

CENTRAL BANK DIGITAL CURRENCY (CBDC): A SENTIMENT ANALYSIS AND LEGAL PERSPECTIVE

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Abstract

Bank Indonesia plans to issue a digital Rupiah as a Central Bank Digital Currency (CBDC) development project. This study aims to review the perceptions of the existing literature regarding CBDC from a legal perspective. This study uses a qualitative method with a sentiment analysis approach. The research builds on 50 papers published by Scopus-indexed journals, the predominant body of literature as of December 12, 2022. The data is then processed using the SentiStrength software. The results of this study indicates that the dominant sentiment is neutral, followed by positive sentiment and then negative sentiment. This sentiment analysis is an overview that can serve as basic research for regulators, practitioners, and academics as valuable insights that can provide a better understanding of the scientific literature's perception of CBDC so that it can be considered in decision making. This research is the first study to conduct sentiment analysis of the scientific literature on the CBDC theme.

Keywords: *Central Bank Digital Currency, Legal, Literature Review, Indonesia, CBDC*

I. INTRODUCTION

Central Bank Digital Currency (CBDC) offers a significant possibility that the general public will have greater access to the financial sector due to technological improvements and ever-increasingly open access to digital banking. The financial industry is ready for innovation, which has the potential to shake up the central banking system and usher in a new era for consumers of financial products and services. Blockchain for instance is an innovation thought to have the potential to change the future of the global financial industry. Blockchain has shown this potential and laid the foundation for developing the idea of digital currency, including CBDC, which stands for central bank digital currency.¹

A CBDC is a digital obligation issued by a central bank publicly available to the general public. Not just the central bank of Indonesia but central banks worldwide are investigating the possibility of issuing CBDCs in their home nations. Bank Indonesia published a white paper on a proposal for a digital

¹ Berry A. Harahap et al., "Perkembangan Financial Technology Terkait Central Bank Digital Currency (CBDC) Terhadap Transmisi Kebijakan Moneter Dan Makroekonomi," *Bank Indonesia* 2 (2017): 1–80.

Rupiah in November 2022. This plan was known as the Garuda Project. With the help of this white paper, Indonesia is attempting to initiate, study, prepare, and test a CBDC.

Other nations are working on CBDCs through the use of pilot projects, and some of those nations have even started using CBDCs as their national currency. One of the countries that is considering adoption of a CBDC is Sweden with the E-Krona. This may be done to minimize the country's reliance on foreign electronic financial systems like Visa and Mastercard. To address structural concerns inside its electronic financial system, Uruguay is also contemplating creating a CBDC known as the E-peso. The Commonwealth of the Bahamas is counted among the nations that have ratified CBDC. The Bahamas government boosted the number of digital transactions in 2020 by launching a new currency known as the Sand Dollar. This occurred despite the existence of an established electronic banking system. The Republic of the Marshall Islands created a CBDC called the Sovereign (SOV) to lessen its reliance on the United States Dollar. E-CNY, China's national digital currency, is the world's most widely used CBDC system (digital yuan). Additionally, the governments of Cambodia and Nigeria each launched their own CBDCs, which were given the names Bakong and E-Naira, respectively.²

The digital equivalent of banknotes that a central bank issues is CBDC. The primary reason for issuing this new type of new money differs from country to country, but one is to make new kinds of money available to the public allowing consumers to have more options to choose from. This is because CBDCs are not significantly distinct from traditional banknotes. However, implementing digital transformative technologies is anticipated to make it simpler, more efficient, and less costly to transfer monetary value. The general public now has the option, thanks to CBDCs, to derive formal transactional benefits from various types of digital money already in circulation.³

The entire population can use CBDC, just like they may use any other kind of money, to make digital payments. On the other hand, because it is a central

² Yeonouk Chu et al., "Review of Offline Payment Function of CBDC Considering Security Requirements," *Applied Sciences* 12, no. 9 (2022): 1–28, <https://doi.org/10.3390/app12094488>.

³ Hongyi Chen and Pierre L. Siklos, "Central Bank Digital Currency: A Review and Some Macro-Financial Implications," *Journal of Financial Stability* 60, no. February (2022): 100985, <https://doi.org/10.1016/j.jfs.2022.100985>; Orla Ward and Sabrina Rochemont, *Understanding Central Bank Digital Currencies (CBDC)*, Institute and Faculty of Actuaries, 2019, <https://eprint.iacr.org/2018/612%0Ahttps://s3.us-east-1.amazonaws.com/files.cnas.org/documents/CNAS-Report-Chinas-Digital-Currency-Jan-2021-final.pdf%0Ahttps://doi.org/10.1016/j.future.2019.05.019%0Ahttps://www.actuaries.org.uk/system/files/field/document>.

bank liability, CDC is the most secure digital asset available to the general public. No credit or liquidity problems will be associated with it.⁴

On the other hand, although central banks in individual nations have a variety of motives for implementing CBDC projects, the fact remains that very few of these initiatives appear to be motivated by particular client use cases or requirements. Consequently, the presence of CBDCs and the growth of CBDCs to this point have focused more on the objectives and goals of the system than on the specific requirements or benefits for individual customers. CBDCs can potentially provide central banks with the ability to address a variety of systemic goals, including but not limited to ensuring financial inclusion, reducing fraud and money laundering, guaranteeing sovereign alternatives to digital payments, stimulating local payment innovation; and developing new instruments for monetary policy.⁵

Since 2017, several studies have shown that central banks are actively studying the possibility of launching digital currencies, which will eventually be accepted everywhere as legal tender and can be used by anybody.⁶ This demonstrates that some nations are designing CBDC projects, while others have not yet decided whether or not they would adopt a CBDC. In this context, the purpose of this study is to conduct a sentiment analysis of the perception of the scientific literature on CBDC, particularly from a legal standpoint, in order to identify research trends of CBDC, including the potential, benefits, and risks of CBDC from a variety of perspectives. Knowledge and description of the extent to which the growth of perceptions of CBDC research around the world is illustrated through chosen published articles are one of the benefits that can be achieved from this research. This is one of the benefits that can be obtained from this research.

⁴ Jooyong Jun and Eunjung Yeo, "Central Bank Digital Currency, Loan Supply, and Bank Failure Risk: A Microeconomic Approach," *Financial Innovation* 7, no. 1 (2021), <https://doi.org/10.1186/s40854-021-00296-4>.

⁵ Jay Cullen, "Economically Inefficient and Legally Untenable: Constitutional Limitations on the Introduction of Central Bank Digital Currencies in the EU," *Journal of Banking Regulation* 23, no. 1 (2022): 31–41, <https://doi.org/10.1057/s41261-021-00162-4>; Muhammad Edhie Purnawan and Retno Riyanti, "Significant Effect of the Central Bank Digital Currency on the Design of Monetary Policy," *Jurnal Ekonomi Indonesia* 8, no. 1 (2019): 125–51, <https://doi.org/10.52813/jei.v8i1.15>; Bastian Muzbar Zams et al., "Designing Central Bank Digital Currency for Indonesia: The Delphi-Analytic Network Process," *Buletin Ekonomi Moneter Dan Perbankan* 23, no. 3 (2019): 411–38, <https://doi.org/10.21098/BEMP.V23I3.1351>.

⁶ Harahap et al., "Perkembangan Financial Technology.

II. LITERATURE REVIEW

In its most basic form, the creation of a digital currency has been inseparable from the aim of preventing the government from maintaining a monopoly on the issuance of money. For example, the launch of Bitcoin in 2008 was an attempt to end the monopoly central banks hold on creating new money. Since 2008, Bitcoin and several other digital currencies have emerged as alternate payment methods, supplementing the conventional currency of the nation. These currencies represent a significant step forward for conventional payment systems, as they can transform physical currency into its digital equivalent, permit private issuance, and foster technological progress.⁷

Digital currency is an asset that is maintained in electronic form and essentially performs the same functions as physical cash, which includes facilitating payment transactions. In 2015, the digital currency was defined as an asset. At first, the only kinds of digital currency used widely were virtual currencies, which could only be produced by private individuals or organizations.⁸ Central banks can fulfil their responsibility in guaranteeing an efficient payment infrastructure and can do so more effectively with the help of CBDCs.

According to the definition provided by the International Monetary Fund (IMF), a CBDC is a digital representation of a sovereign currency that the central bank of a jurisdiction or another monetary authority has issued. A variety of commercial firms manage the existing electronic financial system. However, under the CBDC system, the central bank directly supervises the entire circulation of cash. This is a fundamental distinction between the CBDC and current systems.⁹

The Bank of England has also defined CBDC as electronic central bank money that is more widely accessible than reserves, potentially has much greater functionality for retail transactions than cash, has a separate operational structure from other forms of Central Bank money, which allows it to serve different core objectives, and may be subject to interest, assuming realistically paying rates that will differ from reserve rates.¹⁰

The fact that CBDCs are directly backed by deposits made at a central bank or by the government, fundamentally sets them apart from other conventional forms of digital currency. As a result, CBDCs provide a consistent value and

⁷ Arto Kovanen, "Competing with Bitcoin - Some Policy Considerations for Issuing Digitalized Legal Tenders," *International Journal of Financial Research* 10, no. 4 (2019): 1–16, <https://doi.org/10.5430/ijfr.v10n4p1>; Zams et al., "Designing Central Bank.

⁸ Harahap et al. "Perkembangan Financial Technology".

⁹ Chu et al., "Review of Offline Payment.

¹⁰ Ward and Rochemont, *Understanding Central Bank*.

work toward combining the advantages of common official currencies, such as trust, regulatory consistency, and audit transparency.¹¹

Implementations of CBDCs may use any of a number of different technological models, the specifics of which are determined by a central bank's goals and the use cases in question. CBDCs do not have to rely on decentralized technology because they may be managed by central bank agents and distributed using digital ledger technology. This eliminates the need for CBDCs to rely on decentralized technology. CBDCs can either be kept on physical devices like cards or electronic wallets or take the form of wholly digital book entries. In addition, CBDCs can be issued as stand-alone tokens, which can be kept at any one of several different operators, or as account-based assets held directly at a central bank.¹²

In 2014, the Bank of England was the first central bank to start worldwide conversations on the potential introduction of a central bank digital currency. In subsequent years, the central banks of other nations, including the Bank of Sweden, the Bank of Canada, the Bundesbank, the Federal Reserve of the United States, and the Monetary Authority of Singapore, began investigating the potential of legally issuing CBDCs. At the beginning of 2019, over sixty central banks worldwide were investigating digital currency issuance. These central banks included the Federal Reserve of the United States of America, the Central Bank of Canada, the Central Bank of Japan, the People's Bank of China, the Central Bank of Sweden, and the Central Bank of Russia.¹³ After that, the E-Krona Project came into existence as one of the earliest retail CBDC projects anywhere in the world, serving as a source of information for comparative studies in some other nations, particularly in the process of preparing the legal framework for the issuance of CBDCs.¹⁴

CBDC is an electronically recorded monetary value (digitally or as an electronic token) that reflects a central bank's obligations and can be used to make payments. At its core, a CBDC is an electronic representation of a central bank's liabilities. The necessity of a CBDC must be taken into consideration while determining the qualities, both functional and technological, of a CBDC.

¹¹ Ansgar Belke and Edoardo Beretta, "From Cash to Private and Public Digital Currencies: The Risk of Financial Instability and 'Modern Monetary Middle Ages,'" *Economics and Business Letters* 9, no. 3 (2020): 189–96, <https://doi.org/10.17811/ebl.9.3.2020.189-196>.

¹² Dmitrii A. Kochergin and Alsu I. Yangirova, "Central Bank Digital Currencies: Key Characteristics and Directions of Influence on Monetary and Credit and Payment Systems," *Finance: Theory and Practice* 23, no. 4 (2019): 80–98, <https://doi.org/10.26794/2587-5671-2019-23-4-80-98>.

¹³ *Ibid.*

¹⁴ Pangyue Cheng, "Decoding the Rise of Central Bank Digital Currency in China: Designs, Problems, and Prospects," *Journal of Banking Regulation* 13, no. 7 (2022), <https://doi.org/10.1057/s41261-022-00193-5>.

From the point of view of payments, a CBDC might be implemented in the form of, for instance, a digital payment scheme that is analogous to e-money and would focus on the interests of consumers and merchants. CBDCs may also be implemented as money injected by a central bank into the financial system. This would make real-time securities trading and connected ownership management based on blockchain technology possible.

CBDC has the potential to serve as a reliable unit of account, a medium of trade or inexpensive means of payment, a secure store of value, and even as a kind of legal tender. In addition, CBDC has the potential to alter all aspects of the monetary system and make it easier to implement a systematic and open-minded monetary policy. This is possible because access to CBDC is non-exclusive, meaning that anyone with access to the related technology can use a CBDC; CBDC also bears interest rates, and CBDC interest rate adjustment in following economic needs can encourage actual price stability. The value of the CBDC will stabilize over time concerning a wide variety of consumer price indices, contributing to the maintenance of price stability. The initial purpose of Bank Indonesia was to maintain stability in the value of the Rupiah. However, with the introduction of CBDCs, the central bank could focus on maintaining stability in prices for goods and services in the real economy (price stability).¹⁵

The issuance of digital currency by central banks is undoubtedly one of the most significant implications that can be drawn from the use of distributed ledger technology in central bank operations. This pertains to the fundamentally new money equivalents that central banks create as opposed to the mere modernization of technology that is being used to supply services by central banks. However, the financial risks involved in integrating digital currencies into the existing monetary and credit system is not yet fully understood. These risks affect regulators and other parties involved in the existing monetary, credit, and payment systems¹⁶

III. METHODOLOGIES

Data from scientific publications published in research journals until December 12, 2022, inclusive, and were indexed by Scopus to discuss CBDC themes and legal views were used for this study. A qualitative approach with descriptive statistics on literature research on fifty previously published papers relating to CBDC and its legal viewpoint was utilized for this study.

¹⁵ Purnawan and Riyanti, "Significant Effect."

¹⁶ Kochergin and Yangirova, "Central Bank Digital."

The qualitative research method employed in this study is based on a post-positivist philosophy. This method can be used to analyse the condition of natural things (as opposed to experiments), and the researcher is the primary instrument used in this method. Data gathering methods were carried out by triangulation (combined), data analysis methods were inductive and qualitative, and qualitative research findings emphasized meaning rather than generalization¹⁷.

Descriptive research includes qualitative research. There is no attempt to validate or invalidate hypotheses based on the data obtained (if any). The research results can be presented as a description of obvious symptoms rather than as numerical values or coefficients of correlation between variables.¹⁸ The study of the gathering, compilation, and reporting of summary research data falls under the purview of the statistical subfield known as descriptive statistics. It is necessary to accurately and consistently summarize the data to use it as a foundation for making various decisions. This can be done in tables, diagrams, or graphic presentations. This research was carried out with the assistance of Microsoft Excel.

In this particular investigation, a sampling method known as purposeful non-probability sampling was utilized. A purposive sample is a sample that is designed to assist in better comprehending particular pieces of information. This sample can be broken down into two distinct categories: an assessment sample, which selects members of the sample based on whether or not they meet certain criteria based on previous records or research objectives that need to be accomplished, and a quota sample, which is a sample selected based on a certain quota or category that describes the population dimension (proportion). Both types of samples can be used to gather information about the population.

In this study, the method of analysis utilized was known as sentiment analysis or opinion formation. Research that is widely utilized to measure how the general public feels about a certain topic is called sentiment analysis. Sentiment analysis is a subfield of research that falls under the umbrella of Text Mining. It first saw widespread application back in the early years of 2002. Analysis of sentiment is a type of research frequently used to measure people's feelings concerning a topic. Fifty papers were chosen as data sources because of their discussion of CBDC from a legal standpoint. SentiStrength is a piece of software frequently utilized in sentiment analysis research. It is being used

¹⁷ Sugiyono, *Metode Penelitian Kuantitatif Dan Kualitatif Dan R&D*, Alfabeta Bandung, 2010.

¹⁸ Aisyah As-salafiyah, Aam Slamet Rusydiana, and Muhammad Isa Mustafa, "Meta Analysis on Mosque Economics," *Library Philosophy and Practice (e-Journal)*, 2021.

in this particular study to assess sentiment maps based on the outcomes of CBDC perception paper data and legal perspectives.

In sentiment analysis, the polarity of a particular word can be determined by calculating the relative frequency of occurrence of the word with a particular group of words, the polarity of which is maintained invariably (for example, a positive word such as “good” or a negative word such as “bad”). In this way, the polarity of the word can be compared to the polarity of the group of words. In this sense, one might describe an opinion as having positive polarity, for instance, if the majority of the opinion’s terms are associated with the word “good” more strongly than they are related to the word “bad.”

Pointwise Mutual Information (PMI) statistical metrics are utilized across most applications of this technology. The PMI is defined as the following when placed between the words u and v :

$$P M I (u, v) = \log_2 \left(\frac{Pr(u \wedge v)}{Pr(u) \cdot Pr(v)} \right)$$

The value of $Pr(u \wedge v)$ indicates the likelihood that u and v will appear together. If u and v are not statistically reliant on one another, then the likelihood that they will occur together is denoted by $Pr(u) \cdot Pr(v)$. Therefore, the ratio in the equation reflects the degree of statistical dependence between words. However, the log ratio reveals how much information is communicated if the words appear next to one another in the sentence.¹⁹

To put it more simply, text analysis, rather than numerical processing, is used in the sentiment analysis of the text that ultimately generates research data. Subjectivity categorization, detection orientation, shareholder opinion, and target identification are the three primary sub-processes that makeup sentiment analysis. Because there are so many different places where data can be found in English, the majority of the work that has been done on sentiment analysis has been done in English. SentiWordNet and WordNet are two resources that are frequently utilized in the process of sentiment analysis. The classification of the polarity of text at the level of documents, sentences, or features and aspects is an important task in sentiment analysis. This involves determining whether the opinions expressed in documents, sentences, and feature entities have positive, negative, or neutral aspects. In addition, sentiment analysis can be used to express other emotions, such as happiness, anger, or sadness, to

¹⁹ Jonnathan Carvalho, Adriana Prado, and Alexandre Plastino, “A Statistical and Evolutionary Approach to Sentiment Analysis,” *International Joint Conference on Web Intelligence and Intelligent Agent Technology*, 2014, 110–17, <https://doi.org/10.1109/WI-IAT.2014.87>.

provide an analysis that can serve as a reference when forming impressions of various topics.²⁰

IV. SENTIMENT ANALYSIS OF THE EXPANDING SCIENTIFIC LITERATURE ON CBDC

Based on the findings of the literature review, which is the target of inquiry in this sentiment analysis, several countries have investigated CBDC and attempted to apply it in their respective countries. CBDC was one of the key topics debated at the G20 TechSprint, held in Indonesia in 2022 and co-hosted by Bank Indonesia and Singapore's BIS Innovation Hub. CBDC was part of the third iteration of a long-term global hackathon. Even if there is a very high requirement for central banks to investigate CBDCs, the establishment of the G20 TechSprint Initiative 2022 with the theme of CBDC intended to find the proper design. This goal will be accomplished in 2022. In order to be effective, the actors engaged need an understanding of the intersections between policy goals, concerns, and technology.

Continued progress is being made in digital currencies, one of which can be found in cryptocurrencies. The existence of cryptocurrencies can pose a threat to central banks if the general public begins to use them more frequently. To combat this threat, central banks need to innovate by releasing CBDCs that have their chain and are distinct from cryptocurrencies. The value of the CBDC is equivalent to the value of the nation's fiat currency (notes or coins). On the other hand, cryptocurrencies are digital currencies designed to work as a medium of exchange. They were initially released in 2009. Although a currency that a central bank issues may use blockchain technology in the same way that cryptocurrencies do, many features make it distinguishable from cryptocurrencies. These features include an unlimited supply, controlled transactions, inflation, regulation, the ability to expire, a single jurisdiction and permission from the central bank for use by individuals.

In addition to being distinct from cryptocurrencies, CBDCs are also distinct from the electronic money that financial technology companies' issue. This is because CBDCs are issued by central banks, making them more secure than electronic money issued by financial technology companies, even though both types of currencies can enable digital payments for the general public.

This study attempts to conduct a sentiment analysis on previously published research that are indexed by Scopus and explore CBDC topics from a legal point of view. An explanation of what sentiment analysis is and how it is used

²⁰ Aam Slamet Rusydiana and Lina Marlina, "Analisis Sentimen Terkait Sertifikasi Halal," *Journal of Economics and Business Aseanomics (JEBA)* 5, no. 1 (2020): 69–85.

may be found in the section devoted to methodologies. Simply put, sentiment analysis is a method of research that measures how different sources “feel” about a particular topic. In this study, an investigation into fifty different journal publications was conducted using secondary data sources. SentiStrength was the data processing program utilized for this research project.

It was observed that the outcomes of perceptions can be categorized into five different sorts of ratings based on the findings obtained from the SentiStrength calculations performed on each piece of literature. A high positive (very good) rating, a positive (good) rating, a neutral (neutral) rating, a negative (bad) rating, and a high negative (very bad) rating make up the sentiment rating. The following figure displays the findings from the relevant literature of an investigation of CBDC users’ sentiments and legal perspectives. These findings are broken down into five distinct sorts of categories:

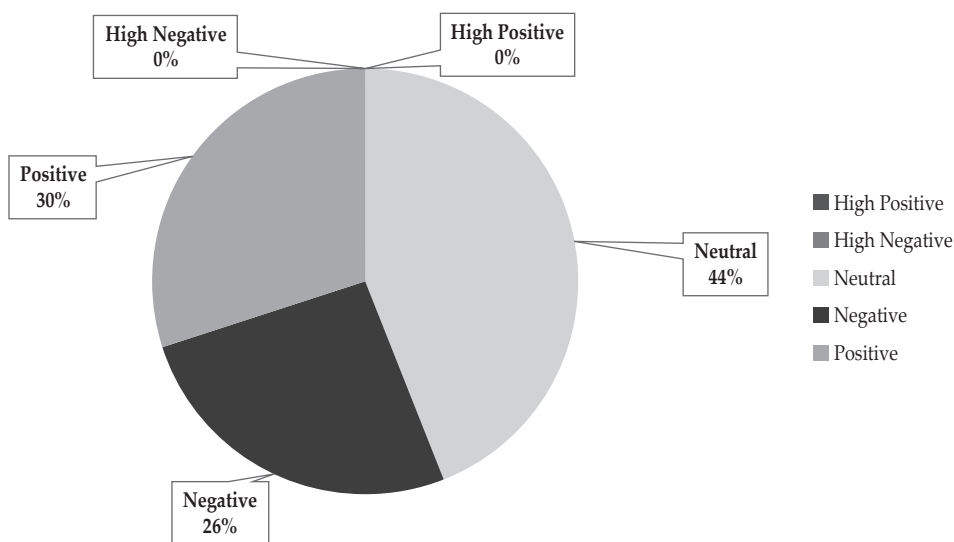


Figure 1. Sentiment Analysis on CBDC

The titles and abstracts of various pieces of scientific literature are used to derive sentiment scores. The SentiStrength evaluation findings are arranged in intervals ranging from extremely negative (-5) to extremely positive (+5), with 0 representing neutrality. The total is determined by adding the scores that SentiStrength ascribes to each word in a passage. According to the data presented in the figure that is located above, the CBDC topic, when viewed from a legal standpoint, has a high proportion of neutral (44%) sentiment, which is followed by a ratio of positive (good) sentiment that is equal to 30%, and the remaining proportion of negative (bad) sentiment is equal to 26%.

This research has a perception that tends to be impartial and not in favour of one direction, which ensures that it is not discriminating. The results of this study demonstrate that the vast majority of the CBDC-related literature has a sentiment that is indifferent to the topic.

The neutrality sentiment demonstrates that CBDC is neither seen as beneficial nor harmful when viewed from a legal standpoint. The research classified as having a neutral sentiment does not advocate for the creation or presence of CBDCs but does not dismiss the possibility of their existence. When describing CBDC from a legal standpoint, neutral literature utilizes phrases such as “adequate” and solely provides explanations of definitions or case studies. Researchers who presented a neutral view of the CBDC brand can identify various prospects for further development of CBDC research since the neutral mood shows these opportunities. If researchers wish to generate stronger positive or negative attitudes, they should probably pay closer attention to additional facts and realities.

However, the percentage of positive sentiment is significantly higher when comparing good and negative sentiments. A good (positive) sentiment is an abstract sentiment derived from literature. It is positive and tends to be hopeful in its response to CBDC from the standpoint of the legal system by applauding its developments. The fact that the literature reflects a generally favourable attitude indicates that researchers favour implementing CBDC. When presenting their perspectives and contributing to the effort to promote CBDC to readers and the general public, the studies that fall under this category use words like “potential” and “recommended.”

Bad (negative) sentiment, on the other hand, refers to an unfavourable opinion that tends to be pessimistic regarding the growth of CBDC and its use in various countries. Within this subgenre of writing, authors have voiced concerns and expressed reservations regarding the presence of CBDCs from a judicial point of view. They use descriptors such as “poor” and “risky” to discuss it. The findings of this study, which indicate a downward trend, will be used as input by the central bank in formulating a plan to address any challenges posed by a rise in CBDC sentiment.

The study also looks to see and establish the elements that influence the numerous attitudes investigated. Because different circumstances such as these can continue to be produced, one way this can be done is by growing the amount of scientific literature that is published in indexed journals. It is hoped that an increase in public knowledge and perspectives on CBDC will be able to occur due to the incorporation of literacy in the financial industry into the CBDC literature, particularly research from a more in-depth legal viewpoint.

Table 1.
Main Factors Influence Sentiment

Positive	Negative	Legal Perspective
Endless possibilities for integration with various financial activities	Chain technology is at risk of downtime and causes losses because, in terms of scalability, CBDC must be able to accommodate fast transactions per second with zero downtime	Public-Private Partnerships must sustain innovation while also increasing efficiency
Logistical payment efficiency	Cyber-attack threats, such as turning off the power grid or taking over nodes	Capacity building on CBDC wallets to prevent massive withdrawals from deposits
Protecting monetary sovereignty, where only the rupiah currency is legal	A threat to banking companies if people save directly to the central bank	Implementation of low limits on offline token based CBDCs to reduce loss rates
Banking activities are becoming more streamlined.	There is the potential for tight controls, such as the expiry period in digital yuan, or restrictions on the use of currency to purchase something; A threat to bank employees apart from the IT sector	Rules limit the information that can be accessed, and which authority has the right to operate it
APBD and APBN are in-chain and transparent, easily accessible	Hyperinflation remains a risk just as with a fiat money	downtime prevention in CBDC implementation
Money laundering is more difficult because the sender and recipient are known	Zero privacy, where all transactions are tracked, and the data can be used for any purpose	Uses permitted Distributed Ledger Technology (DLT), so transaction validators will be known and authorized
Financial crimes are easier to trace, and a new bill on banking secrecy is needed	The level of electricity, telephone and internet penetration is not evenly distributed in Indonesia	Alignment of clearing mechanisms and having the same technical interface between countries
Easier tax levy	Data exploitation risk	
LKHPN is easier on-chain when connected to various agencies		
Reducing counterfeit money		
In forming a cashless society, the challenge is to improve the internet connection		
No ID card required		

A research project that takes the form of a literature review is one example of research that does not express any particular point of view. For instance, a study²¹ indicated that. They concluded that this is because CBDCs are still relatively unknown. His research investigates CBDC classifications within the

²¹ Tronnier, Frederic Tronnier, Michael Recker, and Peter Hamm. "Towards Central Bank Digital Currency – A Systematic Literature Review." In *Towards Central Bank Digital Currency*, 1–14, 2020.

taxonomy of money, gives motivations and reasons, and considers various design options and economic ramifications, as well as issues related to the legal and technical implementation of CBDC. The authors believe this research on CBDC should serve as a jumping-off point for additional systematic investigation. They concluded that even while the CBDC's theoretical basis is acknowledged to be sound, there is still a great deal of work that has to be done by central banks before CBDCs can be implemented. As a result, most nations are currently debating whether or not a CBDC should be designed and implemented, considering the social, economic, and legal issues and the possibility of its technical design and execution.

Among the many studies that have shown a favourable sentiment is research which provides recommendations for implementing the CBDC model in Indonesia.²² They compared the CBDC model to cash and claimed that it was the best applicable model because it was tailored to the circumstances in Indonesia. This model is non-yield bearing, widely accessible, provides anonymity of transactions, and is flexible enough to operate peer-to-peer and online. It also possesses positive qualities that are similar to those of traditional currencies. In addition, a CBDC with general applications that generate direct interest is the model that would be the second best to deploy in Indonesia. A general-purpose CBDC model may have a comparative advantage over traditional currencies in terms of reducing the costs of producing and processing money while at the same time minimizing the influence of shadow banking, frequently cited as a concern in developing nations.

As illustrations of research with a pessimistic outlook, some studies seem to be more concerned about the potentially detrimental effects that CBDC issuance may have. According to the findings of the research, the CBDC as a central bank digital currency, which is announced as a compromise between avoiding writing off cash and making it immaterial, is pronounced not to be a reasonable solution.²³ According to them, bank runs, common characteristics of almost all economic and financial crises throughout history, did not occur because savers wanted to withdraw their deposits from commercial banks to deposit them at the central bank or the bank concerned. On the other hand, bank runs happen because clients of banks are unwilling to deposit money that is not substantial in bank accounts and prefer that their savings be in the form of physical assets. This demonstrates that physical proof and the form of money are still crucial components in today's economy and most likely become even more relevant when economic conditions deteriorate.

²² Zams et al. "Designing Central Bank".

²³ Belke and Beretta, "From Cash to Private."

Research studies CBDCs using a SWOT analysis, which might substantiate the varying outcomes of this research.²⁴ Even though CBDCs have strengths and opportunities, they also face some weaknesses and threats. According to the findings of their investigation, some of the CBDC's strengths include its capacity to effectively implement monetary policy, increase financial inclusion, ensure traceability, and improve payment efficiency. The expensive cost of CBDC infrastructure, the loss of privacy, the limited internet coverage, and system breakdowns are all examples of the potential weaknesses in the system. The second aspect to consider is evaluating external elements in the form of opportunities that CBDC possesses, such as developing technology, network effects, CBDC enthusiasm, and cash inefficiencies. As a corollary, the dangers include the threat of cyber assaults, eliminating banks as a middleman, legal complications, and private crypto assets.

There is an additional study on the advantages and disadvantages of CBDCs.²⁵ They claim that the advantages of CBDC significantly improve the production performance of actors and have the potential to have a positive effect on the economy in Indonesia. Additionally, some of the significant benefits of this innovation include playing an active role in replacing the old payment model with digital commerce, which is super-efficient because it can send little money directly to the account, lowering costs because the operation is quite easy and does not require accommodation costs, lowering production costs also so that producer income can increase further, as well as increasing economic growth, where a central bank has formulated a strategy for increasing economic growth. Before issuing a CBDC, a central bank must, without a doubt, conduct various studies, evaluate management techniques, and assess risks using the existing possibilities to evaluate what potential issues have emerged and been taken into consideration. This is because the Central Bank is accountable for all areas of CBDC in its issuance. Therefore, the Central Bank bears responsibility if something creates a significant danger.

In addition, not only are there positive outcomes, but there are also obstacles to overcome. One of the obstacles is related to financial activities, consumer protection, goals, and financial inclusion. If these challenges are not adequately managed, the objective of boosting Indonesia's economy will not be achieved as effectively. In issuing CBDCs central banks ought to consider the execution of initiatives concerning finances, consumers, and laws.

²⁴ Ferry Syarifuddin and Toni Bakhtiar, "Monetary Policy Strategy in the Presence of Central Bank Digital Currency Monetary Policy Strategy in the Presence of Central Bank Digital Currency." Bank Indonesia, 2021.

²⁵ Prayoga Wicaksana, Prayoga Tri Yunanto, and Muchammad Irfan Maulana Rosandi. "Analysis of the Use of CBDC in Indonesia's Economic Improvement." *Jurnal JEKSYAR (Jurnal Ekonomi Syariah)* 1, no. 2 (2022): 46–51.

Issuing CBDCs falls under the central bank's purview, particularly concerning the provision of legal support. Additionally, the central bank is obligated to uphold honesty and transparency in putting CBDCs into action, particularly concerning those CBDCs that are tied to actors, executors, and users such as the public and the government.

It is, of course, possible for neutral, positive, and negative sentiments, points in the SWOT analysis, and the benefits and obstacles of CBDC to differ from one nation to the next, depending on the speed with which a CBDC program is implemented. According to the findings of a research, the countries of the Bahamas, China, and Uruguay, as well as the Baltic Sea region, were regarded as ideal for the implementation of CBDC (Lithuania, Estonia, and Finland).²⁶ It has been said that South America and Brazil both have a great deal of untapped potential. In terms of the situation in Asia, in addition to China, Malaysia is also regarded capable of putting CBDC into practice. South Africa, which is located on the African continent, is a country that stands out as the best region for the implementation of CBDC.

Research along these lines has also investigated the issues posed by regulations to safeguard CBDC information. The research analysed the discrepancies between the actual operation and design of e-CNY (the name given to CBDC China) and the discrepancies between pilot regulations and legislative laws such as the Cybersecurity Law, the Data Security Law, and the Personal Information Protection Law. Considering the legislative equilibrium between protecting personal information and regulating illegal financial activity associated with the e-CNY system is required.²⁷

Within the framework of Europe, the European Central Bank (ECB) has, up until this point, shown reluctance toward implementing a CBDC program. The reasoning for the ECB's decision not to support CBDCs is that by providing retail users and companies with access to electronic money issued by the central bank, the central bank will be a competing bank and, as a result, affect the stability of the financial system. These developments would also make it more difficult to maintain market neutrality. As a result, the ECB's strategy for developing payment technology was included as part of its broader market neutrality policy position. This policy position aims to minimize the central bank's footprint in the market to avoid potential distortions and misallocations of resources. Consequently, the ECB's approach

²⁶ Sergio Luis Nández Alonso, Javier Jorge-Vazquez, and Ricardo Francisco Reier Forradellas. "Central Banks Digital Currency: Detection of Optimal Countries for the Implementation of a CBDC and the Implication for Payment Industry Open Innovation." *Journal of Open Innovation: Technology, Market, and Complexity* 7, no. 1 (2021): 1–23. <https://doi.org/10.3390/joitmc7010072>.

²⁷ Cheng, "Decoding the Rise."

to the development of payment technology was included as part of its broader market neutrality policy position²⁸.

This demonstrates how critical it is to approach the implementation of CBDC programs with an eye toward the legal aspects thereof. According to the architecture of the CBDC, there are a few different policies that every nation needs to take into consideration in order to implement in order to support its monetary policy.²⁹

To start, the adoption of CBDC will make it more probable that spending will increase due to the high expenses of infrastructure and will also inhibit innovation. As a result, public-private partnerships need to continue fostering innovation while also making progress in efficiency.

Second, the adoption of CBDC suggests that people have access at any time to their deposits, which means that they can take their money whenever and wherever they choose, even amid an emergency situation. It is essential to implement capacity on CBDC wallets to prevent individuals from withdrawing all of their deposits at once and, as a result, avoid the creation of bank disintermediation.

Third, implementing offline alternative payment methods such as offline token based CBDC means that there is a need to increase awareness about passwords or key passwords because if they are lost, the owner loses all of his funds. This raises the importance of increasing awareness about passwords and key passwords. Therefore, putting modest restrictions on offline CBDCs that use tokens can help reduce the number of keys lost if the CBDCs themselves are lost.

Fourthly, the diverse CBDC information that can be monitored indicates that the central bank needs to regulate the boundaries of the information that can be accessed, and which authorities can operate it. This is because of the diversity of CBDC information that may be monitored. Additionally, the legal issues of CBDC issuance need to be customized, and the chosen authority needs to be impartial to win the general public's trust.

Fifth, CBDC is the outcome of technological innovation, which means that it still carries the potential for failure and has repercussions for how a central bank conducts its business. The central bank must take preventative measures by offering all possible backup plan choices to avoid downtime in the CBDC implementation.

Sixth, implementing a DLT (distributed ledger technology) ledger systems suggests that the centralized bank does not have complete control because of the consensus method, particularly if it is done without authorization like

²⁸ Cullen, "Economically Inefficient."

²⁹ Chen and Siklos, "Central Bank."

Bitcoin. As a result, CBDCs can make use of allowed DLTs, which ensures that transaction validators will be known and authorized, allowing for a higher level of transactional control.

Seventh, the introduction of payments between countries demonstrates that CBDCs need for interoperability with other nations' currencies. This means that the central banks must be able to coordinate its clearing procedures and have the same technical interface. In addition, the central bank must ensure that integration between the two systems will not result in a reduction in state sovereignty.

Research that investigated the CBDC concept also focused on the CBDC's legal ramifications.³⁰ CBDCs have the potential to fulfil the requirements of money according to the state money theory and can operate as legal tender. In applying this thinking to CBDCs, countries need to establish a legislative framework to regulate CBDCs as legal tender and as actual currency. However, it is also acknowledged that diverse legal frameworks must be supportive of a variety of CBDC designs in order for them to be valid. Once the CBDC design has been decided upon, the legal ecosystem in Indonesia for CBDCs must be in place. This preparation must include establishing a robust regulatory framework and clear legal relationships between related parties. These elements are necessary to ensure the legality of the issuance, distribution, and transfer of CBDCs. In addition, to make room for the usage of CBDCs, it is necessary to comprehensively examine the pertinent laws in Indonesia, including those about the nation's central bank, money, currency, and technology.

In this sense, regulatory alignments have a significant impact on how successful a policy will be. In order to ensure legal certainty, the DPR RI needs to prepare the CBDC Law in Indonesia as a legal basis as soon as possible and make MOUs with technical implementing parties such as the Supreme Court, Judiciary Institutions, Financial Services Authority, Deposit Insurance Corporation, Labor Unions, the Indonesian Chamber of Commerce, as well as private companies that employ a significant number of people at lower levels.³¹

CBDCs are intended to be composed of wholesalers and merchants, each of whom can authenticate themselves via tokens or accounts. After that, CBDC transactions may be handled by the central bank or conducted using distributed ledger technology (DLT). In addition, the features of CBDC are differentiated according to whether or not the accounts bear interest. The

³⁰ Indrawati, Fransiska Ari. "Central Bank Digital Currency Under the State Theory of Money: A Preliminary Legal Analysis." *Journal of Central Banking Law and Institutions* 1, no. 3 (2022): 371–404.

³¹ Andi Eko Tanjung et al., "Optimization of Preparation for The Implementation of Central Bank Digital Currency Rupiah Bank Indonesia: Education and Financial Literacy Improvement," *G20 TechSprint 2022*, 2022.

implementation and selection of various CBDCs will most probably result in the requirement for regulatory revisions. Regarding the legal elements of CBDC in Indonesia, it is required to modify the substance of Law No. 7 of 2011 on Governing Currency. The law has to state that the Rupiah form includes CBDC, which must be included in an amendment or superseding legislation. Other regulations, such as those pertaining to privacy and property, distributed ledger technologies (DLTs), bankruptcy laws, and competition between CBDCs and depository banks, are also important to keep an eye on.

By examining the drafting process, the CBDC's legitimacy can also be deduced from how it was designed. When designing CBDC for wholesale and retail usage, it is necessary to consider any restrictions or legislation that pertain to the legality of issuing digital currency, the use of digital currency as a payment system, and the settlement procedures. Also, regulations or legislation with CBDCs based on tokens provide greater issues than CBDCs based on accounts. Because inhabitants of other countries can also access CBDCs based on tokens, the restrictions put into place must be handled with caution. In the meantime, selecting an account based CBDC design requires paying attention to the general public's legal authority to open cash checking accounts. Both the direct and indirect designs for the CBDC offer different legal issues. The indirect CBDC, for example, is required to investigate the legal significance of intermediaries in CBDC payment services.

In conclusion, if a design for a CBDC that bears interest is selected, potential legal problems will centre on the prospect of negative interest rates in conjunction with the CBDC's function as a store of value. Law 7/2011 is the most important legislation in Indonesia that must be updated. Following this rule, the type of Rupiah must be included in digital format.³²

The aspiration of a cashless society is affected by a diverse set of variables accelerating the transition to a cashless society in nations worldwide. Convenience has been a primary force pushing the natural evolution towards cashless systems in the western hemisphere, reinforced by decreased transaction costs that make cashless payments more efficient than cash transactions. This natural evolution has been driven in large part by convenience. Despite this, there is still widespread political interest in devising strategies to do away with cash entirely, even for large denominations of currency, to combat illegal activities such as money laundering, terrorism, tax evasion, and corruption.³³

Central banks wishing to issue CBDCs are required, as a matter of course, to comply with the KYB and KYC procedures in order to maintain control

³² Fitri Handayani and Fatma Yuliana, "Design and Legal Aspect of Central Bank Digital Currency: A Literature Review," *Journal of Central Banking Law and Institutions* 1, no. 3 (2022): 509–36.

³³ Ward and Rochemont, *Understanding Central Bank*.

over illegal activities such as the laundering of money, the financing of terrorist organisations, the trafficking of drugs, and either tax evasion or fraud. On the other hand, the central bank is also responsible for providing legal support. This is because a CBDC issued by a central bank has issued has the potential to achieve legal tender status within the confines of a government’s legal framework. In this context, the CBDC is able to serve both as a representation of liability and as a means of storing value.³⁴

There is a description of CBDCs included in the taxonomy of money, which distinguishes them from other forms of money, such as cryptocurrencies and fiat currency. The Venn diagram that represents the taxonomy of money categorizes money based on its past, present, and future features. In addition, the overview provides a description of four important features: the publisher, accessibility, form, and technology. The CBD market may be divided into two primary categories, retail CBDC and wholesale CBDC. Retail CBDC caters to the general public or all of the people who end up using the product. Wholesale CBDCs, on the other hand, are targeted toward financial institutions with reserves held at their respective central banks.³⁵

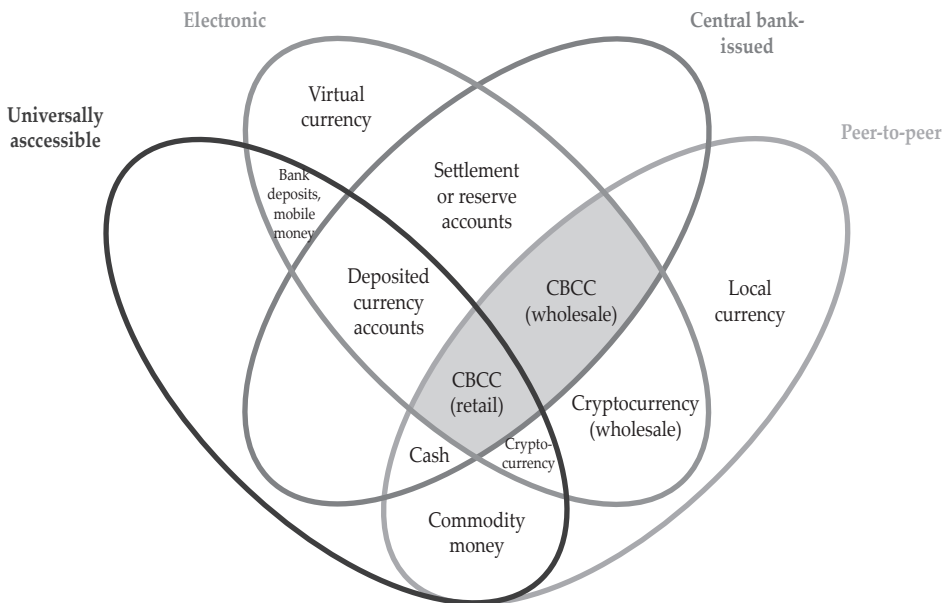


Figure 2. Taxonomy of Money

³⁴ Harahap et al., “Perkembangan Financial Technology.”

³⁵ Morten Bech and Rodney Garratt, “Central Bank Cryptocurrencies,” *BIS Quarterly Review*, no. September (2017): 55–70.

The birth of the digital Rupiah plan was Bank Indonesia's response to the phenomena of cryptocurrencies, which could potentially upset the country's monetary system. Cryptocurrency is comparable to a central bank digital currency; however, the key distinction between the two is that cryptocurrency refers to a form of virtual currency, like bitcoin, which is produced by private companies and whose circulation cannot be regulated by the state. On the other hand, a central bank digital currency refers to a form of virtual currency that is issued by a central bank in a country and can be regulated; it is also recognized as the legal monetary currency of a country. Additionally, Bank Indonesia has issued a regulation prohibiting using cryptocurrencies as a medium of exchange within Indonesia.³⁶

As cryptocurrencies emerged, in countries such as in Indonesia, the Government and Bank Indonesia issued regulations to regulate the circulation of cryptocurrencies and prohibit their use as a medium of exchange. These regulations include Law No. 7 of 2011 on Currency, Bank Indonesia Regulation No. 18/40/PBI/2016 on Implementation of Payment Transaction Processing, and Bank Indonesia Regulation No. 19/12/PBI/2017 on Application. These regulations were issued at the beginning of the entry of cryptocurrency currencies in countries such as Indonesia.³⁷

According to the Bank Indonesia Law, the authority to issue currency lies exclusively with the Bank Indonesia, which serves as the central bank for the country of Indonesia. Accordingly, the law governing currencies in Indonesia needs to be revised so that the CBDC can acquire standing as a legitimate form of payment (legal tender) in the country.³⁸

The difficulties posed by CBDCs in terms of monetary policy should also be examined. If there is a significant decrease in the use of fiat money, then the optimal policy of a central bank will depend on the policies of electronic money issuers. This can significantly hinder the transmission of monetary policy and limit a central banks' ability to act as lenders of last resort. Therefore, the issuance of a digital currency by a central bank that is designed to serve as an alternative to e-money could eliminate the need for such competition.³⁹

³⁶ Dyah Tiara Putri Aggraeni and Enjat Munajat, "Potensi Rupiah Digital Menjadi Solusi Baru Pemberantasan Korupsi Di Pemerintahan Indonesia," *Jurnal Ilmiah Akuntansi Dan Keuangan* 4, no. 3 (2022): 1304–22.

³⁷ Syafira Nurullia, "Menggagas Pengaturan Dan Penerapan Central Bank Digital Currency Di Indonesia: Bingkai Ius Constituendum," *Journal of Judicial Review* 23, no. 2 (2021): 275, <https://doi.org/10.37253/jjr.v23i2.5014>.

³⁸ Eisa Akbar and Karina Dwi Nugrahati Putri, "Central Bank Digital Currency (CBDC) As a New Form of Currency in Indonesia (a Comparative Study of Sweden's E-Krona Project)," *Universitas Gadjah Mada* (2019), <http://etd.repository.ugm.ac.id/>.

³⁹ Ward and Rochemont, *Understanding Central Bank*.

The CBDC policy governance process can be broken down into three stages that overlap. First, the administration of laws and regulations. Because Indonesia is a state ruled by law, the aspect of legality that is being questioned is legislation. There is a need for several modifications to be made to the existing laws in Indonesia, namely in Law No. 7 of 2011 on currency. These changes would include incorporating CBDC as a digital currency within the definition of Indonesian currency. In addition, the regulations governing electronic money outlined in Bank Indonesia Regulation (PBI) No. 20/6/PBI/2018 need to be brought up to date to give Bank Indonesia the ability to manage CBDC. In order for CBDC to eventually become a valid form of payment in transactions that the general public may utilize. Second, governance supports the community's preparation and the infrastructure's readiness. Third, governance is monitoring and maintaining the consistency of CBDC values. As a result, there is a demand in Indonesia for a legal framework that will regulate the use of CBDCs and ensure that the general public will be protected from their effects.⁴⁰

In addition to governance issues, Bank Indonesia as the central bank needs to adapt to technological and information developments, especially to expand the scope for regulation, supervision and intervention in the payment system and economic activities through the development of CBDCs.⁴¹ CBDCs are claimed to be safer and more secure than cryptocurrencies because they are issued and regulated by the central bank. However, the basic concepts of CBDCs have not been studied significantly, and there is still a lack of examination of the legal aspects of cybersecurity risks and CBDC resilience. This is because the Central Bank has to assume responsibility for every transaction, so it is important for BI to consider the cyber security risks associated with CBDC implementation⁴².

V. CONCLUSION

This study includes a sentiment analysis of the expanding scientific literature on CBDC from a legal perspective as of December 12, 2022. This analysis is based on 50 publications published in Scopus indexed journals and equipped with Digital-Object-Identifiers (DOI). In addition, this study incorporates

⁴⁰ Nurullia, "Menggagas Pengaturan."

⁴¹ Ramlan Ginting, "The Legal Perspective on Strengthening the Practice of Bank Guarantees in Indonesia: Revisiting the Provisions Related to Payment," *Journal of Central Banking Law and Institutions* 1, no. 2 (2022): 405–30, <https://doi.org/10.21098/jcli.v1i2.16>.

⁴² Zahrashafa Mahardika, Rizky Banyualam Permana, and Nadia Maulisa, "Going Digital Rupiah: Some Considerations from Sovereignty and Cybersecurity Perspectives," *Journal of Central Banking Law and Institutions* 2, no. 1 (2023): 25–54, <https://doi.org/10.21098/jcli.v2i1.42>.

a literature review derived from an in-depth analysis of research conducted across various disciplines on CBDCs and the legal viewpoints surrounding them. According to the findings, CBDCs have a high proportion of neutral sentiment, which accounts for 44% of the total, followed by a proportion of positive sentiment that accounts for 30% of the whole, and finally, a proportion of negative sentiment that accounts for 26% of the total. Based on these findings, the vast majority of the CBDC-related writing exhibits neutral attitudes, followed by tendencies toward positive and also negative sentiments.

The sentiment's result can be an additional consideration for the government, especially Bank Indonesia, which is currently reviewing the implementation of CBDC in Indonesia. The government can take considerations and learn from the gaps arising from negative sentiment towards CBDC. For instance, most negative sentiments towards CBDC doubts the existing technological capabilities and its risks in avoiding cyberattacks. This can be an evaluation for the government, especially in preparing qualified technology. On the other hand, the government will also have additional reasons to strengthen CBDC implementation from positive sentiments in order to create financial system stability and efficiency.

This study also evaluates numerous legal viewpoint references from CBDCs in various countries. It provides recommendations on things that must be examined from a legal perspective for CBDC implementation to be successful, particularly in Indonesia. According to the findings in several references, it is essential for nations that will issue CBDCs to pay attention to the legal elements of CBDCs. This recommendation applies to the practical application of CBDCs. In the end, there is no doubt that the study of CBDC from a legal standpoint will undoubtedly continue to increase, resulting in the topic becoming one that has the potential to continue to be studied and improved.

It is important to highlight that this research provides an overview of CBDC perceptions and legal viewpoints based on the scientific literature; however, this objective is restricted to publishing only until December 2022. Even though the research was carried out through sentiment analysis and literature studies that were brought up to date, it is still important that readers have a general understanding of the most important data. Despite this, the results presented are not static and are subject to change regularly; for example, when new trends develop, or variables continue to grow or shrink in the future.

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