

**DIGITAL
FINANCE**

OUR MARKET OBSERVATORY
CENTRAL BANK
DIGITAL CURRENCY

Challenges and opportunities
of the new digital currency



WHAT ARE WE TALKING ABOUT?

1	Executive Summary	3
	AIM of the document	4
2	Nexen Consulting Overview	6
	Introduction	7
3	Elements that characterise the digital euro	12
	FIAT currency / euro overview	14
	What are central bank digital currencies?	15
	What differentiates CBDCS from other digital currencies	16
	CBDC: distribution and substitution of the fiat currency	20
	Retail vs. Wholesale CBDC	21
4	Focus on the initiatives of central banks	24
5	Impacts on banking systems and financial intermediaries	27
	Threats to traditional banks	30
	Opportunities and challenges	31
6	Possible effects on monetary and financial stability	32
7	Technological and organisational approach	36
8	Conclusions and follow ups - "The New Normal"	39

AUTHORS

Matteo Artuso

Senior Consultant at Nexen
at Engineering Group

✉ matteo.artuso@eng.it

[in](#) [Matteo Artuso](#)



After a research thesis at CINECA on scientific data for a LHC (Large Hadron Collider) project at CERN in Geneva, he worked on encryption and digital signatures for the Public Sector and Banking Industry. In 2007 he started a professional experience at a multinational leader in management and provisioning credit solutions. He worked on national and international projects in the areas of credit origination, monitoring and collection. Currently, Matteo is a senior consultant for Nexen Solutions in the Customer&Credit group. He supports clients to create the best solutions in the area of credit. He is also the Head of the Credit area in Nexen's Market Observatory.

Adriana Carotenuto

Ph.D Student and Business Analyst
at Engineering Group

✉ adriana.carotenuto@eng.it

[in](#) [Adriana Carotenuto](#)



Adriana earned her degree in Business Administration and International Management. Currently, she is working towards a PhD in Management, researching Blockchain and Digital Banking. She has been collaborating with the Finance Division in Engineering since 2018. She participates to projects and conferences of international scope on topics such as Digital Transformation and Market Innovation. Since 2018, Adriana has participated to projects with Cambridge University and is currently conducting research on Blockchain and the management of personal data. She is the Founder of the IBNO (Italian Blockchain National Observatory), entity created to analyse blockchain technology, follow the developments and offer strategic vision for companies.

1

EXECUTIVE SUMMARY



AIM OF THE DOCUMENT

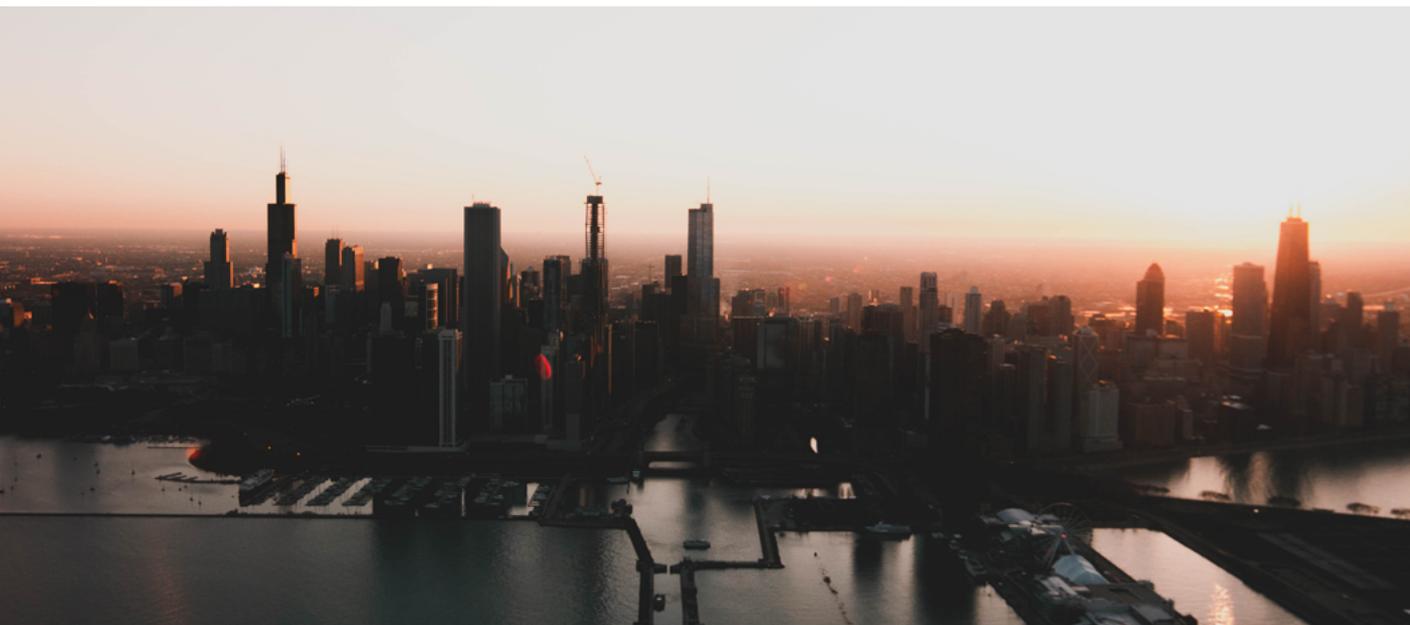
The aim of this paper is to examine the plans of central banks around the world regarding the issuance of the Central Bank Digital Currency (CBDC), how it differs from other digital currencies and finally to analyse what impact large, medium and small banks may have to consider.

The emergence of a 'digital euro' supports the Eurosystem's objectives in terms of promoting digitisation, providing citizens with a new form of secure money in the digital world and contributing to Europe's strategic autonomy, as well as providing an alternative to cross-border payment service providers. The digital euro offers state-of-the-art payment services that reflect people's evolving needs by actively promoting innovation in retail payments, integrating private payment solutions, increasing choice, competition and accessibility of digital payments, and ultimately supporting financial inclusion for all.

In a context in which the most vulnerable sections of the population are using traditional cash because they find it more difficult to join a private banking circuit (for both cultural and economic reasons), and the use of cash is gradually decreasing (if we exclude the first months of the pandemic, which represented an anomalous scenario whereby the use of cash in some Eurozone countries reversed its trend before beginning to decline again), the **European Central Bank must necessarily identify alternative instruments that are equally inclusive and guaranteed.**

There is an additional reason for the impetus that central banks, in particular the ECB, are providing to digital currencies. Indeed, for several years the ECB has been using an extraordinary tool to fight deflation: Quantitative Easing. The objective, however, has not been achieved. In fact, the large amount of money that the central bank has injected through QE has not reversed deflation and, most importantly, has not reached the real economy to support businesses and citizens. First and foremost, the regulatory constraints imposed on credit institutions to prevent systemic crises in the face of the huge portfolios of impaired loans created in the last decade, have contributed to the diversion of money to other forms of deposit and investment, as we will discuss in more detail later in this document.





That is why, especially now, after a year of pandemic (which we hope will have ended by the end of 2021), the Central Bank must find new solutions to directly affect the financial economic system of member countries.

The digital euro therefore represents a concrete possibility for supporting the general economic policies of the European Union (EU), meeting the emerging payment needs of a modern economy by offering (in addition to cash) a secure digital asset with advanced functionalities, and ensuring inclusiveness of the whole population.

In support of this, it is a fact that the central banks of each EU member state are already carrying out analyses to understand the challenges and advantages that may emerge from the introduction of the digital euro. **The digital euro can be designed to replicate some of the key features of cash that are useful for the digital economy, such as offline payments, P2P and, last but not least, anonymity.** Whichever solution is adopted, it will need to satisfy a number of principles and requirements, including robustness and resilience, security, efficiency, and protection of privacy, while simultaneously complying with applicable laws and regulations, including the Anti-Money Laundering and Terrorist Financing Regulations (AML and CFT).

Here at **Nexen, the Business Consulting company of the Engineering Group**, we are following institutional working tables, launching comparisons, workshops and research projects with the subjects involved, on the strength of our knowledge of the subject and the group's technological capabilities, which also allow us to assess the various technological choices and their relative impacts.

We believe that there are many interesting applications on the horizon that will help to improve our world, and that banks and financial institutions will play a key role in this process of change.

DIGITAL
FINANCE

2

NEXEN CONSULTING OVERVIEW

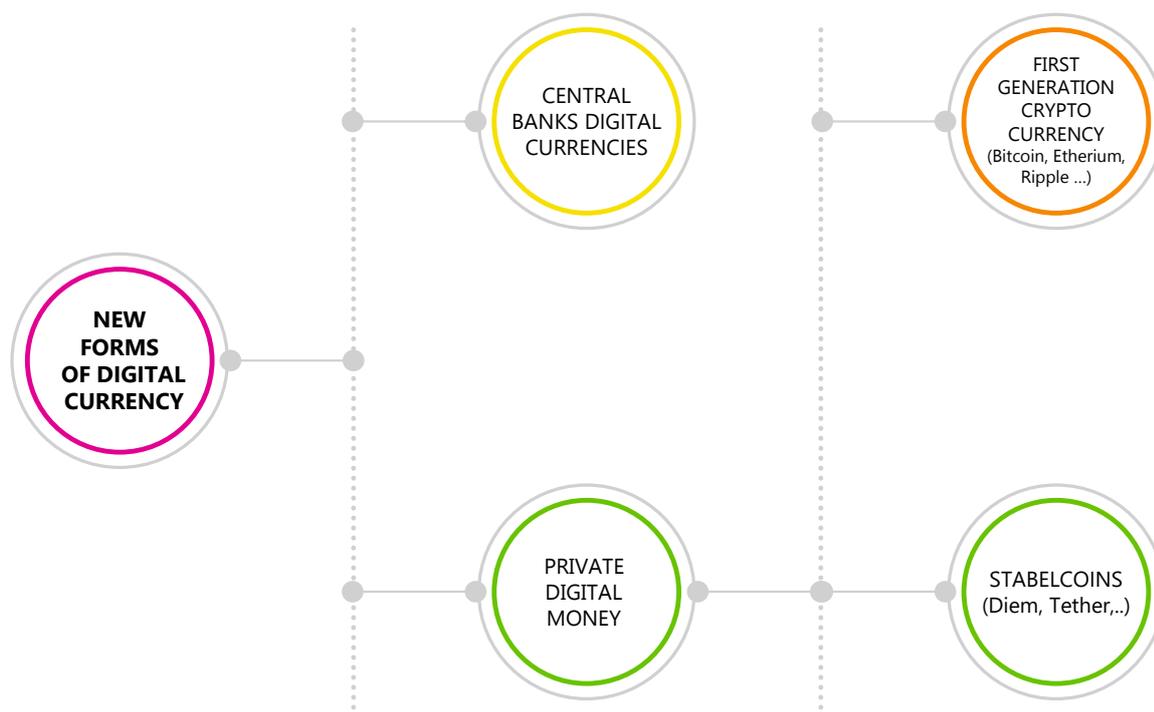
INTRODUCTION

It is important from the outset to clarify the various definitions that will be discussed and that distinguish digital money.

Pure crypto currencies, such as **Bitcoin and Ethereum**, are market currencies and not governed by any institutional body. Their only rules are written into the public algorithm governing their exchange, based on blockchain technology, where it is the circuit itself that guarantees the ownership of assets and the regular exchange of currencies.

Stablecoins are cryptocurrencies, just like their predecessors from a technological point of view, but pegged to traditional assets governed by classic market rules (e.g. FIAT currencies, ETFs, stock market indices, precious metal listings, etc.).

Finally, there are **Central Bank Digital Currencies**, CBDCs, which are genuine FIAT currencies issued by central banks on a par with cash.



For the sake of comprehensiveness, we often speak of virtual currency, which is not a real currency but refers to payment circuits in everyday use that rely on traditional currencies. In practice, these are sometimes confused with the concept of money, i.e. ATM, credit and debit cards, PayPal and so on.

In order to design a system in which the central bank can maintain control over the currency, it is necessary to protect the privacy of users (BIS, 2020 ; Garratt and van Oordt, 2020¹), while at the same time maintaining the authority to supervise anti-money laundering (AML²) and understand the customer base (KYC³). Events such as the COVID-19 pandemic and the emergence of global Stablecoin propositions such as Facebook's Libra (which has now become Diem, pegged to the dollar) are pressures that are accelerating the process of central bank implementation of a CBDC.

Globally, to date, some central banks, such as those of Ecuador, Uruguay and Ukraine, have already completed pilot projects and are now focussing on design and technology choices, albeit with different approaches, to meet their own institutional priorities. Other central banks, such as those of the Bahamas, China, the Eastern Caribbean Currency Union, Korea, South Africa and Sweden, are already close to launching a pilot project.

For Western countries or developed economies, **CBDCs represent an opportunity for governments to achieve the goal of streamlining payment processes in favour of the real economy in one fell swoop**, while ensuring potentially complete control over transactions. For emerging and developing economies (EMDEs), on the other hand, such as Latin America and the Caribbean, it represents above all the possibility of initiating an inclusive ecosystem that addresses the significant gaps in financial access that are still widespread today.

For the different realities, the introduction of a CBDC would give rise to a new balance between central banks, payment services circuits (PSPs), credit services and the like, which, thanks to the possibility of overcoming infrastructural and cross-border barriers, would facilitate the circulation of money and thus promote the better distribution of FIAT money throughout the real economy. In the following chapters, especially *Chapter 4: Impacts on Banking Systems and Financial Intermediaries*, we will see how digital money could overcome the current financial bubble of Quantitative Easing in Europe, USA, Japan.

¹ Central banks and BIS publish first central bank digital currency (CBDC) report laying out key requirements

² Bolt, W., & Van Oordt, M. R. (2020). On the value of virtual currencies. *Journal of Money, Credit and Banking*, 52(4), 835-862.

³ AML Anti Money Laundering – con questa dicitura (in italiano Antiriciclaggio) si intende l'azione preventiva e la lotta al riciclaggio di beni, denaro o altre utilità in genere.

⁴ La Know Your Customer è quell'attività di analisi che le istituzioni finanziarie, aziende o altre società regolamentate sono tenute ad eseguire per verificare il profilo dei propri clienti ed assicurarsi che entrare in affari con loro non presenti profili di rischio.

The main questions that experts in the field and scholars of the phenomenon have asked about the **introduction of CBDC are the following:**

1. Who actually controls these currencies: the central bank or the local banks?
2. What is the relationship between the central bank and the local bank in managing user accounts?
3. Is a fully decentralised ecosystem created? This could result in problems in terms of privacy and the regulation of privacy, but is that outweighed by the benefits of exchange in the ecosystem?

In the following chapters we report on the current state of the art and a possible answer to these questions, in particular in *Chapter 6: Technological and organisational approach*.

The EU has four priorities to address following the adoption of a CBDC:

- **To reduce** fragmentation of the digital single market for financial services;
- **To make European rules** fit for the digital age by promoting innovation and mitigating risks;
- **To create a European financial data space** to foster data-driven innovation. Better use of data in the financial sector will encourage competition. A complete overhaul of the Payment Services Directive (PSD2) will be launched next year (2021), so that EU consumers and businesses can fully exploit the potential of Open Banking;
- **To maintain a level playing field** between existing financial institutions and new market participants.

Italian banks are actively participating in projects and experiments regarding a European Central Bank CBDC, contributing, thanks to the skills acquired in the implementation of infrastructures and distributed governance, to the acceleration of the implementation of an EU initiative.

The Executive Committee of ABI (Associazione Bancaria Italiana) has approved the general lines of the position on digital money and CBDCs. On this issue, since last year ABI has set up a working group dedicated to gaining insight into aspects related to digital currencies and crypto assets.

2 October 2020 is a date that historians will view as a watershed moment. This was the day upon which the European Central Bank formally expressed its interest in a digital euro (see European Commission Report by Christine Lagarde and Fabio Panetta), triggering a public consultation that started on 12 October 2020 and ended in the second week of January 2021. The ECB will publish a detailed analysis of the public consultation in the spring, which will provide important input for the ECB Governing Council when launching a digital euro project. Some 8000 citizens, businesses and industrial associations responded to the online questionnaire .



We can anticipate that there was a high number of responses underlining the great interest in the topic, and that an initial analysis of the raw data shows that the characteristics considered most relevant are:

- privacy of payments (41% of responses)
- security (17% of responses)
- pan-European coverage.

For the digital euro, the CBDC of the European Central Bank, to be successful, it is necessary that the digital currency gains the trust of the citizens. For this to happen, it is essential that the highest standards of security, supervision and compliance with clear and easily understandable rules are met.

The CBDC must be the tool that can meet the need for innovation more than any other alternative, in line with the current regulatory framework, as well as offering a true bridge to the analogue world, reducing the attractiveness of virtual tools issued by private entities that are characterised by an intrinsically higher risk profile..

Thanks partly to the role of private banks, it is possible to identify technical solutions and reference models for preserving the current characteristics of cash, while introducing many of the benefits of the digital world (which are already inherent in electronic payment instruments), including the guarantee of not losing one's own money, **the possibility of operating remotely regardless of the geographical location of the respective parties**, and of using personal devices to operate in a contactless manner, which has become the norm following the 2020 pandemic.

Projecting these reflections into the future, it is possible to state that the availability of a CBDC could enable a series of scenarios that are unimaginable today: encouraging the transmission of currency between peers, facilitating the logic of exchange between person and machine and between machine and machine; facilitating peer-to-peer systems, making cross-border transactions transparent, managing interest rates, exchange rates and counterparty risks; promoting the execution of exchanges based on predefined conditions (thanks to the programmability of these currencies), and simplifying all administrative and management processes.

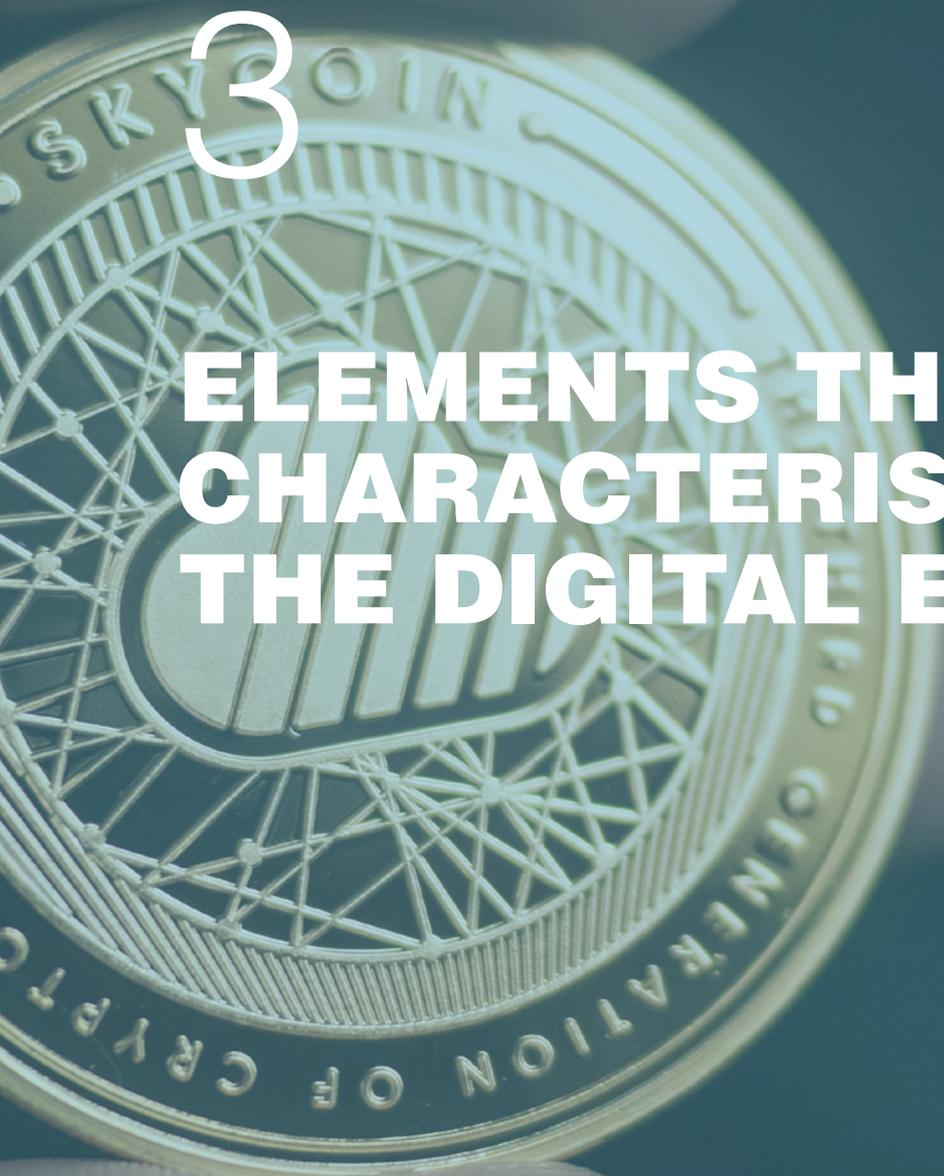


⁵ Report on a digital euro. European Central Bank. Ottobre 2020

⁶ Il questionario era suddiviso in due parti: la prima era destinata alla prospettiva dell'utilizzatore, mentre la seconda parte agli esperti del settore finanziario

3

**ELEMENTS THAT
CHARACTERISE
THE DIGITAL EURO**



The digital euro is an electronic currency that is guaranteed by the ECB and stored in a digital wallet. It can be used for everyday payments as an alternative to cash and payment cards. It will not replace traditional money but will work alongside it. For example, when paying, individuals will be able to choose between using 'physical' euros (in the form of coins, banknotes or credit and debit cards) or digital euros.

As explained in the introduction to this paper, while a cryptocurrency has a volatile price with no underlying guarantee, the digital euro (like other CBDCs) enjoys the same guarantees and quotations as cash, because it is issued, and therefore guaranteed, by the central bank.

It is important to note that, with the introduction of digital money, the central bank not only replaces the old cash with electronic money, but also replaces its own liabilities with the liabilities of the banks (deposits) that are now the backbone of the payments system.



FIAT CURRENCY/EURO OVERVIEW

A fiat currency is a legal tender whose value is not derived from a physical good or commodity, but from the monetary policies and strength of the issuing government. Euros, Dollars, and Pounds, are fiat currencies.

Today, the euro is the currency of 19 countries in the European Community. It is used by more than 340 million European citizens and is one of the most important currencies in the world, making the eurozone one of the largest and most important markets.

Indeed, the Eurozone was conceived as: "an area where the single currency will make it easier for companies to trade across borders, where the economy is more stable and consumers have more choice and opportunities" (European Commission). This has required significant planning and experimentation (e.g. MEC - Common European Market). Similarly, the digital euro (CBDC) requires just as much careful attention and planning, in order to ensure greater stability for all countries in the union.



WHAT ARE CENTRAL BANK DIGITAL CURRENCIES?

A central bank digital currency (CBDC) is a digital currency issued by a national bank that is legal tender. In the same way as a fiat currency, a CBDC is controlled by a central bank to regulate fluctuations and maintain economic stability.

Government control of the digital currency differentiates it from private stablecoins, which attempt to mitigate the volatility of cryptocurrencies by pegging them to other currencies or market assets (stock market indices, ETFs, the price of precious metals or commodities, etc.). The table below gives us a better understanding of what CBDCs aim to achieve and their prerequisites.

Table 1: Overview of the benefits linked to CBDCs and related prerequisites and factors ⁷

BENEFITS OF CBDCs	POSSIBLE LINKED PREREQUISITES AND FACTORS
Payment efficiency in retail	
Efficient and secure for those using them	In particular in economies without high-quality commercial electronic payments, and/or without an efficient and secure payment system
Strengthening resilience and contestability in retail payments	Particularly in economies where demand for banknotes fades and private payment solutions lack competition
Overcoming the use of cash for illicit payments and reserves of value	
Better control of illicit payments and safeguarding of assets, money laundering and financing of terrorism	Richiede: 1) interruzione delle banconote; 2) CBDC non prende la forma di moneta token anonima
Strengthening monetary policy	
Allowing the ZLB (zero lower bound) to be exceeded as negative as negative rates can be applied to CBDCs	Richiede l'interruzione delle banconote
Interest rates on CBDCs provide additional tools of monetary policy, independent of ZLB	
Greater simplicity in the application of helicopter money	
Linked to sovereign money	
Improving financial stability and reducing moral risk in banks by reducing the role of the banking system in money creation	CBDC takes over the insurance of private deposits
More seigniorage revenue to the state, in view of the fact that the state takes over the creation of money from the banks.	

⁷ Revised from Working Paper Series: Tiered CBDC and financial system. European Central Bank. January 2020

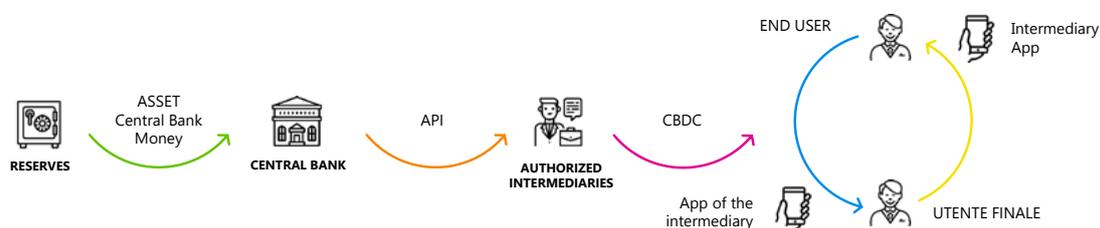
In order to be realised and used, i.e. to meet the needs and requirements mentioned above, a CBDC can be realised in two opposite forms, namely:

1. **In the form of deposit accounts with the central bank for all households and companies.** From a technological point of view, while this is not an innovative solution, it can be very challenging. In the Eurozone, for example, the number of accounts could grow to between 300 and 500 million.
2. **In the form of a decentralised digital token,** whose circulation is not tracked by any central ledger. As with cash, the central bank is therefore unable to determine who actually owns the tokens issued, thus providing a complete guarantee of anonymity.

The first solution hypothesis (i.e. deposit-based) is inherently simpler and also natively guarantees control of money laundering and from other illicit uses (Berentsen and Schär, 2018). It also seems to allow for a high level of security and control of the amount of CBDC base money in circulation, without requiring complex and/or computationally intensive solutions.

In the second hypothesis, the digital currency of the central bank (CBDC) uses a token based on distributed technology (e.g. blockchain) that represents the fiat currency of a particular central bank (national or regional), and better meets the requirements of privacy and anonymity.

The ECB's initial choice in 2019 was a compromise between the two extremes above, resulting in a DLT-based semi-anonymous CBDC design.



Unlike cryptocurrencies, which are neither issued nor controlled by any government agency, CBDCs, regardless of the circuit through which they are offered and used, are subject to the same levels of tax manipulation and devaluation as a legal tender.

CBDCs will be part of the money supply controlled by the central bank, operating alongside other forms of regulated money such as coins, notes, and bonds, combining the best of the digital world – such as dematerialisation, geographical independence, security, and the certainty of not losing your money – with the circulation of money that is today regulated and guaranteed by the traditional banking system.

⁸ Berentsen, A., & Schar, F. (2018). The case for central bank electronic money and the non-case for central bank cryptocurrencies

WHAT DIFFERENTIATES CBDCS FROM OTHER DIGITAL CURRENCIES

The digital solutions adopted by the market today and promoted by governments and central banks are based on the concept of virtual money as defined above. **All member states and their commercial banks have long since adopted a national system for cashless payments.** However, regulatory guidelines mean that such systems are effective mainly at national level, while at international level the costs of payments and transactions are much higher. In response to this problem, a Single Euro Payments Area (SEPA) system was proposed back in 2014, consisting of a package that included certain, limited costs and instant payment times (10 seconds). Due to the requirements and infrastructure costs involved, however, as of 2019 only 51% of EU commercial banks have fully adhered to the scheme, and in most cases the end-user costs are still higher than domestic transactions .

Companies that provide solutions

Private credit card networks and online payment services, such as PayPal, have emerged as the main carrier for cross-border payments, thanks to safe and convenient costs and short transfer times.

If we consider that e-commerce companies have also opened up the possibility for citizens (and not just companies) to easily make purchases abroad, they not only benefit from direct commission income, but also have a **unique database containing the vast majority of international and domestic payments**, with information on the habits and consumption of citizens and companies that is often more extensive than the data held by institutional organisations.



⁹ Rielaborazione da Santamaría, J. (2020). SEPA Instant Credit Transfer: Where are we now and where are we heading? *Journal of Payments Strategy & Systems*, 14(2), 102-105.

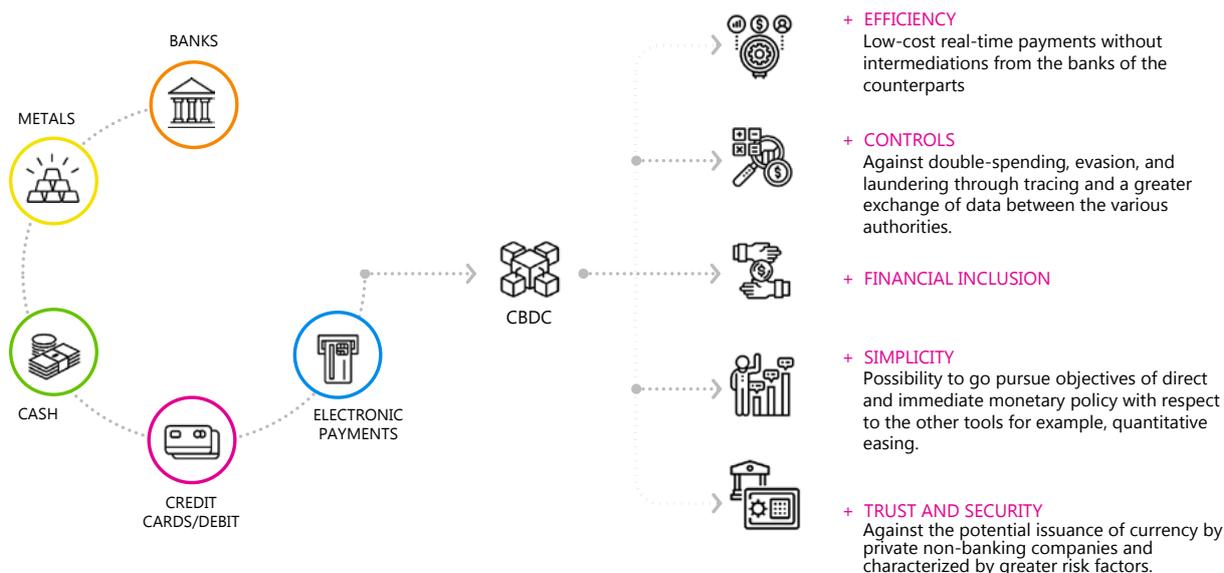
The main one may be Stablecoins, also called stable coins, which are backed by central bank deposits (STCCB), and whose advantages over a CBDC may be:

1. **the trust of citizens**, which might even be higher than with a real currency (CBDC) as they are perceived as interventions to reduce the risk of loss and fraud compared to pure crypto currencies, but not as a government imposition.
2. **efficiency may be higher than for CBDCs** as it grafts onto existing and widespread infrastructures, without creating one from scratch (i.e. they could build on blockchain structures that are already widespread, with minor adjustments)

We should note that one of the main attractions of private digital currencies is the rate of remuneration, which continues to follow logics independent of governments, i.e. it is essentially linked to the efficiency of competing issuing circuits or to the rate of remuneration of reserves. With the introduction of new rules and constraints, the success of these STCCBs would also depend on the ability to guarantee remuneration while limiting its impact.

On the other hand, STCCBs depend on the willingness of central banks to grant the private issuer access to traditional deposits, allowing it to be used directly as a means of payment or converted into a legal means of payment under standard conditions.

Unlike STCCBs, CBDCs aim to meet the needs of citizens' everyday payments, not just those of major commercial transactions or investments. CBDCs are therefore a systemic tool designed to change economic habits at all levels and in a transparent way, from the consumer to large companies, from local circuits to cross-border circuits, both in proximity of physical shops and online.



CBDC: DISTRIBUTION AND SUBSTITUTION OF THE FIAT CURRENCY

Central banks are therefore working to implement instruments to replace traditional currency, both to provide citizens and businesses with the benefits discussed above, and to complement the cryptocurrencies and stablecoins that are spreading globally – and not too slowly.

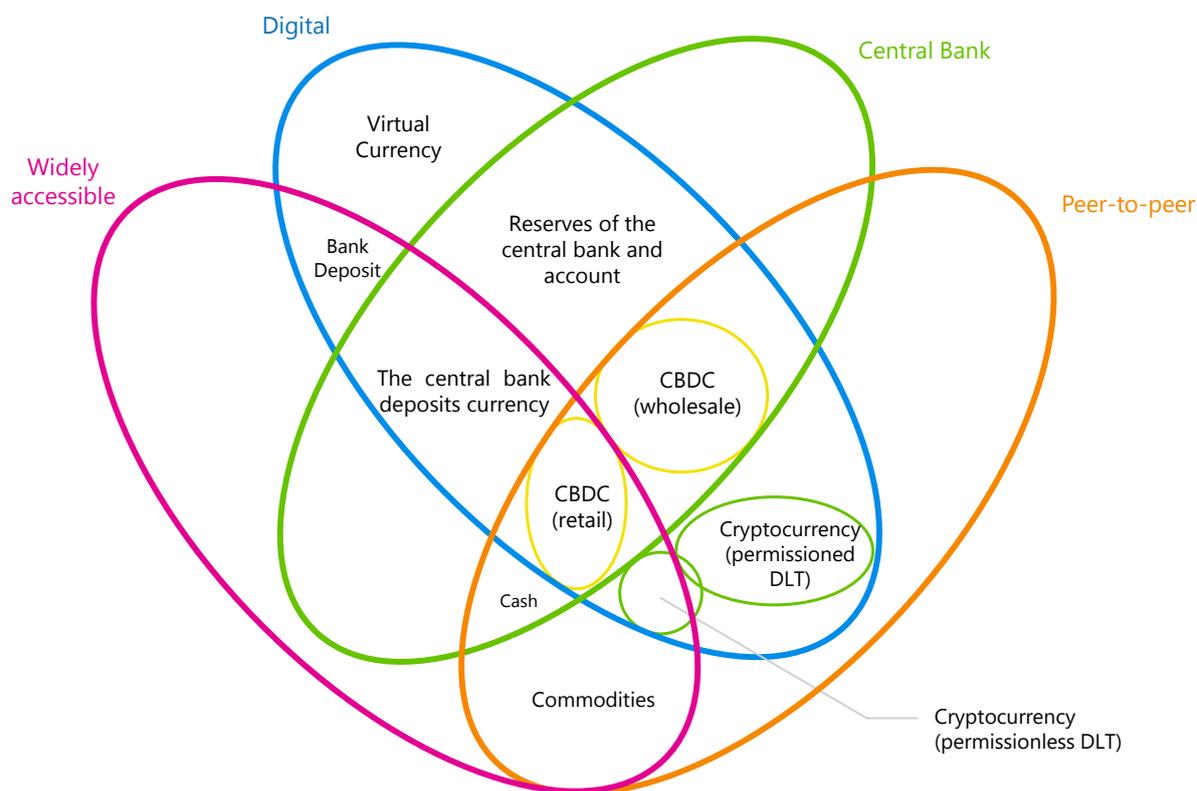
In a region as complex as the Eurozone, the introduction of a digital euro requires all member states to find a common landing point on the possible implications, for each state and between states, so that the pressures from the spread of private circuits, new cryptocurrencies and Stable Coins, carry less weight than at other central banks.



RETAIL VS. WHOLESALE CBDC

As already mentioned, CBDCs can be account-based or token-based, centrally issued or decentralised, and distributed directly by the central bank (Retail CBDC model) or intermediated by accredited banking institutions (Wholesale model). In Chapter 6: Technological and organisational approach, we will analyse the implications.

More specifically, in the **Retail model**, the currency is issued for general use, either for peer-to-peer payments between consumers (for example, the exchange of cash in a shop or between parents and children), while in the **Wholesale model**, consumer payments take place within the circuit of the credited bank and, in the case of subjects belonging to different banks, the difference (global income and expenditure from one bank to another) is settled.¹⁰



¹⁰ Revised from M Bech and R Garratt, “Central bank cryptocurrencies”, BIS Quarterly Review, September 2017, pp 55-70;

Obviously, the Retail and Wholesale models have a very strong impact on the current balance of the financial system; there are, however, ways to mitigate one scenario against the other. For example, considering zero interest or interest expense in central bank deposits in a retail model would still allow private institutions to cultivate healthy competition by securing cheaper rates, as reported in a late 2019 study by the International Monetary Fund (IMF) and the Central Bank of England .

Considering the latter hypothesis, **many central banks, including the ECB, have proposed a two-tier interest rate system to stimulate the adoption of digital currency** without meeting obstacles from the traditional financial system, since the shift from private bank deposit accounts to central bank accounts may have an impact on liability volumes, asset balances and funding availability.

Below, we summarise the main PROs and CONs of the Retail model, which emerged during research conducted by the European Central Bank.

Table 3: Pros and Cons of the CBDC Retail model ¹³

PRO	CONTRO
Potential for faster and cheaper domestic and cross-border payments (both retail and wholesale)	Significant risks to financial stability deriving from banking disintermediation or other forces
Possibility of offering retail depositors safer savings venues (i.e. central bank accounts) with a lower risk of insolvency or loss of funds than storing savings in domestic commercial bank accounts (which varies by country)	Compared to physical cash, this entails significant risks in terms of privacy and consumer protection
Potential to improve the resilience of the payment system to cyber attacks, operational failures and hardware failures related to centralised data storage and processing, which has less data redundancy and therefore may be less robust	Compared to physical money, this increases exposure and vulnerability to cyber-security risks and power outages
Potential to provide an alternative to private sector digital payment technologies, to combat operational risk or monopoly control by such providers if they become dominant, and to serve as a government-issued alternative for cash if it becomes scarce in the future	Challenges of blockchain technology: scalability of transactions, user experience, key management, confidentiality and transaction speed
Potential for inclusion in digital transactions of those excluded from the banking sector	Accentuation of the gap for those who fail to adopt even the governmental CBDC system.
Possibilities to improve AML/KYC functionality and reduce tax evasion, corruption and illicit activities (often not a main area of interest for a central bank)	Possibility for a government to have greater access to citizens' funds for taxation, patrimonial interventions, etc.
Ability to reduce friction and costs associated with storing, transporting and handling physical cash within the banking system	Dependence on IT, networking and electrical infrastructure
Ability to pressure commercial banks into raising interest rates for depositors and providing more financial services	Risk for the stability of the financial system

¹¹ Speech by Tao Zhang, Deputy Managing Director del FMI

¹² Auer, R., Cornelli, G., & Frost, J. (2020). Rise of the central bank digital currencies: drivers, approaches and technologies. Bank for International Settlements, (880), 36.

¹³ Revised from White Paper Central Banks and Distributed Ledger Technology: How are Central Banks Exploring Blockchain Today? World Economic Forum 2019



Although the Retail model is more inclusive and gives central banks greater scope to influence monetary policies and the distribution of money, because of the impacts on the current, well-established banking and financial system in general, and because of the greater complexity of implementation, most pilots in the early stages focussed on the Wholesale model, in which the central bank conversation is only available to institutional intermediaries.

The first research phases deal with small clusters and domestic transitions, before moving on to test the effectiveness of the scenarios implemented, increasing the perimeter of users and progressing to cross-border transactions.

An analysis of current experiments demonstrates that the adoption of **a distributed system based on DLT technologies** makes it much easier to extend the use cases from the restricted context of a pilot project to larger user clusters and cross-border circuits.

The scenarios under study show how a digital currency, even a wholesale one, can stimulate trade both between EU Member States and non-EU countries, thanks to greater efficiency than current private circuits.

In addition to the presence of and competition from cryptocurrencies, stable coins and private sector payment circuits, the ECB is also facing competition from other central banks that intend to take advantage of the impasse to establish themselves as a global monetary reference point. The People's Bank of China, for example, has been working on a CBDC release programme for some time now: the project is currently at an advanced stage and aims to be among the first central banks to release a CBDC file, called **Digital Currency Electronic Payments (DCEP)**, with the stated aim of replacing the current main reference point of the US dollar. If China's central bank succeeds in following through on its Digital Yuan intentions, this could reflexively lead to a weakening of the euro (both traditional and digital).

4

FOCUS ON THE INITIATIVES OF CENTRAL BANKS



To date, according to the Bank for International Settlements, about 80% of central banks worldwide have opened working tables on the adoption of a CBDC .

This figure, which sees virtually all central banks accelerating their CBDC initiatives over the past two years, is a summary of the picture outlined above, i.e. the fierce competition between financial markets, the threat to the governance of money brought about by the growing popularity of cryptocurrency and stable coins, the advent of emerging economies such as China, which are banking on the digital Yuan to establish itself as the world's dominant reserve currency, replacing the US dollar.

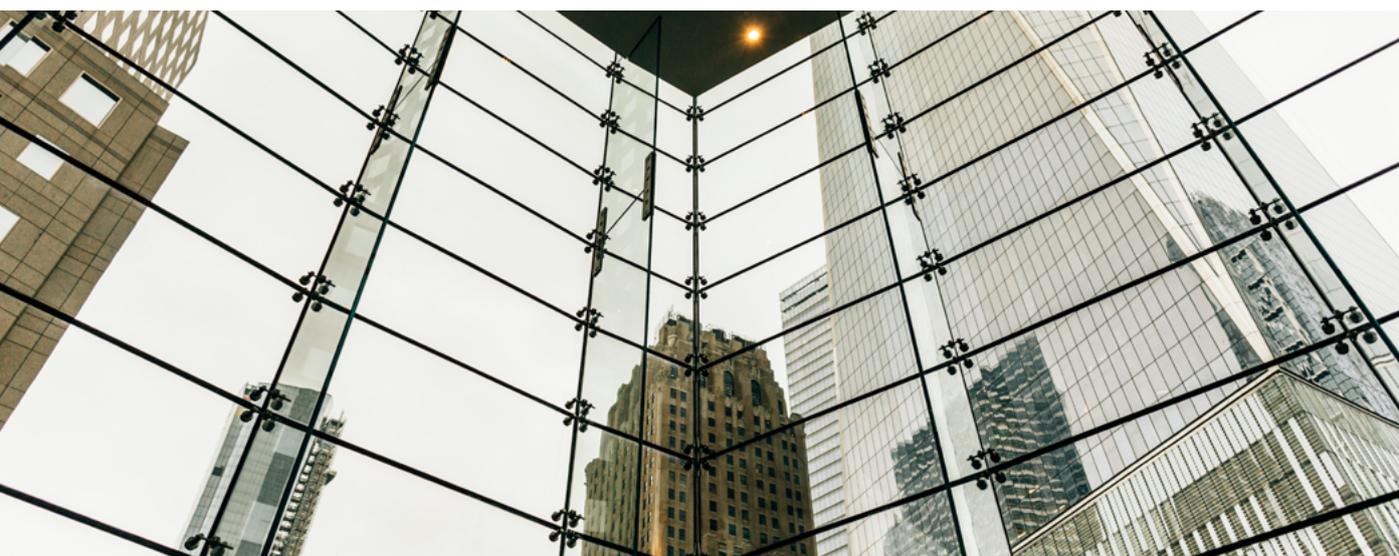
Among major central banks, **Tunisia was the first country in the world to issue its own CBDC** in November 2019 (the e-Dinar), while China is likely to be the first superpower to launch one.

Over the past year, the ECB has also combined its research efforts with the central banks of Canada, England, Japan, Sweden and Switzerland, using its role as a regional union of other central banks to accelerate the adoption of international regulations and position itself as the new reference bank. The limitation of representing all member states makes it extremely slow, however.

In this context, some Eurozone member states decided to explore their own local CBDC, to the extent that in early 2018, the ECB had to intervene to interrupt Estonia's plans to create its own CBDC.

As well as Estonia, the **French central bank has also moved to overcome the ECB stalemate**.

Beyond the considerations noted above, if the ECB fails to reach an agreement among all member states, the Eurozone could once again be fragmented by digital currencies issued by the central banks of individual member states.



¹⁴ Bank for International Settlements (BIS) (2020), “Central banks and payments in the digital era”, BIS Annual Economic Report, Ch. III.

The current projects of the various central banks are outlined below.

Table 4: Examples of CBDC projects ¹⁵

WHO	PROJECTS
BANK OF CANADA	Project Jasper is a collaborative research initiative between the public and private sectors to determine how DLT could transform the wholesale payment system.
BANQUE DE FRANCE, EUROPEAN CENTRAL BANK (ECB)	These two institutes are quite open to experiments together with the ECB and the other central banks of the Eurosystem, in particular with regard to a wholesale CBDC.
CENTRAL BANK GROUP	The Bank of Canada, the Bank of England, the Bank of Japan, the European Central Bank, the Sveriges Riksbank and the Swiss National Bank, together with the Bank for International Settlements (BIS), have set up a group to share experiences as they evaluate potential central bank digital currency (CBDC) cases in their home jurisdictions.
CENTRAL BANK OF BRAZIL	Project Salt is exploring DLT for an interbank payment contingency and resilience system, as well as a decentralised information exchange platform (Project PIER).
CENTRAL BANK OF ICELAND	Rafkróna is exploring
CENTRAL BANK OF THE BAHAMAS	Sand Dollar was introduced on 27.12.2019 with the aim of accelerating reform of the payment system, adding new categories of financial services providers and using the infrastructure of digital payments to make the provision of traditional banking services accessible to all sections of the population. The majority of the advantages of introducing a digital currency are not yet quantifiable. They may, however, include the potential elimination of economic costs associated with the use of cash and benefits to government from improved tax administration and expenditure systems.
CENTRAL BANK OF TUNISIA	E-Dinar - used to study the opportunities and risks inherent in these new technologies, particularly in terms of cyber security and financial stability.
ECB, BANK OF JAPAN	Project Stella explores whether DLT/Blockchain technology can improve internal interbank payments and settlements and facilitate rapid interbank exchange and the settlement of cash securities.
GERMAN CENTRAL BANK	The BLOCKBASTER prototype and other efforts are exploring DLT for multiple purposes, including improving efficiency and reducing risk in interbank securities settlement processes.
MONETARY AUTHORITY OF SINGAPORE	Ubin project is a collaborative project with the banking sector that is exploring the use of DLT for the clearing and settlement of payments and securities, as well as new methods for conducting cross-border payments using CBDC.
PEOPLES BANK OF CHINA	Electronic payment in digital currency (DCEP): a centrally-issued two-tier system is being proposed, supported 1:1 by fiat currency
REPUBLIC OF THE MARSHALL ISLANDS	In February 2018, after the issuance of the Sovereign Currency Act of 2018, a new DLT/Blockchain-based currency called Sovereign ("SOV") was introduced.
SWEDEN CENTRAL BANK	E-Krona – a year-long project launched in 2020 that is addressing concerns regarding the obsolescence of physical cash in Sweden and its consequences.
SWISS NATIONAL BANK	The Swiss Stock Exchange (SIX) and the Swiss National Bank (SNB) are working on a proof of concept to explore how digital central bank money could be used in the settlement of tokenised assets between market participants.

¹⁵ Auer, R., Cornelli, G., & Frost, J. (2020). Rise of the central bank digital currencies: drivers, approaches and technologies. Bank for International Settlements, (880), 36.

5

IMPACTS ON BANKING SYSTEMS AND FINANCIAL INTERMEDIARIES

As mentioned in the opening summary, over the past ten years the central banks of the most developed countries have introduced new tools such as Quantitative Easing and negative interest rates, with the aim of injecting liquidity into the real economy to guarantee economic recovery following the 2009 crisis and combat deflation by stabilising inflation at a level of 2%.

These tools, which should have been extraordinary measures, have in the meantime become standard tools upon which governments exert pressure to finance their public debt through negative rates.

The original aim, however, of providing liquidity to increase demand and thus support inflation, has not been achieved at all. On the contrary, an analysis of the development of the "velocity of money", i.e. the rate at which money is exchanged in an economy through transactions between lenders and borrowers, buyers and sellers, shows that the exact opposite has happened.

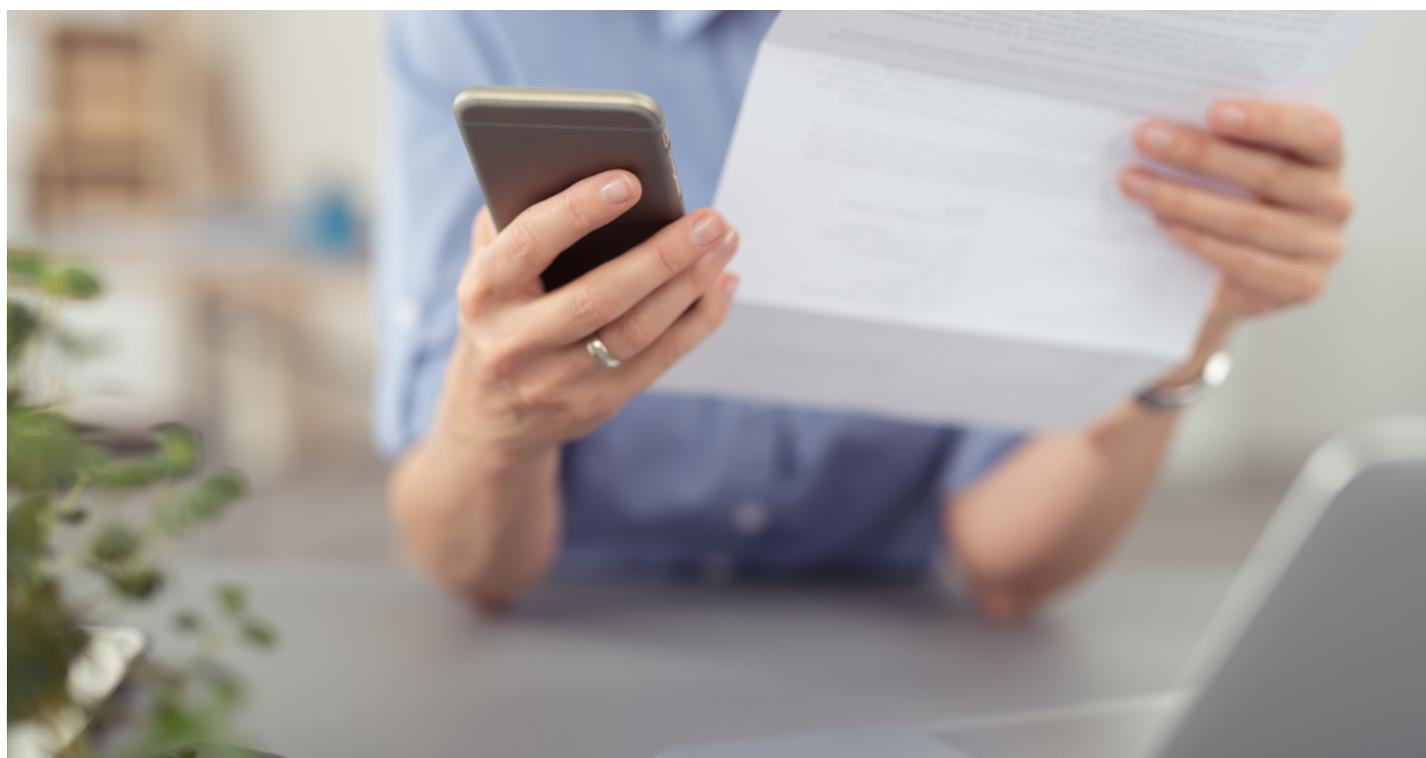
This is due to a context that has changed compared to the past. In particular, the factors in play are:

1. **Technological evolution**, which allows for optimised productions and the introduction of many more products onto the market (greater supply) to match labour capacity.
2. **Immobilisation of capital** within financial intermediaries.

While point 1. is easy to understand, point 2. must be analysed in detail. With the mechanism of QE, central banks buy bonds of the various money-issuing states, which in turn sell them to the traditional banks for injection into the economic system.

Providing liquidity to banks, however, does not necessarily mean transferring it to the real economic system (i.e. businesses and households). On the contrary, as a result of increasingly stringent regulations on credit due to past errors and non-performing portfolios, banks tend to direct their own capital towards large, robust, and low-risk businesses or towards low-return but safe investments, increasing the gap between the poorer sections of the population (who require money out of necessity) and the richer sections (who invest money to create more wealth).

This atypical deflation scenario represents an important accelerator to the introduction of a form of official money (fiat money) directly distributed by central banks to citizens and enterprises through a direct account.



Below we will try to analyse the impact this may have on traditional banks, also depending on the strategic choices of central banks.

A CBDC can only come close to the non-traceability of cash if it assumes the form of a token, such a classic cryptocurrency like Bitcoin, which is accessible from a user account that may be unverified, or through an anonymous payment card that can be purchased in shops or online. Of course, these forms of CBDC suffer from the same risks of loss and theft associated with cash and Bitcoins (i.e. loss of the card, loss of access to the account or violation of the account). Currently, no central bank seems to be moving towards this fully decentralised form of CBDC, which could potentially cause cash to disappear from everyday use.

ECB data shows that demand for and use of cash in the Euro area has constantly decreased over the last decade (most notably in the northern countries), in line with the rise in efficient alternative payment tools. Admittedly, over the past few months, due to the crisis caused by the general lockdown, demand for cash has grown quickly, reaching an all-time high since the launch of the single currency. In Italy, for example, the government is promoting cashless forms of payment to limit the phenomenon. This is, however, not an unusual phenomenon: at times of great uncertainty and stress on the financial system, demand for cash has always tended to grow before returning to the pre-crisis trend.

The money issued by central banks therefore reassures citizens. The question is whether this sense of security is linked to anonymity (i.e. the idea that “the institutions don’t know where my money is and therefore cannot impose fiscal or capital measures on it”, or whether it is simply due to the fact that it is always available, to the detriment of the vicissitudes of the bank that holds our accounts.

This second hypothesis, which is certainly shared by a large number of citizens (just think of the recent successes of BTPs issued directly by the state), imposes the first major assessment on the banks.

If citizens and businesses can have a safe deposit account, in order to continue to manage their customers’ accounts and funds traditional banks must:

1. Become more attractive, offering competitive interest rates,
2. Carefully manage all transactions that affect their stability and soundness, to prevent frightened customers from immediately diverting their funds to an account that is perceived to be safer.

As there is no certainty that all citizens will have the option (at least immediately) of a direct account with the central bank, and that the European central bank itself is studying solutions to limit this phenomenon, (for example, zero rates and negative rates above a certain threshold, even a fairly low one, to discourage the deposit of large sums) it is clear that the central bank is becoming a new player at the table, with much greater powers than others.

THREATS TO TRADITIONAL BANKS

Players that are not exclusively banks and have considerable liquid resources at their disposal, such as insurance companies, service providers and large-scale retailers, can become major competitors of traditional banks by offering simple but better-paid savings products (e.g. deposit accounts with higher rates than banks). In addition, there are also technology giants (Google, Apple, Amazon, Samsung, etc.) which, in addition to their enormous financial potential, also have platforms, infrastructures and technological skills that are far superior to those of the average bank.

These players already offer financial solutions, but citizens and business – rightly or wrongly - recognise a bank as an institution. This is why the vast majority of them trust the bank with their savings and economic needs.

If the perceived institution was no longer the private bank but the central bank, it is possible that traditional banks would lose this competitive advantage and that they would be regarded as equal to other market players.

At that point, each user would only make assessments of pure convenience, in the knowledge that he/she could always resort to the ECB-guaranteed deposit in case of market uncertainties or weakness in their chosen institution.

CBDCs may certainly pose a threat to existing private payment circuits, especially if they are very successful and widespread, while also creating a risk of concentration and a limitation of payment channels.



¹⁶ Se il numero di transazioni aumenta rispetto alla quantità di beni e servizi, i prezzi dovrebbero aumentare perché la quantità totale di denaro in circolazione è aumentata. Al contrario, se il numero di transazioni diminuisce rispetto alla quantità di beni e servizi, i venditori ridurranno i prezzi per cercare di effettuare vendite, spingendo al ribasso l'inflazione.



OPPORTUNITIES AND CHALLENGES

The digitisation of money is a process that accelerates the opening up of existing banking operations and transactions to new players. Regarded alone and isolated from the context, it will be another element of the erosion of traditional business.

On the other hand, digital money can expand the market both to entities that do not use banking services but transact exclusively with cash, and to cross-border services, especially in developing countries where the level of technology and services of our banks is a competitive advantage over local operators.

In addition, **the ability to track digital money (whether anonymously or not) will significantly increase the use of predictive data techniques**, giving each bank's management a more accurate picture of the movement of money and the needs of consumers and businesses.

Indeed, a few years ago, Bill Gates said: "banking is necessary, but banks are not!"

Regardless of the reactions triggered, the first part of what Gates said, namely that people need (and will increasingly need) banking facilities to move, invest, and receive credit is the key point.

The challenge to seize the opportunities on offer is therefore not in the form of money or technology, but in the ability of banks to continue persuading their customers to trust them with their savings and credit needs.

CBDC will be a component of the strategy followed by banks, but what banks can do with the money they have at their disposal will be what will allow them to survive and prosper in the future. In particular, supply chain finance tools, consultancy, new non-banking services, and strategic partnerships are aspects that banks will need to develop in the coming years.

Furthermore, money that is natively digital can enable various applications, including ones that are integrated with physical devices connected to the Internet of Things (IoT). This could be a meter that pays our bills or a fridge that does our shopping when we need it to, for example. Less futuristic examples might include fiscal paperwork that is automatically produced without the need for expensive intermediaries, or stock markets that automatically determine and credit dividends to shareholders. These could be examples of new services that banks offer their customers.

6

POSSIBLE EFFECTS ON MONETARY AND FINANCIAL STABILITY



Central bank money in the form of banknotes and reserves is crucial to our ability to achieve monetary and financial stability.

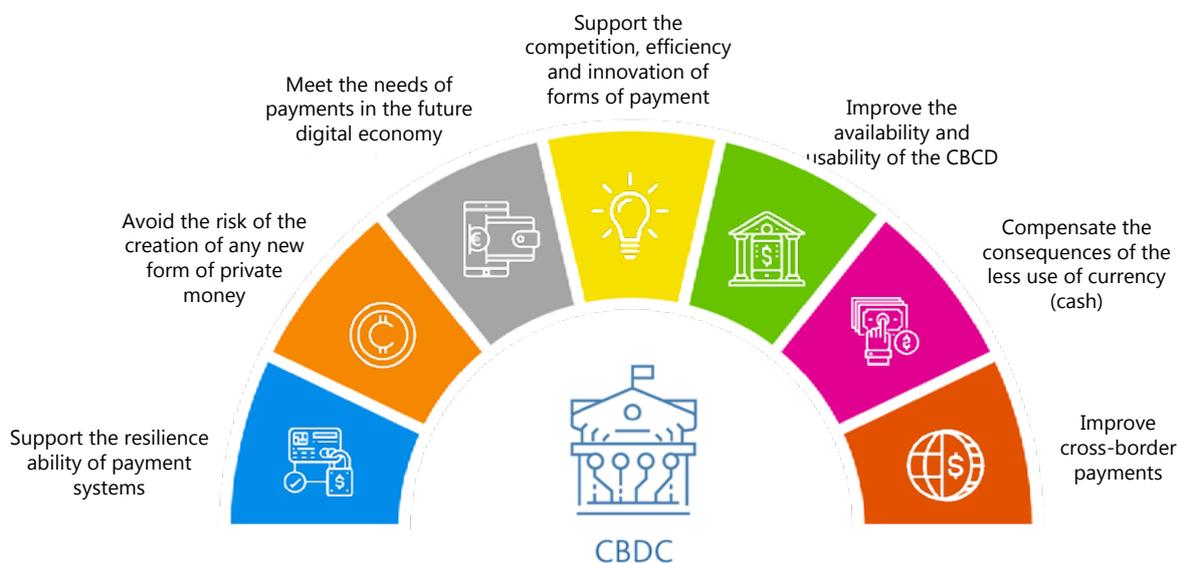
Today, cash also represents a contingency for electronic payment systems in the event of a computer, network or electricity outage. As the use of cash in payments decreases, however, its ability to cope with contingency situations will also decrease, and a CBDC must respond to this.

The CBDC could therefore improve financial stability by contributing to payment resilience as well as extending core services outside the commercial banking system, e.g. by increasing e-commerce possibilities.

A CBDC must be designed to be as resilient as possible, e.g. by considering decentralised solutions to overcome the limitations and temporary blockages of legacy systems.

Even after analysing and overcoming the limitations and problems that payment circuit transactions have highlighted, **a CBDC would still be vulnerable in the face of a large-scale disruption of power grids or internet networks to access data**, meaning that offline forms of payment that can be reconciled at a later date are being considered.

The figure below outlines the issues that a CBDC needs to address to support the monetary and financial stability of countries and to be successfully adopted. (Bank of England, 2020).



Satisfying the future needs of payment in a digital economy

Next-generation payment systems will have to support an increasingly digital and delocalised economy, making the use of money between deposits, credits and investments increasingly simple and transparent to meet the needs of consumers and businesses.

If the CBDC helped to reduce or eliminate the costs of micropayments, both for consumers and merchants, it would represent a major blow to cash and a valuable tool for governments in limiting and combating the phenomenon of evasion.

In addition, as is always the case, higher volumes lead to the development of new services and technologies and can enable new business opportunities.

Improving the availability and usability of central bank money

The storage and deposit of a digital currency would increase the number of users accessing e-commerce, for which cash is a major constraint.

For those who appreciate the physical nature of cash, the introduction of a CBDC is unlikely to affect payment behaviour: the CBDC is therefore likely to act as a complement to cash rather than a substitute, at least for the first generation of consumers who witness its adoption.

The CBDC as an enabling factor for better cross-border payments

The advantages of cross-border transactions have been addressed several times in this report. The ability of central banks to agree from the design of the currency to link the various national CBDCs in a way that they can be used as seamlessly as if there were only one global currency would be a major breakthrough. Individual national CBDCs could then be designed around a set of common standards to support interoperability.

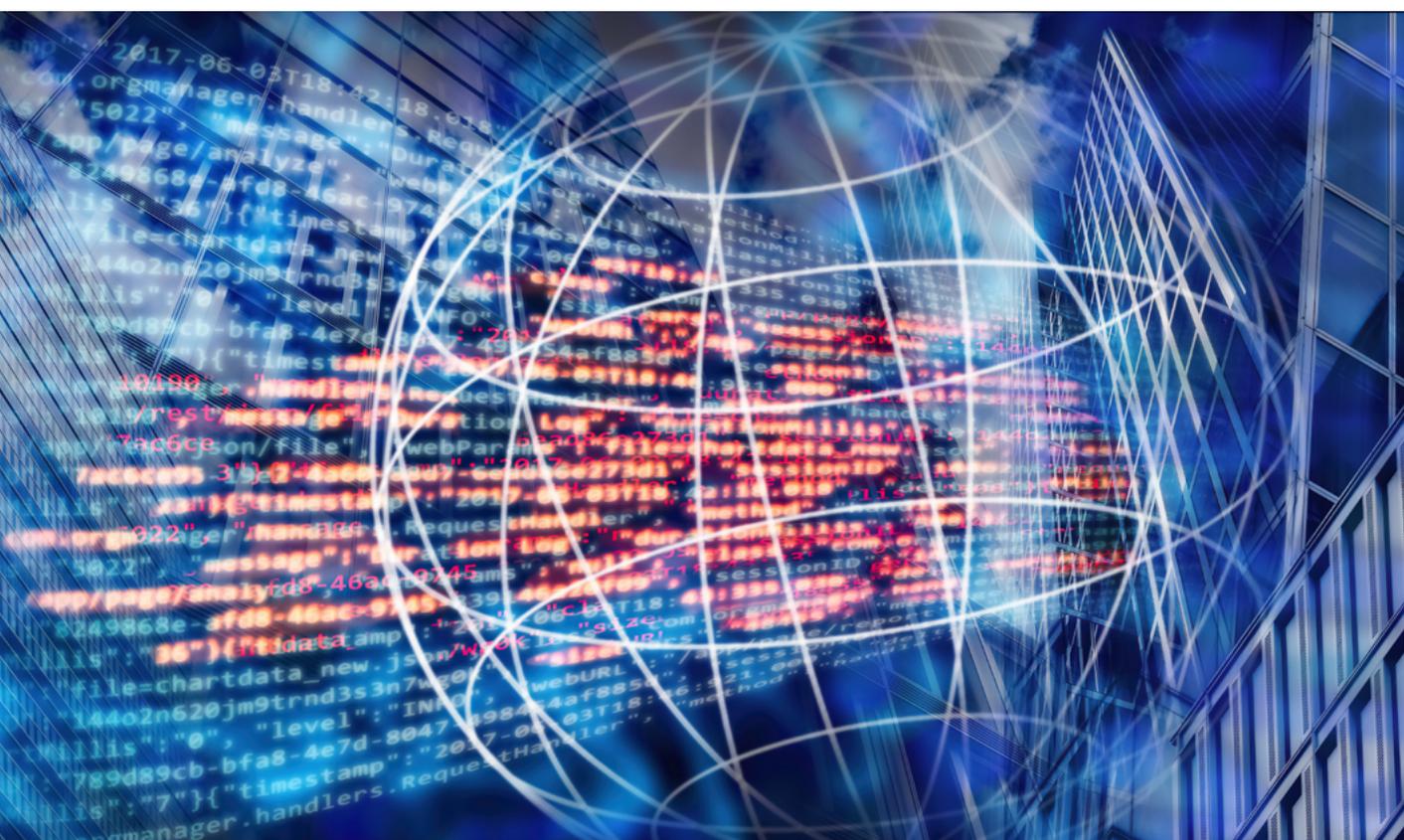


Table 5: Political and monetary impacts of CBDCs ¹⁷

POLITICAL/MONETARY IMPACTS

<p>Monetary impact</p>	<ul style="list-style-type: none"> - The domestic use of foreign CBDCs may hamper the transmission of monetary policy by increasing the substitution of the currency. - If CBDCs are used for specific international transactions, such as remittances, the direct impact on monetary policy may be limited. - CBDCs could also have an impact on the choice of exchange rates. - The cross-border use of a CBDC could also complicate the conduct of monetary policy in the issuing country if external demand for the CBDC results in large flows of capital.
<p>Financial stability</p>	<ul style="list-style-type: none"> - Increased currency substitution induced by foreign CBDCs could exert additional pressures on financing and solvency risks compared to those typically observed in partially 'dollarised' economies. - In a context where several major CBDCs co-exist, currency competition within an area of jurisdiction could make local financial conditions more volatile.
<p>Management of the flow of capital Capital account limitations</p>	<p>Capital flow management measures and other capital account restrictions have been used by many countries and could be circumvented by CBDCs</p>
<p>International monetary system</p>	<ul style="list-style-type: none"> - In general, it is very difficult to predict how the international monetary system might evolve with the arrival of CBDCs. - In the long term, the existence of widely available and strong CBDCs could accelerate changes in reserve currency status. - In a multi-polar world, the composition of reserves could cross geographical and jurisdictional boundaries, depending on whether currency blocs are formed or currencies compete within each country (much like cryptocurrencies and DeFi tokens, Decentralised Finance). - The issuance of CBDCs across borders also raises broader issues for the ecosystem of international payments.

¹⁷ Digital finance: Emerging risks in crypto-assets – Regulatory and supervisory challenges in the area of financial services, institutions and markets. European Parliamentary Research Service. Settembre 2020

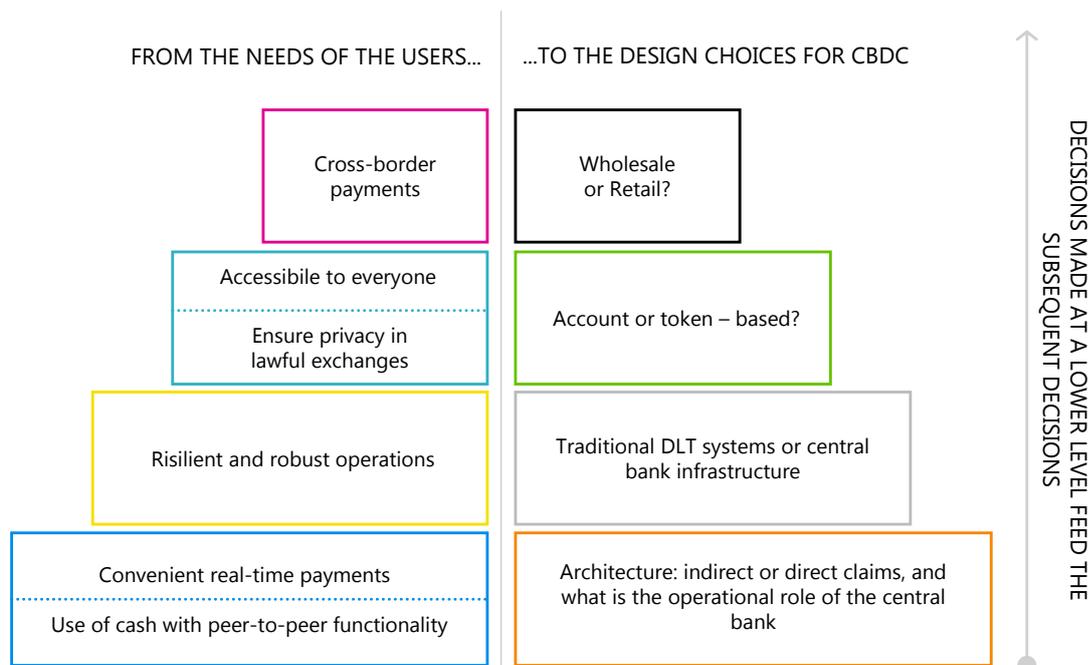


7

TECHNOLOGICAL AND ORGANISATIONAL APPROACH

In order to understand which technological and organisational approach is most suitable for addressing the use of digital currencies, it is useful to begin with the consumer needs that “the coins” must satisfy.

In this regard, **a study by the BIS (Bank for International Settlements) and the University of Innsbruck** has created a pyramid to identify the progressive needs of money users (left-hand side) and the infrastructural and organisational design choices of central banks (right-hand side).



At the base of the pyramid is the role that central banks play with respect to the relationship with users.

1. **Direct:** central banks directly manage the credit and payment system of citizens.
2. **Indirect:** the credit and payment system is managed by intermediaries (the banks) and the central banks only trace movements between accredited private institutions (wholesales).
3. **Hybrid:** through deposit accounts, credit is managed directly by central banks and payments intermediated by institutions.

At this basic level, there is also a need to establish whether payment transactions should be tracked and secure (online), rather than anonymous and offline as in the case of cash.

¹⁸ Auer, R., Cornelli, G., & Frost, J. (2020). Rise of the central bank digital currencies: drivers, approaches and technologies. Bank for International Settlements, (880), 36.

The second level requires a technological choice. The complexity and number of transactions must be comparable to those of all credit and debit circuits/cards, apps, etc., in addition to the use of money, of course. If the central bank wants to open up to distributed or hybrid systems with third parties, this requires a distributed infrastructure in which the nodes participate to guarantee resources to the system and certainty in terms of the ownership of money and the validity of transactions, and must be subject to important service standards and costs.

The third level of the pyramid is another fundamental point. Does each user have a digital ID, or a unique account (like the banking NDG) and will money, credits and transactions be associated with that digital ID, or will the money be represented instead by a token?

While the digital ID could allow for strong controls and high traceability of movements (natively covering different legal purposes, from KYC to AML to tax obligations), it would also deny one of the main characteristics of cash, namely, anonymity. This is without taking into account the fact that in some countries, for a wide variety of reasons, it would not be possible to map every single person belonging to the circuit, and it would therefore be impossible to guarantee universal access to the world of payments. As a consequence, the alternative forms of **DeFi (Decentralised Finance)** that exist today, such as the private stable coins that the CBDC seeks to oppose, would actually be facilitated.

The alternative is a token-based system, where the central bank can recognise the ownership of money, deposits, credits and transactions through an anonymous digital token, e.g. the private part of a public key known to the central bank. In practice, this could also be provided by cards or apps issued by private entities (e.g. banks).

Lastly, the fourth and final level of the pyramid is to define how **the domestic payment system should treat cross-border trade**, and whether, in the case of a retail model at the base, it should manage each account directly or only wholesale trade between central banks (difference between outgoing and incoming transactions).

To date, cross-border transactions are based on the exchange of currency, and this often involves insured risk. Designing CBDCs to include elements to guarantee tokens, accounts, and therefore transactions by parties belonging to other circuits from the outset, would shorten the current payment model and ensure equal competition with stable coins.

In particular, DLT and token-based solutions represent the most open choices to respond to the current and future needs of a CBDC. Even by opting for solutions that are initially more local and limited, the adoption of distributed technologies would not preclude a change of course in the future.



8

CONCLUSIONS AND FOLLOW UPS – "THE NEW NORMAL"



As presented in the report, the subject of CBDCs provides us with much food for thought. Central banks must move to take advantage of this opportunity by adapting their internal infrastructures to support the technological reach of this phenomenon.

Some projects have already been presented, others are in the pilot phase, and the impact on the economic-financial stability of the country with regard to the opportunities have been comprehensively evaluated.

The Italian Banking Association (ABI) has started testing a digital euro based on DLT technology. Consisting of more than 700 Italian banking institutions, the ABI has started work by examining the technical feasibility of a digital euro and the “new value-added services” that would be made possible thanks to the programmable nature of this technology.

The scope of the initiative is to contribute proactively to public debate and support the banks that operate in Italy.

The experiments will be mainly divided into two parts: one will examine the infrastructure and the distribution model to measure technical feasibility, while the other will evaluate how the programmability could provide use cases that differentiate a central bank digital currency from existing electronic payment systems.

In November 2020, the President of the European Central Bank (ECB), Christine Lagarde, said she believed that the monetary authority would move to launch a digital version of the euro in the next two to four years. Together with the central banks of member countries, **the ECB is actively working to design the digital euro and its distribution if introduced.**

In this fast-moving scenario, Nexen has established an observatory on CBDCs to monitor regulatory developments and the consequences that are gradually taking shape, acting as a partner to support financial institutions in assessing the impact on processes, products and services provided, and the possible development of new business lines.



ENGINEERING

For more than 40 years Engineering has been one of the main actors in the digital transformation of both public and private companies and organisations, with an innovative range of services for the main market segments.

With approximately 12,000 professionals in 65 locations (in Italy, Belgium, Germany, Norway, Serbia, Spain, Switzerland, Sweden, Argentina, Brazil, and the USA), the Engineering Group designs, develops, and manages innovative solutions for the areas of business where digitalisation generates major change, such as digital finance, smart government & e-health, augmented cities, digital industry, smart energy & utilities, and digital media & communication. In the course of 2020, Engineering has supported its partners in the continuation and protection of their businesses and key processes, assisting in the design of their 'new normal' and the mapping of new digital ecosystems. With its activities and projects, the Group is helping to modernise the world in which we live and work, combining specialist skills in the final frontier of technologies, technological infrastructures organised in a unique hybrid multi-cloud model, and the ability to interpret new business models. With important investments in R&D, Engineering plays a leading role in research, coordinating national and international projects with a team of 450 researchers and data scientists and a network of scientific and academic partners throughout Europe. One of the Group's strategic assets is the expertise of its employees, whose development is promoted by a dedicated multi-disciplinary training school that provided more than 19,000 training days over the last year.

www.eng.it/en



 www.eng.it

 [@EngineeringSpa](https://twitter.com/EngineeringSpa)

 [Engineering Ingegneria Informatica Spa](https://www.linkedin.com/company/engineering-ingegneria-informatica-spa)