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Executive Summary

There is some confusion about the term “digital currency” and what it really means. This paper therefore starts with a concise and clear definition of this term, also differentiating it from “digital money”, which is often used as a synonym. Similarly, it introduces the term “digital community money”, to differentiate unbacked, private forms of money from official “currency”, which is under the control of an authority, typically a central bank. Adding to the confusion, many blogs, finance websites and other online sources often refer to Bitcoin and similar blockchain-based forms of money as “digital currency”. This paper looks at various forms of money based on blockchain technology. Although blockchain technology can be used for non-money applications, this paper explores blockchain only in the context of digital money.

Digital community money is generally growing in popularity, driven partly by the high profile enjoyed by Bitcoin and similar schemes. In this paper, we show that further growth is expected in that market. Despite lively speculation, high volatility and low performance, these digital community money solutions are still and will remain attractive to investors due to the potential increase in efficiency of the payment methods that they enable. Irrespective of the effects of speculation, blockchain technology has brought an innovative disruption to the market, namely fast and easy settlement of payments on a global scale with low transaction fees.

Digital community money currently dominates the digital money market, but digital currency could become a potential alternative as it would guarantee a certain degree of price stability and regulation if central banks decided to get involved. But there are high economic risks associated with this, and central banks would have to fulfill a new function, namely ultimately managing customer accounts. This would revolutionize the financial system and could compromise the commercial banks' business model, possibly resulting in a one-bank landscape in the extreme case.

This paper concludes by presenting various features of digital money and how they would support different use cases. It also looks beyond digital forms of currency to explore alternative routes to more efficient electronic payment schemes. The benefit of fast settlement of payments can also be realized with instant payments, a concept that is typically based on existing deposit money and therefore eliminates the economic risk of introducing a new form of money. On the other hand, this paper offers an outlook on other use cases for blockchain-based digital community money. These could enable machine-to-machine payments and immensely benefit the growing pace of automation across industry.

1 Introduction

The money and payment landscape in the financial sector has evolved rapidly over the last decade. New payment methods were launched by private companies and some of these have conquered niches within the payment market. Examples of these include Apple Pay, PayPal and Alipay. All these products innovated payment processes, i.e. the way money is transferred from one party to another, but did not alter the underlying money systems. Extending beyond these developments, a new form of money known as “cryptocurrency” innovated the very concept of “money”. This new form of money exists only digitally, does not require a bank account and is not regulated by any authority. The first and most prominent example is Bitcoin. It was introduced in 2008 by a still unknown person or group of people
known by the pseudonym Satoshi Nakamoto. The appeal of Bitcoin has risen steadily ever since.

By design, Bitcoin cannot match the performance of conventional, mainstream payment methods like bank transfers or debit and card payments. Bitcoin currently processes 300,000 transactions around the world every day, compared with more than 70,000,000 every day with conventional methods in Germany alone\(^1\). In the near future, however, when more and more devices will be digitally connected, more business cases could arise for money that exists in digital form only and is available to everybody.

Today, there is still a plethora of terms which are used commonly and interchangeably to describe this new kind of money: “digital currency”, “digital money”, “e-money”, “virtual currency”, “cryptocurrency”, or “sovereign digital currency”, “digital fiat money”, “digital base money”, “central bank digital currency” for regulated versions. No standard naming convention has been established thus far and many authors bend the meanings to fit their needs. To deepen the confusion even further, other use cases that are based on blockchain technology refer to Bitcoin even though they have nothing to do with money.

For the purpose of this whitepaper, we would like to introduce a definition that we consider helpful to distinguish different approaches and concepts around digital forms of money and currency.

A common defining property of money is that anything that is commonly accepted and trusted in a certain community can serve as money provided it fulfills three fundamental functions:

1. Medium of exchange, trusted and used in a community/certain environment;
2. Store of value;
3. Unit of account.

If this money purely exists in digital form, i.e. without physical representation, it can be called digital money.

The term digital money can be categorized into various groups. The first category that meets the above definition is traditional “deposit money”, namely funds held in deposit accounts in commercial banks. This money fulfills the three functions of money, exists only electronically and has been widely used for decades.

Another group is “digital community money” (DCM). Examples such as Bitcoin, Ether and Zcash are already accepted by a growing international community as a form of payment.

In contrast to deposit money, DCM is not linked to a commercial bank account and is typically based on blockchain technology.

\(^1\) http://www.handelsblatt.com/finanzen/banken-versicherungen/bitcoin-hoehenflug-bundesbank-vorstand-warnt-vor-kryptowaehrung/19766954.html?navi=FINANZEN_2_TOP-NEWS_19766954
So DCM classifies as money and can obviously be used as a means of payment or store of value. However, these schemes are typically very volatile in terms of value. Another key attribute is needed in order to maintain long-term trust in the value of money and price stability. This attribute brings us on to our definition of the term “digital currency”:

**Digital currency**

A digital currency is digital money accessible to the general public and not linked to a commercial bank account, where an issuing authority (typically a central bank) which is subject to financial regulation is responsible for a certain price stability, including exclusive rights for the issuing and destruction of that currency.

This authority takes measures to ensure price stability, e.g.

- by setting certain interest rates for loans to commercial banks and
- by controlling the total amount of currency in circulation and
- by securing transport and storage of the currency.

Following this definition, DCM does not classify as digital currency as it is not backed by a regulatory authority. The effects of this are evident, for instance, in skyrocketing Bitcoin prices – fueled by spiraling demand in recent months.

Before discussing how a digital currency could be implemented and what consequences this would have for society, it is important to raise the question as to whether there is really a need for a new kind of money. One way of answering this is by examining the triggers for the introduction of new money in the past. Looking at the evolution of money, we find that it is directly linked to the history of mankind.

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2 Note that commercial bank reserves held at the central banks do not classify as digital currency according to our definition as they are not accessible to the general public in a certain jurisdiction.
Commodity money
The first human settlements resulted in seasonal surpluses of food and other goods. This created a need to store and exchange value. During this first evolutionary stage, communities defined conveniently exchangeable objects of value as money. These included cowrie shells, tea and salt blocks.

Coins
As political and economic development led to the emergence of sovereign entities, a dedicated monetary system became necessary. Central rulers needed a system to pay wages and collect taxes to ensure political stability. The first coins were thus minted to replace everyday objects used for storing and trading value.

Paper money
Exponential population growth, followed by urbanization and industrialization, fueled trade and increased demand for money. As the number of coins in circulation grew, so too did the handling effort – handling all these heavy coins was proving increasingly inefficient and resources to do so were limited. To solve this problem, private banks – and later on sovereigns – issued paper money, as a kind of bond backed by “real” money. The acceptance of paper money, which has no inherent value in its own right, was a powerful step towards the abstraction of value.

Deposit money
Over time, the acceptance of abstraction has grown and paper money has been supplemented by deposit money, typically available to the general public at any time. In a global, digitally connected society, smart (chip) cards are used every day to enable contactless and mobile payments.
Digital community money

The financial crisis created a desire for independent and trustworthy ways to store and exchange value. Technology advances, together with the global mindset of a transnational community, led to the total abstraction of value and the dawn of DCM.

In summary, one can see that social changes and technological progress often triggered the appearance of new kinds of money and the corresponding payment methods. This raises the following questions:

- What are the social and technical triggers that could result in the creation of digital currencies?
- Is the time ripe for digital currencies?
- Does this mean reinventing the way we create and handle currencies or can the handing requirements be met by improving existing electronic payment methods?

This paper continues by analyzing DCM’s ability to meet the general requirements that a monetary system must fulfill. It shows that the major advantages of DCM lie in fast and easy settlement, thus enabling rapid, cheap cross-border transactions. However, DCM lacks the price stability of a currency. It could be argued that this stability could be achieved with digital currencies. Chapter 3 discusses the advantages and disadvantages that digital currencies present when introduced to an economy. Chapter 4 goes on to show that the major benefits of digital currency and DCM schemes can also be realized in existing payment systems, maybe even using the same innovative technology, i.e. a distributed ledger. There nonetheless remain certain use cases specific to digital currency or DCM schemes and these are addressed in chapter 5.

2 General Requirements that Monetary Systems and Digital Community Money Must Fulfill

Before addressing the question as to whether the time is right for a new kind of money, we first need to explore the requirements that money must fulfill. A new kind of money can only be successful if it fulfills fundamental requirements significantly better than traditional money and payment systems. Before going into this discussion, we present a brief overview of the current DCM status.

2.1 Success of DCM schemes

It is relatively easy to build a DCM scheme. This explains why more than 800 had already been identified by July 2017. Although Bitcoin still has the largest market capitalization, other DCM initiatives like Ether are growing fast and shortening the lead. The market capitalization of all DCM schemes is 85 billion US dollars, which is several orders of

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3 https://coinmarketcap.com/
magnitude lower than the 33 trillion US dollars of M1 money\(^4\) reported by G20 countries. However, the majority of DCM systems, Bitcoin included, are not used for payment but rather as a vehicle to store value or speculate. In some high-inflation countries like Venezuela, Bitcoins are used instead of the official currency as citizens have greater trust in their stability and they are easier to access than gold for instance. Some investors buy Bitcoins purely for speculative purposes. This trend was driven by the rapid appreciation – indeed doubling – of Bitcoin value within just a few weeks.

So how does Bitcoin – the world’s first DCM – work? Bitcoin is based on a distributed ledger, which is created using blockchain technology. The distributed ledger is like a database that contains a record of all transactions. New transactions are added to the ledger in files called blocks. The process of creating a new block and adding it to the ledger is performed by “miners”. It involves solving a complex mathematical problem – a task which results in the creation of new Bitcoins. The miners are not necessarily incentivized by transaction fees for their work, but rather by the new Bitcoins they create. This “seigniorage” is what motivates the miner to participate in the run for the next block, coupled of course with the expectation that the value of their Bitcoins will remain stable or – even better – increase. So the cost of today’s mining effort (i.e. the cost of verifying the transactions) is deferred to a future client who will buy these newly created Bitcoins. By design, the number of Bitcoins that can be mined is limited to 21 million. Which means that at some point in time (estimates say 2140), it will no longer be possible to create Bitcoins. Experts therefore deliberate the extent to which this resembles a Ponzi scheme that is ultimately doomed to collapse or whether the business model will evolve towards higher transaction fees.

Most other DCM schemes are similar to Bitcoin and are also based on blockchain technology. There are certain differences in relation for instance to the business model. With the Dash solution, for example, not all newly created coins are given as reward to the miners. Instead, some are invested in services for the network. IOTA is an example based on what is known as the Tangle, a further development of blockchain technology especially designed for M2M payments. More information on the use of IOTA for M2M payments is presented in chapter 5.3.

### 2.2 How could DCM and Bitcoin in Particular Evolve so Successfully?

One reason is that, in the aftermath of the financial crisis in 2009, a community of people embraced the idea of money not controlled by anyone specific. At the same time, DCM meets some of the general requirements that monetary systems must fulfill better than traditional electronic payment. In the following, we look at the major stakeholders in a monetary system and their general requirements. We consider the extent to which Bitcoin meets these requirements.

#### Monetary requirements

The first question to be answered is: Who are the main stakeholders of the monetary system and what are their fundamental requirements? Even though money, by definition, serves multiple functions, this chapter focuses on payment as its major function, especially in a social context. The major stakeholders can be summarized as:

\[4\] M1 money is an indication of the amount of money that can be easily converted to cash. It usually includes cash, demand deposits, checking accounts and negotiable orders of withdrawal accounts.
Central banks (and other regulatory authorities)

A central bank is an authority with privileged control over the emission and destruction of money. It is responsible for monetary policy, the main aim of which is to control inflation.

Commercial banks

Commercial banks are financial institutions for the general public (private and business) that provide financial services. These include provisioning and management of deposit accounts, provisioning of loans and provisioning of investment products.

Payment system providers

Payment system providers support or enable electronic money transfers – typically for merchants but increasingly on a peer-to-peer basis. This can cover both online and POS payments.

Merchants

Merchants sell goods to either end consumers (B2C) or other companies (B2B). They may be online, shop-based or mobile with direct contact to their customers.

Consumers

Consumers purchase goods and services for personal consumption, to give away as gifts or use in some other way.

These stakeholders’ requirements, especially with respect to DCM, are outlined below:

Fast settlement/confirmation

A payment is successful when the payee has received the agreed amount of money. Traditional electronic payment methods usually first send the payer and payee confirmation that the transaction was successful and then, sometime later, that payment has been settled, in other words, that the accounts have been balanced. Currently, common POS payments and money transfers are usually confirmed instantly but not settled until the next day at the earliest. Fast settlement is only available in some countries and within certain limits. For instance, CHAPS Co in the UK offers settlement on the same day but only during working hours and for a relatively high transaction fee (see chapter 4 for more details on instant payments settlements).

In most cases, fast confirmation of payment is sufficient, but the stronger requirement of fast settlement would nonetheless be a compelling advantage. Situations where payments are tied to a due date with late payment penalties are one example where fast settlement is clearly relevant. The same is true of high-value transfers where both the consumer and the merchant are keen to minimize interest lost due to settlement delays.

A payment in Bitcoin is usually executed within a few hours. Although the time for adding a new block takes 10 minutes on average, the average time to settle a payment is longer as transactions are not typically verified within the next block. In addition, to be sure that the transaction is irrevocable, the parties have to wait for approximately six blocks. Thus, it can

http://www.chapsco.co.uk/
take several hours before a transaction is final. Nevertheless, the fact that settlement in Bitcoins can be performed 24/7, i.e. also during weekends and holidays, is considered a great advantage.

No or low transaction fees
Fees are obviously a critical factor, as no-one wants to pay them. Especially for micropayments, i.e. amounts below five euros, the typical transaction fee of some 5 to 15 cents charged to merchants for credit card payments would not be acceptable.

In principle, Bitcoin transactions are free of charge for payer and payee. However, as demand for Bitcoin has risen in recent months, a transaction processing fee is now payable in the amount of tens of US cents. The fee increases if the transaction should be executed within the next blocks (the time to create a block takes ten minutes on average).

The DCM Ripple, however, uses transaction fees to its advantage. It charges low fees that scale with the network load in order to prevent a denial of service attack.6

User experience/seamless integration
Internal payment processes may be complicated but they are not visible to payers and payees, who are looking for a convenient and seamless experience. Ideally, they want a user interface that makes payment as easy as sending an email. In the UK and in the US, Google does indeed offer the possibility to send money by email.7

The Yapital app is an example of a mobile payment service that was discontinued at the end of 2016 due to a lack of users. Rather complicated handling is cited as one major reason for its limited uptake.8 In addition to a good user experience, merchants are also looking for seamless integration of new payment methods into existing infrastructures. Typically, they are reluctant to invest in changes.

For DCM, the user experience strongly depends on the solution both for the scheme itself and the user interface of the digital wallet. DCM could provide a platform for all kinds of financial services offered by traditional players like banks as well as startups.

Anonymity
Anonymity is a much-debated topic, touted as both a benefit and a threat. It gives citizens the possibility to remain untracked in their payment activities, which is generally regarded as a fundamental right. Anonymity means payers can hide their personal purchase data and habits from third parties. Privacy is limited with bank transfers as they are tied to personal information.

At the same time, however, anonymity enables criminals to carry out or conceal illegal activities. One recent example of this is the virus WannaCry, which encrypted files on

6 https://ripple.com/build/transaction-cost/
7 Pay-friends-GMAIL-Google-rolls-feature-lets-attach-money-emails
computer systems and made them unusable. The attackers promised to decrypt the files only after a payment in Bitcoins. Illegal global activities like this would not be possible with conventional bank transfers and very unlikely with cash payments.

Transaction records in the distributed ledger are visible for everyone participating in the Bitcoin scheme. However, transactions are not linked to names but only to identification numbers. As long as the users stay unknown, a payment in Bitcoins can be considered anonymous.

It is questionable as to whether a digital currency could ever be completely anonymous. But even if it were, people would probably not believe it as they would assume that all digital activities are traceable (see chapter 3.6 for more details).

**Regulation/monetary policy**

Central banks emerged when policy-makers realized that public systems function better when there is a general liquidity shortage in times of a financial crisis.9 One of their main tasks is to set out monetary policy and to ensure the stability of sovereign currencies. At present, currencies like the US dollar or the euro are not backed by assets such as gold (the gold standard was abandoned in the 70s), but by people’s trust in the central banks. DCM schemes such as Bitcoin do not have this backing, resulting in high volatility and this is probably perceived as their most critical weakness.

**Fast cross-border transactions with low fees**

One effect of globalization is increased demand for fast and cheap cross-border payments. In 2016, 22% of PayPal’s total payment volume was generated by cross-border transactions.10 Today, PayPal accepts payment in 25 currencies and is available in more than 200 countries.11 It charges special fees for currency conversions.12 Over the coming years, cross-border e-commerce is expected to grow significantly.13

As Bitcoin is global by design, cross-border money transfer is another important use case for it. Even though Bitcoin is not really instant (transaction confirmation and settlement could in fact take hours), traditional systems typically take much longer and often come with relatively high fees.

**Payment without a banking infrastructure**

A study conducted by the World Bank showed that two billion people worldwide were unbanked in 2014.14 In Sub-Saharan Africa, one of the major reasons for citizens not having

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13 [http://www.dhl.com/content/dam/Campaigns/Express_Campaigns/Local_Campaigns/apem/express_campaign_spice_trade_apem_en.pdf](http://www.dhl.com/content/dam/Campaigns/Express_Campaigns/Local_Campaigns/apem/express_campaign_spice_trade_apem_en.pdf)
a bank account is the fact that financial institutions are too far away. Especially in Kenya and Tanzania, mobile money solutions like M-Pesa are widely used for money transfers as they do not require an existing banking infrastructure. All the user needs is a mobile phone (not even necessarily a smartphone). The World Bank initiated a Universal Financial Access program with the goal that “by 2020, adults globally have access to a transaction account or electronic instrument to store money, send and receive payments”.

Bitcoin and other DCM schemes are seen as advantageous in this regard as they are also suitable for unbanked people given that they do not require a banking infrastructure. But they do require smart devices (e.g. smartphones), which also limits adoption in some areas of the world.

Despite its success, Bitcoin is – by design – not suitable as a mainstream payment method. It is limited to seven transactions per second. That is only sufficient to cover the transaction load of about 400 supermarket registers for instance, and is therefore nowhere close to competing with the loads supported by major payment schemes like Visa/MasterCard. Moreover, operation of the Bitcoin system consumes a significant amount of energy. Today, Bitcoin consumes approximately as much energy as a nuclear power plant produces (around 2 GW). Given that Bitcoin in practice processes around 300,000 transactions per day, the energy consumption per transaction is thus equivalent to that of several households in the USA for one day. Nevertheless, other DCM schemes have already improved on these ratings. However, the fundamental question as to whether the costs of a distributed ledger-based system are indeed lower than a conventional central database system, where both systems offer the same level of security, has yet to be definitively clarified.

2.3 National Positions on DCM

Acknowledging the growing and obvious success of DCM schemes, central banks are observing developments and evaluating the scene with varying degrees of intensity. Some countries even embrace the concept of Bitcoin or accept Bitcoins for tax payments and suchlike (see figure 3). Most countries regulate the possession of Bitcoins in order to levy taxes on earnings from Bitcoin speculation with multiple classification of Bitcoin’s official status. It ranges from treating Bitcoin like a foreign currency (e.g. Germany or Switzerland), commodity (e.g. Japan prior to April 1, 2017) or even art (Sweden), to acknowledging Bitcoin as an official means of payment (Japan, since April 1, 2017, provided the trading platforms adhere to local regulations such as “know your customer”, which may be difficult to achieve). In the Swiss town of Zug, Bitcoins are accepted for payments to the municipality of up to 200 Swiss francs, mainly with the intention of showing support for fintechs and driving innovation.

Other countries have banned financial institutions from using Bitcoins (e.g. China) but are now working on their own solutions for digital currencies. These will have the advantage of being controlled and regulated by the authorities.

15 http://ufa.worldbank.org/
3 Digital Currencies

3.1 Advantages of a Regulated Digital Currency

Given that digital currencies clearly appeal to a wide audience for many different reasons, this raises the question as to whether central banks should issue their own digital currencies as an alternative to existing solutions. This would create a digital currency under the regulation and control of the issuing central bank and ideally tied to the existing currency in a 1:1 exchange rate, so that it is stable in value, backed and, most importantly, does not carry a default risk. These benefits, coupled with the advantages of existing DCM schemes – such as fast and easy settlement, no intermediaries, no bank account required and a certain level of anonymity – could greatly increase the appeal of a digital currency. Nonetheless, the roles of both central banks and commercial banks in the money landscape need to be clarified.

3.2 National Positions on Digital Currencies

Most central banks are following the development and implications of DCM and digital currency schemes with varying degrees of interest. This is being driven by a desire to gain a better understanding of the development and potential impact of DCM schemes like Bitcoin. Another driver is the fact that central banks are evaluating their role in an increasingly cashless society. So far, cash has been the only means of payment that central banks provide directly to the population. They are questioning whether they should review this policy in a society that is moving to digital. And the obvious answer would be to issue a digital currency in parallel to cash. But balancing benefits and risks, most central banks are not yet convinced to follow that route. In particular, they have no intention of contributing to a reduction in cash levels as central banks are indifferent to the means of payment the public may want to use. As can be seen in the next chapter, there are alternative solutions that capture some of the advantages of a digital currency (i.e. fast and easy settlement, therefore providing a platform for payment innovations) without the risk of introducing a new form of...
money. In other words, there are alternative possibilities to store value in a new way. Ultimately, the decision is market-driven and depends on what consumers and merchants accept or do not accept.

Figure 4 shows the position of central banks and/or individual countries on digital currencies. While some countries do not see the necessity of a digital currency, others embrace the concept and are even looking to create their own, i.e. regulated, version (e.g. China). The countries with the most advanced digital currency projects are listed in the following.

**Ecuador – Dinero Electronico**

Ecuador is among the first countries to introduce a central bank-issued digital currency, the “Dinero Electronico”. The concept is that anyone can open an account at the central bank, which is then accessible via mobile phone (not necessarily a smartphone). The Dinero Electronico is tied to the US dollar and is only available as a prepaid account, i.e. the account has to be charged upfront. There is an official website explaining how to subscribe to the Dinero Electronico. At USD 0.05 for private users and USD 0.20 for commercial users, the transaction fee is comparatively low.

**Sweden – eKrona project**

Sweden is one of the countries with the lowest cash circulation levels in the world. The Swedish Riksbank supports innovation in electronic payment as this is demanded by the market, but it has no intention of abandoning cash completely. The eKrona project, which is still at an exploratory stage, focuses on analyzing the impact of a digital currency, addressing issues such as whether commercial banks should be involved, whether interest should accrue and how financial stability could be guaranteed.

16 http://www.sri.gob.ec/web/guest/dinero-electronico
Canada – Project Jasper

Project Jasper is a joint project between the Bank of Canada and partners like Payments Canada, R3 and Canadian commercial banks. They expect larger changes in the payment landscape due to new technologies (distributed ledger), a trend that is also largely driven by changing customer needs and the entrance of new players in the market. Similar to Sweden, the focus is on understanding the impact of a Canadian digital currency but also the potential of distributed ledger technology to optimize the existing settlement systems.

Tunisia – eDinar

The Tunisian postal service was awarded a license by the central bank to introduce an electronic version of the dinar, the eDinar, based on the solution delivered by the Swiss-based fintech Monetas. The primary function of this solution is to enable foreign money transfers via mobile phones (similar to M-Pesa with the major advantage of lower fees).

Senegal – eCFA

The commercial bank Banque Régionale de Marchés together with the fintech eCurrency Mint Limited has launched a joint project to investigate a common digital currency for eight West African countries using the CFA franc. The intention is to support the largely unbanked population by giving them access to better financial services than would be available based on the existing banking infrastructure.

Barbados

In 2016, Bitt Inc. (fintech from Barbados) introduced a mobile payment system based on blockchain for the (largely unbanked) population. The intention is to create a pilot project for the entire Caribbean region, which has a rather weak banking infrastructure overall.

China

The People’s Bank of China is currently testing a prototype digital currency\(^\text{17}\) with mock transactions between the central bank and some of the country’s commercial banks. The expectation is that a digital currency would lower the cost of payment transactions and provide greater oversight. A central bank-issued digital currency could become an important alternative to privately owned payment platforms like Alipay and WeChat, which are very successful in China. Irrespective of this prototype project, it is estimated that most Bitcoins are possessed by Chinese citizens.

3.3 Benefits of a Digital Currency Issued by a Central Bank

There are currently only very few firm plans to introduce true digital currencies, i.e. under the full control of a central bank (either issued by the central bank itself or issued by a commercial provider under license by and regulation of a central bank). Such a concept would indeed have certain advantages.

Regulated alternative to digital community money

Since digital currencies would provide the same benefits as DCM with the added backing of a central bank (which would make them less volatile), it is very likely that they would be more attractive to users. In the mid to long term, this could squeeze DCM schemes and consequently reduce the economic risk that a DCM might potentially present. It has to be stated though that even without a measure like this, the economic impact of DCM is still very small (see chapter 2.1 for more details).

Potentially lower cost than cash

The cost of cash is one argument that is fueling the debate in favor of abandoning cash. There are multiple studies that publish the cost of cash. In Germany, for instance, the cost of cash amounts to 10 billion euros per year, the largest portion of which is generated in retail in the form of handling costs. An electronic alternative that would be very close to cash in the public perception could therefore cannibalize cash usage and ultimately reduce cost. But it is currently unclear as to whether a digital currency would indeed be cheaper than cash. One element that needs to be taken into consideration is the fact that digital currency solutions would rely on the existing private infrastructure (e.g. the user’s smartphone), and these costs are not included in the calculations.

Solution for reduced availability of cash in rural areas

In rural areas, even in developed countries, people find it more and more difficult to access an adequate supply of cash. Bank branches continue to vanish and a rural population – which is often elderly – are rarely mobile enough to travel large distances to reach ATMs in adjacent towns. Small shops in rural areas (such as butchers and bakeries) are often not big enough to cover payment card fees as they already work on very tight profit margins. For these areas, a digital currency issued by a central bank – and therefore trusted – could be a viable solution, assuming sufficient mobile phone and Internet coverage and acceptance of mobile payments by the population. In addition, ease of use is a prime requisite for financial inclusion and therefore a strong argument for cash usage.

However, there are alternative ways to supply these areas with cash, for instance with mobile “banking buses” that drive through villages and provide financial services including cash withdrawal. Another option would be cashback solutions at supermarkets (where the customer is not even obliged to buy anything).

Financial services for unbanked populations

Especially in developing countries, large parts of the population do not have bank accounts. The majority of payments are settled in cash, which of course is only possible if the two parties are at the same location. Long-distance money transfers are difficult and this gap has led to the development of solutions like M-Pesa. Its success in Kenya shows that there is a need for at least these kinds of financial services. A digital currency could serve here as an alternative, also providing greater security against theft. The rather poor success of M-Pesa in countries such as India, mainly due to a lack of trust in the service provider among citizens, shows that schemes such as this are heavily dependent on maturity of the underlying infrastructure.

18 https://www.welt.de/finanzen/article116392426/So-viel-kostet-die-Deutschen-ihr-Bargeld.html (German only)
Increased monetary information available to the central bank

Especially in largely unbanked countries, central banks have very limited information about the flow of money and therefore about supply and demand. A digital currency based on a distributed ledger would provide more information and even real-time insights, while remaining at least partially anonymous. This information would be very valuable in improving monetary policy for instance. As central banks are viewed as administrative bodies with no interest in commercializing or exploiting the data they collect, the general population would be more likely to confide personal data to central banks than companies with commercial interests.

Interest accumulation

A digital currency could be designed to bear interest. The interest accruing on a digital currency could of course also be negative. For central banks, this would have the advantage of overcoming the zero-interest lower bound, as cash by design has zero interest and is always an alternative for citizens if interest on other forms of money (like deposit money) falls too far into the negative. Of course, this advantage could only be realized if cash is more or less abandoned and enjoys little or no acceptance among end users.

3.4 Risks that Digital Currencies Present to the Economy

A digital currency has both upsides and downsides. It is highly liquid and could be converted very quickly from one form of money to another or easily moved on a global scale. As discussed in the previous chapter, existing DCM solutions like Bitcoin are, to a very large extent, used to store value or speculate and not necessarily to perform payments. But even as both the number of DCM solutions as well as their value continues to rise, their total market capitalization is still several orders of magnitude smaller than the kind of volume needed to significantly impact macroeconomic developments. However, a digital currency issued by the central bank of an industrialized nation could quickly become large enough to influence the economy and this would introduce new risks. These are outlined in the following.

Potential new role for central banks

People might find it more convenient to hold their short-term liquidity in default-free, fee-less digital currency schemes instead of depositing it at a bank. If employers agree to send money directly to the digital wallets of employees, and they could easily pay all their bills from their digital wallets, many people would probably no longer want to have bank accounts. Consequently, central banks would find themselves acting as substitutes for commercial banks and payment system providers. In the extreme case, this could lead to a one-bank system. The pros and cons of narrow banking are discussed in various papers (such as 19) but the question has yet to be addressed as to whether central banks are able or willing to provide basic financial services to the public. These services would probably include credit assessments, etc.

Increased risk of bank runs

A digital currency designed as an adequate alternative to cash would have the advantage that it could be withdrawn from a bank deposit account more quickly than cash, and stored in the cloud or a distributed ledger more safely than “under the mattress”. If a bank or the entire banking system were to be hit by bad news, and this could even be fake news, many people might consider it safer to store their money in a default-free, convenient digital currency scheme provided by the central bank rather than a commercial bank deposit account. This bank run could result in now real, severe problems for the banking system.

Limited options to control cross-border money transfers

Many countries have regulations that limit the amount of cash that can be transferred out of the country without it being declared. In the EU, for instance, this limit is set at 10,000 euros. Above this limit, it is still legal to export cash but it has to be declared at customs. Any digital currency would – by design – be global, i.e. it could be easily moved around the globe, stored in the cloud or a distributed ledger and accessed from everywhere in the world. So traveling abroad would de facto mean that people take their digital currency with them as they could access it as easily from the foreign country as they could from home. Even though technical solutions to prevent this are conceivable, control over cross-border money transfers would need to be considered when designing a digital currency.

Risk of cyberattacks threatening trust in the currency

To date, successful cyberattacks have “only” compromised payment systems (albeit on a large scale in some instances such as the February 2016 breach of Bangladesh’s bank system and theft of 81 million dollars using the SWIFT messaging network), but never a currency itself. If the distributed ledger or any other technology that forms the basis of a digital currency were compromised, this would heavily undermine trust in the entire system. The basic question is: Would distributed ledger technology be safe enough to withstand even future attacks given that it could not be exchanged quickly once an entire money system had been built upon it?

3.5 Against What Assets Should a Digital Currency be Issued?

To avoid the above-mentioned bank runs, a central bank could decide to keep the amount of money represented by digital currency under its full control. It could decide what assets – and how much of them – it would buy against a digital currency, e.g. treasury bills. But this would lead to a difficult situation. If demand for a digital currency exceeds the volume the central bank would want to supply, the market price of the digital currency would rise, leading to a situation where the exchange rate relative to the base currency is no longer 1:1. The digital currency, even though it is backed by financial assets – unlike DCM – would now truly become a currency per se with its own value. This is probably not in the best interests of a central bank. For further discussion of macroeconomic impacts, refer to 20 21 22.

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21 http://www.bankofengland.co.uk/publications/Pages/speeches/2016/886.aspx
22 http://www.bankofengland.co.uk/research/Pages/workingpapers/2016/swp605.aspx
3.6 Can a Digital Currency Replace Cash?

As mentioned above, a digital currency could reduce cash circulation and maybe even pave the way to a cashless society. There is a lively debate around the pros and cons of abandoning cash; that subject is beyond the scope of this paper. Irrespective of the pros and cons, however, the question remains: Do digital currencies have the potential to replace cash?

This is of course a difficult question to answer and the answer may change over time, but in the short and medium term at least it is safe to state that this is rather unlikely. Discussions with many central banks have shown that they do not intend to replace cash with a digital currency even if they are considering introducing one. As long as a country does not decide to completely phase out cash, the decision will ultimately lie with the citizens. And even today, they have non-cash options that they may or may not prefer. Adding another digital money/payment option probably does not significantly influence the preference for cash versus non-cash payments.

Another aspect is anonymity, or more precisely “perceived anonymity”. Even if a digital currency was fully anonymous, people probably would not believe it as they assume anything they do with their smartphones can be tracked. To be on the safe side, they would probably still prefer cash if anonymity is a priority.

Last but not least, one should not forget that there are still many people without sufficient access to and knowledge of digital media – both of which are essential to use digital currencies. Even though this will change over time, it will not happen overnight. Ultimately, cash is the only means of payment that can be used anywhere, by any one without a supporting infrastructure.

4 Instant Payments as an Alternative to Digital Currency

As mentioned before, the main attractions of DCM and digital currency lie in fast and cheap digital money transfers as well as 24/7 availability of payments. In many of the currently established payment systems, a digital money transfer could take days and the systems are not always available.

But fast digital money transfers and permanent availability are not restricted to digital currency and DCM schemes. There are alternatives, such as instantaneous bank transfers, that provide the same benefits as a result of innovations to established payment systems. In other words, one could realize the main benefits of digital currencies without the risk of introducing a new form of money. Instant payments are a prime example.

Instant payments are well positioned to solve many of the problems that a central bank would face with a new digital currency. This chapter takes a closer look at instant payments, also assessing the extent to which they match the other value propositions of a digital currency such as cross-border payments, multi-currency payments, payments for people without a bank account and anonymity.
4.1 What are Instant Payments?

In simple terms, instant payments are payment solutions

- where digital money flows within seconds from one account to another,
- that are always available – 24 hours a day, 7 days a week, all year round, and
- that could be executed through an online bank transfer, a card payment at a POS or any other payment instrument.

The European Retail Payments Board (ERPB), chaired by the European Central Bank, has defined instant payments more precisely as "electronic retail payment solutions available 24/7/365 and resulting in the immediate or close-to-immediate interbank clearing of the transaction and crediting of the payee’s account with confirmation to the payer (within seconds of payment initiation). This is irrespective of the underlying payment instrument used (credit transfer, direct debit or payment card) and of the underlying arrangements for clearing (whether bilateral interbank clearing or clearing via infrastructures) and settlement (e.g. with guarantees or in real time) that make this possible."23

Daily experience confirms that digital money transfers are not usually instantaneous. Depending on the country, bank and payment scheme, digital money is rarely immediately credited to the payee's account. Due to the underlying backend systems, many of which are a few decades old, clearing and settlement runs are typically executed in batch modes. Clearing can be understood "as being the validation of the payment details, posting as being the credit and debit of the accounts and settlement as being the actual irrevocable exchange of funds; in line with the definitions provided by Swift."24 For a bank transfer in a country such as Germany, clearing is performed a couple of times a day, but settlement is processed in bigger batches and takes one working day.

The market for instant payments is fragmented as this service is not available in all countries. Sometimes a trusted third-party provider acts as a middleman between the customer and the bank in order to simulate the user experience of an instant payment.

Some third parties offer payment guarantees or immediate availability of funds in a non-banking account, e.g. by pre-funding before the underlying digital money transfer has been completed over the banking network. However, they charge rather high transaction fees for their service. PayPal is a good example.

4.2 Instant Payments – the “Cashless Cash”

Just because instant payments are faster does not necessarily mean they are better. Instant payments also carry a higher risk that must be managed. To explore the full potential of instant payments, it is necessary to have a closer look at their different use cases.

First of all, instant payments meet rising expectations for a convenient user experience as set by non-banking sectors. Consumers live in a world shaped by car-sharing services such

as Uber, streaming platforms such as Spotify, two-hour delivery services from retailers such as Amazon Prime Now and many more. Today’s consumers expect information to be accessible anywhere within seconds. However, in many countries it takes days before money transferred from one bank to another arrives at its destination. Payment transactions have to keep up with the accelerated pace of doing business in an increasingly digitalized world.

So how could real-time digital money transfers be realized?

Google is enabling their email service Gmail to send money as an attachment with Google Wallet. This service means that money can be sent and received as quickly as an email.

Buying a second-hand car from a private person or buying something from a flea market are just two scenarios where a complex payment infrastructure is not in place and cash is typically the only option. Instant payments would offer an alternative for such P2P payments as the payee can hand over the goods (e.g. the car keys) as soon as their account has been credited, much like a cash payment today.

If bank transfers could be processed in real-time, consumers would be able to pay by bank transfer at a supermarket till.

Late invoice payments, which could incur default fees, could be another use case for instant payments, as would just-in-time salary transfers to employees’ accounts. This would have the added benefit of decreasing a company’s working capital.

Instant payments would also be a good solution for payment on delivery, where the ordered item is paid for when it is delivered to the consumer’s door.

Another possible scenario would be regions where the payment infrastructure, including ATM and POS systems, is limited. Here payment cards would be of no use and unbanked citizens have little choice. With instant payments, mobile phones could replace the payment infrastructure, making it easy for citizens not only to communicate with each other but also to exchange money in a P2P and P2B context.

Consumers with a poor credit rating struggle to obtain approval for credit cards and have to contend with rejected transactions. In this use case, instant payments would allow payments to be performed without necessitating a credit rating check by third-party providers.

And what about the merchant? When using instant payments, a merchant receives the money directly after the payment transaction. This overcomes the current problem of handling rejected offline payments when the consumer has already walked away. In addition, merchants can improve liquidity management as they have immediate access to the money and do not have to wait till the next day. Merchants may also hope that transaction fees would be lower than is the case with today’s payment systems.

4.3 Today’s Instant Payments Landscape Around the World

The concept of instant payments is not new. Several national solutions exist for instant bank transfers, such as the one in the UK.
In 2008, a company called Faster Payments successfully introduced an instant payments method to the UK.\(^{25}\) Banks participating in the Faster Payments scheme offer their customers instant processing of bank transfers. The receiving party can see and access the funds within minutes (if their bank has joined Faster Payments as well).

Since its launch nine years ago, Faster Payments has been growing at a constant rate and now processes 15% of all transactions in the UK. This service has raised expectations around electronic payment services as shown in a 2015 survey.\(^{26}\) Today, 40% of UK citizens expect money to reach the recipient’s account within 5 minutes. Almost half of the people interviewed in the survey would be inclined to switch to a different bank if the new bank offered access to a faster and more convenient electronic payment service. Based on that finding, banks in the UK will only be able to keep their customers satisfied and thus retain their customers if they fulfil these expectations in relation to processing speed.

In 2014, Faster Payments built on its success and launched Paym to expand its offering from online banking to P2P mobile payments, also bringing mobile payments to small businesses and sole traders. Paym uses the Faster Payments infrastructure. In other words, Paym further improves the user experience offered by Faster Payments by not only speeding up the processing time in the background but also by enabling the customer to perform a transaction more quickly. Users have the added convenience of not having to disclose their account details as Paym works with their mobile phone number only. Furthermore, Paym users appreciate fewer trips to the ATM. According to consumer research in 2016, 80% of the almost 3.3 million active users would recommend Paym.\(^{27}\)

Moving forward, the success of Faster Payments may inspire other instant payment use cases such as pay-at-POS.

Faster Payments is not the first implementation of instant payments. The Zengin System, Japan’s main retail payment system, was launched as early as 1973 and has evolved since then.\(^{28}\) Initially only offering immediate settlement of bank transfers to domestic banks during banking hours, it is now in its sixth generation with almost 1,300 financial institutions participating. JBA and Zengin-Net have announced plans to launch a new platform in order to enable fund transfers 24/7.

\(^{25}\) http://www.fasterpayments.org.uk/
\(^{28}\) https://www.zengin-net.jp/en/zengin_net/zengin_system/
As can be seen in figure 5, there are other instant payments solutions that are live or being planned in various countries around the world. Although they are based on different underlying concepts, it is obvious that there is currently strong momentum for instant payments worldwide – driven by both banks and consumers. In order to prevent fragmentation and to encourage uniform implementation in the Single European Payments Area (SEPA), standardization activities to introduce regulations governing instant payments by November 2017 are already underway.

4.4 The European Solution – SEPA Instant Payments

The ERPB plans to introduce a regulation governing instant payments in SEPA. In 2014, the European Payments Council (EPC) was assigned the task of preparing a policy on Instant SEPA Credit Transfers (SCT\textsuperscript{inst}), set to become an important payment instrument in SEPA, based on the existing SEPA Credit Transfer standard using IBAN. It covers P2P payments, retail payments and online banking as well as cross-border payments within SEPA.

The SCT\textsuperscript{inst} requirements stipulate that the payee must be able to see and use the funds within 10 seconds after the transaction has been initiated. As banks in Europe are struggling with interchange fees, they would like to bypass global schemes by adopting SCT\textsuperscript{inst} transactions for POS use cases. In this context, consumers will be able to initiate a SCT\textsuperscript{inst} transaction with a payments app on their mobile phone at the POS instead of using cash or a card, which initiates an EMV transaction. In this case, the processing window needs to be reduced to two seconds.

4.5 Do Instant Payments Cover All Value Propositions that a Digital Currency Presents?

The innovative appeal of instant payments lies in fast digital money transfers and 24/7 availability. As mentioned at the beginning of this chapter, these are also the core advantages of a digital currency. Nevertheless, they are not the only benefits promised by a
digital currency. So to what extent could instant payments fulfill other core value propositions that a digital currency presents?

Cross-border and multi-currency payments
The topic of interoperability across different instant payments solutions, which is one of the objectives of SCT^inst, is a given for countries in SEPA. However, this is not currently being planned on a global scale although multi-currency transactions are becoming more relevant as globalization increases. For money transactions outside SEPA countries, the standard non-instant mechanisms still have to be used.

Looking to the future of instant payments, solutions could be based on distributed ledger technology in order to support cross-border and multi-currency payments at a much faster speed than is possible today. Currently, several financial institutions are involved in international bank transfers. In addition to the local banks of the debtor and creditor as well as the national clearing houses, transnational financial institutions such as central banks are also needed to manage the currency exchange. With distributed ledger technology, the debtor and creditor banks could trade different currencies directly in the marketplace. The DCM Ripple supports this concept.

Adequate supply for rural areas and payment instrument for unbanked citizens
As already mentioned in chapter 2, there is still a large number of unbanked people in the world. Instant payments, when combined with mobile money solutions, are promising in this context as they offer benefits similar to digital currencies.

The mobile financial service provider Target is a good example. Serving the unbanked population of Mexico, it fills the banking infrastructure gap in Mexico, as ATM and POS systems are rather scarce in rural areas.

Anonymous payments at the POS
Paying truly anonymously is very difficult regardless of the system used. Even though some systems might protect the consumer’s privacy better than others, the average consumer is not typically in a position to evaluate the technical details (see also chapter 3.6). This holds true of digital currency, DCM and instant payments schemes.

Assuming people trust the system, the issue is more about the focus of the desire for privacy. Consumers may want to stay anonymous to the merchant or the service provider or may not want to be tracked by government agencies.

Anonymity with instant payments methods can be partially achieved. So the buyer can remain anonymous to the merchant but full anonymity (as opposed to pseudonymity) is excluded by design. But this is also difficult to achieve with other digital means of payment.

5 Use Cases for DCM

Even though today’s DCM schemes are probably most often used to store value and not to perform payments, several new use cases could become especially attractive for DCM payments. Some of the 800+ different DCM schemes that exist today were designed specifically to address certain use cases.
This chapter takes a look at two promising applications, namely payment between machines and micropayments/nanopayments.

5.1 Machine-to-Machine Payments

We are moving towards a networked future where more and more machines and devices are interconnected over the Internet of Things (IoT) – whether that be in smart homes, smart factories, connected cars or smart cities. Machines will use services from other machines. But this presents a new problem. Machines do not typically have a bank account or credit card. This raises the question as to how one machine will pay for the services of another. There are certainly ways to use a conventional payment system and adapt it to M2M payments, but conventional payment systems have not been designed for this. DCM is indeed a promising solution for the world of IoT. This is especially true if DCM is combined with the other benefits of blockchain technology such as smart contracts. In the case of DCM, it is likely that it will be easier to integrate machines into the payment network than it would be with conventional payment schemes.

A payment system that fulfills the requirements of M2M payments might have a disruptive impact on business models. Particularly “pay per use” services over the IoT could drive a paradigm shift in many industries. Although manufacturers of machines and devices aim to deliver good quality, they try to ensure that their goods do not last too long. Long lifetimes reduce the need for customers to buy a new machine or device, which means no new revenue streams are created. To an extent, this dynamic represents a conflict of interests between the manufacturer and the consumer, who of course is interested in long product lifetimes. With “pay per use”, the interests of machine vendors and their customers align. The machine manufacturer would be the owner of the machine while it is in service and the user only pays the manufacturer when the machine is in operation. So it will be in the best interest of the manufacturer to design machines with long lifetimes and low downtime in a resource- and maintenance-efficient way. This ultimately also serves the environment by saving resources, and thus benefits society in general as well as governments.

Although some DCM schemes are a good fit for IoT and M2M use cases, Bitcoin does not seem to be a good solution for this scenario. IoT payments will soon require hundreds of thousands of payment transactions per day, most of which will be nanopayments of less than a euro. Bitcoin is limited to a few transactions per second and transaction fees would often exceed the transferred value. It is therefore generally desirable to have a DCM scheme that has no transaction fees or at least no fixed fees per transaction. In the calculation of DCM costs, the interchange fees and the exchange rate risk must also be taken into account.
5.2 Micropayments and Nanopayments

Imagine consumers had to accept terms and conditions or sign a contract before they could buy a newspaper at a POS. In fact, this is often the case – even for low-value e-commerce transactions known as micropayments. Obviously, this is not an ideal situation for consumers.

Consumers expect that all low-value transactions over the Internet should be as easy as cash payments at a POS. The idea of convenient micropayments is not new; in fact, it is as old as e-commerce itself. However, various hurdles have prevented widespread commercialization of micropayment schemes. The two main ones are outlined in the following:

- **Transaction fees**: One of the key problems is that the payment network is not free and must be financed, but even small transaction fees could be a problem if the transaction value is very low.
- **Poor user experience**: The user experience should be as convenient as cash payments, i.e. no signing of contracts, no additional steps, no reading and no compromising anonymity.

Therefore a successful micropayment solution needs to avoid transaction fees and ensure ease of business (contracting).

Both of these attributes are core benefits of blockchain technology: it is based on an inexpensive, decentralized network including smart contracts. But there are also other micropayment solutions that meet these criteria and solutions with similar but nonetheless different approaches. IOTA is a good example.

5.3 DCM for Machine Payments and Micropayments

IoT devices must be able to automatically pay minuscule amounts of money to one another in a seamless flow without influencing product design by necessitating additional hardware. IOTA is a DCM scheme designed especially for the IoT and M2M payments as well as micro- and nanopayments. IOTA has raised interest in the DCM community. It is designed to avoid
fees and to handle thousands of transactions per second. In order to achieve these goals, IOTA’s design diverged from that of a traditional blockchain-based DCM scheme. It still retains the core principles of the distributed consensus ledger, but it uses a different design in order to scale with the IoT ecosystem:

- IOTA has no blocks and therefore no blockchain. Everything is built on transactions.
- IOTA is not based on mining and therefore there is no payment to miners.

This raises the question as to how the network is sustained and able to process thousands of transactions in near-real time. IOTA builds on a core, innovative technology, which it calls the Tangle, to address these challenges. One of the basic concepts behind the Tangle is that a user who sends a transaction also has to confirm two other transactions chosen at random. This eliminates the need for miners. All IOTA tokens are pre-mined so no new coins are added to the system. The bigger the Tangle grows, the greater its performance. True decentralization is achieved as there is no separation of miners and users, unlike most of the other DCM schemes.

IOTA is probably one of the first steps towards an efficient M2M payment solution. It might evolve further or new solutions might be invented to solve the challenges of the machine economy. In general, one of the biggest advantages of DCM schemes and digital currencies is the fact that they provide a platform for financial innovation, either in the form of new money systems or the financial services that are built on top of these systems.

6 Conclusion

Even though DCM schemes are gaining momentum, they are still nowhere close to delivering the performance required by mainstream payment methods. Most people in the world have no holding in a DCM scheme such as Bitcoin and have no intention of acquiring one. Even though there are regular press reports about new merchants accepting Bitcoin for instance as a means of payment, the sheer fact that this information is considered newsworthy just goes to illustrate that DCM schemes are far from mainstream.

Central banks should nonetheless observe this phenomenon closely. Indeed, some are already evaluating whether they should introduce their own, regulated alternative, which would be a true digital currency. A digital currency would be attractive to central banks as it would allow them to support citizens on the digitalization journey. Today, the main means of interaction between central banks and citizens is cash. In societies where cash usage may be declining, central banks feel they should provide an alternative.

This does not mean that they intend to replace cash with digital currency or that a reduction in circulating cash would be significantly accelerated by a digital currency. Ultimately, it is a market decision as to whether cash is still used or not and the attractiveness of cash remains unchanged in large parts of the world.

A digital currency also bears significant risks and is more complex than it might appear in the first instance. Its high liquidity and mobility can have a significant macro-economic impact,
the consequences of which are difficult to foresee. Currently, hardly any central banks have firm plans to introduce a digital currency.

The basic innovation of blockchain-based DCM or digital currency solutions, which is fast and easy settlement, does, however, have the potential to improve existing inter-banking infrastructure without necessitating the introduction of new forms of money and the possible risks this could entail.

Known as “instant payments”, the capability of fast and easy settlement based on conventional deposit money is indeed an attractive alternative to digital currencies. From the user perspective, they may offer a similar experience to digital currencies. The ability to transfer and settle money within seconds could drive new payment use cases and innovative financial services. But these require new, enhanced security measures, including at the front-end in order to prevent fraud or unintended payments. Instant payments do not offer a “second line of defense” – once transactions are initiated, it becomes very difficult to block or retrieve them.

Beyond these arguments, DCM may still be attractive for various new use cases, in particular M2M payments and micropayments. In the world of IoT with billions of connected devices, machines will receive services from other machines, creating a need for direct and instant payment for these services. This is a paradigm shift for payment that could – as has happened in the past – trigger a real need for a new form of digital money.
## List of Abbreviations

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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ATM</td>
<td>Automated Teller Machine</td>
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<td>B2B</td>
<td>Business-to-Business</td>
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<tr>
<td>B2C</td>
<td>Business-to-Consumer</td>
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<td>DCM</td>
<td>Digital community money</td>
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<td>EMV</td>
<td>Europay MasterCard and Visa</td>
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<td>ERPB</td>
<td>European Retail Payments Board</td>
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<tr>
<td>IBAN</td>
<td>International Bank Account Number</td>
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<td>IOT</td>
<td>Internet of Things</td>
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<td>M2M</td>
<td>Machine-to-Machine</td>
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<td>P2B</td>
<td>Person-to-Business</td>
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<td>P2P</td>
<td>Person-to-Person</td>
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<td>POS</td>
<td>Point of Sale</td>
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<tr>
<td>PSP</td>
<td>Payment System Provider</td>
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<tr>
<td>SEPA</td>
<td>Single European Payments Area</td>
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<td>SCT&lt;sup&gt;inst&lt;/sup&gt;</td>
<td>SEPA Credit Transfer (instant)</td>
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