would ensure that end users could make a payment even if the amount exceeded their current digital euro funds” (ECB, 2022d, p. 8)	Funding and defunding; homing costs; ↑

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Table 4 continued from previous page

Cycle / Position	Passage / paraphrase (source, page)	Theme (feature; K&D criterion; direction)
C2 — Synthesis	“To achieve the objectives of a digital euro and ensure that everyone in the euro area could pay and be paid in digital euro, a digital euro scheme would appear best suited for the distribution of a digital euro” (ECB, 2022d, p. 9)	Distribution; homing costs; ↑
C3 — Antithesis	“BEUC supports the development of a digital euro app by the Eurosystem and would like to see this app as part of the core services offered to consumers....” (ECB, 2023b, p. 7)	Application (access); homing, switching costs, network effects; ↑
C3 — Antithesis	“Given the concerns mentioned above on interfaces developed by PSPs, BEUC supports the development of the digital euro app as the only app for the digital euro which all intermediaries are then obliged to use....” (ECB, 2022e, p. 10)	Application (access); platform design; ↓
C3 — Antithesis	Regarding digital euro app “Ensuring a strong digital euro branding and recognisability in the market, favouring word-of-mouth marketing and network effects” (ECB, 2022b, p. 13)	Application (access); network effects; ↑
C3 — Antithesis	“Portability will be essential for both, citizens and merchants. We welcome the indication that the Eurosystem and the future digital euro scheme will support the setup of portability to allow a seamless and harmonised journey from a customer and merchant point of view....” (ECB, 2023b, p. 49)	Application (access); switching costs; ↑
C3 — Antithesis	“Core services should include all services which consumers use for daily payments, this includes paying in shops and online, initiating and receiving credit transfers, charging (digital) euros on their payment instrument, consulting the level of funds on their accounts, direct debits and standing orders. This list of core services corresponds to the features of a basic payment account (see Article 17, Payment Account Directive) and should be offered free of charge to consumers....” (ECB, 2023b, p. 49)	Services; homing costs (user); ↑
C3 — Antithesis	“The concept of “core” cannot be equalled to “for free”, but the whole issue of an economic sustainable model should be addressed and an appropriate compensation needs to be discussed, including for core services....” (ECB, 2023b, p. 20)	Services / business model; homing costs (intermediary); —
C3 — Antithesis	ESBG: “The core service of a digital euro is only one: to be the digital image of cash, meaning that any additional values should be built by the supervised intermediaries/ASPSPs and offered in competition with each other” (ECB, 2023b, p. 38)	Services; platform design; —

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Cycle / Position	Passage / paraphrase (source, page)	Theme (feature; K&D criterion; direction)
C3 — Antithesis	“Our membership, however, has strong concerns about the approach proposed in the ERPB technical sessions concerning the one-account limit for Euro Area citizens. In the current regulatory context, with the access to the ECB settlement system limited to certain account-based payment service providers (PSPs), the likely scenario is that every digital euro user will be onboarded through the bank where they hold their main current account” (ECB, 2023b, p. 31)	Access (holding limits); homing costs; —
C3 — Antithesis	“Limiting the number of D€ holdings (accounts or wallets) to a single one per citizen would be one of the unfavourable consequences of wanting to introduce fixed limit holdings (without requiring undue identity matching across different intermediaries), which may launch the D€ on the wrong foot already” (ECB, 2023b, p. 42)	Access (holding limits); homing costs; ↑
C3 — Antithesis	“We support the ECB’s proposed way forward – there should be maximum one digital euro account/wallet per citizen, at least at the initial stage. This is important to control the amount of digital euro in circulation and to preserve the financial stability of banks...”; “Besides, there should be low limits on digital euro holdings (maximum EUR 500), and a limit on transaction amounts (including the waterfall mechanism)...” (ECB, 2023b, p. 10)	Access (holding limits); homing costs; ↓
C3 — Synthesis	“A portability procedure for digital euro accounts would allow an end user to easily change the PSP providing the digital euro account. To facilitate portability, end users would keep the same digital euro account identifier, irrespective of their PSP. The Eurosystem is investigating possible emergency portability procedures...” (ECB, 2023c, p. 6)	Access; switching costs; ↑
C3 — Synthesis	“The Eurosystem is proposing that in the initial releases of the digital euro the focus would be on enabling access for euro area residents, merchants and governments...” (ECB, 2023c, p. 5)	Access; network effects; ↓
C3 — Synthesis	“The overall amount of digital euro in circulation could be controlled in a pragmatic way (and in line with current practice in the public sector) by limiting the number of accounts per individual...” (ECB, 2023c, p. 6)	Holding limits; homing costs; ↓
C3 — Synthesis	“The Eurosystem believes that PSPs, as defined in PSD2, would be best placed to distribute the digital euro.” (ECB, 2023c, p. 7)	Distribution; platform design (moderated service distribution); —
C3 — Synthesis	“End users could access and use the digital euro either through PSPs’ existing online banking/payment apps or through an app provided by the Eurosystem that would offer a harmonised entry point for basic payment functionalities provided by PSPs...” (ECB, 2023c, p. 7–8)	Application (access); network effects; ↑

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Cycle / Position	Passage / paraphrase (source, page)	Theme (feature; K&D criterion; direction)
C3 — Synthesis	“For in-store payments (point-of-sale use case), both QR-code and NFC contactless payments are envisaged....” (ECB, 2023c, p. 8)	Payment method (access); technological solution (evolutionary); —
C3 — Synthesis	“Supervised intermediaries could provide a variety of digital euro services to end users and build on the digital euro’s advanced functionalities. All PSPs distributing digital euro to end users would be required to provide a set of core services, whereas optional and value-added services could be offered voluntarily by supervised intermediaries to further enhance the core product and improve end-user experience....” (ECB, 2023c, p. 9)	Services; platform design (service development); ↑
C3 — Synthesis	“Within the scope of the digital euro project, conditional payments refer to payments that are instructed automatically when pre-defined conditions are met. Conditional payments are a broad category that includes both optional and value-added services” (ECB, 2023c, p. 11)	Services; platform design (open service development); ↑
C4 — Antithesis	“If the ECB verifies and records transactions, it can infer payment patterns.” (Mooij, 2023, p. 20)	Privacy; network effects, homing costs; ↓
C4 — Antithesis	“In particular, a high level of privacy could be met for the purpose of settlement. The Eurosystem will not see or store users’ private information.” (ECB, 2023d, p. 3)	Privacy; network effects, homing costs; ↑
C4 — Antithesis	“balances design choices to safeguard privacy and enable the fulfilment of compliance requirements (KYC, AML /CFT) while allowing intermediaries to process customers’ payment data based on customers’ consent to provide value-added services” (EBF, 2023, p. 4)	Privacy; homing costs; ↓, Services; network effects; ↑
C4 — Antithesis	“foresees a robust business model so as to incentivize intermediaries to provide services and innovate based on the digital euro” (EBF, 2023, p. 4)	Business model; network effects; ↑
C4 — Antithesis	“An open question the ECON Committee may want to take up with the ECB is whether participation in the digital euro scheme would be voluntary in all circumstances (i.e., a system of “opt-in”), or whether (certain) intermediaries would be required to distribute the digital euro.” (Grünwald, 2023, p. 16)	Distribution; network effects; —
C4 — Antithesis	“It is difficult to consider the latter to be part of “promoting” smooth payments rather than taking over payment infrastructure.” (Mooij, 2023, p. 15)	Application (access); network effects; ↓
C4 — Antithesis	“According to the European statistics, the percentage of population that possesses the basic digital skills varies, e.g. from 79% of the Finnish and Dutch populations to 45% in Italy. [...] The introduction of the digital euro increases the potential risk for creating a new form of a digital divide.” (Mooij, 2023, p. 28)	Inclusion; network effects; ↓

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Cycle / Position	Passage / paraphrase (source, page)	Theme (feature; K&D criterion; direction)
C4 — Antithesis	“This threshold might prove prohibitively low for the digital euro’s usability. While it is important particularly during the introductory period to manage risks to financial stability, a holding limit must strike an appropriate balance between curbing abrupt outflows from bank deposits on the one hand and user needs on the other. To achieve its objective as a monetary anchor, a digital euro must be widely available and useable.” (Grünewald, 2023, pp. 11–12)	Holding limits; homing costs; ↑
C4 — Synthesis	“The European Central Bank should implement appropriate technical and organisational measures, including state-of-the-art security and privacy-preserving measures, to ensure that the identity of individual digital euro users cannot be linked with the information in the single access point by entities other than payment service providers whose client or potential customer is the digital euro user.” (European Commission, 2023b, p. 22)	Privacy; homing costs, network effects, ↑
C4 — Synthesis	“The digital euro is granted legal tender status which entails inter alia its mandatory acceptance by payees” (European Commission, 2023b, p. 12)	Legal tender; network effects; ↑
C4 — Synthesis	“For the purpose of Article 15(2), any merchant service charge or inter-PSP fee in relation to digital euro payment transactions shall comply with the principle of proportionality” (European Commission, 2023b, p. 47)	Business model; network effects, platform design; —
C4 — Synthesis	“The digital euro shall: (a) have usage and service features that are simple and easy to handle, including for persons with disabilities, functional limitations or limited digital skills, and older persons; (b) be accessible for persons with disabilities by complying with the accessibility requirements laid down in Annex I of Directive 2019/882” (European Commission, 2023b, p. 51)	Accessibility; homing costs, network effects; ↑
C5 — Antithesis	“The offline digital euro shall be available for offline digital euro payment transactions as of the first issuance of the digital euro. The online digital euro availability shall be subject to conditions set out in the Article 3.” (Navarrete Rojas, 2025, p. 121)	Scope; network effects; ↓
C5 — Antithesis	“To ensure an effective use of the euro, both its online and offline functional modalities are necessary and essential and both should therefore be available from the first issuance of the digital euro...” (Council of the European Union, 2025, p. 4)	Scope; network effects; —

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Cycle / Position	Passage / paraphrase (source, page)	Theme (feature; K&D criterion; direction)
C5 — Antithesis	“The situation in Parliament changed on Wednesday evening, when the centre-right politician Fernando Navarrete, who is the leading rapporteur on the file, announced the withdrawal of his position to reduce the scope of the digital euro to offline use only.” (Euronews, 2026)	Scope; network effects; —
C5 — Antithesis	“For the purpose of properly enforcing any limits on the use of the digital euro decided upon by the Commission...” (Navarrete Rojas, 2025, p. 30)	Holding limits; platform design; —
C5 — Antithesis	“The European Central Bank shall without delay adjust the holding limits set in accordance with Article 16 to comply with the overall ceiling established in a Council implementing decision...”; (Council of the European Union, 2025, p. 91)	Holding limits; platform design; —
C5 — Antithesis	“The financial impact of the digital euro poses a serious challenge on banks in the euro area given that significant investments for upgrading IT systems, infrastructure and processes (110 million euro in change costs per bank on average) will be required for redundant use cases.” (PricewaterhouseCoopers, 2025, p. 29)	Business model / Compensation model; homing costs (intermediary); —
C5 — Antithesis	“A new study from PwC conducted on behalf of the European Banking Federation, the European Association of Co-operative Banks (EACB), and the European Savings and Retail Banking Group (ESBG) shows that the introduction of the digital euro could cost up to €30 billion for banks in the eurozone, even though – as currently conceived – it would not offer any recognizable added value for either consumers or businesses” (Bundesverband der Deutschen Volksbanken und Raiffeisenbanken, 2025)	Business model; homing costs (intermediary); —
C5 — Antithesis	“During the initial phase after the first issuance of the digital euro, the absence of reliable cost data and the lack of stabilised unit costs do not permit to calculate the fee caps on the basis of actual costs incurred for the provision of digital euro payment services. Consequently, the fee caps applicable during the transitional period should be based on relevant data concerning comparable means of payment” (Council of the European Union, 2025, p. 28)	Business model / Compensation model; homing costs; —

B Data Sources

This appendix lists documents analysed in this paper, in chronological order of publication. The table indicates besides document that was included in analysis, the issuer of document, the year of issuance and position of paper in the dialectical cycle structure.

Document	Issuer	Year	Position
Report on a digital euro (ECB, 2020)	ECB	2020	C1 Thesis
Eurosystem report on the public consultation on a digital euro (ECB, 2021)	ECB	2021	C1 Antithesis; C2 Antithesis
1st progress report on the investigation phase (ECB, 2022a)	ECB	2022	C1 Synthesis; C2 Thesis
EBF response to EC targeted consultation (EBF, 2022)	EBF	2022	C2 Antithesis
4th ERPB technical session: form factor (ECB, 2022b)	ECB / ERPB	2022	C3 Antithesis
Written feedback after 4th ERPB technical session (ECB, 2022e)	ECB / ERPB	2022	C3 Antithesis
2nd progress report on the investigation phase (ECB, 2022d)	ECB	2022	C2 Synthesis; C3 Thesis
Written feedback after 5th ERPB technical session (ECB, 2023b)	ECB / ERPB	2023	C3 Antithesis
3rd progress report on the investigation phase (ECB, 2023c)	ECB	2023	C3 Synthesis; C4 Thesis
EBF Vision on a digital euro ecosystem (EBF, 2023)	EBF	2023	C4 Antithesis
Market research outcome report (ECB, 2023d)	ECB	2023	C4 Antithesis
Assessment of the first two progress reports (Niepelt, 2023)	EP (EGOV)	2023	C2 Antithesis; C4 Antithesis
A legal framework for the digital euro (Grünewald, 2023)	EP (EGOV)	2023	C4 Antithesis
Digital euro's legal framework (Mooij, 2023)	EP (EGOV)	2023	C4 Antithesis
Proposal for a Regulation on the establishment of the digital euro (European Commission, 2023b)	European Commission	2023	C4 Synthesis; C5 Thesis

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Document	Issuer	Year	Position
Digital euro cost study (PwC, commissioned by EBF, EACB, ESBG) (PricewaterhouseCoopers, 2025)	Banking sector / PwC	2025	C5 Antithesis
EP Rapporteur draft report (Navarrete Rojas, 2025)	European Parliament	2025	C5 Antithesis
Council position (Council of the European Union, 2025)	Council of the EU	2025	C5 Antithesis
EU Parliament unblocks key political hurdle (Euronews, 2026)	Euronews	2026	C5 Antithesis
European lawmakers reach breakthrough on digital euro (TechCentral, 2026)	TechCentral	2026	C5 Antithesis

Table 5: Data sources analysed in this paper, listed in chronological order.