Central Bank Digital Currency Terminologies

line 1: 1st Given Name Surname line 2: *dept. name of organization* *(of Affiliation)* line 3: *name of organization* *(of Affiliation)* line 4: City, Country line 5: email address or ORCID	line 1: 1st Given Name Surname line 2: *dept. name of organization* *(of Affiliation)* line 3: *name of organization* *(of Affiliation)* line 4: City, Country line 5: email address or ORCID

This paper addresses the terminological ambiguity surrounding Central Bank Digital Currencies (CBDCs) in academic and practitioner discourse. Various terms, including electronic money, digital cash, digital currency, digital money, digital fiat money, and central bank cryptocurrency, are interchangeably employed to refer to CBDCs. This inconsistent nomenclature has resulted in confusion and misunderstandings in CBDC-related research, leading to potential errors in researchers' understanding of CBDCs. The main aim of this research study the terminologies to mention CBDC by researchers and practitioners. The research method used was a multivocal literature review. The result reveal that the terminologies used to mention digital currency issued by a central bank are digital money, official digital currency, digital currency, centrally banked cryptocurrencies, digital cash, digital central bank money, central bank digital currencies, central bank-issued cryptocurrency, central bank cryptocurrency, digital fiat currency, central bank-issued digital cash, sovereign digital currencies. This study could be helpful for future research in CBDC because researchers could use the terminologies found in this study to simplify the collaboration between academics and policymakers, namely central banks, industry, and software developers.

Keywords— Digital Currency, Central Bank Digital Currency, CBDC, Terminology.

insert (key words)

I. Introduction

Digital Currency (DC) is a currency available in digital or electronic form, not physical form [1], while electronic currency or money or cash, named e-currency or e-money or e-cash, is an electronic representation of central bank paper currency in the digital platform, for example, WeChat, Alipay, and M-Pesa to facilitate instantaneous peer-to-peer transfers of value in a way that was previously impossible in a variety of contexts [2].

Central Bank Digital Currency (CBDC) is defined as a new form of digital central bank money [29], a tokenized and digital representation of a sovereign currency [26], an electronic form of central bank money that can be exchanged in a decentralized manner [34], the universally accessible central bank issued money [24], and monetary value stored electronically that is a liability of the central bank [22].

The rise of private digital currency (cryptocurrency) such as Bitcoin puts the sovereignty of central bank-issued currency at risk, obliging central banks to research how to digitalize their money[1] and distribute it with security.

In March 2018, the Bank for International Settlements (BIS) proposed a high-level overview of the CBDC and its implications for payments, monetary policy, and financial stability, reflecting the initial thinking in this rapidly evolving area and a starting point for further discussion and research [3]. In January 2020, BIS published a survey applied to 80% of central banks in the world that are researching CBDC where they assumed that their purpose in researching CBDC are financial stability, monetary policy implementation, financial inclusion, domestic and cross-border payment efficiency, and safety/robustness payment system [4]. The last report [1] published in July 2023 pointed out that 88 central banks are researching retail CBDCs, 35 are researching wholesale CBDCs, four live retail CBDCs in the world, namely in Bahamas, Eastern Caribbean, Nigeria, and Jamaica, and several pilots in 37 jurisdictions covering both wholesale and retail CBDC.

Different terminologies such as electronic money, digital cash, digital currency, digital money, digital fiat money, central bank cryptocurrency, and other terminologies are being used by academic and practitioner researchers to mention a digital currency issued by a central bank, creating mistakes in CBDC understanding. If a researcher uses only one of these terminologies in a search string, essential reference papers cannot be found and included in the research. Otherwise, central banks and other policymakers' reports are using different terminologies to mention CBDC as digital currency, consequently, these several dominations could create mistakes in CBDC understanding.

This gap needs to be solved with a list of the terminologies used to mention CBDC providing a matrix of common CBDC terminologies used to improve CBDC research and understanding.

In this scope, we search for works that mention a list of terminology used to mention CBDC, accessible for economists, technologists, and lawyer researchers and experts, which can be used by a multidisciplinary area to discuss CBDC projects and design choices. We found one related work entitled "*A global perspective on central bank digital currency*" [5], where the authors discussed the critical considerations of CBDC design to balance benefits and risks, proposing a set of the best practices in CBDC design from a global perspective and a list of CBDC definitions. We didn't find any research paper that list the terminologies used to mention CBDC.

[1] Rise of CBDC updated in July 2023 - https://www.bis.org/publ/work880.htm

The paper is organized into five sections. Here, in section 1, we introduce the paper with the research relevance, objective, and structure. In section 2, we explain the research method methodology. In section 3, we present the results of the research question. In section 4, we discuss the results. Finally, we made the concluding remarks in section 5.

II. Research Method

In this section, we detail the research methodology.

The main aim of this research is to survey the conceptualization of the CBDC and propose a list of terminologies used by researchers and practitioners to mention CBDC.

We intend to find a response about **which terminologies describe CBDC.**

The research method used was the Multivocal Literature Review (MLR), defined by [6] as a form of the Systematic Literature Review that includes the grey literature (e.g., reports, white papers, discussion papers, and others) in addition to the published formal literature (e.g., journal and conference papers). We chose this research method because it provides summaries of academics' and practitioners viewpoints.

The MLR research method is composed of 3 steps: i) Planning, ii) Conducting, and iii) Reporting (see Figure *1*).

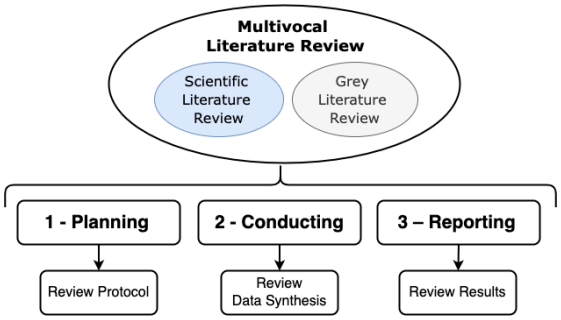

Figure 1 – MLR Process [12]

In the planning step, we made the review protocol which includes the review need or motivations, the research goal and questions, the search strategy, selection criteria, and quality evaluation. In the conducting step, we synthesized the data with the study's identification, selection, quality assessment, data extraction of the selected papers, data analysis, and data synthesis. Finally, in reporting step, we presented the results of the research question.

The search was done in August 2022. To find all relevant scientific literature, we adapted the search string in the most critical electronic digital libraries in software engineering: ACM, IEEE, Web of Science, Google Scholar, science@Direct, Scopus, Springer Link, and Semantic Scholar. To find all relevant grey literature, we search for reports, white papers, and discussion papers from policymakers such as Central Banks, the World Economic Forum (WEF), the Bank for International Settlements, and Technology providers, namely Hyperledger, CORDA, and R3. Then, we made the screening process by removing duplicates and analyzing the written language, the author identification, the data, the document title, and the accessibility.

The study selection was based on the inclusion and exclusion criteria [7]. We used the PRISMA guideline [8] to identify and select the study. This guideline is composed of four Steps: 1) Identification, 2) Screening, 3) Eligibility, and 1) Inclusion.

First, we identified 97 documents: 73 scientific studies and more 25 reports from policymakers and practitioners' organizations. Then, we made the screening process by removing duplicates and analyzing the written language, the author identification, the data, the document title, and accessibility. As a result, we screened 62 documents, removing 15 duplicate documents and 20 documents by title.

For eligibility analysis, we read all abstracts to analyze each study and if it is focused on the CBDC terminology. As a result, we eliminated 35 studies by abstract, and 12 documents by scope, meaning that these documents were unrelated to CBDC terminology.

After full read these 15 documents, we analyzed the document quality, according [7] and [9], as result, we removed six (6) documents by quality remaining nine (9) documents for data extraction.

After thoroughly reviewing the selected documents, we incorporated more seven documents through the snowballing process [10]. Finally, we included 16 papers for data extraction.

The extraction was done before a complete reading of selected reports. We extract the year, title, author, keywords, document type, and terminologies used.

III. Results

In this section, we present the result of data synthesis and the answer to the research question.

We Selected 16 papers including ten scientific papers and six grey literatures, comprising one discussion paper, four reports, and one white paper (see Figure 2).

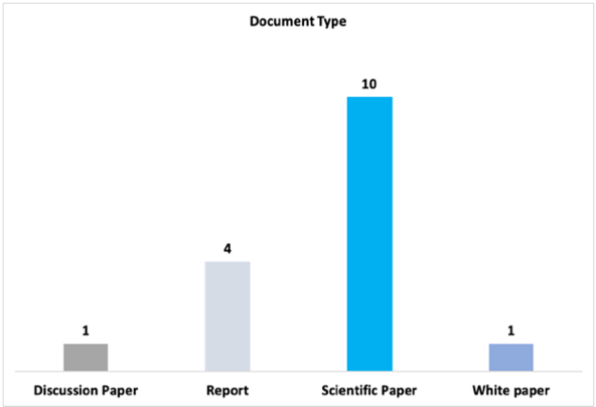

Figure 2 - Selected document type

The year of selected papers varies between 2008 and 2019 (see Figure 3).

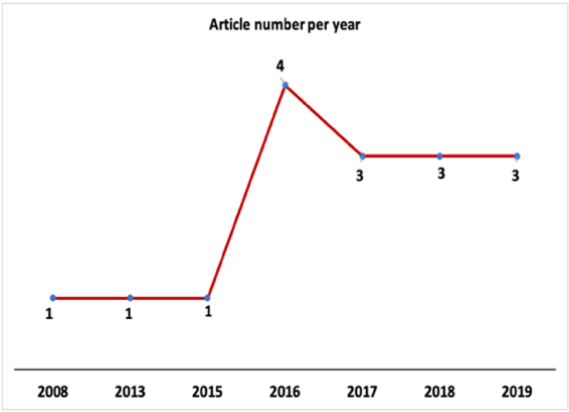

Figure 3 - Selected article per year

The papers selected are ordered by reference (see Table 1). The table information includes title, year of publication.

Table 1 – Selected Papers

Ref	Title	Year
[11]	Central bank digital currencies: a framework for assessing why and how	2016
[12]	Central bank digital currencies-design principles and balance sheet implications	2018
[13]	Designing new money-the policy trilemma of central bank digital currency	2017
[14]	Digital currencies	2015
[15]	Taxonomy and definition of terms for digital fiat currency	2019
[16]	Central bank digital currencies	2018
[17]	Digital Cash: Principles & Practical Steps	2019
[18]	Central bank issued digital cash	2018
[19]	Centrally Banked Cryptocurrencies	2017
[20]	Digital cash: why central banks should start issuing electronic money	2016
[21]	The evolution of currency: Cash to cryptos to sovereign digital currencies	2019
[22]	Fedcoin: A Central Bank- issued Cryptocurrency	2016
[23]	Central bank cryptocurrencies	2017
[24]	Digital central bank money and the unbundling of the banking function	2016
[25]	Official digital currency	2013
[26]	Dematerialized monies-new means of payment	2008

A. *CBDC Terminologies*

In this section, we present the results of the research question which are terminologies used to describe CBDC?

To answer this research question, we analyzed the terminologies used in each document. The results reveal that authors, in the same document, it's used several synonymous of the CBDC terminologies (see Table 2).

The terminologies were organized as a term matrix as proposed by [27]. We identified terminologies in title, abstract, and keywords of the selected papers.

We found 12 different terms used to mention CBDC (see Table 2). The table is organized by year of publication, in this scope, we observed that four papers with different terminologies were published in 2016 and the Central Bank Digital Currency become more widely used in 2019.

The first terms used are **digital money** and **digital currency** by Pîrjan and Petroşanu [26] in 2008. The authors call attention to the fact that an international digital currency would perturb existing economy and interfere with regional and local currencies, emphasizing the need for dematerialization of money and proposed a central bank digital money that act as an authentic economic discharging power that will be accepted by most economic agents which verified their authentication against a centralized or distributed authentication database, ensuring that it can be exchanged in physical money at different banks.

Table 2 – CBDC Terminologies

Year	Terminologies											
	Digital Money	Official Digital Currency	Digital Currency	Centrally Banked Cryptocurrencies	Digital Cash	Digital Central Bank Money	Central Bank Digital Currencies	Central Bank-issued Cryptocurrency	Central Bank Cryptocurrency	Digital Fiat Currency	Central Bank-issued Digital Cash	Sovereign Digital Currencies
2008	x		x									
2013		x	x									
2015			x				x					
2015				x								
2016			x		x							
2016						x	x					
2016							x					
2016			x		x		x	x				
2017			x						x			
2017			x				x					
2018					x						x	
2018							x					
2018							x					
2019	x		x							x	x	
2019												x
2019					x							

In 2013, Shoaib and all [25] analyzed the paper currency risks, counterfeit, printing, and transferring costs to argue the relevance of digital currency, using the terminology **official digital currency** to propose a digital currency issued and controlled by the state/central bank of a country explaining the functionality and the implementation framework which could be used in day to day transaction, emphasizing the security and economic advantages issues.

In 2015, the Bank for International Settlements (BIS) [14] used the terminology **digital currency** to discuss three key aspects relating to the development of the private digital currencies: The first, the risks of assets such as bitcoins with monetary characteristics similar to electronic central bank money, but not issued by a central banks and with the liability of any entity, but not backed by any authority. The second, the transfer mechanism typically via a built-in distributed ledger which is an innovative element within private digital currency schemes. The third, a variety of third-party institutions such as non-banks. These facts motivated the BIS

to propose that central banks need to consider digital currency as a potential policy response of the private digital currency challenge, investigating the potential uses of distributed ledgers in payment systems or other types of financial market infrastructure (FMIs).

In the same year (2015), the cryptocurrency like as Bitcoin built on decentralized blockchain-based transaction ledger, their benefits such as independence from political control and their limitation like as costs and scalability was studied by Denizis and Meiklegohn [19] who used the terminology **centrally banked cryptocurrencies** to propose a RSCoin as a cryptocurrency framework in which central banks maintain complete control over the monetary based on distributed set of authorities named mintettes to prevent double-spending. The RSCoin goal is to demonstrate the possibility of a modest degree of centralization using distributed ledger technology, proposing a new consensus mechanism.

In 2016, several authors discussed CBDC conceptualization using different terminologies, namely **digital cash** [20] [17]**, digital central bank money** [36]**,** and **central bank digital currencies** [11].

The **digital cash** terminology was proposed by Dyson & Hodgson[20] from Positive Money, who analyzed the declining use of cash and the rise of digital currencies such as bitcoin to argue that these issues are strong arguments for central banks to start issuing digital cash. These authors discussed the issuance of a digital currency supported by a centralized payment system or a decentralized "distributed ledger", the economic, the technological, and regulatory challenges faced by central banks when issuing a digital cash, and the implications of having two competing forms of electronic money in the economy namely, digital cash and bank deposits. The terminology **digital cash** is also used by Bordo and Levin [17] in 2019, arguing that digital cash could support the effectiveness of monetary policy, characterizing some potential steps for implementing digital cash via public-private partnerships between the central bank and supervised financial institutions.

The **digital central bank money** terminology is used by the Inter-American Development Bank [36], which analyzed the alternative organizational models for the payment system and their implications for the banking industry, concluding that innovations in digital payment technologies and digital currencies suggest extended access to central bank money (CBM) to firms and individuals.

The terminology more used today by researchers is the **central bank digital currency,** first mentioned in 2016 by the Bank of Canada [11] to discuss the rise of public authorities and central banks around the world that were monitoring the developments in digital currencies and studied their implications for the economy, the financial system and central banks. This central bank proposed a framework for assessing why a central bank should consider issuing a digital currency and how to implement it to improve the efficiency of the retail payment system.

In 2018, the Bank for International Settlements [16] published a report of an initial analysis of **CBDCs** investigated by the Committee on Payments and Market Infrastructures and the Markets Committee. This report analyzed the potential implications of the CBDC for payment systems, monetary policy implementation, and transmission, as well as for the structure and stability of the financial system, emphasizing that CBDC is not a well-defined term and it is used to refer to several concepts. However, it is envisioned by most to be a new form of central bank money which would be an innovation for general-purpose users (retail) but not for wholesale entities because central banks previously provide digital money in the form of reserves or settlement account balances held by commercial banks and certain other financial institutions at the central bank.

The R3 analyzed Bitcoin and proposed the terminology **central bank-issued digital** to explain Fedcoin, as a peer-to-peer electronic cash system that dates back to the original design goal of Bitcoin, which reintroduces one central point of control to the monetary system by ensuring a central bank the ability to set the supply of token on a Fedcoin blockchain, allowing the central bank to guarantee the one-to-one equivalence between digital Fedcoin token and physical notes.

In 2017, Ole Bjerg [13] evaluated three different scenarios for the implementation of CBDC in terms of their monetary policy implications and proposed several CBDC features, namely a digital currency issued by a central bank cash, reserve money, universally accessible, bank account money, and electronic. In the same year, Bech and Garratt [23], discussed the problem faced by several central banks in exploring or experimenting distributed ledger technology to research central bank crypto or digital currency, calling attention to confusion over what these new currencies are, and discussions often occur without a common understanding of what is being proposed. With this focus, they used the features presented by Ole Bjerg [13] to propose a money flower and taxonomy that identifies two types of the CBDC (retail and wholesale), differentiating them from other forms of central bank money, such as cash and reserves.

In 2018, the **central bank issued digital cash** terminology was used by Furch and Sojli [18], who investigated the technology options available for such implementations, concluding that issuing fiat currency as centrally issued digital certificates is the most likely path to success because digital certificates are the most similar technology to issuing physical cash, they can be secure, and allow for flexible delivery approaches, where the existing economic agents can continue their existing roles. In this same year, the Bank for International Settlements (BIS) [16] published a report using the **central bank digital currencies** to give a high-level overview of CBDC and their implications for payments, monetary policy, and financial stability and the inclusion of the CBDC in central bank balance sheet. The inclusion of the CBDC in the central bank balance sheet is then explained by the Central Bank of England [24], which explains the CBDC design principles and balance sheet implications.

In 2019, the International Telecommunication Union (ITU) Standardization Sector (ITU-T) - Focus Group Digital Currency, including Digital Fiat Currency, published a report written by Reiss [15] from the Central Bank of Brazil of money taxonomy, which uses the terminology **digital fiat currency** and includes several others terms such as money issuance and distribution, physical currency, social currencies, central bank-issued digital currency, digital money, digital currency, virtual currency, and stablecoin. In the same year, the **sovereign digital currencies** terminology was used by Didenko and Buckley [34], who analyzed existing forms of currency based on their functional characteristics and provided a comprehensive taxonomy of sovereign digital currencies integrating the likely forms of upcoming sovereign digital currencies into proposed taxonomy and outlines the corresponding challenges.

IV. Discussion

The CBDC is a new type of central bank money, which is being mentioned with different terminologies by academic and practitioners' researchers, creating mistakes in CBDC understanding.

The **terminologies** used to mention digital currency issued by a central bank are digital money, official digital currency, digital currency, centrally banked cryptocurrencies, digital cash, digital central bank money, central bank digital currencies, central bank-issued cryptocurrency, central bank cryptocurrency, digital fiat currency, central bank-issued digital cash, sovereign digital currencies.

This comprehensive CBDC terminology list elucidates the linguistic landscape and clarify the interpretation nuances across different terminologies. Such granularity in terminology is instrumental in aligning conceptual understanding.

The uncovered rich list of terminology ranging from legal, technological, and economic dimensions clarifies the elucidation of the distinct denomination of the CBDC, providing a comprehensive blueprint of the multifaceted nature of CBDCs.

V. Conclusion

This research study survey the most common terminologies used to mention CBDC using the multivocal literature review. This process has allowed us to discern commonalities, differences, and key nuances in the terminologies used.

We conclude that CBDC is mentioned by several terminologies which could create mistake about this type of digital currency.

This study solves the gap about the ambiguity surrounding Central Bank Digital Currencies (CBDCs) in academic and practitioner discourse. This research could be helpful for future research in CBDC because researchers could use the terminologies, found in this study as a basis to simplify the collaboration between academics and policymakers, namely central banks, industry, and software developers.

References

[1] H. Narayanan, "Is Future a Rule of Digital Currency???," *Int. J. Res. -GRANTHAALAYAH*, vol. 8, no. 8, pp. 96–106, 2020, doi: 10.29121/granthaalayah.v8.i8.2020.935.

[2] M. Brunnermeier, H. James, and J.-P. Landau, "The Digitalization of Money," *Ssrn*, no. 941, p. 35, 2019 [Online]. Available: http://www.nber.org/papers/w26300.pdf

[3] B. for I. S. BIS, *Central bank digital currencies*. 2018 [Online]. Available: www.bis.org

[4] R. Auer, G. Cornelli, and J. Frost, "Rise of the central bank digital currencies: drivers, approaches and technologies," *BIS Work. Pap.*, no. 880, 2020 [Online]. Available: https://www.bis.org/fsi/fsipapers17.htm

[5] D. K. C. Lee, L. Yan, and Y. Wang, "A global perspective on central bank digital currency," *China Econ. J.*, vol. 14, no. 1, pp. 52–66, 2021, doi: 10.1080/17538963.2020.1870279. [Online]. Available: https://doi.org/10.1080/17538963.2020.1870279

[6] V. Garousi, M. Felderer, and M. V. Mäntylä, "Guidelines for including grey literature and conducting multivocal literature reviews in software engineering," *Inf. Softw. Technol.*, vol. 106, no. May 2018, pp. 101–121, 2019, doi: 10.1016/j.infsof.2018.09.006.

[7] B. Kitchenham and S. Charters, "Guidelines for performing systematic literature reviews in software engineering," 2007 [Online]. Available: http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.117.471. [Accessed: 26-Nov-2019]

[8] A. Liberati *et al.*, "The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration," *J. Clin. Epidemiol.*, vol. 151, no. 4, pp. e1–e34, 2009, doi: 10.1016/j.jclinepi.2009.06.006. [Online]. Available: https://pubmed.ncbi.nlm.nih.gov/19631507/

[9] L. M. Kmet, R. C. Lee, and L. S. Cook, *Standard Quality Assessment Criteria for Evaluating Primary Research Papers from a Variety of Fields*, no. February. Alberta Heritage Foundation for Medical Research, 2004.

[10] C. Wohlin, "Guidelines for snowballing in systematic literature studies and a replication in software engineering," *ACM Int. Conf. Proceeding Ser.*, 2014, doi: 10.1145/2601248.2601268.

[11] B. S. C. Fung and H. Halaburda, "Central Bank Digital Currencies: A Framework for Assessing Why and How," *SSRN Electron. J.*, 2016, doi: 10.2139/ssrn.2994052.

[12] M. Kumhof and C. Noone, "Central Bank Digital Currencies - Design Principles and Balance Sheet Implications," *SSRN Electron. J.*, no. 725, 2018, doi: 10.2139/ssrn.3180713.

[13] O. Bjerg, "Designing New Money - The Policy Trilemma of Central Bank Digital Currency," *SSRN Electron. J.*, no. June, pp. 1–57, 2017, doi: 10.2139/ssrn.2985381.

[14] CPMI Committee on Payments and Market Infrastructures, "Digital currencies," *BIS*, no. March, pp. 1–34, 2018 [Online]. Available: https://www.bis.org/cpmi/publ/d174.pdf

[15] R. Architecture and W. Group, "Taxonomy and definition of terms for digital fiat currency," *ITU-T, Telecommunication Standardization Sector of ITU - Focus Group Digital Currency including Digital Fiat Currency*, 2019 [Online]. Available:

https://www.itu.int/en/ITU-T/focusgroups/dfc/Documents/DFC-O-012_Taxonomy and definition of terms for DFC.pdf

[16] BIS, *Central bank digital currencies*, no. March. 2018 [Online]. Available: http://file//localhost(null)%0Apapers3://publication/uuid/B47B3FF7-D88A-4403-9BD5-9E22746EAB8C

[17] M. D. B. A. T. Levin, "DIGITAL CASH: PRINCIPLES & PRACTICAL STEPS," *Angew. Chemie Int. Ed. 6(11), 951–952.*, vol. 3, no. 1, pp. 10–27, 2018 [Online]. Available: https://medium.com/@arifwicaksanaa/pengertian-use-case-a7e576e1b6bf

[18] A. Furche and E. Sojli, "Central Bank Issued Digital Cash," *SSRN Electron. J.*, 2018, doi: 10.2139/ssrn.3213028.

[19] G. Danezis and S. Meiklejohn, "Centrally Banked Cryptocurrencies." arXiv preprint arXiv:1505.06895, 2015 [Online]. Available: https://doi.org/10.48550/arXiv.1505.06895

[20] B. Dyson and G. Hodgson, "DIGITAL CASH: Why Central Banks Should Start Issuing Electronic Money," *Posit. Money*, pp. 1–36, 2016 [Online]. Available: https://positivemoney.org/wp-content/uploads/2016/01/Digital_Cash_WebPrintReady_20160113.pdf

[21] A. Didenko and R. P. Buckley, "The Evolution of Currency: Cash to Cryptos to Sovereign Digital Currencies," *SSRN Electron. J.*, vol. 42, no. 4, 2018, doi: 10.2139/ssrn.3256066.

[22] J. P. Koning, "Fedcoin : A Central Bank- issued Cryptocurrency," *R3 White Pap.*, 2016.

[23] Morten Bech and Rodney Garratt, "Central bank cryptocurrencies," *BIS Q. Rev.*, vol. September, no. September, pp. 55–70, 2017 [Online]. Available: https://www.bis.org/publ/qtrpdf/r_qt1709f.htm?mod=article_inline%0Awww.blockchain.info

[24] J. A. Ketterer and G. Andrade, "Digital Central Bank Money and the Unbundling of the Banking Function," *Discuss. Pap.*, no. IDB-DP-449, pp. 1–18, 2016 [Online]. Available: http://www.iadb.org

[25] M. Shoaib, M. Ilyas, and M. S. Hayat Khiyal, "Official digital currency," *8th Int. Conf. Digit. Inf. Manag. ICDIM 2013*, pp. 346–352, 2013, doi: 10.1109/ICDIM.2013.6693982.

[26] A. Pîrjan and D. M. Petroşanu, "DEMATERIALIZED MONIES – NEW MEANS OF PAYMENT," *Rev. Lit. Arts Am.*, vol. 3, no. 2, pp. 37–47.

[27] R. T. Watson, "a Nalyzing the P Ast To P Repare for the F Uture : W Riting a," *MIS Q.*, vol. 26, no. 2, pp. 2005–2008, 2002 [Online]. Available: http://www.springerlink.com/index/R777101802276537.pdf