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**ANALYSIS OF PUBLIC PERCEPTION OF CENTRAL BANKS DIGITAL
CURRENCIES: A SURVEY ANALYSIS**

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Analysis of Public Perception of Central Banks Digital Currencies:

A Survey Analysis

Merkez Bankaları Dijital Para Birimlerine İlişkin Kamu Algısının Analizi:

Anket Analizi

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ABBREVIATION LIST

ACH	Automatic Clearing House
AML	Anti-Money Laundering
ATMs	Automated Teller Machines
BIS	Bank For International Settlements
BMA	Bahamas Monetary Authority
BoE	Bank Of England
BS\$	BSD, Bahamian Dollar
BTC	Bitcoin
CAGR	Compound Annual Growth Rate
CBDC	Central Bank Digital Currencies
CBOE	Chicago Board Options Exchange
CFT	Counter-Terrorism Financing
CPSS	Committee On Payment and Settlement Systems
EFT	Electronic Fund Transfers
e-KYC	Electronic Know Your Customer
FATF	The Financial Action Task Force
FPC	Financial Policy Committee
FSB	Financial Stability Board
FSB	Financial Stability Board
GDP	Gross Domestic Product
GFN	Global Financial Network
IFoA	Institute And the College of Actuaries
IMF	International Monetary Fund
IoT	Internet of Things
KYC	Know Your Customer
LPPL	Log-Periodic Power Law
MTB	Money Transmission Businesses
NGOs	Non-Governmental Organizations

NIB	National Insurance Board
NPC	National Payments Council
OECD	Organization For Economic Co-Operation and Development
OPEC	Organization For Petroleum Exporting Countries
P2P	Peer-To-Peer
POS	Point of Sale
PSD	Project Sand Dollar
PSMI	Payment System Modernization Initiative
PSP	Payment Service Providers
RTGS	Real Time Gross Settlement
SFI	Supervised Financial Institution

ABSTRACT

Human is the creature that can adapt most easily to all kinds of changes. Along with the technological revolutions experienced around the world, our habits and needs are changing rapidly. “Saving time” is one of the things that humanity needs most today. New approaches emerging both in sociological, economic and scientific dimensions stem from the need for rapid and excessive consumption. In return, it forces you to think fast and produce fast. On the basis of the concept of economy, which is the focus of production and consumption, money and its functions lie. Money, like all other social and economic elements, has begun to evolve with the digital transformation. So, it's time to look ahead and consider what kind of money and payment systems will be needed to meet the needs of the increasingly digital economy. With the transition to Digital Transformation and Digital Economy, paper banknotes, the most common form of money, began to give way to payments with debit cards, virtual POS and QR codes. This evolution in the economy gained different dimensions with the inclusion of the Blockchain Algorithm in payment systems. The use of the Distributed Ledger structure together with the concept of crypto assets has created a new formation such as decentralized digital money, which cannot yet be classified as a type of money. Today, a decentralized payment system contains many uncertainties that are not reliable in terms of the economic policies of the States. Therefore, as a result of the development of the Digital Economy, Central Banks print their Central Bank Digital Money (CBDC) electronically and present them to the public as a new payment system through digital wallets. Some countries create their own CBDC systems, while others try to adapt applied models. Therefore, it is very important to understand the current models in terms of adapting CBDC in the form of National Official Digital Currency. In the literature review, the reasons for many countries taking action regarding CBDCs; The emergence, development and results of the Bahamas Sand Dollar Project, which is accepted as the first official retail CBDC example and officially started to be implemented in 2019, have been seen to be effective. In addition, in the Working Paper published by the Bank of England in 2020, the

opportunities and challenges that CBDCs will create when they are implemented in the UK are discussed with their most critical points in terms of the risks they may create in financial markets, society and institutions through the Platform Model. These two models were also taken into account when other countries were creating their transitional designs to CBDC. In the continuation of this study, the studies of the main countries that have made progress on CBDCs in the world are mentioned too and information about the current situation is given. With these inferences from the models, it has been determined that CBDCs have many important advantages such as tax evasion, preventing financial terrorism such as fraud and providing low cost, but they have disadvantages that can negatively affect monetary policy, financial stability and the banking sector if not implemented well. A survey study was conducted on the online platform to measure the public perception of the advantages and disadvantages determined. In this survey study, 3 questions about gender, age and the sectors they work for people who have a financial background and work in the finance sector and those who do not work in the finance sector; A total of 26 questions were asked, 23 of which were Likert scale questions, about the advantages and disadvantages of CBDC. A total of 317 people were reached through the survey. The data collected as a result of the research were evaluated with Cronbach's Alpha and Independent Sample t-Test, and it was observed that people with a financial background were significantly different from those who are not from financial sector, and that the public did not have enough information about CBDCs according to the sample group. So, Central Banks should be very careful when transitioning to Digital Currencies and raise public awareness on this issue.

Keywords: *Central Bank Digital Money, Crypto Asset, Financial Stability, Distributed Ledger Structure, Blockchain.*

ÖZET

İnsan her türlü değişime en kolay uyum sağlayabilen varlıktır. Dünyada yaşanan teknolojik devrimlerle birlikte alışkanlıklarımız ve ihtiyaçlarımız da hızla değişiyor. “Zaman tasarrufu” günümüzde, insanlığın en çok ihtiyaç duyduğu şeylerden biridir. Hem sosyolojik hem ekonomik hem de bilimsel boyutta ortaya çıkan yeni yaklaşımlar, hızlı ve aşırı tüketim ihtiyacından kaynaklanmaktadır. Bu yeni yaklaşımlar sizi hızlı düşünmeye ve hızlı üretmeye zorlar. Üretim ve tüketimin odak noktası olan ekonomi kavramının temelinde para ve işlevleri yatmaktadır. Para, diğer tüm sosyal ve ekonomik unsurlar gibi dijital dönüşümle birlikte gelişmeye başlamıştır. Bu sebeple artık geleceğe bakmanın ve giderek artan dijital ekonominin ihtiyaçlarını karşılamak için ne tür para ve ödeme sistemlerine ihtiyaç duyulacağını düşünmenin zamanı geldi. Dijital Dönüşüm ve Dijital Ekonomiye geçiş ile beraber en yaygın para formu olan kâğıt banknotlar yerini banka kartı, sanal pos ve kare kod ile ödemelere bırakmaya başladı. Ekonomideki bu evrim ödeme sistemlerine Blok Zincir Algoritmasının da dahil olmasıyla farklı boyutlar kazandı. Dağıtık Defter yapısının kripto varlık kavramıyla beraber kullanılmaya başlanması merkeziyetsiz dijital para gibi henüz bir para çeşidi olarak sınıflandırılmayan yeni bir oluşumu meydana getirdi. Günümüzde merkeziyetsiz bir ödeme sistemi, devletlerin ekonomi politikaları açısından güven taşımayan birçok belirsizliği barındırır. Dolayısıyla Dijital Ekonominin gelişmesi sonucunda Merkez Bankaları, Merkez Bankası Dijital Paralarını (MBDP) elektronik ortamda basmakta ve dijital cüzdanlar aracılığıyla yeni bir ödeme sistemi olarak kamuoyuna sunmaktadır. Bazı ülkeler kendi MBDP sistemlerini yaratırken bazıları ise uygulanmış modelleri uyarlamaya çalışmaktadır. Bu nedenle MBDP’lerin, Ulusal Resmi Dijital Para formunda uyarlanabilmesi açısından mevcut modelleri kavramak çok önemli bilgi kaynaklarıdır. Literatür taramalarında, birçok ülkenin MBDP’ler ile ilgili aksiyon almasında; ilk resmi perakende MBDP örneği olarak kabul edilen ve 2019 yılında resmen uygulanmaya başlamış Bahamalar Kum Doları Projesi’nin ortaya çıkışının, gelişiminin ve yarattığı sonuçların etkili olduğu görülmüştür. Bununla beraber 2020 yılında İngiltere Merkez Bankası tarafından

yayınlanan Çalışma Tebliği'nde MBDP'lerin, Birleşik Krallık'da uygulanmaya gireceği zaman yaratacağı fırsat ve zorluklar, Platform Model üzerinden finansal piyasalarda, kurumlarda ve toplumlarda yaratabileceği riskleri bakımından, en kritik noktalarıyla tartışılmıştır. Bu iki modelin, diğer ülkeler tarafından da MBDP'ye geçiş tasarımlarını oluştururken dikkate alındığı görülmüştür. Bu çalışmanın devamında dünyada MBDP'ler konusunda ilerleme kaydeden başlıca ülkelerin çalışmalarından da bahsedilmiş ve mevcut durum hakkında bilgi verilmiştir. Modellerden elde edilen bu çıkarımlar ile MBDP'lerin vergi kaçırma, sahtecilik gibi finansal terörü önleme ve düşük maliyet sağlama gibi birçok önemli avantajı barındırdığı fakat iyi uygulanmadığı takdirde para politikasını, finansal istikrarı ve bankacılık sektörünü olumsuz etkileyebilecek dezavantajları olduğu belirlenmiştir. Belirlenen avantaj ve dezavantajlara ilişkin kamuoyu algısını ölçmek için online platform üzerinden bir anket çalışması yapılmıştır. Bu anket çalışmasında finansal bilgi geçmişine sahip olan ve finans sektöründe çalışan kişiler ile finans sektöründe çalışmayan kişilere cinsiyet, yaş ve buldukları sektörler hakkında 3 adet; MBDP'nin avantajları ve dezavantajları hakkında da 23 adet Likert ölçekli soru olmak üzere toplam 26 adet soru sorulmuştur. Anket ile toplam 317 kişiye ulaşılmıştır. Araştırma sonucunda toplanan veriler, Cronbach's Alfa ve Bağımsız Örneklem t-Test ile değerlendirilmiş, neticede finansal geçmişe sahip olan kişilerin, finans sektöründen olmayan kişilerden anlamlı derecede farklı olduğu ve örneklem grubuna göre kamuoyunun MBDP'ler hakkında yeterli bilgiye sahip olmadığı gözlemlenmiştir. Bu nedenle Merkez Bankaları, Dijital Paralara geçiş yaparken çok dikkatli davranmalı ve halkı bu konuda bilinçlendirmelidir.

Anahtar Kelimeler: *Merkez Bankası Dijital Parası, Kripto Varlık, Finansal İstikrar, Dağıtık Defter Yapısı, Blok Zincir*

INTRODUCTION

The concept of crypto money first entered our lives in 2008 with an article published by Satoshi Nakamoto. With the gradual development of the digital economy, countries have given more importance to digital transformations and have started to develop their own digital currencies against cryptocurrencies as retail. There are many studies about whether cryptocurrencies have the feature of being money or which group of money they belong to. Discussions continue because the studies are not in consensus. According to CoinMarketCap, the value of the global crypto market cap is \$1.36T as of June 2021. For cryptocurrencies that are not yet large enough to adversely affect the financial markets and banking sector, it is a more accurate expression to say crypto projects instead of speculative investment tools or the concept of crypto money. Because they are produced by institutions and companies with the aim of supporting certain projects and providing funds. Today, anyone can issue their own cryptocurrency at very affordable prices. However, the costs of mining and attracting investors are not so reasonable that individuals can easily afford them. Although the concept of decentralization, which has entered our lives with crypto assets, is an inspiration for successful studies, it still serves very important crimes such as financing terrorism and money laundering by malicious people. For this reason, it should be well researched which project is involved while investing. It has also been proven by official sources that the crypto asset that emerged with the name Bitcoin was used for bad purposes in the first years of its production so the element of trust is very important. CBDCs seem to provide confidence in this respect. Crypto assets, which have become a trend, have brought a different dimension and speed to the production of their own digital currencies, namely CBDC, of central banks in money issuance and digital market issues. The subject of my thesis is to discuss the risks and advantages that may occur if CBDC units, which are inspired by the technology of crypto assets, replace paper money on a national and global scale, by discussing the current models and presenting suggestions about their applicability.

The aim of the research is to measure how these analyzes are perceived by the public by discussing how the smooth functioning of the finance sector can be ensured in any problem that may occur in the payment networks in payments to be made with the Central Banks Digital Currencies. In the first part of my thesis, I will separate Money and its Being Money Properties. I will underline the importance of Digital Transformation in our lives and the new concepts it has created. Next, I will explain whether Crypto Assets can be used as a substitute for Money. In the second part, I will talk about the history and algorithm of CBDCs. In the third chapter, while I was doing research on the subject, I will bring together previous studies in the literature review section that I prepared by presenting opposing and similar views from both encyclopedia, books and academic studies. In the fourth chapter, I will explain the designs of the countries that have made the transition to CBDCs for the first time in the world and continue their qualified studies in terms of benefits, harms and difficulties. I think that this section will be useful in order to understand the current developments by comparing them together. In the fifth chapter, I will interpret all the scientific data of current models in pros/cons comparison table, which I have created by filtering all the information about the future of CBDCs and their effects on the current order. In the 6th Chapter, Data and Methodology; I will explain the Cronbach's Alpha and t-Test methods that I used in the statistical analysis of the data I collected after analyzing the demographic characteristics of 317 people in my survey study, which I prepared based on Chapter 5. In Chapter 7, I will present the statistical findings. In Chapter 8, which is the conclusion part, I will present the CBDC models applied in the world, the results of the survey study and my suggestions regarding the transition processes to implementation.

1. CRYPTOCURRENCY

1.1. Money, Functions and Types of Money

A. Money;

The acceptance of an object or tool as money depends on its acceptance by the society. John K. Galbrith defined money as anything people will accept to use as money. But the general definition of money in the public is cash. In economic doctrine, it is not sufficient for economists to limit money to the word "cash", since all check and demand deposit accounts that can be quickly and easily converted into cash and used as payment instruments are included in the scope of money. In other words, if at least two people accept any object or property as a store of value, even temporarily, this object can act as a medium of exchange (Mishkin, F. S., 2011).

In the Great Encyclopedia of Economics, money is defined as ready-to-use purchasing power and first-order liquidity. It can be effective money or fiat money. It is not only a means of making payments and accumulating value, it is also a means of savings (The Great Encyclopedia of Economics).

As stated above, even in economic theory there is no single definition of money and money supply. In the book, Principles of Economy (2012), an example of the perception created by money in society is given.

People see the ability to earn and use money as a natural right given to them. In societies where the monetary system works well, such as the United States, the basic mechanics of the system go unnoticed. People consider it their right to go to shopping malls, cafes and buy whatever they want as long as there are enough green pieces of paper (\$). The idea that you can buy anything with money is natural. But stop for a moment and ask yourself;

“How can a shopkeeper sell a loaf of bread or a steak for worthless pieces of paper?” On the other hand, why do you need a bag of money to buy a block of cheese at some times and in some places? The answer to these questions lies within the four basic functions that make up the definition of money. (Case, K. E., et.al., 2012).

B. Functions of money;

Today, money has 4 basic features as the element of exchange (payment), the element of value accumulation, the unit of account, and the element of economic policy (Carkacioglu, A., 2016).

1. It is an exchange (payment) element,

Looking at the history of money, many objects and goods such as seashells, dolphins' teeth (still used for investment in the Solomon Islands), cocoa beans were traded to fulfill the functions of today's money. In the monetary system of the modern economy, money is given in return when a good or service is bought and sold. No one does it by barter when it comes to trading. Because the acceptance of a certain object as a means of exchange or payment prevents the harmony confusion created by the barter procedure (Case, K. E., et.al., 2012).

2. Value is an element of accumulation and speculation,

The fact that the purchasing power of money can be transferred to any time gives it the ability to accumulate value. Therefore, it is used as an investment tool.

3. It is the unit of account and value,

The use of a standard unit of account while determining the price for a good or service has made it easier to make transactions and gain from trade (Krugman and Wells, 2013, p.383). This gives rise to the property of money as a unit of measurement.

4. It is an element of economic policy,

In order to meet the supply and demand easily in national economies, economic policies are formed with interest rate control (Carkacioglu, A., 2016).

C. Types of Money;

When we look at the oldest history of money, we see that the types of money, including various commodities used for barter, are divided into two classes as commodity and fiat money. However, governments mandate legal government money to the public because of the functions of paper money as a store of value and a means of payment (Case, K. E., et.al., 2012). That is, governments declare their money to be used for payments through laws. Therefore, money in advanced economies is now classified according to two new types. The first is fiat currency and the second is commercial bank money (Ward, O., & Rochemont, S., 2019).

1. Fiat currency;

A fiat currency is a banknote and a coin whose physical value and cost are lower than when it was owned. Here, the expression “value when owned” is derived from supply and demand. Only central banks have the authority to issue official banknotes and coins of countries.

2. Commercial Bank Money;

Commercial bank money used to purchase a service or good. It is the name given to the currency that commercial banks generate from debt with the fractional reserve banking system. In order to make a profit, banks keep a certain amount of cash available for customers to use loans and withdraw money, which is called fractional reserve. This allows for the creation of new money. Commercial banks and major financial institutions hold these funds in central banks' Real Time Gross Settlement (RTGS) systems to facilitate electronic clearing. This is also called central bank electronic money (Ward, O., & Rochemont, S., 2019).

1.2. Digital Transformation and Digital Economy

With the digitalization process that has accelerated in recent years, digital transformation has started in almost every area of life. If a general definition is to be made, the use of artificial intelligence and robotic systems that emerged with advanced technological developments in the production of goods and services is called digital transformation.

Since the 1980s, technology has begun to be used and developed intensively. So, information has become both easily accessible and easily shareable. These

transformations have changed the criteria of quantitative and qualitative analyzes used during the classification of enterprises (Marangoz, M., 2012). At the same time, new initiatives were paved (Hafezieh et al., 2011).

All innovations that have emerged due to technological developments in the fields of information and communication defined as the new economy, that is, the "digital economy". According to some, the digital economy means e-commerce, according to some, the internet, and according to others, it means the transition to fully computerized systems in businesses.

Although the digital economy is known as e-commerce, it is actually a much broader concept in terms of scope. According to OECD (2015), electronic payment systems, internet-based advertisements, online application stores (Google Play, App Store...), cloud storage systems, social media, virtual currency, participation-based networking platforms and high-frequency transactions and even 3D printers can also be used. is included in the activities of the digital economy.

1.3.What Are Electronic, Digital and Virtual Currencies?

A. Electronic Currencies;

Electronic money (e-moneys) is a term used with the digitalization of payment systems in the 1990s. Kurtzman, J., in his study in 1993, mentioned that money has turned into a network system where hundreds of thousands of different types of computers are connected to each other. Although the purpose of use differs from country to country, electronic money in form is different from cash money, and it is not physically printed money (Ozturk, N., & Asuman, K. O. Ç., 2006).

Electronic coins are produced with computer software in exchange for a fund. In other words, deposit banks “print” by giving loans. Statistically, electronic money printed by banks is much more than paper money, namely cash, printed by central banks (Tatliyer, M., 2018).

Payments made with electronic money called EFT, Electronic Fund Transfers. With the widespread use of Automated Teller Machines (ATMs), EFT transactions are frequently used in money transfers between different banks. He listed some of the distinguishing features of electronic money (Piffaretti, N. F., 1998) in his study as follows;

- i. It has three legs in terms of its structure. So, there is a creditor and a payer.
- ii. It is a limited asset used only to make payments. The recipient must deliver the electronic money to the bank in order for it to be finally paid. Then e-moneys will be exterminated.
- iii. It cannot circulate: E-money cannot remain after payment. Hence, it cannot circulate among institutions.
- iv. E-moneys is not homogeneous, as each issuer generates different currencies (CPSS, 1996).

The widespread use of this electronic transition in the financial system and the increase in the earnings in current accounts with various banking policies caused a decrease in the balances held in wallets to make transactions and increased the demand for electronic money (Piffaretti, N. F., 1998).

B. Digital Currencies;

Digital currencies can be stored and transferred electronically. At the same time, the fact that digital currencies can only be issued by central banks is the most important feature that distinguishes them from the concept of electronic money. With the decrease in transactions made with cash, traditional money has started to be digitalize.

For example, the money in our bank account is digital. The emergence of POS (Point of Sale) devices and the acceleration of banks' accessibility through mobile applications have reduced the difference between digital money and cash (Griffith, K., 2014).

At the same time, this system has also popularized Virtual Pos platforms. Some of the companies that offer Virtual Pos service are: Paypal, Yandex Money, PayU, PayTr, Iyzico, Paratika, Ipara and Flexible Pos (yatirimkredi.com, Access: 01.06.21), Yandex Money, One Purse, Qiwi'nin, Moneybookers, WebMoney, Stormpay, Money Mail, RUpay, Liqqpay etc. In short, it has been since the history of humanity that money turns into only a concept and begins to gain intangibility (Çakraccioğlu, A., 2016).

C. Virtual Currencies;

According to a report published by the International Monetary Fund (IMF) in 2016, virtual currencies are coins that have their own unit of account and are issued by private developer companies. The production purpose and usage area of virtual currencies is mostly limited to a service or product. Virtual currencies are not used in legal payments because they have no legal basis by the state or institutions.

Although virtual currencies are similar to electronic money and digital money in terms of being produced in a computer environment, they are one different concept. In various academic studies about virtual currencies, the concept of virtual money is used with different meanings. Because of the difference in expression and meaning, they are mostly confused with the expressions of crypto money and digital money because they are not expressed over a common term (Uzer, B., 2017).

In essence, even though they are all created in the computer environment, they are separate concepts in terms of usage purposes, production purposes, values and properties. Additionally, when they are used interchangeably, they create confusion. Another aim of this study is to contribute to the literature in terms of the classification of traditional money together with technology.

The best example for virtual currencies is the following. There are various digital products and features that are downloaded to the phone via mobile applications or sold in-game to add effectiveness to the game in computer games (FarmVille, PubG etc.). In order to purchase these products, first the game money, virtual money, is purchased with a credit card, and then the desired product in the game. Virtual currencies have no validity in the real world. In other words, it is not possible to pay in a restaurant with the virtual UC or AG money sold in the PubG game today.

1.4. What is Cryptocurrency?

It is difficult to define a single definition for cryptocurrency (Maese, V. A., et. al., 2016). The concept of Cryptocurrency first emerged in 2008 with the financial crisis, digitalization and artificial intelligence technology in the world (Ağan, B., & Aydın, U., 2018). Cryptocurrency, which has an important place and structure in digital banking, actually has an encrypted structure. This structure is called

cryptographic. Cryptography is a unit of calculation based on algorithms and rules, derived from mathematical concepts in computer science. Thanks to the algorithms used in cryptography, passwords that are not easy to guess can be selected, and unused sessions can be closed on various platforms. Different algorithms are used for each operation (Paribulog, Access: 01.06.21). In other words, thanks to cryptography, these transactions are recorded in blockchain databases.

In general, Cryptocurrency is not issued in exchange for any physical money, it is an exchange tool that cannot be confiscated, produced and transferred with an end-to-end coding structure (Ağan, B., & Aydın, U., 2018). This feature is due to the fact that it is used in the exchange of products and services (Unsal, E., & Kocaoglu, O., 2018). They are decentralized by the way they emerge and by their nature. This is the most important and distinguishing features. Because unlike other currencies (electronic money, digital money and virtual money), they are not tied to any nation, central bank and financial institution.

The concepts of cryptocurrency and Bitcoin, which emerged with the article published by Nakamoto S. in 2008, have gained popularity rapidly, so many institutions or companies have started to launch their own cryptocurrencies (altcoins) today. Thus, there are thousands of altcoins in the crypto market around the world (up-to-date data can be found on the CoinMarketCap website). Almost every day, a new altcoin is released to crypto exchanges as the product of a project or proposal. Ethereum, Cardano, Neo, and Litecoin are the most popular cryptocurrencies after Bitcoin (LaFountain, C., 2021).

In the market research of PR, Newswire (2021), it has been calculated that Cryptocurrency Market Size is USD 1.6 billion as of 2021, but this figure may be USD 2.2 billion in 2026. Hence, it is expected to grow at a 7.1% Compound Annual Growth Rate (CAGR).

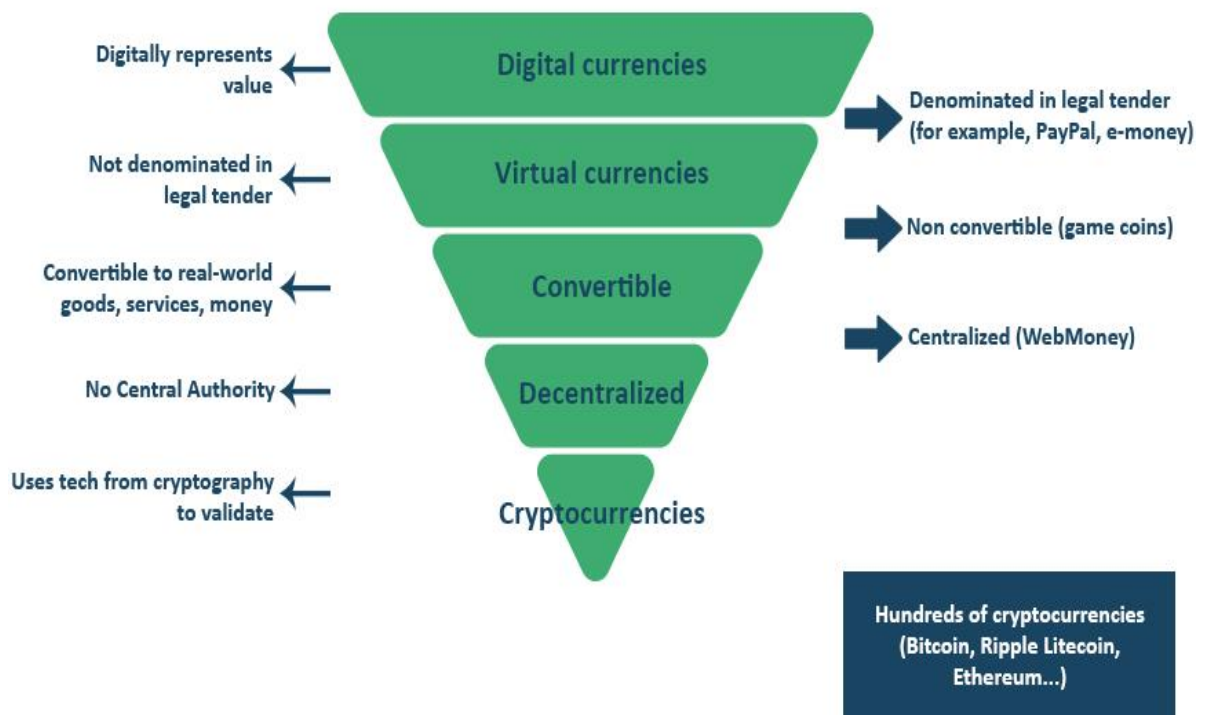


Figure 1. Currencies Hierarchy

Source: IMF Report (2016)

a) What is Blockchain?

Blockchain is a database. They function in networks of independent and voluntary nodes, and they are not a system belonging to an institution or protocol (LaFountain, C., 2021). Therefore, identity data such as who processes the data in the network system cannot be read by any institution or person. In other words, although all transactions are recorded anonymously, they are transparent and easily accessible.

Data is stored by grouping into the Blockchain database. A limited amount of data is recorded in blocks within each data set. After the blocks are full, they combine with the past and future blocks to form chains. Full blocks store data records permanently and indefinitely.

Alpago, H., in his 2018 study named *Crypto Money from Bitcoin to Selfcoin*, defined the concept of blockchain as the global transaction ledger in the digital record system of crypto money. The virtual money produced in the system (produced by the miners) is written in this ledger. The reason why these chunks of digital information are called Bitcoin is because the smallest unit of data in a computer is called a “Bit”.

1.5. Are Bitcoin and Crypto Currencies Money or Not?

There are various opinions on the subject in the literature. Although these different views have been defended by separating them from each other with certain lines, a clear conclusion has not been reached yet in the general framework. In this respect, while making my assessment in my thesis, I aim to convey the ways in which Crypto Currencies are accepted both legally and financially and their results, both in the literature review section and in different opinions within the subject.

Bal, A., in his study on the taxation of Bitcoin in 2015, is of the opinion that any tool that can have the quality of money should be defined in the economic and legal framework, that is, Bitcoin can be a "legal payment tool".

Is the questioned thing in the legal definition statement the responsibility of a central government and is it physically bearer? As a result, it is clear that the concept of money and all other assets that have the character of money are means of payment and that they are the responsibility of the central government, without creating any doubt around the laws.

In addition, if we look at the ability of Bitcoin and Crypto Currencies to be money, the authority to print money is given by law and is the responsibility of the central

banks. However, the production of Bitcoin and some altcoins are produced with great effort and patience through servers by miners who are responsible for providing security and solving problems. Also, they generally produce for a project so some call it project money (CEFIS Seminars, 2021). A maximum of 2 can be produced per day and has limits. This method is called the mining method, and the person who digs is called a miner.

However, as a result of the efforts of central banks to ensure economic stability in order to print money, necessary decisions are taken, and then printing and distribution take place in accordance with a series of procedures. When the adequacy of being money is sought, no element should be defined as money by evaluating only in terms of the basic functions of money. Because it only pays off economically.

In order for Bitcoin to be included in the real definition of money, it must also have a legal definition. When we look at the place of Bitcoin in the economic literature, we see that its value and definition have not yet been clarified. The increase in Bitcoin's value day by day is due to the fact that it will be produced in limited numbers. Although it seems to have fulfilled its function as a store of value, a legal restriction or a technical network issue may cause the Bitcoin system to come to a standstill. In this case, it may even completely lose its partially owned store of the value function.

Crypto Currencies have features that transfer value using the blockchain structure and resemble digital currencies with their technology. Transactions follow each other and work with a distributed ledger system. Many of them, especially Bitcoin, are strictly separate from fiat currencies in terms of their decentralized structure, mode of production, and risks they carry.

Users who trade on crypto exchanges can be exposed to hacking and fraud, which we can call cyber-attacks, many times when they want to transfer their money to their accounts. The technical expressions used by Satoshi Nakamoto about Bitcoin (BTC) are also used for other virtual currencies as a method. Bitcoin can be divided up to 8 digits and its smallest unit is known as “Satoshi”. 1 BTC corresponds to 100 million Satoshi. In other words, it is possible to exchange 0.00000001 Bitcoin (Alpago, H., 2018).

In fact, the reason why this new money form, designed by Nakamoto and written since 2007, was put forward with the 2008 crisis, is a response to the governments' inability to manage the crises well and the presence of banks and other intermediary institutions in the financial markets (Bal, A., 2015).

A Bitcoin wallet is a real wallet in its rough definition, but it is contained within the network structure. It has nothing similar to credit cards. Because you are only allowed to spend up to the available balance. After the first Bitcoin ATM was opened in Vancouver, Canada, it was put into use at City's Nisantasi Shopping Center in Turkey (Btcfinans.com, Access: 02.01.21). There are no legal sanctions for investing in Bitcoin, but some countries have restrictions on making direct purchases with Bitcoin.

However, there are also countries that allow shopping with Bitcoin. For example, in February 2018, a news about the Central Bank of Saudi Arabia was published on the website called EMIS Professional, which provides market intelligence and analysis, with the headline “A central bank is switching to crypto money for the first time” (EMIS, Access: 20.03.21). In the continuation of the news, it was announced that the Central Bank of Saudi Arabia made an agreement with the cryptocurrency Ripple for domestic and international payments. Also, this news announced on the BloombergHT Web Site too (Access: 28.06.21). According to

company officials, Saudi Arabia would be able to make money transfers in 4 seconds thanks to this move. Compared to the processing times of traditional banking, which can take up to 5 days for international transfers, 4 seconds would provide significant time savings. Currently, Ripple has a centralized structure, unlike other Crypto Currencies. In other words, all the ledgers traded are within the body of Ripple, an international fast money sending company (RippleNet, Access: 01.06.21).

EMIS Professional published another news titled “The Central Bank of Russia is against the use of cryptocurrencies” in May 2019. Sharing the data on the Russian Economy in the news, Central Bank President Elvira Nabiullina stated that cryptocurrencies cannot be substituted for existing instruments in the Russian Economy and it is not appropriate to include them in the financial system. In the details of the news, the Russian Finance Minister Anton Siluanov stated that the use and supply of cryptocurrencies should be under state control (EMIS, Access: 20.03.21).

According to The Financial Action Task Force in 2014, crypto currencies were defined as virtual currencies that can be transacted in the digital environment. Although they can also be traded as a medium of exchange, unit of account and store of value, they cannot be used in a valid and legal payment offer as they are not within the scope of the jurisdiction FATF (The Financial Action Task Force, 2014).

According to Rotman S. (2014), who has the opposite view, while Bitcoin and altcoins are concepts that we often hear in our daily life; coins (digital and virtual currencies) other than Bitcoin and its derivatives are not valid coins on their own. Digital and virtual currencies are dependent on the central authority. They are

regulated and supervised by governments and central banks. He stated that Bitcoin is a currency by itself and cannot be regulated and controlled by any center.

In addition, Japan and France have officially defined Bitcoin as of 2017. They defined this new type of money as “legal means of payment”. Therefore, for these countries, Bitcoin and Crypto Currencies have fulfilled the basic functions of money. Apart from that, storage functions continue in countries where they are defined as assets. In summary, Bitcoin has begun to adapt to the traditional definition of money, albeit partially. More precisely, it has partially made itself accepted by some countries by preserving its originality.

As a result, Bitcoin does not fit the definition of legal money due to its decentralization and inability to embody. In other words, it has not yet been able to fully meet all the necessary criteria for money in legal terms. More importantly, discussions will continue about how an uncontrollable structure can be legalized.

2. CBDC AND IT'S HISTORY?

Central banks are the institutions that have the authority to issue and distribute a single currency and also implement the most comprehensive macro and micro policies. In this way, it manages the financial system and works towards improvement. It sells money to commercial banks, and commercial banks provide facilities according to their customers' needs through transactions such as deposit accounts and various loans. In the past, the first thing that comes to mind when talking about money, cash money has been replaced by various mobile applications on mobile phones, namely digital currencies. When it comes to cash, the first thing that comes to mind is that it is the only representative of the national currency. With this decrease in the use of cash, most of the money in the market has turned into digital form. Therefore, the concept of central bank digital currencies (CBDC) is not a new concept. However, until a few years ago, these digital currencies were carried out only between institutions (as the reserves of financial institutions) with the phrase "wholesale CBDC", but today, research on "retail CBDC" models has begun.

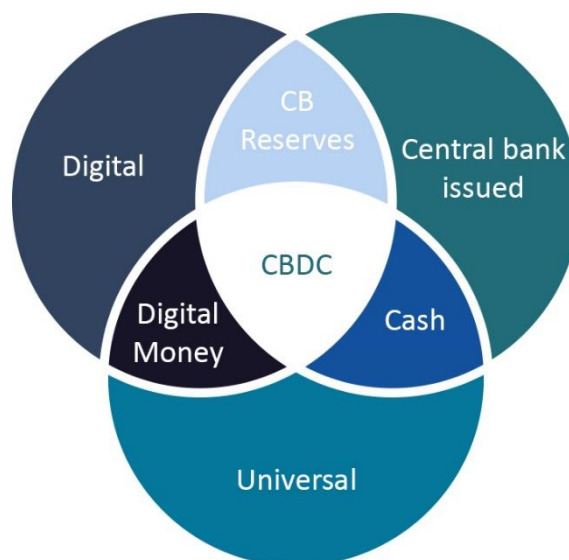


Figure 2. Classification of Central Bank Digital Currency

Source: Bank of England (2020)

The Committee on Payments and Market Infrastructures (CPMI) and Markets Committee (MC) defines CBDCs, as a new type of currency, different from paper money than from central bank reserve and settlement accounts (CPMI-MC, 2018). These new retail central bank digital currencies will be the new official digital currencies of the nations. A clear definition for a central bank digital currency has not yet been established because it is a practice that differs from country to country. All of them are produced with a distributed ledger structure and the way they are used is digital wallets. However, for each country, there are very specific applications and features other than these. Because the needs, views and laws of every society and country in terms of economy are different from each other.

According to Yanagawa, N., & Yamaoka, H. (2019) defined CBDCs, a digital instrument, have actually been described by central banks as digitized instruments in loan payments.

In case of a negative impact on the banking system, some of the countries that produce their digital money aim to offer digital currencies through commercial banks. Banks will also distribute them to the wallets of individuals and institutions through digital wallets. This system is easier to implement within the general framework of laws. This means retail CBDC.

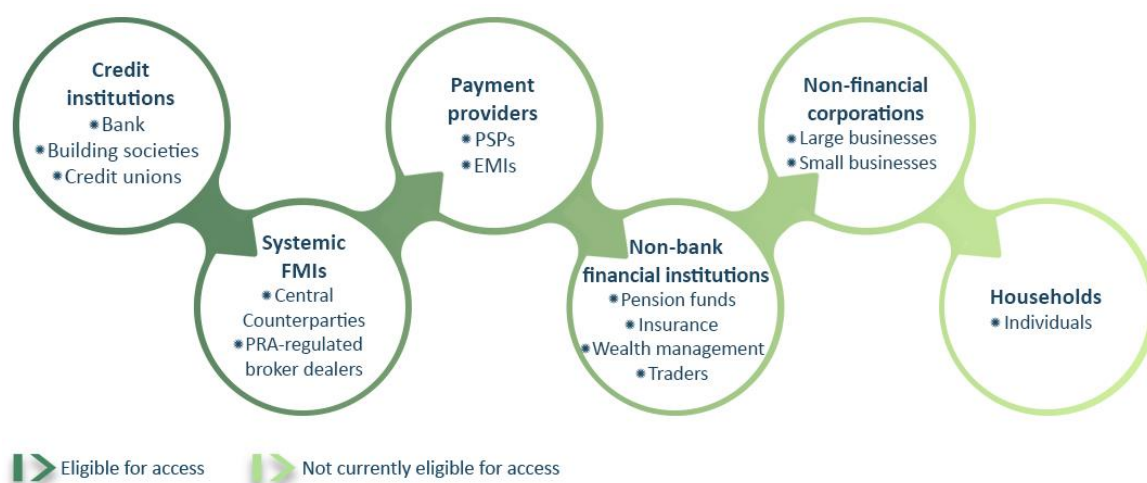


Figure 3. Stylized Continuum of Access to Electronic Central Bank Money

Source: Bank of England (2020)

These developments, which are still very new, have caused the benefits and harms of CBDC issuance to be investigated very carefully and attracted attention. Many question marks in mind have not been answered yet. It is useful to use model studies to get an idea about applications. In Chapter 2 and Chapter 3, the aspects of the models from different perspectives are discussed. A detailed study on what the advantages and disadvantages might be will be explained in Chapter 5.

Thanks to the smart contracts to be used in its structure and the scattered ledger structure; user balance sheets can be tracked easily and they will be able to trade only with the digital form of the country's main currency. All these transactions are processed on the blockchain base via distributed ledgers.

2.1. Distributed Ledger Technology (DLT);

DLT is a chronologically ordered technology that cannot be undone because it is shared by all users in the network and is cryptographically signed. Authenticated users can view the history of another user's transactions on the network. The biggest feature of this technology is that it is decentralized. The exchange of values takes place between spouses based on consent, thanks to certain algorithms. All the elements in the figure below are independently included in the structure of the DLT (BoE, 2020). All elements in the figure below are potentially independently adaptable.

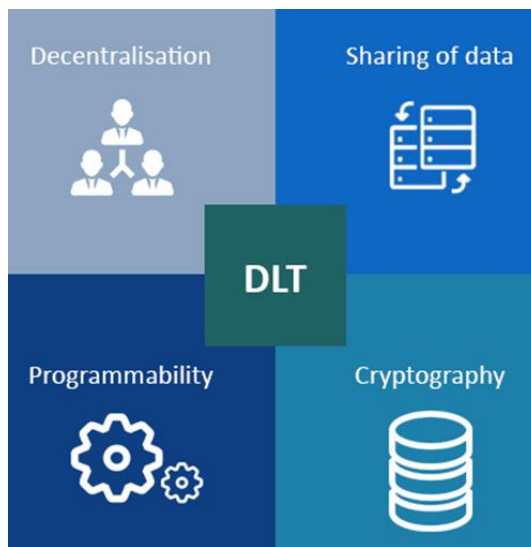


Figure 4. Elements of DLT

Source: Bank of England (2020)

Although there is no clear consensus about blockchain and DLT yet, blockchain technology is actually the most known and widespread DLT technology. Because DLT is the supporting protocol infrastructure that enables synchronous updating of computer processes joining the network from different locations. This structure ensures that your decentralized systems are secure. One of the suggested methods to increase security is to diversify payment systems.

Thus, when there is a malfunction in the systems, the whole system will not be damaged. The reason for the rapid decline in cash usage is the formation and diversification of special payment infrastructures. Since CBDCs will be in a two-tier structure, the private sector will also be able to make payment service provider initiatives. Thus, positive developments will be experienced in terms of financial stability, competition and innovation (Allen, S., et. all, 2020). All these technological developments will also facilitate access to financial services for rural or unurbanized regions such as islands.

2.2. Smart Contracts

Smart contracts are the ability to program digital money. A number of restrictions and conditions apply to the transactions made. In case the expenditures make the account negative, the order can be cancelled. Or, for a certain % of digital money, the government may impose a restriction on spending only in certain sectors. Thus, with digitalization, privacy will gradually decrease, but current market monitoring will also become easier. Thanks to this functionality, "atomic" (indivisible) operations will be possible.

In other words, as long as the asset transfer is mutual during the transfer, the transaction can be carried out. Hence, indivisibility derives from this connection and transactions are reciprocal. Although the national CBDC was initially thought of as the digital equivalent of the principal, it may be possible to talk about more than one national CBDC in the future.

For such cross-currencies, security services that provide Pay-to-Payment (PvP) or Pay-to-Delivery (DvP) may come into play. In short, the concepts of Digital wallet and smart contract that join daily life will bring together concepts such as Digital General Ledger (Ledger-i Kebir) and account management (Allen, S., et. all, 2020).

3. STUDIES IN THE LITERATURE

Bordo, M. D., & Levin, A. T. (2017) stated how the electronic money system that central banks are trying to establish could be included in the market and how to manage financial policies transparently within a certain order in a simplistic way in their study. They asserted that digital currencies would provide a simple and influential exchange and could serve stably. In this study, 5 different questions are explained in a detailed approach. Principally, "Will CBDC payments include the transfer method among the accounts of individuals subject to the central bank or the digital coin system that can be sent between individuals?" was studied. In the second heading, the question "Will cash money and CBDCs be used together in the financial market and if the cash currency is not removed, should a program be created for the realization of transfers between digital money and cash currencies?" In the following part, the question of "Should the CBDC be a currency with interest or indexed to the total price index instead of having a nominal value?" has been underlined. In the fourth heading, "The probable effects of the CBDC on the current central bank financial policy" is examined. In the last section, the question "How will CBDC affect the relationship between the central bank and financial authorities" has been answered (Bordo, M. D., & Levin, A. T., 2017). In addition, the features that an accurately designed CBDC model should have are also included in this study. It has been stated that CBDC will contribute to the efficiency of the payment system and this supposition has been supported by a study by the IMF. Additionally, the approach of different countries to CBDC and the benefits provided by CBDC to central bank financial policies are discussed in the study. In this study prepared by Bordo and Levin, how the role of CBDC could be facilitated and the effects of CBDC on central bank financial policies are explained clearly. Despite the fact that Bordo and Levin have also explained the possible risks of adopting a passive approach, It was written that it may be logical to monitor the activities of those central banks which have implemented the CBDC model and examine probable problems through this in the study (Bordo, M. D., & Levin, A. T., 2017).

Bilir, H., & Serif, C. A. Y. (2016) focused on 3 main sections in their study. In the first part, digital payment methods are discussed and in the second part, the concepts of financial stabilization are examined. In the third and last part of the study, how the market reacts to the change and development of digital payment methods and how they are affected are discussed. It is not known how to synchronize the concept of money and how to follow the possible changes in the financial market, and this is a situation that poses a question mark in people's minds. This study is to examine how electronic currencies and their derivatives will take place in the financial market and as a result, their possible effects on the financial order to bring a shed some light on something to the discussions in the society. As a result of this study, it was understood that the main issue that states should be cautious about this new money concept is how much they would be able to protect their authority by using digital/electronic money in financial markets through central banks and what kind of path they would follow in case of possible instability (Bilir, H., & Serif, C. A. Y., 2016).

MacDonell, A. (2014) studied about Popping the Bitcoin Bubble has been prepared under 4 titles. First part included how to create the Data and ARMA Model is defined. In the second title, the term Financial Bubble has been examined. In the third title, Log-Periodic Power Law (LPPL) models, analyzed data and formulas are explained, in the fourth and final title, the dramatic Bitcoin decline in December 2013 and the fact that the LPPL model has analyzed this decline beforehand are explained. In this report prepared, it is assumed that the value of Bitcoin is directed both by being an exchange tool and using it as an investment tool. The CBOE Volatility Index examined in the report shows that investor movements are effective at the moment, but consumer movements are ineffective. Since Bitcoin has a large rate of instability, the amount of hypothetical earnings is higher. MacDonell, A. stated that this is why people who invest in Bitcoin invest not because they want to keep digital money, but because they think that they will make a high profit, and that these people can cause insecurity and instability in the market by spreading

news that is not based on reality for the sake of earning more. In such a reckless market, the thing that can help a Bitcoin investor the most is to be warned before sudden and bulky dips occur. LPPL models can detect key points in the Bitcoin market. These models, which analyze the data before the decline in value, are working successfully without any declines and have ensured that many investors do not suffer a large amount of loss (MacDonell, A., 2014).

Wang, H., & Gao, S. (2021) published a study about how a CBDC network will be formed in the future, the regulations that can be experienced and how the Global Financial Network (GFN) will be affected. Their opinions are CBDCs are very different from paper money and will likely cause a radical change of balance in the International Financial System. In the first part of the study, it was argued that the CBDC system does not have a centralized structure and will have an uncoordinated structure within itself. In the second part, the effect of the CBDC network to be formed on the political spread is examined. In the third and last part, how the CBDC will affect the balance between the Global Financial Network (GFN) and the different leading roles is discussed. It is thought that CBDCs will create a network that will dramatically affect the international financial market in the future (Wang, H., & Gao, S., 2021). This is because CBDC has a different structure than cash. It is expected that the CBDC network may cause limited cooperation and the conflicts that may occur will greatly affect the international financial system. It has been stated that GFN will also be affected by this change and the process of transition to a flatter network structure will accelerate. It is stated that the actors involved in the future CBDC network will try to increase their power on the network by trying to improve their position. According to this study, international organizations will play an important role on the basis of the cooperation to be formed. The arrangements to be made should not cause the CBDC network to lose its self-identity. An international behavioral ethic should be established, and this will be a spark for the predictability and reliability of the international economy, which will

prevent possible problems partially. The most critical point in the CBDC network is low risk and financial stability (Wang, H., & Gao, S., 2021).

Bindseil, U. (2020) briefed on the implementation and importance of digital currency in the series of working papers published by the European Central Bank. First, the advantages and disadvantages of CBDC are emphasized. Later, two main issues were emphasized. One of them is that banks do not mediate digital currency and the role of the Central Bank in this process, and the second is the risk of banks working in crisis situations. The double-standard pricing of Digital Currency has been presented as a suggestion to these two main issues. Finally, this research compared the effects of CBDC on crypto assets and digital money in international contexts on the bank and financial accounts. As a result of the study, when the innovative coins and the concerns they arose were examined, it was noted that the financial results of CBDC were similar to Libra and Stablecoins (Bindseil, U., 2020).

Juškaitė, A. (2019) study in which CBDC was discussed as a subject of discussion, it was mentioned that CBDC is a safe payment and low-cost method that meets the needs of people. On the other hand, considering the export of digital currency, it was emphasized that this is a factor that varies from country to country and that it should be created by taking the characteristics of the country into consideration. However, in addition to this, it was emphasized that CBDC needs a common goal and agreement in order to respond to a global purpose. In this context, firstly, the practical perspective of the Bank of Lithuania was discussed in the study, and then the experience of digital, new coin printing technology was emphasized. As a result of the research, the existence of various CBDC variants was mentioned, it was emphasized that it could be a widely and easily accessible currency without risk, as well as it was emphasized that the currency could have negative consequences for politicians, the estimated benefit and cost balance relationship was mentioned and

for a global financial solution in the current world. It has been said that it can be a safe and systematic method (Juškaitė, A., 2019).

Dow, S. (2019) focuses on Central Banks, digital currencies and monetary reform movements, it is emphasized that there has been a monetary reform with the newly introduced digital money. At the same time, it was emphasized that it is important to meet the needs of not only digital money but also other innovations that generate credit and liquidity in the financial sector. As a result of the research, which included various suggestions, they stated that these suggestions may create some difficulties of various kinds, and even that the Central Bank digital currency could not meet these difficulties as much as possible and instability may occur as a result of these. Although it seems nice to design and implement a new system thanks to technological developments, it is thought that separating the money and payments of a state can create some problems in the monopoly. However, it has been concluded that this idea is not the only reason to make a judgment and that such progress can only be achieved by focusing on development and conducting more comprehensive socio-economic research (Dow, S., 2019).

Mandeng, O. J. (2020) states that instant payments in Central Bank money and foreign exchange trading have highlighted many advantages of digital money that it also facilitates foreign exchange trading. It has been said that CBDCs significantly reduce payment transactions compared to the Central Bank and thanks to CBDCs, the Central Bank's liquidity can progress more effectively. On the other hand, it is inferred that digital money reduces financial risks in the global arena. This study is in the nature of a discussion about what results may arise as a result of the implementation of CBDC. It is concluded that the foreign exchange market will be one of the most important beneficiaries of digital money. It is thought that instant transactions can help in accessing the Central Bank's money in trade and reconciliation. It is among the results of the study that thanks to the CBCD, it can

be very beneficial for the Central Bank by ensuring a more equitable distribution of the Central Bank's money. It is envisaged that the creation of CBDCs will create a more complementary effect on the money market, as opposed to possible foreign exchange market modification (Mandeng, O. J., 2020).

Ward, O., & Rochemont, S. (2019) aims to make the digital currency models in the Central Banks understandable in their report. This study was carried out with volunteer workers under finance and investment sponsorship. The Institute and the College of Actuaries (IFoA) has taken steps to develop and regulate themselves both in the UK and internationally. For this, many models are focused on, but a full and clear recommendation cannot be made yet. In order to make a clearer recommendation, it is thought that more careful examinations should be made on the security and interest rates of digital money. In the study, it is thought that technology will be very helpful in the emergence of digital currencies as in crypto assets. But besides this, security concerns of the Central Bank are that it is not convinced that this will be viable. It is seen that the researches on crypto-assets made in 2018 were transferred to the literature in the light of negative information. However, it has been emphasized that the benefits of Blockchain application are also increasing in the public sphere. Within the scope of the researches, it has been seen that the payment methods in most countries in the global sense have changed considerably. Central Banks have also begun to accept that developments have occurred thanks to these changes, and the need for technology has been emphasized in order to realize these developments. It is also said that there may be some risks in potentially launching a CBDC using existing technologies. Finally, it is stated that the risks and benefits that can be correctly named for some countries may not be correct for some developing countries (Ward, O., & Rochemont, S., 2019).

According to Nández Alonso, S. L., & Jorge-Vazquez, J., & Reier Forradellas, R. F. (2021), it is necessary to well determine the CBDC and the optimal of countries in which it will be applied. In the research, CBDCs, which are central bank digital currencies, were analyzed. Applying this method; Several countries have been studied, such as the Bahamas, China, and Uruguay. The system has been applied to these countries, which are thought to be the most suitable for establishing a CBDC, has been tested with statistical data and according to the analysis results, positive results have been found according to the regions where they are located. As a result of the study, the most suitable regions to be implemented in Europe were countries such as Lithuania, Estonia and Finland. A high correlation was found between the sample of China in Asia and the results of South Africa in Africa. At the same time, according to research results, Africa has been the most suitable country for digital money application. In the research, which referred to the need for technology for the use of the Central Bank digital money, it was still stated that more research would be needed for this transformation to occur. This indicates that CBDCs will be a structure that includes advantages and disadvantages that may vary by the specific needs of each country (Nández Alonso, S. L., & Jorge-Vazquez, J., & Reier Forradellas, R. F., 2021).

Chorzempa, M. (2021) examine have been conducted on the importance of the Digital Central Bank in being the first of the United States and China. It was emphasized that crypto assets, which were seen as an extreme idea a few years ago, have now become a structure that is examined by 80% of central banks. The United States and China, which have two important economies, have taken initiatives to evaluate the World Banks and the importance of CBDCs. China has been making some attempts to launch CBDCs since 2016. At this point, China has realized a pilot implementation and has taken an important development in this direction. This article then criticizes China's role in the study of CBDCs. Even if China is the first country to advertise in this market, it is thought that there is a possibility of falling behind in this regard with the development of technology later on. In the conclusion

part of the research, it was emphasized that the advantages and disadvantages will not be proven until many more pilot studies are activated, apart from the pilot study applied to China. It is believed that China is acting aggressively in developing CBDC, and it is more advantageous to understand the risks and benefits of high-income countries such as the USA as well as this developing country. Although the first move in this market seems to be an advantage at first, it has been concluded that it may turn into a disadvantage with the development and change of needs and technologies in the future (Chorzempa, M., 2021).

Caglar, B., & Yavuz, U. (2021) investigated the effects of financial newspaper news on Bitcoin price predictions. As a method, quantitative and prediction methods were used by using artificial neural networks. For the Bitcoin price estimation, many values such as number of wallets, costs, number of transactions per day and number of confirmed transactions were taken into consideration. As a result, there is not any strong link between newspaper news and Bitcoin price prediction in general, but some effects are still observed depending on the popularity of newspapers. It has been accepted its creation of various effects, particularly The Wall Street newspaper, then the Financial Times, Nhon Keizai Shinbun, Handelsblatt and Moskovskiy Komsomolets. At the very end of the study, the conclusions of the analysis were compared with similar studies in the literature (Caglar, B., & Yavuz, U., 2021).

Zengin, B., & Gungordu, A. (2014) suggest that electronic commerce has increased with new developments in the financial system. Financial markets are changing and the physical borders on them are being erased. However, studies are carried out to enhance the number of participants even more. The effects of digital payment systems, including Bitcoin, on the economy, are investigated in terms of monetary policy, marketing, cash and risk management. Cash management will generate even more effective results as such digital financial instruments offer the opportunity to

make transactions quickly and at low costs. Most importantly, with the reduction of liquidity and financial risks, positive developments will be achieved in sectors such as banking, insurance and retail (Zengin, B., & Gungordu, A., 2014).

Yermack, D. (2013) argues that the three basic functions of real currencies. According to the study, Bitcoin and cryptocurrencies don't have these functions in their extremely volatile and speculative nature. For this reason, they cannot be used as an exchange tool, cannot act as a store of value and cannot be used as a unit of account. It has been mentioned that the volatile and volatile structure of Bitcoin is much more than all the commonly used currencies. At the same time, it has been interpreted as "hedging" or including it in the system in risk management is useless because it is almost zero related to the variability in the daily rate of bitcoin and the exchange rates of commonly used currencies and gold (Yermack, D., 2013).

Lo, S., & Wang, J. C. (2014) explain that it is necessary to compare Bitcoin, which they described as a financial claim, with money. They evaluated the effectiveness of other payment systems and the main factors that shape the future of Bitcoin. And finally, it is mentioned if Bitcoin has the functions of fiat money. Bitcoin has been researched in terms of its currency feasibility, technological infrastructure, compatibility with banking policies, and similarity with other currencies such as its place in the market. The research method, in order to comment from a general perspective, the relationship of Bitcoin with the most traded currencies in the markets has been examined in a 5-year period. All currencies were evaluated according to the daily price movements of the USD. As a result, it has been observed that the highest volatility is in Bitcoin. Researchers have concluded that the price of Bitcoin has increased and decreased significantly. Moreover, Bitcoin has shown more distortion and kurtosis than other currencies. This shows that the crypto market is experiencing very large standard deviations. The general opinion is that Bitcoin is not enough stable to compare with major currencies, but that Bitcoin's technology and network are too important to ignore for fundamental financial changes as well (Lo, S., & Wang, J. C., 2014).

Buchholz, M., & Delaney, J., & Warren, J. (2012) tried to prove that Bitcoin is prone to bubble formation due to its speculative and unbalanced changes in its structure. In this study, using the ARCH/GARCH model, it was seen that the price of Bitcoin was positively affected by the unbalanced pricing experienced before reaching the ATH (All-time High) level. In addition, in the TGARCH model used, it has been observed that positive and negative shocks create asymmetric effects when the market is at the ATH level. This proves the bubble structure of the Bitcoin market and the involvement of speculators in the system. According to the researchers, this result is consistent because it provides the motto “Less Time More Money” for speculators, arbitrageurs and other market participants in the market before the bubble bursts. Bitcoin is a digital financial instrument that has a very different system from cash with its decentralized structure. The fact that Bitcoin is digital data causes the double-spending problem. This problem – that user in the system can copy, reproduce and use the currency they have more than once – is prevented by the “blockchain” recording technology, which is publicly recorded and cannot be retrieved. The working principle of this recording technology is based on the use of CPU power supplied to the network by users, called miners, who receive a small amount of Bitcoin in return (Nakamoto, S., 2008). As the number of transactions made increases, the amount of Bitcoin miners earn decreases. Thus, the Bitcoin supply increases by a decreasing amount (Buchholz, M., & Delaney, J., & Warren, J., 2012).

Kancs, D. A., & Ciaian, P., & Miroslava, R. (2015) discussed whether the features of Bitcoin that prevent it from being a currency that can be used as a medium of exchange, a unit of account and an investment tool in their JRC Technical Report. In addition, in this study, Bitcoin was compared with other currently used currencies. In the analyzes made, it has been seen that the unbalanced value change of Bitcoin is very different from standard currencies. To understand the reason for this unbalanced price change, the price formation processes and the importance of the factors are discussed econometrically. The fact that Bitcoin price is based on

speculation and sensation shows that it cannot compete against other currencies. There are two competing views on whether Bitcoin has the three criteria (a medium of exchange, a unit of account, an investment instrument) that a currency must have (Mankiw, N.G., 2007). Therefore, the discussions about the replacement of currently used financial units such as the US Dollar, Euro and Yen are still ongoing. In a legal sense, there is no agreement on Bitcoin's place in the global market, as there is no international law regulating Bitcoin. The regulations and perspective in each country are different. In the study, the perspective of some countries towards Bitcoin is included. As long as the financial value of Bitcoin is determined by speculative investors, it is seen that it cannot compete with the currently used currencies. Features such as the irreversibility of Bitcoin transactions, difficulty in purchasing, not granting a loan in Bitcoin, and the need for a high level of computer knowledge to understand and use Bitcoin technology are all negative reasons for not being able to replace the currencies currently used by countries. In addition, extremely volatile changes in Bitcoin price make it difficult for Bitcoin to be accepted as a worldwide currency. Short-term speculative investments can create Bitcoin price bubbles. Long-term speculative investments, on the other hand, are that Bitcoins that can be used can be stored in high volumes. The success of Bitcoin depends on the elimination of these negative possibilities (Kancs, D. A., & Ciaian, P., & Miroslava, R., 2015).

In 2015, Cheung, A., & Roca, E., and Su, J.-J. published a study and they discussed the issue using the econometric analysis method about the bubbles in the price structure of Bitcoin. Because especially similar with this subject there is no academically qualified study in literature according to them. By examining Bitcoin pricing in the years 2010-2014, researchers noted that there were short-term bubble formations in the Bitcoin market. In addition, in the study they published, the researchers mention that there were 3 large balloon structures with a duration of 66-106 days between 2011 and 2013. Unlike cash currencies such as Bitcoin, Dollar, Euro, Yen, it has been included in the market as a transparency-based digital

currency where the supply is not at the discretion of the regulators. Due to these features, 1Bitcoin = 1200USD in 2013, an increase of approximately 700% since its launch in 2009. The bankruptcy of the Mt.Gox' stock market in 2014 proves the bursting of the Bitcoin bubble structure (Cheung, A., Roca, E., and Su, J.-J., 2015).

Segendorf, B. (2014) study, digital units are discussed in 3 different groups determined by the European Central Bank, and the main features of Bitcoin, the most popular digital currency, are examined and the risks that can be experienced with digital currencies are mentioned. Virtual currencies can be obtained in many different ways and are intended for use in virtual payment methods (Segendorf, B., 2014).

Gultekin, Y., & Ozdemir, F. S. (2017) in their master thesis study deals with the volatility of digital currencies and the risks and returns of using the 100 cryptocurrencies with the highest trading volume in the market as a value storage unit. The aim of this study is to divide the digital currencies into subgroups according to their characteristics and to contribute to the selection process when investing in crypto money based on the differences in the volatility values of these groups. Gultekin, Y., & Ozdemir, F. S., recorded the 2016 USD values for each cryptocurrency and found the daily exchange rate. Then, annual volatility was determined. Finally, another volatility figure was found by taking the arithmetic average of the 3-month volatility figures using the historical average model. In addition, the inverse relationship between volatility and time to market was determined by the correlation test. According to these test results; It has been determined that there is an inverse correlation between market unit value, market capitalization size and the number of days traded and volatility, and there is a (linear) correlation with the percentage of market presence. In summary, the ideal currency to choose when investing on the basis of volatility; It has been seen that there is a currency that has been included in the market before, has a larger

capitalization and has a higher market unit value, but has a low percentage of market presence yet (Gultekin, Y., & Ozdemir, F. S., 2017).

Mankiw, N.G. (2010) states that in the classical quantity theory of money that when the amount of money in circulation increases in an economy, prices or the amount of production will also increase. In this theory, the velocity of circulation of money is considered to be constant. However, when the rate of money that individuals want to hold changes, the circulation speed of money changes in the opposite direction (Mankiw, N.G., 2010). Initiatives in financial sectors have an undeniable effect on money demand. For example, ATMs have reduced the amount of cash held by individuals, and on the other hand, increased the circulation rate of money (Mankiw, N.G., 2010). These and other financial innovations are the main reason for the change in the economic movements of society. Thanks to the developing technology and the internet, the ability to make payments in a short time reduces the amount of cash carried in the wallet. It has been understood that classical theories should be reinterpreted due to technological and financial developments (Mankiw, N.G., 2010).

Baur, D. G., & Dimpfl, T., & Kuck, K. (2017) applied the GARCH volatility analysis method and determined that there was no relationship between the Dollar-Gold-Bitcoin. Bitcoin's decentralized nature and the absence of any government behind it are similar to those of gold, but the idea that it is a medium of exchange makes it similar to cash. Bitcoin has been classified as something between gold and the dollar. The current high returns and volatile price changes prove that Bitcoin is a highly speculative asset compared to the US dollar and gold. It has been determined that Bitcoin pricing moves independently from other asset prices, but weekly fluctuations in the US/British Pound exchange rate have a slightly negative effect (Baur, D. G., Dimpfl, T., and Kuck, K., 2018).

Atik, M. Kose, & Y., Yılmaz, B., & Saglam, F. (2015) purpose to discuss the relationship between Bitcoin and exchange rates within the scope of Granger causality analysis. In this study, it was determined that there is only a one-sided and delayed connection between Bitcoin and Japanese Yen, from Japanese Yen to Bitcoin. As a result of the examinations, the basis of this relationship is based on the regulations made by the Japanese government for the use of the Bitcoin system in the capital market and being the first country to allow its active use in daily life. The money stolen from Mt.Gox, a Japanese digital commerce channel, can be easily used in the realization of illegal activities and due to such scandals in the media, countries have had to take precautions and make legal regulations against cryptocurrencies (Atik, M., et all., 2015).

Carrick, J. (2016) study published about 5-year data of Bitcoin and the value and price change of Bitcoin compared to emerging market units were analyzed. In addition, this study is one of the first to examine the use of Bitcoin as a complement to emerging market currencies. In this study, the formulas for minimizing the uncertainties about Bitcoin and maximizing the benefits are also mentioned. In this study published by Carrick, it is mentioned that Bitcoin can be used as a financial tool and that it should attract much more attention from the scientific community. As a result of the study, it has been stated that Bitcoin has suitable features to be used as a complement to emerging market units (Carrick, J., 2016).

Glaser, F., et all. (2014) published it is investigated whether Bitcoin is used as a currency or as an alternative store of value. Bitcoin is a decentralized digital currency that is very popular in the media and has a large user base. In the research conducted between 2011-2013; The commercial data of the Bitcoin exchange, the Bitcoin transaction data in the Blockchain, the visitor statistics of the Bitcoin article on Wikipedia and important issues in the history of Bitcoin were evaluated. As a

result, it has been observed that new users included in the Bitcoin ecosystem see Bitcoin as a speculative investment tool (Glaser, F., et al., 2014).

Nakamoto S. (2008) known as the person or group who is the founder of Bitcoin, talks about the digital structure of Bitcoin, the working principles of the network and the features of Bitcoin in his/her work. Bitcoin is a peer-to-peer digital currency system that makes it possible to make online payments from one party to another without any financial institution (Nakamoto S., 2008).

4. CBDC MODELS OF ENGLAND, BAHAMAS AND ALL OTHER COUNTRIES WORKING ON CBDCs

4.1. A Platform Model of The Bank of England

4.1.1. Definition and History of The Bank of England

The Bank of England, which was established in 1694 by the decision of the Parliament as the Central Bank of the United Kingdom, has been serving the people of England in the financial region in the center of the City of London for more than 325 years with the aim of sustain a safe and risk-free financial environment. With the Royal law enacted in the first years of the central bank, it was not allowed to establish another joint stock bank in England and Wales until 1826.

Thanks to this law, the Bank was the largest and most prestigious financial institution in the UK with the competitive advantages it gained thanks to its special status. In those years, some impotence arose in the economy due to the French Revolution and the Napoleonic Wars. Funding had to be provided for Britain to be financed in these conflicts, and this made a huge impact to increase the Bank's actions. In 1946 the Bank was now nationalized. At that time, coinage, managing reserves, the government as well as consulting services, such as making gold, foreign exchange and money markets determine the policies of the bank in the unauthorized practice. With the authority to "determine short-term interest rates" given in 1977, its effectiveness in the markets further increased.

The Bank maintains its goals and economic stability with the powers granted by the Parliament. In recent years, the reliability of banknotes has increased as "polymer banknote" has been used instead of paper. Reconstructing payment services,

constantly innovating, the Bank increased its investments to restructure its Real Time Gross Settlement (RTGS) service.

Additionally, it improves the existing payment systems with the support it provides to the private sector, while strengthening the electronic payments infrastructure (Adam, 2019).

4.1.2. Bank of England's Thinking on Stable Coins, CBDC Design and Crypto Assets

The Bank of England does not accept Crypto Assets as a currency or money. As is known, many crypto assets are privately issued and not supported by any central party. The British Central Bank's idea on this issue is that Crypto Assets does not fulfill the basic functions of money (Bank of England, Discussion Paper, 2020).

Due to not being able to provide trust by itself, it is not possible to use crypto assets as a store of value. Crypto assets do not have a large enough area to enable them to be a means of exchange, a medium of exchange, which is one of the basic functions of money. Therefore, it is not possible to use them as a unit of account (Carney, M., 2018).

The Central Bank advocates that the qualifications of Stable Coins should be increased and the way they are included in the current order should be analyzed correctly in order to complete the deficiencies on this issue, to sustain financial stability and to reduce the risks at the same time.

In light of these objectives, the Bank offers models for providing an environment of thought and discussion on the issue by asking various questions to its counterparts in the Central Bank Digital Currency (CBDC) studies. At the very exact moment of writing this thesis, the latest of these studies is the Bank of England

Discussion Paper, which includes questions about design principles, opportunities and challenges, published by the Central Bank in March 2020, including the Spring term of 2021.

All these studies are not yet a reference that the Bank will officially initiate CBDC applications; it only contains ideas on proposals that encourage thinking about the CBDC and create an environment where public policy is at the forefront. One of the important points mentioned by the Bank about CBDCs is the determination of the targets that the CBDC design called "Platform Model" will serve and it is under the umbrella of the Central Bank.

Considering the sensitivity of a country's Central Bank in terms of stability in the economy, the opportunities that CBDCs will create in the markets and all other possibilities should be meticulously discussed and analyzed with their positive and negative aspects.

Due to the fact that not having enough study and practice because of being a new subject, just by taking the reports published by other Central Banks in the world and in the sources in the literature into consideration, predictions about the future about CBDCs are shared in general.

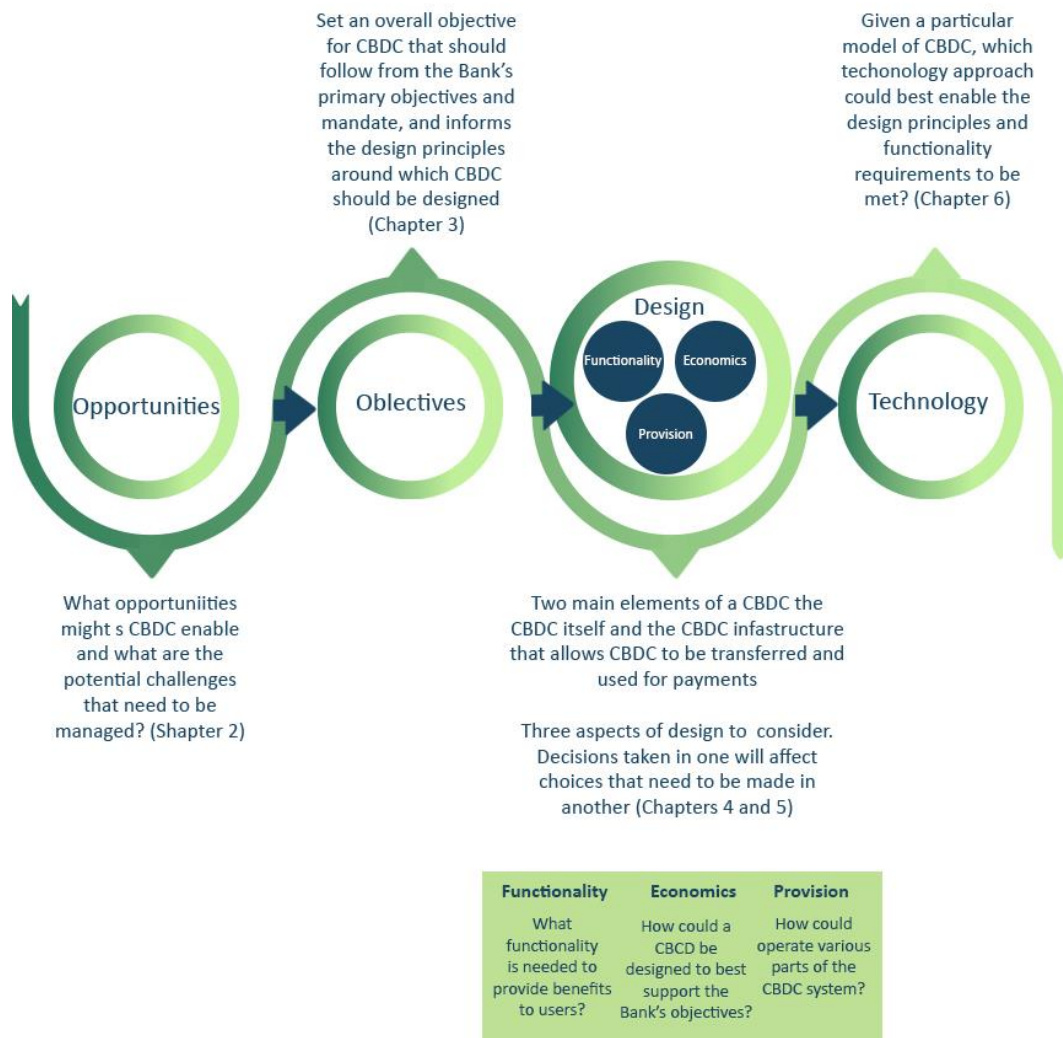


Figure 5. Bank of England Approach

Source: Bank of England (2020)

While previous studies have focused on "Wholesale CBDC", which will provide consensus in financial markets and payment systems, this study has now included important information about "Retail CBDC" in the Discussion Paper by the Bank of England in order to create the infrastructure. For this reason, the Platform Model of the Bank discussed with the following aspects and the mentioned points are conveyed.

4.1.3. Opportunities and Challenges of The Bank of England

Digital Currency

The British Parliament attaches great importance to the Bank's maintenance of monetary and financial stability. It is discussed that the reliable currency in England, Scotland, Wales and Northern Ireland is issued by the Bank of England. Herewith, CBDCs must comply with the stability policies defined by the Parliament. In the discussion paper, where the opportunities and innovations about CBDCs published by the BoE are shared, attention is drawn to their suitability for the aims of the Parliament. In this period of time, when CBDCs have not yet been implemented, one of the bank's methods of sustaining stability targets is that major financial institutions and all commercial banks can keep electronic money accounts in the Real Time Gross Payment (RGTS) system (BoE, Discussion Paper, 2020).

These accounts are called "closing" and "reserve". If the obligations at the Central Bank are fulfilled, limits are not exceeded and there are no penalty periods, this function can be used with indirect tools that determine the reserve money supply. Changes in "Overnight (interbank)" and money market interest rates depend on the effect of banks on their liquidity positions and the re-establishment of reserve supply and demand balances.

During these developments in the financial markets with the demand for reserves, the central bank also determines the liquidity of the system and undertakes the market distribution (Lipsev Richard G., & Stenier Peter O., 1978).

This liquidity also ensures that unexpected demands are met and companies' payments are not delayed. Thanks to electronic money, people's need for banknotes is met. Thus, as Central Banks can have flexible payment systems, they can reach the financial stability target. Considering the activities and deposit transfers in the

system in terms of volume, not only cash and reserves but also retail systems and card networks are used in public payments. Any payment failure that may be experienced makes the reliability and stability policies of the banking system question. It is the responsibility of Central Banks to take steps to strengthen the system. In the UK, the Financial Policy Committee (FPC) defines payment systems as one of the vital values of the economy. That is why the BoE has highlighted seven key topics for the opportunities and challenges CBDCs present in the UK. These headings are included in the graphic below Figure 4.2.



Figure 6. Supporting Monetary and Financial Stability with Opportunities of CBDC

Source: Bank of England (2020)

4.1.3.1. Supporting a Resilient Payment Landscape

Card networks have now become a necessity rather than an option. As we mentioned about reserves, today only certain institutions keep their deposits in

digital accounts at central banks. At the point reached with the increase in needs and demand, it is necessary not to be dependent on electronic money and electronic payment methods collected in a single channel. Flexibility is a factor that will increase the quality of payment systems. In short, both card networks and CBDC networks cannot be interrupted at the same time. Or this is considered to be very unlikely. While the BoE drew attention to the importance of the offline feature in the CBDC application, it added that it was concerned that CBDC models might delay different attempts to increase speed and efficiency in the current payment flow.

4.1.3.2. Avoiding the Possible Risks of New Forms of Private Money Creation

Commercial banks are not risk free. The measure taken at this point is to secure the deposits with insurance. Thus, deposit account holders know that their money is safe. This element of trust may or may not be satisfactory in new ventures. The main new venture proposals are “stable coins” and “crypto assets”. In order to prevent inefficiencies, attention has been drawn to the integration of Stable coins into the existing system.

4.1.3.3. Increasing Competition, Innovation and Efficiency in Payments Systems

Payment systems has an important role in the functioning of the economy. System; It includes many elements such as payment instruments, participants, organizations, procedures and technology. In brief, it takes place in the economy as a transfer of monetary value (Kirdaban, M. İ., 2005). In a competitive environment, the proposed innovations should be flexible enough to quickly serve the needs of users. In this sense, if CBDCs are well designed and presented as an open platform, their integration into the digital economy and their competitiveness becomes easier. The innovation and development environment in the sector is always beneficial for the

economy. With the changes in payment systems, it is aimed to offer CBDCs to users at low costs (BoE, Discussion Paper, 2020).

4.1.3.4. Introducing Future Payments Requirements in a Digital Economy

New generation payment systems must embrace the digital economy so that a seamless connection environment can be established. CBDCs can lead to the easy implementation of the system defined as programmable money. The system will gain functionality with physical devices or Internet of Things (IoT) applications. The system called the Internet of Things (IoT) is a communication network. It covers software and hardware access services. In this way, the control and follow-up of physical events is ensured (Gokrem, L , Bozuklu, M ., 2016). For example, when we make an annual subscription to a magazine, we pay monthly, even for articles you don't read. Instead, CBDCs will allow micropayments, allowing us to pay just a few cents just to read the article or news we want. These examples can be multiplied, such as automatic insurance and tax payments, and the automatic payment of dividends from stocks to shareholders.

4.1.3.5. Improving the Availability and Usability of Central Bank Money

In the current order, money is only in the form of banknotes for households. Although the money on our cards looks digital, it is different from the CBDC system. CBDCs allow you to own central bank digital wallets and electronic central bank money. This allows digital money to be used in wider areas than cash. According to the Bank of England, a potential use of CBDC for the UK would provide risk-free stability in Sterling payments.

4.1.3.6. The Consequences of a Decrease in Cash

Privacy level offered by cash may decrease if the rate of cash usage increases. For countries and communities where there are not enough banks, for example, a guarantee of meeting needs is always necessary. The decline in cash use will create risks in such societies (Sveriges Riksbank, 2018). According to the study of McKay, S., & Rowlingson, K., & and Overton, L., (2019) in the United Kingdom, the proportion of adult individuals who have a deposit account is 98% for 2018. Therefore, as long as there is demand for cash, CBDCs cannot fully replace cash, they will only be complementary. Banks are also obliged to fulfill incoming cash demands at all times.

4.1.3.7. Enabler of More Preferable Cross-Border Payments

The fact that the buyer does not know the amount to be deducted from the credit and the sender does not know when the payment will arrive always creates difficult situations regarding cross-border payments. At the same time, this type of payment is known as expensive and slow (CPMI, 2018).

Stablecoins are a suggestion for these delays, but some studies have proven that they also cause risky situations (G7 Working Group on Stablecoins, 2019). That's why CBDCs are considered a secure system by the Bank of England for better cross-border payments.

4.1.4. The Bank of England' Platform Model Principles

The Platform Model of CBDC that was announced in the Discussion Paper of CBDC published by the Bank of England in March 2020, is carrying the attribute of future innovations in the field of payment for the public and private sector. The design content, benefits and challenges of the Platform Model are still open to discussion and development, so it is not a project description, including at the time of writing this thesis.

There would be new models in the future too. It is only for the purpose of increasing the discussions on the subject. The increase in researches allows us to understand the feasibility and effectiveness of CBDCs (BoE, Discussion Paper, 2020). Only in this way, the risks to be encountered would be minimized. The presented model has been prepared by the Bank's employees, taking into account past research.

A Platform model has two main aspects:

The first one is CDCB own and the second is creation of a technological infrastructure that makes CBDC usable for payments. Secure main book in technology;

- i) Layered architecture,
- ii) PAY.UK.

The method which is called Layered Architecture bear resemblance to the World New Payments Platform in Australia and Payments Canada which is a modernization program. In addition to this circumstance, it is a suggested model in Pay.UK's New Payments Architecture Program in the UK (BoE, Discussion Paper, 2020).

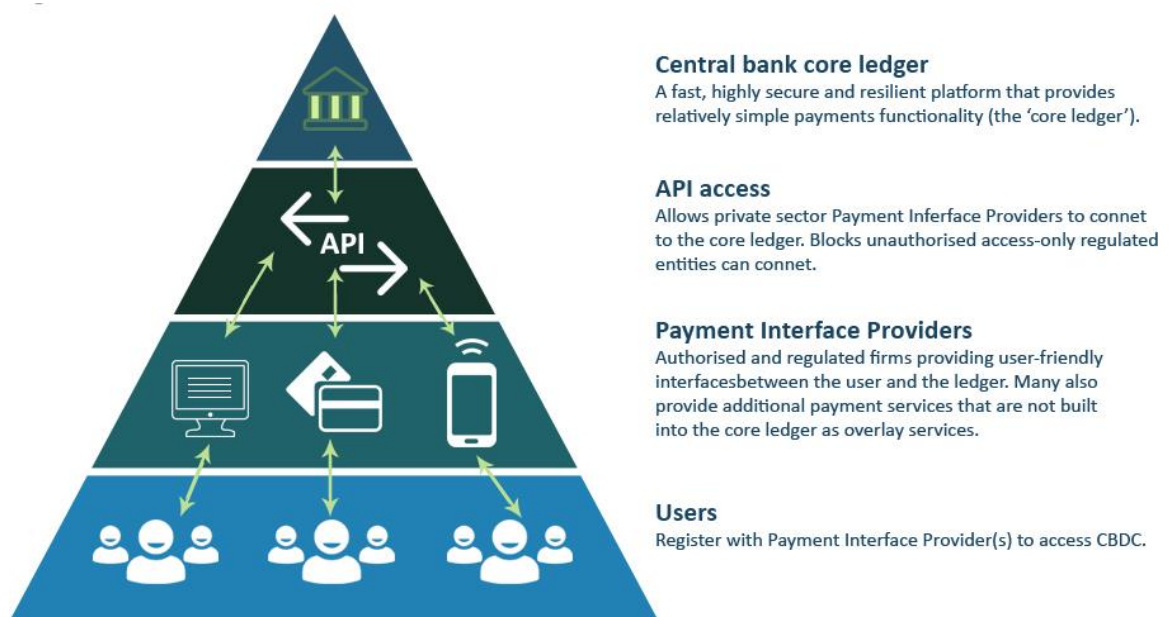


Figure 7. Explanation of the Platform Model

Source: Bank of England (2020)

This Figure is explanation of the Platform Model of CBDC with layered architecture approach;

Step 1: Central Bank Core Ledger

Creating a Core Ledger - side database- with quick payment functions, which is highly secured and durable compared to simple payment functions.

- For push payments (sender-initiated payments), the ability to enquiry the current balance and transaction history will be available.

Step 2: API Access

A third-party payment interface is an application programming interface (API) that allows providers to receive updates from the general book and create payment instructions. The most crucial point here, no matter which technology method is used, only the bank is able to create and destroy CBDC.

- For security, only third-party organizations approved by the bank could be linked to the main ledger.
- Besides running the main ledger on their own, the banks hold the facility to create maintenance and transaction directions for the ledger.

Step 3: Payment Interface Providers

Payment Interface Providers could manage all activities of CBDC. In this context, private sector companies will expand the functionality of CBDC.

Fundamental Authorities of Payment Interface Providers;

- A user-oriented interface such as a website or mobile application will be developed to enable private sector companies to manage their CBDCs and make their payments.
- It is very important to verify the identity of customers. When necessary, service should be obtained from third parties.
- Pseudonymous accounts should be created for users, so that fake accounts could be followed over the user information registered in the bank.
- To protect cybersecurity against lost or stolen devices and fraud, users must be verified before initiating payment.
- To prevent money laundering, sanctions will be imposed and services will be provided by third-companies when necessary.
- Some payment interface providers will be able to use the authority to provide “merchant services” to facilitate businesses and retailers to receive CBDC payments from consumers.
- A separate account will be kept in the main ledger for each user. For users who have the same payment interface provider, payments will be processed via the main ledger.
- Payment interface providers can keep the CBDC ledger accounts of all users in a single pool as an alternative model design. It is recorded how the funds in the pool are divided among users. Payments between users using the difference providers must also go through the main ledger.
- Payment interface providers can be used not only to make payments, but also to attract customers. In this case, for example, payments coming through online accounting platforms will be monitored, accounting records will be created and also invoices and salary payments will be made. In addition, websites that can provide marketplaces (sales areas) for retail companies will be integrated into CBDC payments. This will provide additional functionality (overlay services).

Step 4: Overlay Services

Payment interface providers must develop “coating services” to achieve additional functionality. The main book will have simple functions in this model by design.

- The main purpose of Overlay Services is to provide the public expectation of trust in money. For this reason, it is important that the coating services are safe, flexible, compatible (interoperable) and open to competition within the framework of the standards related to the Bank. In this way, services that may arise in the future or meet new usage areas that cannot be foreseen will be created. This makes the system as a whole, open to development and expandable.

4.2.CBDC Model of Central Bank of the Bahamas (The Sand Dollar Project)

4.2.1. Definition and History of The Central Bank of Bahamas

Political independence was achieved about fifty years ago in the Bahamas. In the past, problems were frequently encountered in various aspects in the financial markets due to the lack of an institutional authority. During the years when the Bahamas were politically dependent on Great Britain, there was no mentioning about central bank authority (Wallis, H., 2012).

The increasing demands of the markets over the years provoked the establishment of a supervisory and regulatory board, that’s why the Monetary Board, which had limited powers, was established in 1919. The most important of the powers of the board was the issue of money. Due to foreign-dependent policies, the legislation inadequacies and restrained powers held at that time prevented the Money Board from working efficiently. With strong commercial ties with the United States of

America (USA), the Government now cut the currency link with the British pound and equalized the currency to the US \$. This development resulted in exchange rate losses on banks that kept most of their assets in sterling balances.

In 1965, thanks to the Banks and Foundation Companies Regulation Law, increasing the powers of the Monetary Board within the scope of strict licensing and operating needs ensured some relief, but in 1967, the financial turmoil which was caused by the devaluation of the British pound, to which the domestic currency was dependent, scaled up the necessity for an institutional regulation.

Within the framework of these events, instead of the Monetary Board, the Bahamas Monetary Authority (BMA) was established in 1968. The authority assumed total foreign exchange risks of domestic banks in the country. It set up systems for clearing and settlement transactions in banks and started selling government treasury bills by auction. BMA actually had broad powers in terms of inspection. However, the absence of a legal authority to take measures for monetary policies made the system very weak. In the late 1960s, BMA was also unable to maintain its control over credit expansion.

Subsequently, the deficiencies in the system grew even more due to the damage caused by the global oil crisis caused by the Organization for Petroleum Exporting Countries (OPEC) in 1970. In addition to all these cases, with the development of technology and the increasing needs, it has become difficult to respond to the demands of the expanding financial markets. Thereby, a more institutional and independent authority was needed to a large extent.

Meanwhile, the Government of the Bahamas acquired political independence from Great Britain in 1973. At the end of all these developments, the Bahamas Central

Bank was established in 1974. The Central Bank has been maintaining its independent monetary policy and supervision operations in the financial company with its customers since very first day when it was put into practice.

4.2.2. Central Bank of The Bahamas's Approach to Designing Project Sand Dollar

The central bank digital currency (CBDC) proposed as a continuation of the Bahamian Payment System Modernization Initiative (PSMI), which first appeared in the Bahamas in the early 2000s, is called the Sand Dollar Project.

The Central Bank introduced a digital version of the Bahamian dollar, starting with a pilot in Exuma (a region of more than 365 islands in the Bahamas) in December 2019 and extending all the way to the Abaco Islands in the first half of 2020. The Bahamas announced on October 20, 2020, on the social media platform Facebook, that the Project Sand Dollar is the Central Bank of the Bahamas Digital Currency (CBDC). At that time, the Sand Dollar made the Bahamas the first country in the world to officially launch CBDC.

As the Bahamas renews payment systems, it is working on making local payment systems more efficient by targeting all financial requirements and a regulated structure to facilitate access.

Even if financial developments and public access rate in Bahamas are higher than international standards, financial banking services are still available to the public at affordable costs. Chaozhen Chen, Deputy Director of E-Solutions at the Central Bank of the Bahamas, explained in Bloomberg's report that he sees the Digital Official Currency Sand Dollar as a real solution for their sovereign nation. Sand Dollar, which provides access to digital payment and online banking infrastructure

for the people living in remote islands, has provided very important conveniences for the people (Phillips T., 2020).

According to some local and current surveys followed by the Central Bank of the Bahamas, information has been recorded that digitalization is actually seen as a part of a financial literacy campaign, as well as improving both knowledge and awareness of financial products and responsible financial behavior.

As more, in the report published by the Central Bank of the Bahamas on Project Sand Dollar, it is stated that the digital currency includes steps to reduce transaction costs for businesses and consumers, today and in the future.

In another detail shared in the report based on the feedback from the Exuma region, it is observed that a large part of the population is willing to use electronic payments and digital financial services due to the high use of mobile phones in the region. Of course, in this case, it is quite important to ensure the online transaction security of the public.

While explaining the issue of security, the Central Bank of the Bahamas shared the knowledge that these problems are being overcome by making the public educated in terms of the use of digital financial services with the help of the structure and design of the digital currency. It is essential for a country nowadays to have a digital currency, for it has significant benefits for the Government in terms of improved expenditure and tax systems, considering the economic expenses associated with cash use.

Therefore, the Bahamas Government is the strongest supporter of digital payments adoption, both as a participant and a user, ensuring that the Central Bank's model is

successful in implementation. In this regard, it makes the necessary regulations in terms of legislation in the implementation of various international institutions and standards in order to ensure the compliance of both the public and large small businesses with digital financial services.

One of the most important details observed in Exuma, where the pilot implementation took place, while progress was made gradually, was that strong policies were followed in the point of increasing consumer protection and incentives within the framework of data protection standards.

Regarding all these, there will be additional reforms of the Central Bank within the scope of the New Bahamas Law and the Payment Systems Law.

4.2.3. Key Specifications of the Proposed Solution (Fundamental Features of the Suggested Solution)

Very serious studies are being carried out by the Central Bank of the Bahamas in order to select a technology solutions provider for the design and implementation of the Digital Fiat. This process is carried out very meticulously. Providing electronic and financial services has many infrastructural challenges. For this reason, the necessity of sound solutions in accordance with international regulatory standards is emphasized. The Central Bank of the Bahamas selected NZIA Limited as its solution provider in March 2019 as the technology provider for the infrastructure of the Digital Sand Dollar model.

NZIA Limited, headquartered in Nassau, which is the capital city of the Bahamas, uses unique hybrid technology systems to create a payment infrastructure for CBDCs. At the same time, this company provides edge computing hardware to

blockchains via wireless communication methods (Official Web Site and LinkedIn Profile of NZIA.co, Access: 03.05.2021).

Key Points of NZIA Suggested Solutions:

1. All service companies can access digital currency and use the Sand Dollar Network for retail Bahamian Dollar payments. Thus, integration between the existing system and the new system for payment services will be provided.
2. Possible communication interruptions between islands will be prevented thanks to the "offline functionality feature". With this feature, users can make payments with a predetermined dollar value during interruptions. When the network connection is re-established, the wallets are updated and the transactions are not interrupted.
3. All transactions and real time transactions are verified instantly.
4. Point of sale support is provided for businesses. Thanks to the solutions specific to Payment Service Providers (PSP), businesses can accept payments with credit card and cash card machines or mobile phone applications.
5. In order to protect user confidentiality, the standards that regulate access are strictly enforced, and transactions that are open to inspection, ie non-anonymous, can be easily followed and monitored.
6. Tracking systems are in place to prevent illegal transactions such as fraud.
7. The use of the Bahamian Sand Dollar by non-native creditors is prohibited and is only available to Bahamas citizens. Thanks to PSPs, people who have digital wallets can integrate their digital accounts with commercial banks,

make transactions electronically for foreign exchange purchases and sales, and can easily use their accounts in international environments.

8. Payment transactions are carried out securely with the double-step authentication method (single-use confirmation codes sent by electronic mail and short message service).
9. Digital Identity Solution is applied by using Know Your Customer (KYC) and identification features in system design in order to use services in financial sectors.

With the help of all these comprehensive and safe measures and practices, the Bahamian Sand Dollar can be used for both retail and wholesale applications. In practice, the use of wholesale transactions in payment settlements between banks will be restricted, and in this respect, it continues to be similar to clearinghouse transactions.

Retail digital currency allows island communities to make and accept payments with the Digital Sand Dollar. The most important point here is based on the emphasis on centralization; has equivalent accounts in the Central Bank as well, valid for each user. Thus, each account holder has the right to directly obtain their receivables from the Central Bank. Innovation studies are carried out regularly with technology providers in order to develop technological systems in all these pilot stages and applications. At the same time, the pilot applications that started in Exuma in December 2019 expanded to Abaco in the first half of 2020. Communication features are tested regularly during emergencies in all-natural disasters that may occur in Abaco, and it is very important to establish early connections in order to ensure that financial services are not interrupted and the retail businesses of the island can be improved quickly (PSD, 2019).

For this reason, it is of great importance for the Bahamas, which consists of 700 islands, that the technological infrastructure is safe in every sense. Therefore, all measures are taken immediately.

4.2.4. Monetary Policy and Financial Stability Safeguards

The Central Bank of the Bahamas is sensitive to the consequences that may arise in terms of the effects of Sand Dollar on monetary policy and especially financial stability. Therefore, it takes the necessary precautions with precision.

The Sand Dollar report published by the bank contains information about the risks of digital currencies and combat the abuse of the Financial Action Task Force. These situations are documented in detail by organizations such as the Financial Stability Board (FSB), the International Monetary Fund (IMF) and the Bank for International Settlements (BIS), (PSD, 2019). The issues to be considered within the scope of these measures are the identification of customer situations, as well as the prevention of terrorism financing, money laundering and tax evasion.

Central Bank of the Bahamas; financial stability has designed several important factors for Digital Money offers in accordance with its policies in order to reduce and prevent the risks of the funds in banks shifting to CBDCs and most importantly, cyber security issues. It imposes a limit on the amount of B\$ instrument that individuals, institutions, businesses and all other audited and non-audited users can hold in their wallets so that it does not replace traditional banking deposits.

More importantly, individual digital wallets are integrated with deposit accounts at local financial institutions, especially for high-value transactions. Project Sand Dollar's main goal is financial participation. Individual users with less functional

mobile wallets do not need any built-in bank account. There is no interest that paid for digital currencies. However, all wallets owned by businesses are connected to established bank accounts without any exceptions. The focus of financial stability concerns is related to the speed of electronic transfers rather than deposit transactions, with the aspect addressed in Bahamian Central bank practices.

As a result, according to the Project Sand Dollar Report, all protection measures have been developed in the Bahamas. Real-time consolidated transaction monitoring systems have been put into use to provide early warning to all critical threats. Circuit breaker systems are used if deemed necessary in case of systemic failures or emergency situations such as the use of bank liquidity.

4.2.5. Key Stakeholders' Contribution and Their Roles

Key stakeholders of the Bahamas Digital Currency, the Sand Dollar, are the Central Bank, the Central Bank's licensed buyers, the public sector, the National Insurance Board, General businesses and the public. All stakeholders have separate roles in terms of innovation and implementation efficiency. It is always very important for institutions and the government to cooperate during the smooth implementation of digital money. The central bank, apart from its most known role, money printing, now regularly controls and monitors the market and conducts multi-faceted studies on being responsible for the infrastructure of identities with a Know Your Customer (KYC) approach. Instead of keeping the information in the bank, the relevant customers are obliged to submit all the data requested from them for registration. According to the report dated December 24, 2019, in which the Bahamas Central Bank shared all the details of the Sand Dollar, it was announced that the credit unions would be legally guaranteed to share KYC approval with the audit institutions called SFI in line with the demands of the customers.

PSPs, known as service providers, make evaluations by taking into account the information that commercial banks have acquired and stored in their databases for

the purpose of recognizing existing customers. In addition to these, the identity information stored in the state database is also taken into consideration. The most important feature of the Central Bank at this point is that it keeps the accounting books of the digital currency and all assets owned by individuals. However, there are still no applications such as front-end customer service and digital wallet sponsorship.

In addition to all these, in accordance with the regulation, all records are kept by the Central Bank controlled institutions (SFIs) in order to prevent terrorism and money laundering within the framework of the countries' global anti-money laundering (AML) and counter-terrorism financing (CFT) standards.

Financial intermediaries include credit institutions, banks, money transmission businesses (MTBs) and payment service providers (PSPs), as well as any Central Bank-controlled entities (SFIs) that will sponsor digital payment wallets. At the same time, PSPs and MTBs have the infrastructure technology that can offer mobile payment wallets from the beginning of the process and are able to keep up with development.

Eventually, wallet holders who finance their digital money in their wallets cooperate with banks to ensure the regularity of their transactions, such as automatic payment orders or withdrawals in their deposit accounts. With the start of making these transactions through digital currency, the ACH system, called the Automatic Clearing House, now includes payment receipts and a more equipped structure.

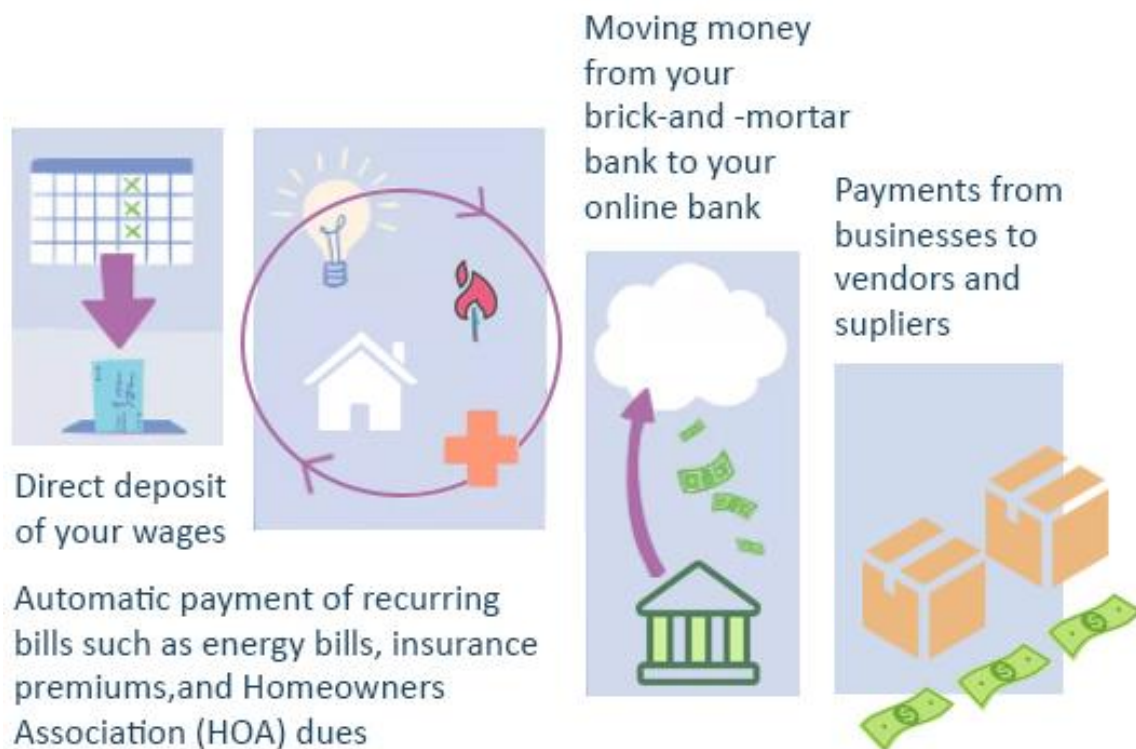


Figure 8. Examples of ACH Transactions

Source: Image by Hilary Allison © The Balance 2020

The Figure shows that the Automated Clearing House (ACH) is an electronic system that connects banks together. With this system, money transfers can be made easily between deposit accounts in different banks. Today, the ACH system uses computers connected to the computer in the banks' transaction centers completely electronically and transmits the payment information over the phone lines. The ACH system is designed for recurring payments such as mortgage installments, payrolls, invoices and insurance premiums. Recurring payments are paid by giving automatic payment instructions with ACH. Therefore, the cost is only once permitted, even if multiple transfers are required during payments (McAndrews, J., 1994). The government and National Insurance Board (NIB) are the two biggest investors in the digitalization process.

The two major elements are similar in that it is a large-scale data repository for private business entities included in the new system. These data are provided by Memoranda of Understanding between the Central Bank and other public institutions, with the proposal of the Central Bank.

Institutions under the control of the Central Bank, private commercial institutions, public and all other institutions, digital payments are defined as "business" or "B", which are the basic elements of the digital payments model, as well as individual buyers as retail digital payment creators, namely "peers or Ps". Regardless of the transaction volume, micro and small businesses also benefit from the use of Digital Money. However, during the determination process, it verifies whether the profiles created for active transactions take their wallets for commercial or individual purposes by requesting various documents.

4.2.6. Converting the Digital Currency Experience

In the application of the digital currency, the Central Bank of Bahamas has firstly classified the users according to their categories, and then imposed an upper limit on the amount to be kept in digital wallets and the annual transaction limit depending on the needs and demands of the customers. However, Central Bank Controlled Institutions (SFIs) are not included in the scope of the maximum limit application in order to avoid any conflicts due to their settlement transactions with the Bank. In addition, the Central Bank will be able to change the limits of all digital wallet transactions over time in accordance with AML / CFT standards in order to ensure the principle of increasing transaction limits depending on the users' due diligence. The situation is a little different for businesses. The maximum limit to be applied is calculated within a certain proportion of the annual sales receipts for non-individual digital wallet owners.

For example; The total balance of annual sales receipts is set at BS \$ 8,000 and the maximum limit for businesses larger than 1/20 is BS \$ 1 Million. Likewise, this application is also evaluated at monthly limits over 1/8 of the annual sales or BS \$ 20,000 and the larger figure is taken into consideration. Individual users are classified according to the adequacy and content of the information obtained in the detailed examinations they undergo during their identity verification.

Those with an advanced state can hold a maximum of US \$ 5,000 in their wallet, as well as trade in the amount of US \$ 100,000 per year or US \$ 10,000 per month. Other individual users have a maximum balance of BS \$ 500, but payments up to BS \$ 1,500 are confirmed on receipts (PSD, 2019). Users who fulfill the requirement to establish a link between transactions, financial institutions and deposit accounts, deposit accounts and personal wallets will be able to make their transactions at higher limits. Regarding the issue, there is explanatory information about the process in the diagram of the Digital Money Eco System in the report published by the Central Bank of the Bahamas on Sand Dollars. The simplicity of the creation process of the wallets will increase and ease the use.

Therefore, KYC system approved payment systems providers and banks are expected to comply with the procedures set by the Central Bank. From the beginning of these processes through credit unions, MTBs, PSPs and banks, the account codes previously created by the Central Bank will be used.

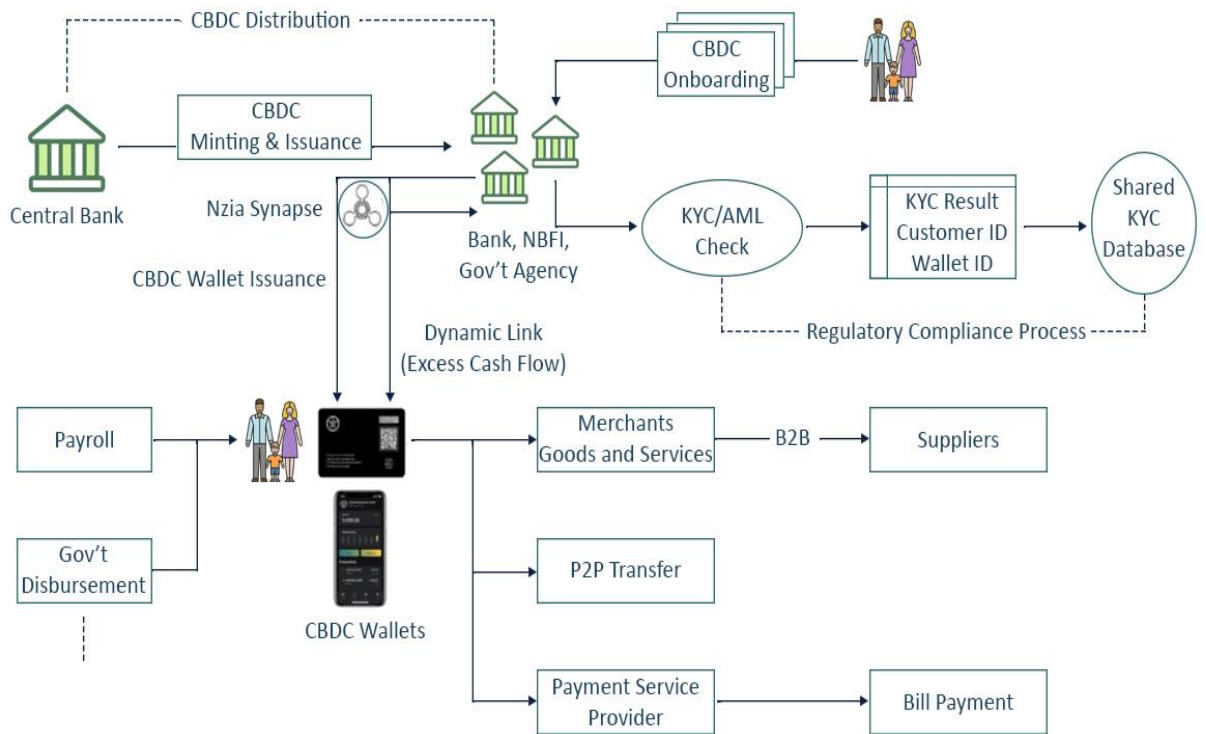


Figure 9. Digital Sand Dollar System

Source: PSD (2019)

Sand Dollar users download digital wallets (CBDC wallets) to their mobile phones through mobile apps. They get support from service providers, provided that they are also licensed for the setup of the accounts. All users can initially create an account with low transaction limits. Of course, the limits are increased by classifying them according to their passing verification tests. At the same time, all transactions can be performed offline. Both their digital wallets and their balances will always be up to date.

4.2.7. The Bahamas' Implementation Plan

The central bank felt that Exuma was the most representative of the Bahamas configuration and the best place to start pilot testing to expand operations across the country (Sand Dollar Web Site, Access: 24.05.21).

Therefore, Exuma Pilot organizes and improves financial services with intense work. In November 2019, the National Payments Council (NPC) held a special meeting with key stakeholders. At the meeting, Know Your Customer Standards discussed Personal Data Protection and P2P Payments Expenses. As a result of these, on 27 December 2019, digital wallets started to be created with the support of financial institutions. Exuma Pilot for modern Bahamian infrastructure has been the foundation for financial reform with improvements in client retention and management. Reform is protected by Central Bank Laws.

These regulations cover legal obligations involving the bank, credit unions, financial intermediaries, clearing banks and Sand Dollar Financial partners to forward user-requested eKYC confirmation to an SFI payment service provider. Establishing a structure for electronic money regulations provides direct access to Central Bank payment accounts of Money Transmission Businesses (MTBs) and Payment Service Providers (PSPs), which include financial partners and mobile wallet technologies. ACH integration will also make real-time automatic payments or withdrawals from deposit accounts of banks, users financing their electronic financial gains (PSD, 2019).

4.2.8. Gauging Potential Benefits Against Costs

While the financial costs of developing and maintaining a digital currency system can be measured on the Central Bank's balance sheet, many of its benefits and advantages will not be recorded. Central bank money printing costs are expected to

be moderate in proportion to the rate of adoption in electronic payment systems. These advantages provide benefits that will positively affect the financial market to a large extent. These benefits are grouped under the following four headings.

4.2.8.1. Improved Financial Inclusion

The potential for improving financial inclusion is particularly important for remote and isolated communities. Enhanced centralized and portable KYC data, when synchronized with electronic channels for deposits and withdrawals, will enable banks to remotely perform basic deposit services and rely on digital infrastructure for lending. Expanding access to banking transactions beyond the physical branch network and reducing the high branch network costs will make it possible for their networks.

As Sand Dollar's power grows over time, it is expected that the government will prevent irregularities in the tax system and provide relief to accounting systems. Taken as a whole, this is an element with significant benefits for revenue management. In addition, with the increase in the use of digital finance, it facilitates the monitoring of activities, reliability and the formation of evidence-based policies.

4.2.8.2. Minimizing The Negative Effects of Cash Usage

In the study of Fielding, W. J. (2015), it was investigated whether the household income is related to being exposed to crime because the Bahamas is an island country and the island people have limited opportunities to hide their precious properties. It has been shared that the listed crimes include armed robberies and theft.

Therefore, it has been suggested that economic and legal policies should be aimed at reducing crime rates in the country (Fielding, W. J., 2015). Thus, the national defense will strengthen in a sense, as the demand for cash decreases and financial

transactions can be followed more easily. Thanks to the developments in the field of AML/CFT, which is accelerating, it also increases the position and reliability of the international financial services sector.

4.2.8.3. Minimized Transactions Costs

Depending on the acceleration of digital currency transactions, the expenses of electronic fund transfers and bill payment systems will decrease. Thanks to low transaction costs, the new payment system covers larger audiences. Transactions during the day can be carried out largely thanks to ACHs, but this is an additional cost for banks, although ACH costs are low. Sand Dollar provides the opportunity to carry out all these operations at lower costs with the same performance.

4.2.8.4. Strengthened Economic Surveillance

As Sand Dollar's power grows over time, it is expected that the government will prevent irregularities in the tax system and provide relief to accounting systems. Taken as a whole, this is an element with significant benefits for revenue management. In addition, the increase in the use of digital finance; It facilitates the follow-up of activities, reliability and the formation of evidence-based policies.

4.2.9. Education And Marketing Strategy

Bahamas Central Bank, which carries out sensitive studies on education, informs the public about the registration of the Sand Dollar wallet and cybercrime, as the technology used builds a newly learned system. The establishment of public awareness is of great importance at this point. PSPs are the most important player in this process. The renewed “e-KYC” structure provides great convenience when registering customers, since data can be moved easily. The central bank emphasizes the importance of training on social media as well as printed and oral media for real,

legal and Non-Governmental Organizations (NGOs). Thus, promotions are accelerated through the business world and civic groups in cultural events.

4.2.10. Results of Sand Dollar Project

Sand Dollar, the Bahamian Central Bank Digital Currency, will facilitate the participation of larger masses in financial activities, thereby increasing the pace of economic development. It will be easier for the masses to adopt this digital currency system if it is ensured that it is accessible to everyone without discrimination and is not too different from cash in terms of use. According to the Bahamian Central Bank's report, 1 Sand Dollar is equal to 1 Bahamian Dollar (B\$).

Currently, it is known that 1 Bahamian Dollar corresponds to 1 US Dollar (Wise.com, Access:30.05.21). In addition, the active involvement of major participants such as utilities and the National Insurance Board has been mandated by the government.

This new system will be based on an advanced regulatory structure for local payments and other financial services. The Central Bank and the government will cooperate for the continuity of development. In addition, the Bank will ensure the implementation of protection policies in line with international standards in order to prevent illegal financial activities.

4.3. All Other Countries Working on CBDC

Bahamas achieved the distinction of being the first central bank in the world to switch to CBDC (Sand Dollar Project, 2019). According to the survey in the BIS 107 report on the subject, central banks with developing and developed economies around the world are working to issue their own digital currencies.

The information in the details clearly reveals that the perspectives of central banks on CBDC have changed on an official scale. Currently, 66 central banks around the world (as far as is known, because the survey covers the years 2018-2019) have started and participated in extensive research on central bank digital currencies (Boar, C., & Holden, H., & Wadsworth, A., 2020). After these countries participating in the research have chosen their digital currencies, they will continue as a team on the main design, technology and cross-border collaborations.

Below are short examples from its applications around the world;

a) China-Digital Yuan;

The developments regarding the Digital Yuan issued by China are shared very limitedly. No information is given about the design of the model, the steps of which were started in 2014, and the process is planned to be completed by 2035. The general purpose is to make the national currency, the Rembinini, an international currency (Baitao, L., 2019).

In October 2020, digital wallets began to be tested. In fact, for the first time, 30 million digital yuan was distributed to the public through the national lottery within 3 months for incentive purposes by a central bank. The winners of the lottery are limited in being able to spend digital coins on their purchases from the shopping site JD.com (CNBC, 2020).

This is an example of smart contracts. This is also because Tencent is increasing the use of Digital Yuan instead of Alipay. A number of tools have also been patented for the system called Digital Currency Electronic Payment (DCEP) to operate in a coin-like system and to adjust lending rates to commercial banks (Qian, Y., 2018). The patents obtained give an idea about the details of the system. In the system, digital wallets will be distributed through commercial banks, thereby reducing the risks of the central bank (Murphy, H. & Yang, Y., 2020).

b) European Union-Digital Euro

In January 2020, the European Central Bank established a working group for CBDC research. The purpose of the digital euro is to ensure that foreign currencies are not used in eurozone regions. The digital Euro is expected to be indistinguishable from the banknote Euro. However, if the number of Digital Euro used in the system is not kept under control or limited, some important financial risks may arise in Europe;

- The decrease in the deposit weight of banks limits the risk analysis of banks.
- If government bonds are converted to digital euro, the risk-free rate will be negatively affected.
- Bank balance sheets become harder to control, which undermines financial stability.

In addition to all these, Digital Euro can increase criminal activities if it is preferred globally. All kinds of developments in Europe can affect the monetary policies of other countries. In short, the risks and recommendations for other digital currencies are also available here. For example, if the offline feature is made available, identity privacy will not be ensured (The ECB, 2020). The start date of the project is calculated as 2021, third quarter (Ledger Insights, 2020).

They aim to be available in about four years (The ECB Web site, A digital Euro, Access: 4.06.21).

c) Swedish - E-krona

The Central Bank of Sweden (Riksbank) shared the national CBDC model in the report it published in 2017. This digital currency model belonging to Riksbank is “e-Krona”. Swish (mobile payments) is used at a very high rate in almost every field in the country. One of the most important results of this was observed on Gross Domestic Product (GDP) in 2018.

While the ratio of Euro to GDP was around 10%, this rate was around 1% in Sweden. Therefore, the people of the country are prone to mobile and digital financial applications. In the report it shared, the Central Bank shared the effects of e-Krona on financial stability and monetary policies with detailed analysis. In addition, two different systems are presented for the e-krona.

The first suggestion is to use digital wallets opened within the central bank so that transactions can be tracked. Since it is an electronic value, no interest income will be obtained. However, this comes with some advantages as well as disadvantages. For example; Riksbank's bond policies may be weakened by the form of e-krona with no interest. Because the country has been implementing a negative interest rate policy for about six years. Therefore, a product with 0% interest will form the interest base at a rate of zero. In this case, if the 0% interest rate does not have a positive effect on the markets, the government may have to pay very heavy prices (Sveriges Riksbank, 2018).

The suggestion offered in the other option is that digital currencies can be used through bank cards or mobile applications. In this case, since the e-krona will be account-based, you can earn interest. But here, too, there may be a problem

in terms of transaction confidentiality. Because all transfers will be kept in bank records. At the same time, an example of an interest-bearing digital currency will add to the deposit earnings of banks.

There may not be an improvement in loan rates in the short term, but in the long term, Riksbank may need to fund the banks. Thus, even if interest rates increase, lending rates will not increase to the same degree. At the same time, banks that cannot find funds in the interbank market in cases of financial crisis should be provided with sufficient credit support by the Riksbank. All risks must be considered in such applications. For example, if there is a certain limit to owning e-krona; this limit necessarily shows institutional and individual differences. Therefore, this may lead to the emergence of a new market. The widespread use of e-krona turns it into a product attractive to foreign investors. Therefore, the Riskbank balance sheet grows. First of all, the Swedish economy will experience ups and downs as it will affect foreign exchange and inflation. In any scenario, even if Riskbank is strong enough to provide funds, a credit market that works properly with all its dynamics cannot be associated with deposit volume alone. For the e-krona, steps should not be taken to increase its attractiveness by viewing it as an investment tool. It will be safer to plan proposals for pricing strategies in a centralized system (Sveriges Riksbank, 2018).

d) **United States:** Fedcoin or USDcoin

Federal Reserve Banks have come together to conduct extensive research on CBDCs. Agreements were made with MIT and BIS Innovation Hub in order to provide innovation and technological support. The aim of these studies, which will be carried out in cooperation, is primarily to spread a digital Dollar application with the same power as Dollar's dominance all over the world. The

effects of such a system in the world will undoubtedly have very important consequences. Just like Europe's transition to the Digital Euro, there are financial and political elements that require a lot of sensitivity. The points that unite FED Banks on CBDCs are financial stability, banking, monetary policy, the payments ecosystem (Figure of Chapter 3 is an example) and consumer protection. Central banks in the coalition will share their experiences and act jointly against risks, which will provide a great advantage in combating cybercrime, fraud and money laundering. If a worldwide integrated “CBDC financial system” is not formulated correctly, large-scale crises and stresses will arise (Brainard, L., 2020).

e) **Bank of Canada**

Engert, W., Fung, B.S.C. and Hendry, S. (2018) presented a report to discuss the risks that the Bank of Canada will face in a possible CBDC application. The most important of these, and indeed the forerunner of other problems, is the shrinkage of the central bank's balance sheet. Because three-quarters of the money printed by the central bank in the country is directly under the responsibility of the bank. Current money is held as government bonds and treasury bills. Therefore, the transfer of existing cash to the digital environment means the loss of seigniorage revenues. If the deductions made by the parties in the financial system can be increased and domestic borrowing and monetary expansion can be achieved, the balance sheet can regain its former volume. Other risks that may occur during its conversion should be analyzed very carefully.

5. ADVANTAGES AND DISADVANTAGES OF CBDC

The table below shows the advantages and disadvantages of CBDCs. There are specific and general effects of CBDCs on the banking sector, financial stability, monetary policies, international monetary policies and at the same time, it may even affect the primary duties of central banks.

If we make a general comment, the advantages and economic benefits of the transition to the CBDC system are much more than the disadvantages if correctly analyzed and applied. As in the studies of the countries I have included in the chapters above; each country needs to make designs for its own economic problems and needs. With a survey conducted by BIS (2019), it has been published that more than 80% of Central Banks in the world have started to develop CBDC projects. In order to understand the benefits and harms, many other countries have created tables similar to the one below, as in the Sand Dollar Project published by the Bahamas.

The “Table 1.” in my thesis was created by me as a result of my research on all policies related to the subject and the information that I filtered the effects of the countries I examined. In addition to the evaluations on the basis of countries, it is aimed to evaluate all the data obtained in this chapter together. Each item is explained in detail according to the subject title it is included in.

CENTRAL BANK DIGITAL CURRENCIES'	PROS	CONS
They can reduce costs and increase processing speed.	x	
They can reduce conflict between existing payment systems.	x	
Ancillary costs, external expertise and consultancy costs will be paid to set up the infrastructure.		x
Cyber-attack attempts can pose risks.		x
Overseas transfer times will be minimal.	x	
Financial technologies will accelerate.	x	
Intermediary companies will not be needed thanks to blockchain technology.	x	x
Since virtual transactions will be recorded, money laundering will not be possible and financial terrorism will be prevented.	x	
Tax evasion will be prevented.	x	
There are many unknowns because there is not a system that is fully implemented yet.		x
There are not enough pilot applications to be referenced.		x
Access to financial services and products will be easier.	x	
There are chances of systems getting hacked.		x
Paper money counterfeiting will be prevented.	x	
In order to revive the economy, analyzes for the sector will become easier.	x	
The banking system may disappear.		x
Monetary policy will be affected if fintech companies and commercial banks are empowered to operate independently at central banks.		x
CBDC always provides assurance to users.	x	
CBDC can be seen as a safe alternative when it comes to bankruptcy of any bank.		x

There will be no privacy of the individual, all transactions will be recorded.		x
Personal privacy violation possibility.		x
The purchasing behavior of the people will be directed by the states.	x	
New concepts such as account management and smart contracts will enter our lives.	x	

Table 1. Advantages & Disadvantages List

Below are the advantages and disadvantages of CBDCs. The advantages are more noticeable;

- **Transaction costs will decrease; domestic and international transfer times will be shortened;**

Despite all other ongoing efforts to increase efficiency, transaction and transfer costs are still high. In the 2019 report published by the World Bank, Global Average Costs are given comparatively by years. The figure was 9.67 percent in the first quarter of 2009; It is 6.82 percent in the 4th quarter of 2019. In 2030, this rate is expected to be below 3% (The World Bank, 2019).

Transaction and bookkeeping costs can be reduced by 65% (+15/-15) thanks to digital wallets that enable the use of CBDCs. In addition to these, the heavy commission fees paid will also decrease.

To give an example of saving time as well as costs, one of the most important factors in the Bahamas' transition to CBDC was to speed up inter-island transfers. Consisting of hundreds of small and large islands, this country has seen the transition to CBDC as an important solution, like inventions born out of necessity, and has successfully implemented it. Again, in the UK's Platform studies, the decrease in international transfers from 3-5 days to seconds was evaluated positively.

Waiting times at different platforms and banks will also be minimized. Another example of reducing costs is that all payment transactions can be made using QR codes with mobile phones. As long as you have your mobile phone with you, you can buy plane tickets, vacation packages, education packages, clothes, food, drinks, even cars and houses. It is also one of the benefits that states can make instant payments to the public in situations that require emergency assistance such as natural disasters.

- **Access to financial products and services will be facilitated;**

Saving time and easier access to financial products brought by CBDCs will increase overnight account and liquidity earnings. Financial products such as foreign currency, securities and real estate are liquid assets as they can be easily converted into cash. It takes time to liquidate assets with little or no liquidity. This loss of time brings with it a loss in value due to loss of profit. We can list financial assets according to their liquidity characteristics as checks, government bonds, corporate bonds, stocks, consumer durables and immovables. At the same time, access to electronic payments will be provided for people who are not included in the banking system or who cannot benefit adequately. All this makes CBDCs a financially inclusive system.

- **Conflicts and risks between existing payment systems will be reduced;**

Today, there are multiple intermediary institutions that provide payment platforms, detect tax evaders and money launderers (for example, MASAK in Turkey). Thanks to the globalization of the transition to the CBDC system, conflicts and connection problems between these systems will also be eliminated. At the same time, the trust problem that occurs during payments will be eliminated and a support system will be created.

The main benefits of this come from blockchain technology. Even if central banks do not produce their digital currencies and use this algorithmic infrastructure, the need for intermediary institutions will decrease (Ruskin, M. & Yermack, D., 2016). However, the complete disappearance of intermediary institutions may also limit technological developments arising from competition. That is why it is marked as both positive and negative features in the table. While anonymity and speed are positive, anonymous transactions can make tracking difficult. In other words, although income statement and identity verification tests are applied while transferring CBDCs to the wallet (Know Your Customer), it is still a question mark whether Central Banks can access information about the identity of the user who withdraws large amounts of money from the account. For this reason, there is an upper limit for the amount of money kept and processed in the accounts for control purposes in pilot applications.

- **New terms will come into use;**

Many new concepts such as account management, digital wallet, smart contract, distributed ledger technology, blockchain will be widely used. I expect financial literacy to increase drastically in the future.

- **Fraud and financial terrorism will be easily prevented;**

Since all transactions will be recorded in the virtual environment, money laundering will not be possible. Thus, many illegal transactions, from financing terrorist organizations to unfair profits, will be prevented. Thanks to this, it will be easier to fight against other crimes such as income statement avoidance and tax evasion. The only point **those states** abstain from here is that the systems are compromised due to cyber-attacks and there is a risk of electronic counterfeiting. In this case, some standards should be developed (AML/CFT) and cooperation should be established with developer institutions in order to prevent financial terrorism. Because, thanks to CBDCs, real technological revolutions can be experienced.

By taking all, we should also consider the fact of individual privacy might be violated by governments, for as stated above every move will be recorded accordingly. Therefore, the laws on the Protection and Processing of Personal Data should be rearranged in favour of the public. Otherwise, the public may react strongly. Such a situation significantly undermines the effectiveness of CBDCs.

• **Purchasing behavior will be guided by states;**

Sectoral analyzes will be facilitated in order to revive the economy. Various campaigns and facilities will be offered to whichever sector is desired to be supported. It will be easier to sell the service or product by stipulating the conditions. For example, an orientation will be provided to the sector with low earnings according to one-month expenditure statistics. Let's say there is a slowdown in winter tourism. In this case, Central Banks may stipulate the following condition; Individuals can spend 30% of their monthly salary in their digital wallet only in the tourism sector, and 10% of this spending will be refunded next month. Although this situation is strange at the first stage, we have already adapted to similar examples in our current system. For example, we use the points we earn in grocery shopping only to buy certain products in that market, or these examples can be multiplied, such as campaigns at gas stations. Therefore, savings, which are kept under the pillow in a well-executed CBDC model and lose their value day by day, will contribute to positive growth, especially in underdeveloped and developing countries' economies. Ruskin, M. & Yermack, D. (2016) also mentioned in their studies that controlling the financial opportunities of individuals through the national CBDC model will strengthen the dominance of central banks.

In addition to these benefits, which are grouped together, there are also important risks. These risks are explained below by presenting similar issues in the table together.

- **Infrastructure costs;**

Digital innovations always come with certain costs. A number of payments will be made for Technology Solution Providers and specialist consultations. Although issuing a digital currency will drive economic growth, legal changes must be made. This requires infrastructure expenditures for pilot implementations. Countries should provide substantial funding for this area while doing their preliminary studies.

- **Lack of access to adequate resources on CBDCs;**

Although many of the countries in the world are motivated in this regard, there are not enough pilot studies at the time this thesis was written. Therefore, it is not possible to answer some unforeseen and uncertain questions yet. For example, it is still unclear how the exchange rate in international transfers will be fixed. Because pilot applications have been started only for solutions in the country and preliminary studies are continuing.

- **The banking system may disappear;**

If central banks take over the role of banks, banks will lose their role as intermediary institutions. In addition, if the CBDC system is completely run by CBs, perhaps easier and less costly work will increase CBs' expenses. In this case, it can slow down competitive technological developments. As mentioned in the pilot studies in Chapter 4, it is mentioned that CBDC digital wallets are working towards opening deposit accounts for individuals through commercial and private banks.

Although the main task of Central Banks is to stabilize the economy and keep unemployment and inflation at low levels, in practice; Central Banks are also in an intermediary position in terms of directing the sectors and creating the flow between institutions. Even within the current system, commercial banks and Fintech companies are looking for ways to transact independently from the intermediation of Central banks. For example, some banks are working on balancing their accounts

using DLT. In this way, it is aimed to eliminate the central bank's position of being an intermediary and giving direction. Different channels can be mediated to finance supply and demand. This may restrict the Central Bank from being a source of funds. It is important in the economy that the CB sets the political rate and prints money. In other words, monetary policies will suffer if the efficiency of not only commercial banks but also Central Banks decreases.

For example, if the Bank of Canada switches to CBDC, there will be a significant contraction in the central bank's balance sheet. Therefore, as discussed in Chapter 4.3, each country should try to take measures by evaluating the possible situations within itself so that financial policies (monetary policy, flexible monetary policy, international monetary policy) and financial stability are not damaged.

In the current system, the policy rate cannot be set as negative. Central Banks can provide flexibility in CBDC accounts by declaring negative nominal interest rates for flexible monetary policy (Haldane, A. G., 2015). With the public having official digital wallets, the distribution and withdrawal of money can also be easily achieved with CBDCs. In this way, advanced economies recover quickly by drawing hard-ended graphs (V) instead of rounded graphs (U). The most important factor to be considered in the distribution of money is that there are no duplicate accounts. That is, if digital wallets are managed by commercial banks, it should not be repeatedly distributed to people who have accounts in more than one bank. Therefore, it is both possible for banks to continue as intermediary institutions and brings with them details that need attention.

In addition to all these, another issue that should be mentioned is the stable economy, namely financial stability. For example, in a severe financial crisis, a commercial or private bank may be on the verge of bankruptcy. In such a case, individual and institutional investors working with that bank will withdraw and look

for different investment alternatives. CBDCs can also be seen as a safe alternative as they are the national currency. A commercial or private bank may bring the bank even closer to bankruptcy, which loses its customers as a result of its customers buying CBDCs. Most importantly, the money that is suddenly withdrawn and turned into CBDC can disrupt the entire financial system. At the point of financial stability, which I mentioned frequently in Chapter 4, Bahamas, England and European CBs have concerns about this issue. As the most important solution, it is recommended to set an upper limit for the amount of CBDC that a person or institution can receive in a certain period of time.

However, CBDCs should not be an alternative investment vehicle, but a digital version of the national currency, that is, a integral transition system. This feature should be taken into account when applying. It is very important that it is offered as a service to the public rather than the customer. However, if CBDCs are approached in this way, it will be analyzed and applied correctly. If it is presented as an alternative, its effects on monetary policies, financial stability, financial market and institutions/institutions will have devastating and irreversible consequences. For example, the aim in the Bahamas is the transition to a National Digital Currency.

England and the European Central Bank have also insisted on this point. If people of different nationalities start to transact in Digital Euro due to the increase in exchange rates (it is not an exact statement), the escape from the banks where trust has decreased will accelerate. The money flowing to the central bank suddenly increases the risks and the balance sheet. Therefore, the amount of CBDC to be included in the system should be kept under control.

Although I aim to address and detail the subject from a general perspective, the classification of advantages and disadvantages about of CBDCs will not be able to answer all questions for a while due to inadequacies in practice. Because although

many countries conduct research on CBDCs today, some still abstain. Some, as in the politics between America and the Bahamas; It conducts remote observations by providing financial and theoretical support to the experimenting countries.

Also, Bordo, M. D., & Levin, A. T (2017) examined of the Central Bank digital currency and the future of this currency, it has been investigated how to transform the CBDC in a practical, systematic and transparent manner in all aspects. As a result of the research, it was concluded that CBDC can be obtained at no cost. However, it has become a question that the Central Banks accept this change and adapt quickly to this situation. In addition to the benefits of adopting this situation early, it was mentioned that politicians should take some risks. These; macroeconomic impotence, loss of control of money, some systematic risk factors are susceptibility to past crises. While countries ranging from Canada to Ireland can make inferences about using the digital currency in the future, the USA, known as the world's money power, seems to play a more abstaining role for a while (Bordo, M. D., & Levin, A. T., 2017).

6. DATA AND METHODOLOGY

6.1. Data

In this research, the survey method was used to measure the public perception of the Central Bank Digital Currencies, which gained momentum with the widespread use of Blockchain and Distributed Ledger technologies. Questionnaire technique, which is accepted as one of the primary data collection tools, is a type of observation made with a list of questions that the people to be interviewed can read and answer directly (Seyidođlu, H., 2009). While preparing the survey, BIS's report, which examined the motivations of Central Banks about CBDCs, with a survey including the countries mentioned in Chapter 4 in 2019; Many similar publications were reviewed, such as the research report prepared by BBVA Research in 2019, where the effects of CBDCs on financial markets were analyzed. Questionnaire questions (see also Appendix) were prepared on the website known as SurveyMonkey.com, which is widely used in survey studies, using a Likert scale with the qualitative research method.

The survey, especially the UK (Platform Model) and Bahamas (Sand Dollar) models included in Chapter 4; After reviewing the ongoing work of China-(Digital Yuan), European Union (Digital Euro), Swedish (E-krona), United States (Fedcoin or USDcoin) and Central Bank of Canada on their transition to CBDCs, Chapter 5 is included. It has been prepared on the subject of Advantages and Disadvantages of CBDC. It was prepared based on the "Pros & Cons" table in Chapter 5; It is aimed to probe the perception of CBDC in the public. The survey was conducted with 317 participants between September 2, 2021 and September 13, 2021.

In this context, 26 questions were asked to the participants. In the explanation section of the questionnaire, the participants were given a brief information paragraph about the brief definition of CBDCs, the retail and wholesale CBDC application, and the existence of countries in the world that are in the process of preparation and starting to use them, and their opinions were received.

While collecting data in the study, verbal consent of the participants was obtained on the basis of confidentiality and voluntariness. Survey responses were shared with people from all walks of life that could be reached via the online survey link. At the end of the survey, questions that were left blank, if any, were re-directed so that there were no questions that were passed without an answer. The participants were reminded that they should definitely mark an answer in order to avoid a disconnection in the data set. The sector-based characteristics of the places, people, institutions and organizations where data is collected are as follows;

Employees of some Private Equity Investment and Deposit Banks, Capital Markets Licensed professionals, Independent Auditors, Certified Public Accountants, Certified Public Accountants, Academics working in the financial fields, Graduate Students and real sector employees; It is divided into 4 sector groups as “Banking”, “Real Sector (Financial Services)”, “Real Sector (Other)” and “Academic” according to their fields of expertise, and participants who do not identify themselves in any of these groups are offered another option as “Other”. . Therefore, the sector options were determined as 5. Thus, in order to measure the public perception about CBDCs, no restrictions were placed on the people to whom the survey was shared in terms of sector, age and gender.

While there are 3 demographic analysis questions (gender, age and sector of work) in the survey; There are a total of 26 Turkish questions, 23 of which are likert scale, related to the "Pros & Cons" table determined in Chapter 5. Likert scale answers are Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree, respectively.

Persons were directed to answers as Female and Male according to their gender, and as 20-29, 30-39, 40-49 and over 50 years old according to their age. It will be analyzed whether there are consensuses or differences of opinion among young, old, women, men, people working in the Finance Sector or working outside the Finance Sector, for some situations that may occur with the spread of CBDCs in the future.

6.1.1. Demographic Features of Participants;

The demographic variables in the survey study were divided into three groups as gender, age and the sector. These variables were first shown independently of each other by proportioning them according to the total number of participants. Then, the distribution of these 317 participants by age groups according to their gender, the distribution of their age according to the sectors they are in and finally the distribution of the sectors they are in according to age groups are shown by creating graphs using the SPSS (28.0) program. (“n”, “N” shows that the number of participants in the tables and figures.)

- **According to Genders;**

While 150 of the 317 participants were women; 167 of them are men. The total ratio of women and men is 47.32% and 52.68%, respectively.

Genders	%	n
Women	47,32	150
Men	52,68	167
Total	100,0	317

Table 2. The Gender Distribution

- **According to Age Groups;**

213 of the participants are under the age of 40 and their rate is the highest with 67.19%. Participants aged 40 and over are 104 people and their rate is 32.8.

Age Groups	%	n
20-29	37,85	120
30-39	29,34	93
40-49	22,71	72
50 and Over	10,09	32
Total	100,0	317

Table 3. The Age Distribution

- **According to Sectors;**

The Sectors of the Participants, on the other hand, consist of 148 professionals in the Banking sector, with the highest rate of 46.69%, as shown in the tables and graphics. The lowest participation is made up of the Real Sector (Other) group with 25 people and 7.9%.

Sectors:	%	n
Banking	46,69	148
Real sector (Financial Services)	14,51	46
Real sector (Other)	7,9	25
Academic	10,4	33
Other	20,5	65
Total	100	317

Table 4. The Sectors Distribution

6.1.2. Percentage of Agreement

The table below which presents an overall assessment of the survey responses, shows the participation rates given only to the questions asked, regardless of sectors, age, and gender. Participation rates consist of the sum of “Strongly Agreement” and “Agreement” responses.

While the statement "Central Banks' systems may be the target of cyberattacks", which ranks 12th, was the most agreed recommendation with 79.2%; the statement “When the Central Bank Digital Currencies are accepted, the banking system will disappear”, ranked 21st, was the statement with the least "agreement" answer with 28.1%. The average participation rate of 23 questions was calculated as 64.46%.

Statement	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree		Total		Percentage of Agreement
	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
<i>1.</i>	25,2	80	38,8	123	22,1	70	9,5	30	4,4	14	100,0	317	64,0
<i>2.</i>	28,7	91	45,7	145	14,8	47	8,2	26	2,5	8	100,0	317	74,5
<i>3.</i>	29,3	93	47,3	150	13,9	44	6,3	20	3,2	10	100,0	317	76,7
<i>4.</i>	26,2	83	45,4	144	14,2	45	10,1	32	4,1	13	100,0	317	71,6
<i>5.</i>	26,8	85	45,7	145	16,1	51	8,8	28	2,5	8	100,0	317	72,6
<i>6.</i>	19,6	62	32,5	103	26,2	83	15,8	50	6,0	19	100,0	317	52,1
<i>7.</i>	17,0	54	36,0	114	28,1	89	13,9	44	5,1	16	100,0	317	53,0
<i>8.</i>	22,4	71	51,4	163	15,5	49	6,0	19	4,7	15	100,0	317	73,8
<i>9.</i>	18,3	58	29,0	92	26,5	84	19,9	63	6,3	20	100,0	317	47,3
<i>10.</i>	17,7	56	46,4	147	18,6	59	10,7	34	6,6	21	100,0	317	64,0
<i>11.</i>	24,9	79	46,4	147	16,4	52	9,5	30	2,8	9	100,0	317	71,3
<i>12.</i>	34,7	110	44,5	141	10,7	34	6,6	21	3,5	11	100,0	317	79,2
<i>13.</i>	18,6	59	47,0	149	18,6	59	10,7	34	5,1	16	100,0	317	65,6
<i>14.</i>	23,3	74	45,4	144	20,2	64	8,5	27	2,5	8	100,0	317	68,8
<i>15.</i>	25,9	82	48,6	154	16,4	52	6,3	20	2,8	9	100,0	317	74,5
<i>16.</i>	27,8	88	38,8	123	17,0	54	13,9	44	2,5	8	100,0	317	66,6
<i>17.</i>	20,8	66	40,4	128	24,3	77	11,7	37	2,8	9	100,0	317	61,2
<i>18.</i>	21,5	68	39,4	125	22,1	70	15,1	48	1,9	6	100,0	317	60,9
<i>19.</i>	18,0	57	47,0	149	19,6	62	11,0	35	4,4	14	100,0	317	65,0
<i>20.</i>	17,7	56	48,0	152	19,9	63	10,7	34	3,8	12	100,0	317	65,6
<i>21.</i>	10,4	33	17,7	56	16,7	53	41,6	132	13,6	43	100,0	317	28,1
<i>22.</i>	20,8	66	48,3	153	18,6	59	7,9	25	4,4	14	100,0	317	69,1
<i>23.</i>	20,5	65	36,9	117	24,3	77	12,9	41	5,4	17	100,0	317	57,4

Table 5. Percentage of Agreement

6.1.3. Rate of Genders & Ages

The charts below show the proportions of 167 men and 150 women surveyed by age groups. According to this, while the majority of men are 34.73% (N: 58), the participants are between the ages of 20-29; respectively, 25.75% (N: 43) are between the ages of 30-39, 25.15% (N: 42) are between the ages of 40-49, and 14.37% (N: 24) are between the ages of 50 and is on it. While the majority of women are between the ages of 20-29 with 41.33% (N: 62); respectively, 33.33% (N: 50) are between the ages of 30-39, 20.0% (N: 30) are between the ages of 40-49, and 5.33% are aged 50 and over. Age distributions are close to each other according to genders. The number of participants aged 50 and over has the lowest share with 10.09% (N: 32) in total rate. For this reason, while testing the hypotheses in Chapter 7 (Findings), age groups were divided into two groups as “Under 40” and “40 and Over”.

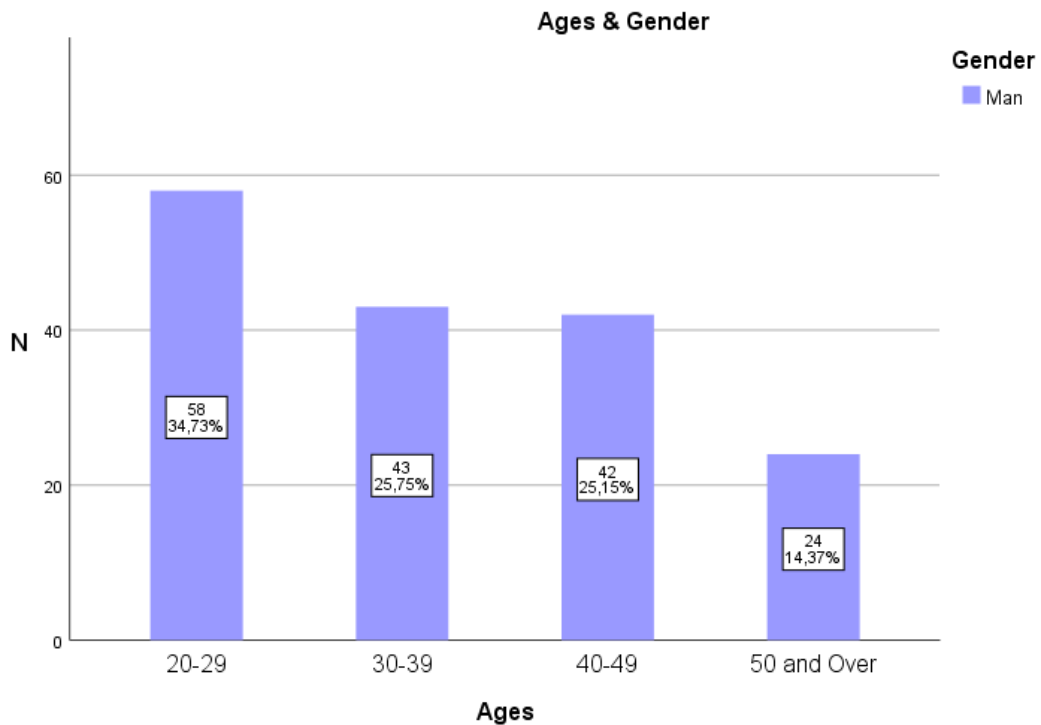


Figure 10. Rate of Men and Ages

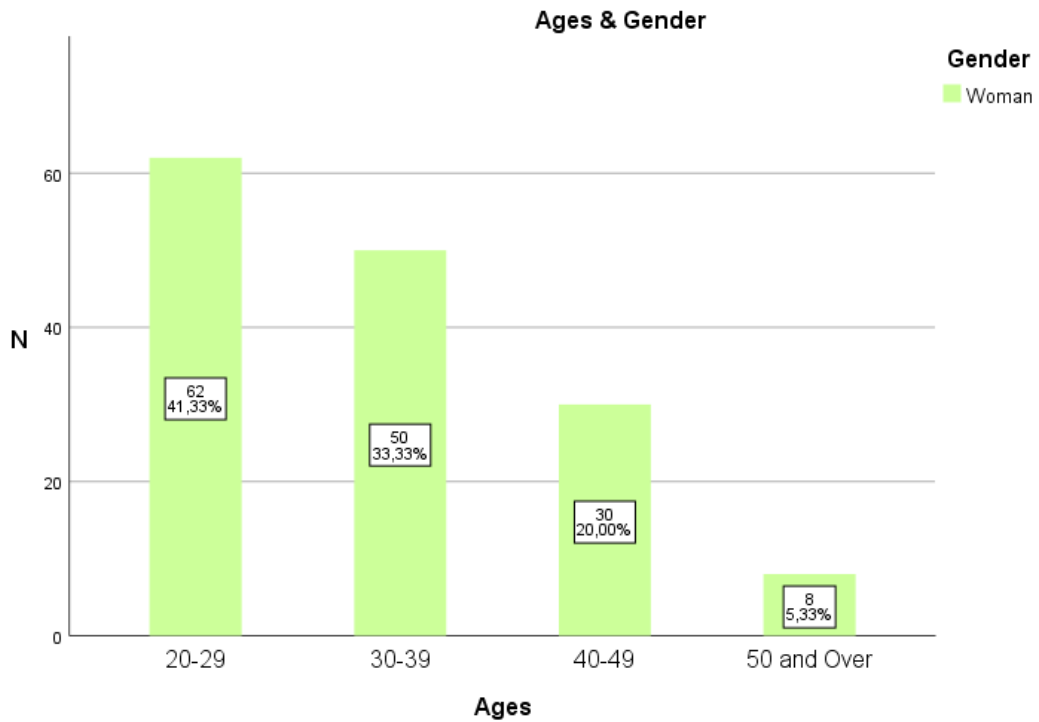


Figure 11. Rate of Women and Ages

6.1.4. Rate of Genders & Sectors

Figures shows the distribution of the participants according to their gender and sectors. The highest participation rate of 167 male participants with 41.92% (N:70) is from the “Banking” sector. This ratio is respectively; While watching the “Other” group, which thinks that they are not included in the sectors presented in the options with 19.76% (N:33); 17.32% (N:29) of men are included in the "Real Sector (Financial Services)" class. The rate of men included in the Real Sector (Other) group is 11.38% (N:19). Finally, 9.58% of the men (N:16) participated in the "Academic" class.

While 52.0% (N:78) of a total of 150 female participants were experts in the “Banking” sector, this ratio was 21.33% (N:32) for the “Other” group. The “Academic” and “Real Sector (Financial Services)” groups are followed that show equality with 11.33% (N: 17). On the other hand, “Real Sector (Other)” has the lowest share among the sectors in which women participate, with 4.0% (N:6).

Considering their characteristics, the sectors that participate in the financial markets and come from a common background can be grouped as Academic, Real Sector (Financial Services) and Banking. The sum of these three sectors, regardless of gender, with 227 people, constitutes 71.60% of the total participants. The participation rate, consisting of Real Sector (Other) and Others, which are not known to be from financial markets or have direct connections, are 28.39% (N:90). In Chapter 7, these classifications will be explained by statistical analysis.

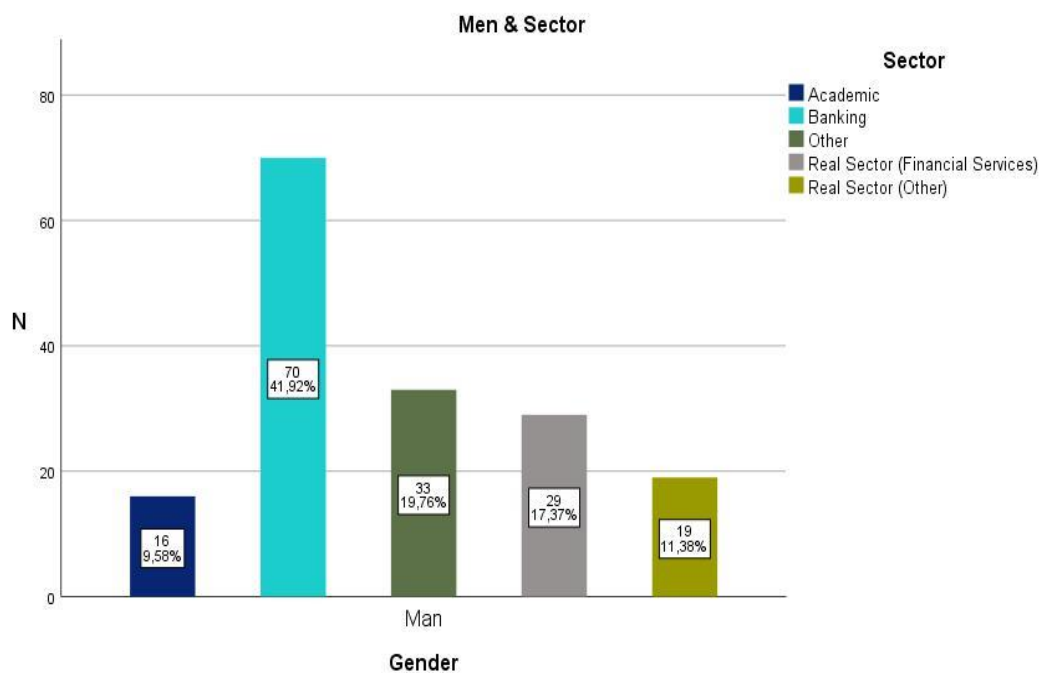


Figure 12. Rate of Men and Sectors

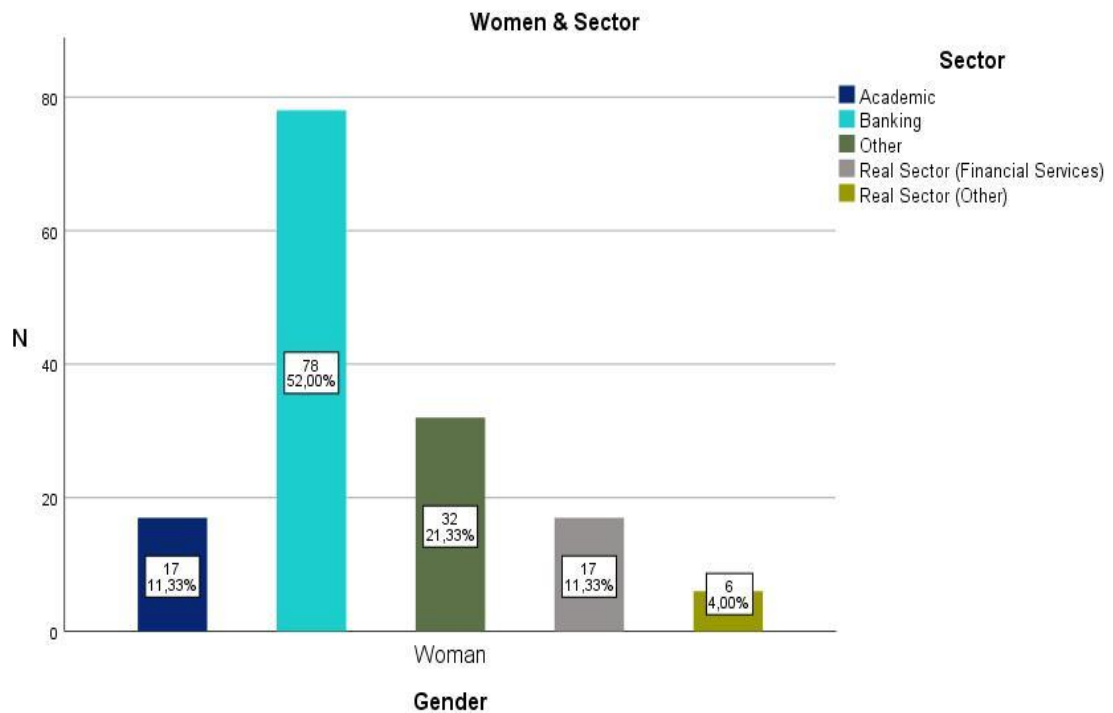


Figure 13. Rate of Women and Sectors

6.1.5. Rate of Sectors & Ages

Those Figures below shows the distribution of the 5 sectors in which the participants are located, according to age groups divided into 4 classes. “Under 40” people and “40 and Over” people mentioned in Rate of Genders & Ages were examined according to sectors. It was seen that out of 148 people in the “Banking” sector, those with “Under 40” had the largest share with 62.16% (N: 92) and people who are “40 and Over”, considered middle-aged, are 37.84% (N:56).

63,04% (N:29) of people with “Under 40” in the “Real Sector (Financial Services)” class; people with “40 and Over” are 36.96% (N:17).

The rate of “Under 40” in the “Academic” class consists of 87,88% (N:29), while those with “40 and Over” consist of 12.12% and 4 people.

The “Real Sector (Other)” group is the sector with the lowest number of participants with 25 people in totally. Among 25 people, “Under 40” is 68.0% (N:17), “40 and Over” is 32.0% (N:8).

The “Other” group, which does not include itself in any occupational group, is the second class that includes the participants the most, with 65 people. Persons with “Under 40”; 70.77% (N: 46); people with “40 and Over” have a share of 29.23% (N:19).

When we look at the distribution of people who are included and not included in the financial markets by age, it is seen that the total of those who are “Under 40” from the "Banking", "Academic", "Real Sector (Financial Services)" classes has a share of 47.32%; it has been understood that those with “40 and Over” have a share of 24.3%. On the other hand, for the “Real Sector (Other)” and “Other”, the participants with “Under 40” in these two groups were 19.87%; Those who are “40 and Over” are 8.51%.

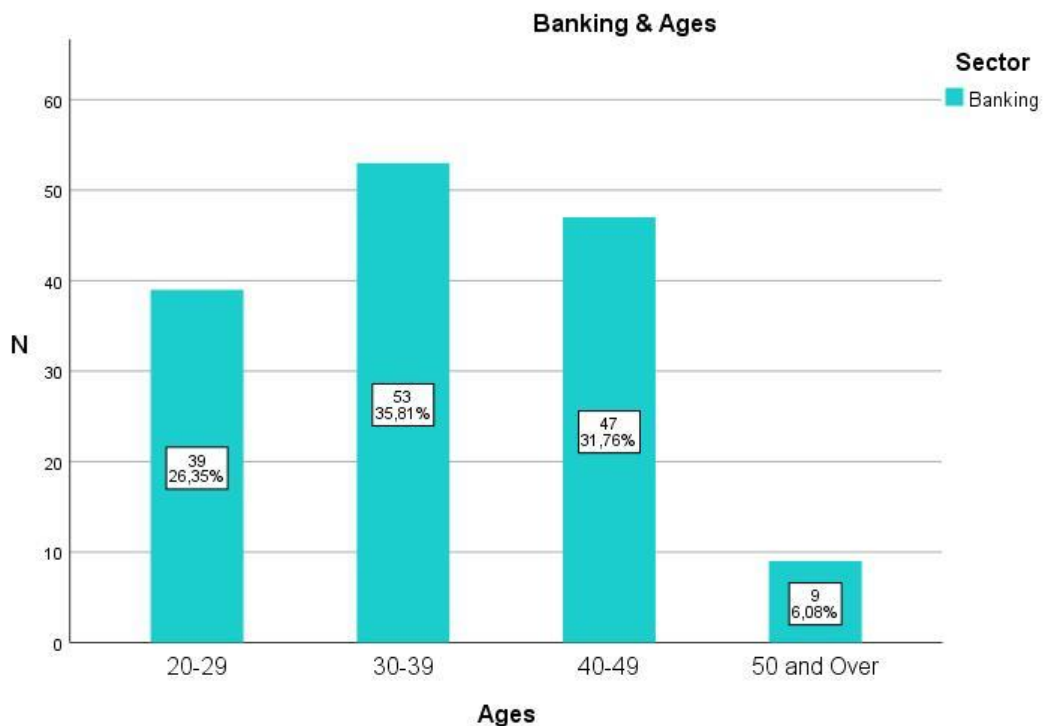


Figure 14. Rate of Banking and Ages

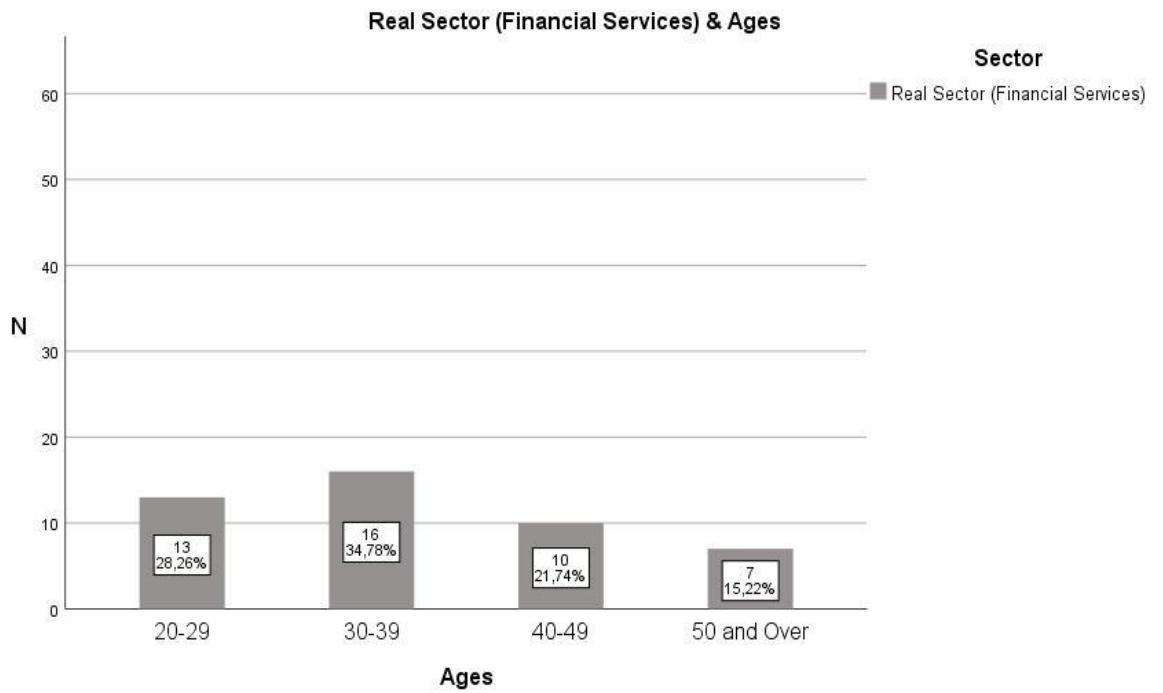


Figure 15. Rate of Real Sector (Financial Services) and Ages

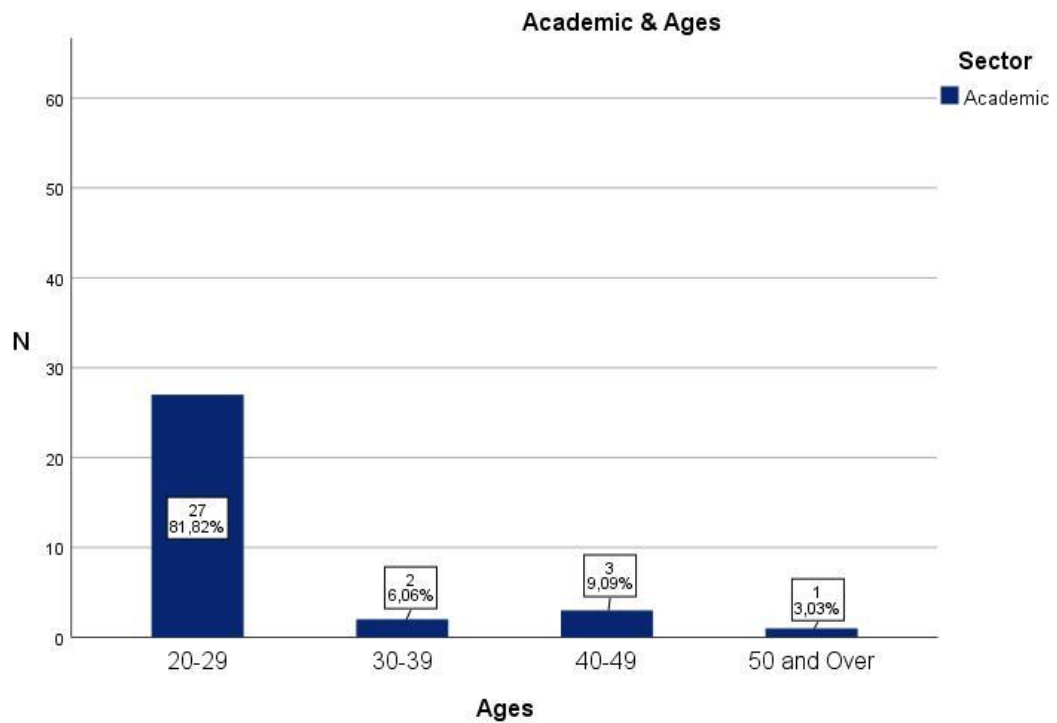


Figure 16. Rate of Academic and Ages

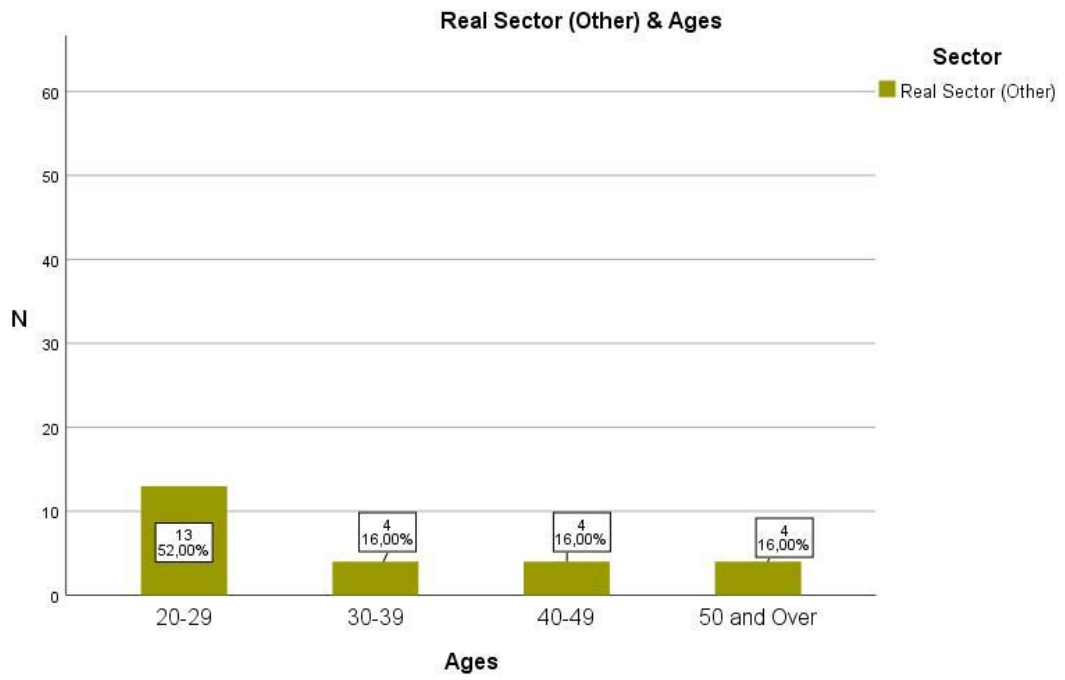


Figure 17. Rate of Real Sector (Other) and Ages

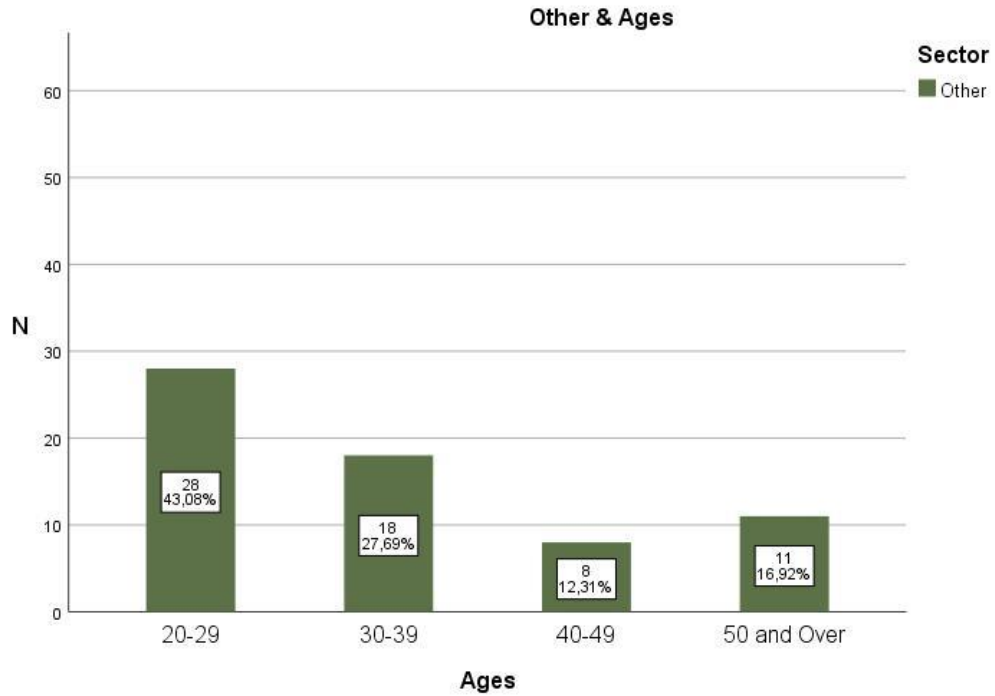


Figure 18. Rate of Other and Ages

6.2. Methodology

One of the variables that are tried to be measured and frequently used in research is perception. The person's stimuli such as an object, word, concept, event and fact; Understanding, defining, interpreting and explaining in the structure of thought with the help of their learning and intuition is defined as “perception” (Usal A., & Kuşlivan Z., 2000). In this study, the survey data were analyzed in terms of perceptions of the sample group by classifying them according to their gender, age and sector. The methods and models used in the analysis are described in this section. It is frequently used to measure perceptions of a research topic in many fields such as social sciences, political science, marketing and education; One of the scales that is convenient to apply, code and measure is the Likert scale developed by Rensis Likert in 1932 (Cramer, D., & Howitt, D. L., 2004). For this reason, a Likert scale was used in this study. With Likert-type questions, options are presented to determine the level of participation in the statement containing opinions about the researched subject. Here too, the options are accepted as “Strongly Agree” as 5; respectively, “Agree” was rated as 4, “Neutral” as 3, “Disagree” as 2, and “Strongly Disagree” as 1. Thus, the collected qualitative data was converted into quantitative data and analyzed.

The questions created with the online survey platform, Survey Monkey, and the data collected by the link were analyzed with 317 participants according to the 95% confidence interval and 5% sampling error. After the study results were converted into quantitative data with Microsoft Excel and analyzed using IBM SPSS Statistics 28.0 program, graphs were created.

First of all, reliability analysis with Cronbach's Alpha was applied to the research. Independent Sample t-Test (two-tail) was used to evaluate the following hypotheses.

$$H_0: \mu_x = \mu_y$$

$$H_1: \mu_x \neq \mu_y$$

μ : the variable of age, gender and sector groups.

Here, " H_0 " (Null hypothesis), the answers given do not differ from each other on average;

" H_1 " (Alternative hypothesis) was determined as the answers given differ from each other on average.

These hypotheses for the purpose of applying the questionnaire were tested separately for 23 questions with the t-Test method. Based on the H_0 and H_1 hypotheses given above, question by question hypotheses were formed according to age, gender and sectors. T-test and Cronbach's Alpha statistical methods used in the verification of the hypotheses are given below with their explanations and formulas. The results obtained afterwards were evaluated in this context according to the questions. In Chapter 7 (Findings) the results are analyzed.

6.2.1. Cronbach's Alpha;

Cronbach's Alpha, revealed by Lee Cronbach in 1951, is the internal consistency, that is, safety analysis, used in Likert-type scales (Ercan, İ., Kan, İ., 2004). Scales with a high Cronbach's alpha mean that the items consist of items that are consistent with each other and measure the same feature. Its formula is as follows;

$$\alpha = \frac{N\bar{c}}{\bar{v} + (N - 1)\bar{c}}$$

N: the number of items,

\bar{c} : average covariance between the items,

\bar{v} : average variance.

As seen in the formula, if you increase the number of items, Cronbach's alpha will also increase. If the mean inter-item correlation is low, the alpha will also be low. If the mean correlation between items increases, so does Cronbach's alpha (if number of items constant). The reliability criteria are as follows.

$0,00 \leq a < 0,40 = \text{scale is unreliable,}$

$0,40 \leq a < 0,60 = \text{scale is low reliable,}$

$0,60 \leq a < 0,80 = \text{scale is quite reliable,}$

$0,80 \leq a < 1,00 = \text{the scale is highly reliable.}$

6.2.2. Two Sample t-Test: Unequal Variance;

The t-Test is a statistical technique used to test the significance of the difference between the means. Independent Sample t-Test (unequal variances) is used to test hypotheses based on the parameters of two independent communities through data obtained from two independent samples (Ural, A. & Kılıç, İ., 2005). The Independent Sample t-Test (two-tail) was used in this study because there was a sample group of 317 participants and these groups were classified according to gender, age and sectors. Its formula is as follows;

$$t = \frac{(\bar{x} - \bar{y}) - (\mu_x - \mu_y)}{\sqrt{\frac{s_x^2}{n_x} + \frac{s_y^2}{n_y}}}$$
$$m = \frac{\left(\frac{s_x^2}{n_x} + \frac{s_y^2}{n_y}\right)^2}{\frac{\left(\frac{s_x^2}{n_x}\right)^2}{n_x - 1} + \frac{\left(\frac{s_y^2}{n_y}\right)^2}{n_y - 1}}$$

\bar{x} and \bar{y} : the sample means,

s_x and s_y : sample standard deviations

n_x and n_y : two sets of data size

If x and y = normal,

Or n_x and n_y = sufficiently large, then the random variable has distribution $T(m)$.

1. By Genders;

H_0 : The answers given regarding the advantages and disadvantages of the CBDCs by gender do not differ from each other on average.

H_1 : The answers given about the advantages and disadvantages of CBDCs by gender differ from each other on average.

2. By Ages;

H_0 : The answers given about the advantages and disadvantages of the CBDCs by age are not different from each other on average.

H_1 : The answers given about the advantages and disadvantages of CBDCs by age differ from each other on average.

Age groups were analyzed by t-Test according to the findings obtained during Table 2, where the age distribution of the participants was shown, while the young people were divided into two groups as “**Under 40**” and the middle-aged people “**40 and Over**”. Thus, the way CBDCs are perceived according to young and middle-aged people is discussed.

3. Those in the Financial Sector and Not;

H_0 : The answers given by the financial sector and non-financial sectors regarding the advantages and disadvantages of CBDCs do not differ from each other on average.

H_1 : The answers given by the financial sector and non-financial sectors regarding the advantages and disadvantages of CBDCs differ from each other on average.

While applying the t-Test method according to sectors, people with the same financial background were determined as Group A, and those who did not were determined as Group B. Those who mark their sector as “Banking, Real Sector

(Financial Services) and Academic” are designated as A group. Those who chose their sector as “Reel Sector (Other) and Other” were determined as B group.

The purpose of these consolidations made for ages and sectors; to evaluate similar factors together and to observe perceptual differences or similarities about the questions asked by creating contrast.

The findings regarding the Cronbach's Alpha and t-Test results used while testing the above hypotheses are included in Chapter 7.

7. FINDINGS

In this section, the results of the survey made according to the answers received from a total of 317 people; It was chosen from the important questions included in the 9 titles, which are grouped according to the "Pros/Cons" table in Chapter 5, where the advantages and disadvantages are listed. For the analysis of the data, the t-test was used to compare the sample means with the assumption of unequal population distribution variance of the responses given by the participants. The selected questions include statistically significant differences as a result of the t-Tests according to each subject of chapter 5 and each group of participants. The t-Test results, statistical summaries and SPSS graphics for all other questions are presented in the Appendix section. The findings were analyzed by Independent Sample t-Test (two-tail) as "Men & Women", "Under 40 Age & 40 and Over Ages" and "Group A (Financial Sectors) & Group B (Non-Financial Sectors)". As explained in Chapter 6.2, it is accepted as " H_0 " (Null hypothesis) that both variables grouped according to gender, age and sectors are not related to each other, they are not different from each other on average, that is, there is no statistically significant difference between them; It is accepted as " H_1 " (Alternative hypothesis) if there is a relationship between them, that they are different from each other on average, that is, there is a statistically significant difference between them.

7.1. Cronbach Alpha Reliability Analysis Results

For questions about Advantages and Disadvantages of Central Bank Digital Currencies, reliability was tested with Cronbach's Alpha analysis. The results are in below.

Reliability Statistics		
Cronbach's Alpha	Alpha	N of Items
,930	,932	23

Table 6. Reliability Statistics

As can be seen from the Reliability Statistics table, the result of the Cronbach's Alpha reliability test applied to the entire questionnaire was calculated as $\alpha = 0.930$. According to reliability criteria; $0.80 \leq 0.930 < 1.00$ = the scale is highly reliable. That is, this value shows that the questionnaire is perfectly reliable.

In the Case Processing Summary Table below, since Excluded = 0, it is understood that the reliability analysis was applied to all the data obtained from the questionnaire.

Case Processing Summary			
		N	%
Cases	Valid	317	100,0
	Excluded ^a	0	0,0
	Total	317	100,0

a. Listwise deletion based on all variables in the procedure.

Table 7. Case Processing Summary

Scale Statistics			
Mean	Variance	Deviation	N of Items
84,211	231,908	15,2285	23

Table 8. Scale Statistics

Table 8 shows the statistical summary of the survey data. Accordingly, the average of 23 items is 84,211; variance 231.9, deviation; It is 15.22.

Looking at the values in the Item-Total Statistics table below, it is seen how the Cronbach's Alpha value changes when any question is deleted.

Considering the reliability values for this questionnaire, it is seen that there is not a big change and none of the questions negatively affect the reliability of the questionnaire. In this way, it can be stated that all questions are correlated with each

other. In other words, since no item decreases the reliability value, it does not need to be removed from the scale.

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Question 1	80,502	213,706	,539	,481	,928
Question 2	80,312	210,874	,696	,699	,926
Question 3	80,278	210,416	,719	,733	,925
Question 4	80,416	210,655	,650	,674	,926
Question 5	80,356	211,490	,671	,557	,926
Question 6	80,773	210,651	,599	,570	,927
Question 7	80,751	210,010	,660	,620	,926
Question 8	80,404	209,716	,728	,589	,925
Question 9	80,880	210,093	,603	,553	,927
Question 10	80,634	209,454	,666	,569	,926
Question 11	80,401	211,412	,665	,526	,926
Question 12	80,208	214,532	,548	,471	,928
Question 13	80,577	211,403	,628	,474	,927
Question 14	80,426	218,074	,445	,464	,930
Question 15	80,328	216,765	,504	,494	,929
Question 16	80,457	217,179	,425	,381	,930
Question 17	80,565	212,474	,615	,567	,927
Question 18	80,577	216,150	,480	,503	,929
Question 19	80,580	211,073	,654	,493	,926
Question 20	80,562	211,538	,657	,532	,926
Question 21	81,514	220,732	,270	,171	,933
Question 22	80,479	214,257	,557	,384	,928
Question 23	80,669	212,950	,545	,430	,928

Table 9. Item-Total Statistics

In addition, the fact that there are no negative values in the "Cronbach's Alpha if Item Deleted" column in this table indicates that no reverse coding was used while determining the Likert scales of the questions.

The table showing the Item Statistics summary below shows the averages and standard deviations of the Likert scale degrees given to 23 questions by 317 participants.

Item Statistics			
	Mean	Std. Deviation	N
Question 1	3,710	1,0811	317
Question 2	3,899	,9917	317
Question 3	3,934	,9834	317
Question 4	3,795	1,0669	317
Question 5	3,855	,9958	317
Question 6	3,438	1,1474	317
Question 7	3,461	1,0832	317
Question 8	3,808	1,0051	317
Question 9	3,331	1,1695	317
Question 10	3,577	1,1014	317
Question 11	3,811	1,0073	317
Question 12	4,003	1,0173	317
Question 13	3,634	1,0607	317
Question 14	3,785	,9799	317
Question 15	3,883	,9591	317
Question 16	3,754	1,0833	317
Question 17	3,647	1,0257	317
Question 18	3,634	1,0396	317
Question 19	3,631	1,0400	317
Question 20	3,650	1,0128	317
Question 21	2,697	1,2104	317
Question 22	3,732	1,0191	317
Question 23	3,543	1,1147	317

Table 10. Item Statistics

7.2. Independent Sample t-Test Analysis Results

Below, the 1st, 7th, 9th, 14th, 16th and 21st questions of the survey questions (see also, Appendix) are selected and reported for all sample groups. The reason for choosing these questions is primarily because different findings were obtained in the t-Test results and sample groups in which the " H_0 " hypothesis was rejected or not rejected. In addition, these questions generally cover the grouped topics related to advantages and disadvantages in Chapter 5. The remaining questions are included in the comments in Chapter 8, Results.

7.2.1. Perceptions of the Sample Group on the Advantages and Disadvantages of CBDCs by Gender

According to the Independent Sample T-test results for male and female participants, when all questions were examined, it was seen that there was a significant difference between the genders only in the 7th and 9th questions. (The t-test table for other questions is in the Appendix.) Here, both Questions 7 and 9 are reported, and selected questions, which are thought to represent the general scope, are reported according to gender.

Question 1;

H_0 : The answers given by women and men about the decrease in money transfer costs (EFT, Swift etc.) with CBDCs are not different from each other on average.

H_1 : The answers given by women and men about the decrease in money transfer costs (EFT, Swift etc.) with CBDCs differ from each other on average.

Independent Samples Test										
Genders: Women & Men		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
Question 1									Lower	Upper
	Equal variances assumed	1,815	,179	,679	315	,497	,083	,122	-,157	,322
	Equal variances not assumed			,683	314,989	,495	,083	,121	-,155	,321

Group Statistics					
Genders: Women & Men		N	Mean	Std. Deviation	Std. Error Mean
Question 1	Women	150	3,75	1,023	,084
	Men	167	3,67	1,132	,088

Table 11. Statistics of Question 1 (Genders)

In the Independent Sample t-test table “Sig. value”; Since $0.179 > 0.05$, equal variance assumed line “Sig. (2-tailed) value”, it is $0.497 > 0.05$. For this reason, fail to reject the null hypothesis. When the results of the analysis are examined, it is seen that there is no statistically significant difference between the genders in terms of decreasing CBDCs and money transfer costs.

Question 7:

H_0 : The answers given by women and men to the issue that effective tax collection methods will come into play with the issuance of CBDCs are not different from each other on average.

H_1 : The answers given by women and men to the issue that effective tax collection methods will come into play with the issuance of CBDCs differ from each other on average.

Independent Samples Test										
Genders: Women & Men		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 7	Equal variances assumed	4,209	,041	2,504	315	,013	,303	,121	,065	,540
	Equal variances not assumed			2,523	314,719	,012	,303	,120	,067	,539

Group Statistics					
Genders: Women & Men		N	Mean	Std. Deviation	Std. Error Mean
Question 7	Women	150	3,62	,994	,081
	Men	167	3,32	1,141	,088

Table 12. Statistics of Question 7 (Genders)

In the Independent Sample t-test table “Sig. value”; Since $0.041 < 0.05$, equal variance not assumed line. According to the “Sig. (2-tailed) value”, it is $0.012 < 0.05$. For this reason, the null hypothesis rejected. When the results of the analysis are examined, it is seen that there is a statistically significant difference between the genders that effective tax collection methods will come into play with the issuance of CBDCs.

Question 9;

H_0 : The answers given by women and men about the elimination of limited assurance risks such as government guarantees up to 150 thousand TL to their deposit accounts with CBDCs are not different from each other on average.

H_1 : The answers given by women and men about the elimination of limited assurance risks such as government guarantees up to 150 thousand TL to their deposit accounts with CBDCs differ from each other on average.

Independent Samples Test										
Genders: Women & Men		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 9	Equal variances assumed	1,626	,203	1,963	315	,051	,257	,131	-,001	,515
	Equal variances not assumed			1,972	314,881	,049	,257	,130	,001	,514

Group Statistics					
Genders: Women & Men		N	Mean	Std. Deviation	Std. Error Mean
Question 9	Women	150	3,47	1,109	,091
	Men	167	3,21	1,212	,094

Table 13. Statistics of Question 9 (Genders)

In the Independent Sample t-test table “Sig. value”; Since $0.203 > 0.05$, equal variance assumed line. According to the “Sig. (2-tailed) value”, it is $0.051 > 0.05$. For this reason, fail to reject the null hypothesis. When the results of the analysis are examined, it was seen that there was no statistically significant difference between the genders in terms of eliminating the limited assurance risks such as government guarantees up to 150 thousand TL provided to deposit accounts with CBDCs.

Question 14;

H_0 : The responses of women and men to the fact that CBDCs have many unreliable unknowns because it is not a widely practiced system do not differ from each other on average.

H_1 : The responses of women and men to the fact that CBDCs have many unreliable unknowns because it is not a widely practiced system differ from each other on average.

Independent Samples Test										
Genders: Women & Men		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 14	Equal variances assumed	1,065	,303	,250	315	,803	,028	,110	-,190	,245
	Equal variances not assumed			,249	309,161	,803	,028	,111	-,190	,245

Group Statistics					
Genders: Women & Men		N	Mean	Std. Deviation	Std. Error Mean
Question 14	Women	150	3,80	,997	,081
	Men	167	3,77	,967	,075

Table 14. Statistics of Question 14 (Genders)

In the Independent Sample t-test table “Sig. value”; Since $0.303 > 0.05$, equal variance assumed line “Sig. (2-tailed) value”, it is $0.803 > 0.05$. For this reason, fail to reject the null hypothesis. Considering the results of the analysis, it was seen that there was no statistically significant difference between the genders in terms of having many unreliable unknowns, since CBDCs are not a widely applied system.

Question 16;

H_0 : In a system where CBDCs are implemented, the answers of women and men about the right to privacy at risk are not different from each other on average, since all transactions regarding the income and expenses of users will be recorded.

H_1 : In a system where CBDCs are applied, the answers of women and men about the right to privacy are at risk differ from each other on average, as all transactions regarding the income and expenses of users will be recorded on average.

Independent Samples Test										
Genders: Women & Men		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 16	Equal variances assumed	0,096	,757	-,736	315	,462	-,090	,122	-,330	,150
	Equal variances not assumed			-,737	312,685	,462	-,090	,122	-,329	,150

Group Statistics				
Genders: Women & Men	N	Mean	Std. Deviation	Std. Error Mean
Question 16	Women	150	3,71	1,072
	Men	167	3,80	1,095

Table 15. Statistics of Question 16 (Genders)

In the Independent Sample t-test table “Sig. value”; Since $0.757 > 0.05$, equal variance assumed line “Sig. (2-tailed) value”, it is $0.462 > 0.05$. For this reason, fail to reject the null hypothesis. When the results of the analysis are examined, it is seen that there is no statistically significant difference between the genders in terms of the right to privacy at risk, since all transactions regarding the income and expenses of the users will be recorded in a system where CBDCs are applied.

Question 21;

H_0 : The answers given by men and women about the disappearance of the banking system as CBDCs begin to be accepted are not different from each other on average.

H_1 : The answers by men and women that the banking system will disappear as CBDCs become accepted differ on average.

Independent Samples Test										
Genders: Women & Men		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 21	Equal variances assumed	,705	,402	1,624	315	,105	,221	,136	-,047	,488
	Equal variances not assumed			1,621	308,870	,106	,221	,136	-,047	,488

Group Statistics					
Genders: Women & Men		N	Mean	Std. Deviation	Std. Error Mean
Question 21	Women	150	2,81	1,228	,100
	Men	167	2,59	1,188	,092

Table 16. Statistics of Question 21 (Genders)

In the Independent Sample t-test table “Sig. value”; Since $0.402 > 0.05$, equal variance assumed line. According to the “Sig. (2-tailed) value”, it is $0.105 > 0.05$. For this reason, fail to reject the null hypothesis. When the results of the analysis are examined, it is seen that there is no statistically significant difference between the genders that the banking system will disappear as CBDCs begin to be accepted.

7.2.2. Perceptions of the Sample Group on the Advantages and Disadvantages of CBDCs by Age

As defined in Under 40 & 40 and Over Chapter 6.2.2 (#2) in the t-test tables, along with its reasons;

- ✓ **Under 40 include;** 20-29 ages and 30-39 ages

✓ **40 and over include:** 40-49 ages and 50+ ages.

Question 1;

H_0 : The answers given by the participants who are under the age of 40 and over, about the decrease in CBDCs and money transfer costs (EFT, Swift etc.) are not different from each other on average.

H_1 : The answers given by the participants, who are under the age of 40 and over, about the decrease in CBDCs and money transfer costs (EFT, Swift etc.) differ from each other on average.

Independent Samples Test										
Ages: Under & 40 and Over		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 1	Equal variances assumed	,495	,482	-,573	315	,567	-,074	,129	-,329	,181
	Equal variances not assumed			-,556	189,528	,579	-,074	,133	-,337	,189

Group Statistics					
Ages: Under & 40 and Over		N	Mean	Std. Deviation	Std. Error Mean
Question 1	Under 40	213	3,69	1,050	,072
	40 and Over	104	3,76	1,145	,112

Table 17. Statistics of Question 1 (Ages)

In the Independent Sample t-test table “Sig. value”; Since $0.482 > 0.05$, equal variance assumed line. According to the “Sig. (2-tailed) value”, it is $0.567 > 0.05$. For this reason, fail to reject the null hypothesis. When the results of the analysis are examined, it is seen that there is no statistically significant difference between the age groups regarding the decrease in CBDCs and money transfer costs.

Question 7;

H_0 : The answers given by the participants under the age of 40 and over that effective tax collection methods will come into play with the issuance of CBDCs are not different from each other on average.

H_1 : The answers given by the participants under the age of 40 and over that effective tax collection methods will come into play with the issuance of CBDCs are different from each other on average.

Independent Samples Test										
Ages: Under & 40 and Over		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 7	Equal variances assumed	,342	,559	,761	315	,447	,099	,130	-,156	,354
	Equal variances not assumed			,749	196,033	,455	,099	,132	-,161	,359

Group Statistics					
Ages: Under & 40 and Over		N	Mean	Std. Deviation	Std. Error Mean
Question 7	Under 40	213	3,49	1,067	,073
	40 and Over	104	3,39	1,118	,110

Table 18. Statistics of Question 7 (Ages)

In the Independent Sample t-test table “Sig. value”; Since $0.559 > 0.05$, equal variance assumed line “Sig. (2-tailed) value”, it is $0.447 > 0.05$. For this reason, fail to reject the null hypothesis. When the results of the analysis are examined, it is seen that there is no statistically significant difference between the age groups that effective tax collection methods will come into play with the issuance of CBDCs.

Question 14;

H_0 : Participants who are under the age of 40 and above; The answers they gave about the fact that CBDCs have many unreliable unknowns because it is not a widely applied system are not different from each other on average.

H_1 : Participants who are under the age of 40 and above; Their answers to the fact that CBDCs have many unreliable unknowns because they are not a widely applied system differ from each other on average.

Independent Samples Test										
Ages: Under & 40 and Over		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 14	Equal variances assumed	2,624	,106	-,525	315	,600	-,062	,117	-,293	,169
	Equal variances not assumed			-,552	232,957	,581	-,062	,112	-,282	,158

Group Statistics					
Ages: Under & 40 and Over		N	Mean	Std. Deviation	Std. Error Mean
Question 14	Under 40	213	3,77	1,024	,070
	40 and Over	104	3,83	,886	,087

Table 19. Statistics of Question 14 (Ages)

In the Independent Sample t-test table “Sig. value”; Since $0.106 > 0.05$, equal variance assumed line “Sig. (2-tailed) value”, it is $0.600 > 0.05$. For this reason, fail to reject the null hypothesis. Considering the results of the analysis, it was seen that there was no statistically significant difference between the age groups in terms of the fact that CBDCs are not a widely applied system, and there are many unknowns that do not inspire confidence.

Question 16;

H_0 : Participants who are under the age of 40 and above; In a system where CBDCs are implemented, the answers given by the users about the risk to privacy are not different from each other on average, since all transactions regarding their income and expenses will be recorded.

H_1 : Participants who are under the age of 40 and above; In a system where CBDCs are implemented, the answers given by the users about the right to privacy at risk are different from each other on average, since all transactions regarding income and expenses will be recorded.

Independent Samples Test										
Ages: Under & 40 and Over		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 16	Equal variances assumed	4,513	,034	-,506	315	,613	-,066	,130	-,321	,190
	Equal variances not assumed			-,535	236,001	,593	-,066	,123	-,308	,176

Group Statistics					
Ages: Under & 40 and Over		N	Mean	Std. Deviation	Std. Error Mean
Question 16	Under 40	213	3,73	1,136	,078
	40 and Over	104	3,80	,969	,095

Table 20. Statistics of Question 16 (Ages)

In the Independent Sample t-test table “Sig. value”; Since $0.034 < 0.05$, equal variance not assumed line “Sig. (2-tailed) value”, it is $0.593 > 0.05$. For this reason, fail to reject the null hypothesis. When the results of the analysis are examined, it is seen that there is no statistically significant difference between the age groups in terms of the right to privacy at risk, since all transactions regarding the income and expenses of the users will be recorded in a system where CBDCs are applied.

Question 21;

H_0 : The answers given by the participants under the age of 40 and over that the banking system will disappear as CBDCs begin to be accepted are not different from each other on average.

H_1 : The answers given by the participants who are under and over the age of 40, that the banking system will disappear as CBDCs begin to be accepted, differ from each other on average.

Independent Samples Test										
Ages: Under & 40 and Over		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 21	Equal variances assumed	12,779	,000	2,137	315	,033	,308	,144	,024	,591
	Equal variances not assumed			2,280	242,285	,023	,308	,135	,042	,574

Group Statistics					
Ages: Under & 40 and Over		N	Mean	Std. Deviation	Std. Error Mean
Question 21	Under 40	213	2,80	1,271	,087
	40 and Over	104	2,49	1,052	,103

Table 21. Statistics of Question 21 (Ages)

In the Independent Sample t-test table “Sig. value”; Since $0.00 < 0.05$, equal variance not assumed line. According to the “Sig. (2-tailed) value”, it is $0.023 < 0.05$. For this reason, the null hypothesis rejected. When the results of the analysis are examined, it is seen that there is a statistically significant difference between the age groups that the banking system will disappear as CBDCs begin to be accepted.

7.2.3. Perceptions of the Sample Group on the Advantages and Disadvantages of CBDCs by Sectors

Group A and Group B in the t-test tables, Chapter 6.2.2. (#3) defines the sectors that group them because they have similar backgrounds. According to this;

- ✓ **Group A include;** Banking, Real Sector (Financial Services) and Academic,
- ✓ **Group B include;** Reel Sector (Other) and Other.

Question 1:

H_0 : Participants from the Financial Sectors or not; The answers they gave about the decrease in money transfer costs (EFT, Swift, etc.) with CBDCs are not different from each other on average.

H_1 : Participants from the Financial Sectors or not; The answers they gave about the decrease in money transfer costs (EFT, Swift, etc.) with CBDCs are different from each other on average.

Independent Samples Test										
Sectors: Group A&B		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 1	Equal variances assumed	13,517	,000	3,749	315	,000	,4947	,1320	,2350	,7543
	Equal variances not assumed			3,391	135,318	,001	,4947	,1459	,2061	,7832

Group Statistics					
Sectors: Group A & Group B		N	Mean	Std. Deviation	Std. Error Mean
Question 1	Group A	227	3,850	,9797	,0650
	Group B	90	3,356	1,2390	,1306

Table 22. Statistics of Question 1 (Sectors)

In the Independent Sample t-test table “Sig. value”; Since $0.00 < 0.05$, equal variance not assumed line. According to the “Sig. (2-tailed) value”, it is $0.001 < 0.05$. For this reason, the null hypothesis rejected. When the results of the analysis are examined, it is seen that there is a statistically significant difference between the sector groups that CBDCs and money transfer costs (EFT, Swift, etc.) will decrease.

Question 7:

H_0 : Participants from the Financial Sectors or not; Their answers on the issue that effective tax collection methods will come into play with the issuance of CBDCs are not different from each other on average.

H_1 : Participants from the Financial Sectors or not; Their answers on the issue that effective tax collection methods will come into play with the issuance of CBDCs are different from each other on average.

Independent Samples Test										
Sectors: Group A&B		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 7	Equal variances assumed	,419	,518	3,934	315	,000	,5190	,1319	,2594	,7786
	Equal variances not assumed			3,894	160,010	,000	,5190	,1333	,2558	,7823

Group Statistics					
Ages: Under & 40 and Over		N	Mean	Std. Deviation	Std. Error Mean
Question 7	Group A	227	3,608	1,0520	,0698
	Group B	90	3,089	1,0773	,1136

Table 23. Statistics of Question 7 (Sectors)

In the Independent Sample t-test table “Sig. value”; Since $0.518 > 0.05$, equal variance assumed line. According to the “Sig. (2-tailed) value”, it is $0.000 < 0.05$. For this reason, the null hypothesis rejected. When the results of the analysis are examined, it is seen that there is a statistically significant difference between the sector groups that effective tax collection methods will come into play with the issuance of CBDCs.

Question 14;

H_0 : Participants from the Financial Sectors or not; The answers they gave about the fact that CBDCs have many unreliable unknowns because it is not a widely applied system are not different from each other on average.

H_1 : Participants from the Financial Sectors or not; The answers they gave about the fact that CBDCs have many unknowns that do not inspire confidence because it is not a widely applied system are different from each other on average.

Independent Samples Test										
Sectors: Group A&B		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 14	Equal variances assumed	15,459	,000	3,993	315	,000	,4763	,1193	,2416	,7109
	Equal variances not assumed			3,584	133,549	,000	,4763	,1329	,2134	,7391

Group Statistics					
Sectors: Group A & Group B		N	Mean	Std. Deviation	Std. Error Mean
Question 14	Group A	227	3,921	,8789	,0583
	Group B	90	3,444	1,1329	,1194

Table 24. Statistics of Question 14 (Sectors)

In the Independent Sample t-test table “Sig. value”; Since $0.000 < 0.05$, equal variance not assumed line. According to the “Sig. (2-tailed) value”, it is $0.000 < 0.05$. For this reason, the null hypothesis rejected. Considering the results of the analysis, it was seen that there is a statistically significant difference between the sector groups in terms of the fact that CBDCs have many unknowns that do not give confidence because they are not a widely applied system.

Question 16;

H_0 : Participants from the Financial Sectors or not; In a system where CBDCs are implemented, the answers given by the users about the risk to privacy are not different from each other on average, since all transactions regarding their income and expenses will be recorded.

H_1 : Participants from the Financial Sectors or not; In a system where CBDCs are implemented, the answers given by the users about the right to privacy at risk are different from each other on average, since all transactions regarding income and expenses will be recorded.

Independent Samples Test										
Sectors: Group A&B		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 16	Equal variances assumed	5,068	,025	2,416	315	,016	,3236	,1339	,0601	,5871
	Equal variances not assumed			2,276	145,374	,024	,3236	,1422	,0426	,6045

Group Statistics					
Sectors: Group A&B		N	Mean	Std. Deviation	Std. Error Mean
Question 16	Group A	227	3,846	1,0297	,0683
	Group B	90	3,522	1,1825	,1246

Table 25. Statistics of Question 16 (Sectors)

In the Independent Sample t-test table “Sig. value”; Since $0.025 < 0.05$, equal variance not assumed line. According to the “Sig. (2-tailed) value”, it is $0.024 < 0.05$. For this reason, the null hypothesis rejected. When the results of the analysis are examined, it is seen that there is a statistically significant difference between the sector groups in terms of the right to privacy at risk, since all transactions regarding the income and expenses of the users will be recorded in a system where CBDCs are applied.

Question 21;

H_0 : Participants from the Financial Sectors or not; Their answers about the disappearance of the banking system as CBDCs begin to be accepted do not differ from each other on average.

H_1 : Participants from the Financial Sectors or not; Their answers that the banking system will disappear as CBDCs begin to be accepted differ from each other on average.

Independent Samples Test										
Sectors: Group A&B		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 21	Equal variances assumed	,191	,662	,797	315	,426	,1202	,1509	-,1766	,4170
	Equal variances not assumed			,795	162,775	,428	,1202	,1512	-,1783	,4186

Group Statistics					
Sectors: Group A&B		N	Mean	Std. Deviation	Std. Error Mean
Question 21	Group A	227	2,731	1,2095	,0803
	Group B	90	2,611	1,2150	,1281

Table 26. Statistics of Question 21 (Sectors)

In the Independent Sample t-test table “Sig. value”; Since $0.662 > 0.05$, equal variance assumed line. “Sig. (2-tailed) value”, it is $0.428 > 0.05$. For this reason, fail to reject the null hypothesis. When the results of the analysis are examined, it is seen that there is no statistically significant difference between age groups that the banking system will disappear as CBDCs begin to be accepted.

CONCLUSION

Despite its changing forms throughout history, money has come to the present day without losing its importance. Although its shape and value unit has changed, its basic functions have not changed. Money has only brought new systems and developments with it. With the transition from banknotes to plastic cards, there has been a serious decrease in the use of cash. The use of banknotes will decrease noticeably with CBDCs, but will not be completely obsolete. The decrease in the use of paper money will reduce the risks in many issues from money printing, distribution and energy costs to illegal transactions.

The most important reason for this is the beginning of the digital transformation era with technology. The wholesale digital currencies used between institutions in central banks have begun to give way to retail digital currencies. Central Banks aim to protect the power of their fiat money from the increasingly popular concept of crypto assets. Having fiat money means having economic freedom.

The biggest motivations of central banks in wanting to produce retail digital money are; If they cannot keep up with technological developments, it is to prevent private companies from filling the gap with new cryptocurrencies. Central Banks are now attempting to catch up with the speed of technology.

Therefore, according to the latest data published (BIS, 2019), only 20% of the countries in the world have not yet taken a step towards CBDCs. Some of the rests are working introverts and secret, some Stated started their work by establishing commissions with some countries together about CBDCs. One of the inferences I have made from the data of the countries I have examined is that CBDCs are not a system that will completely replace cash, but rather a complement to it. Otherwise, the money supply will increase and the money policy multiplier will suffer.

Moreover, the only role of central banks is not to print and distribute money. To explain their duties in general; To ensure stability by closely following the effects

of developments in financial markets on institutions, to create effective payment systems, to follow innovations and to include all elements of the national economy.

Considering the increasing motivation of countries about CBDCs as a result of the literature review, a survey was applied to a simple sample area about measuring the perceptions of the society about this issue and how conscious it is. With the survey, 317 people were reached. As social perception is wanted to be observed, these people were chosen from different occupational groups, different ages and genders. It has been observed that the most striking group among the occupational groups are those who work in the financial sectors or have a financial knowledge background.

In fact, a comprehensive method was applied with this questionnaire, which was prepared with 23 general and specific questions from the topics in Chapter 5, which was created based on the models related to the opportunities and challenges that CBDCs will create as they become widespread. Because these questions have actually emerged after analyzing many studies, opinions and differences of opinion.

The answers given to the questions were analyzed statistically on the basis of sectors, on the basis of genders and on the basis of ages, with the t-test method. In Chapter 7, questions were selected specifically to measure the general perception from these questions, and besides these, statistically different results were reported.

As a result of all these, as it was deduced before the survey study, the most important result is that the society has not yet reached a sufficient level of awareness on CBDCs. Although the questionnaire is sent to the participants via the online link, there are also some participants who have the opportunity to meet face to face. While the questionnaire was shared with these people, it was observed that many questions were asked about the subject.

This study also created an awareness on this issue for the audience reached. Despite the informative text written about CBDCs in the description of the survey shared via online platforms, the feedbacks are, generally, that the subject is very new and there are not enough resources, so it arouses curiosity and after the survey, the

participants want to know more about this subject. It was observed that the participants generally focused on privacy and the possibility of directing their purchasing behavior, and they were in agreement on the disadvantages included in the survey. In the analyzes made by age groups, there was a difference of opinion between the groups only regarding the disappearance of the banking sector. According to the genders, the average consensus for this statement is the same, only that tax evasion can be prevented and that banks offer limited guarantees as per the laws they are bound to, statistically significant differences were observed between the genders. Apart from these, the answers given by age and gender are not different from each other on average. As explained above, it has been concluded that the audience in the financial sectors and with a financial background actually agrees with these statements more consciously than those without a financial background. Because, according to the findings obtained, the results mathematically prove that they are different in both groups.

For this reason, central banks need to use a significant part of the budget they set aside for the digital money they will offer to increase financial literacy rates. Considering the already existing technological opportunities, the development level of the countries and their economic situation, the transition period to CBDCs will bring certain costs for both individuals and states. In order to accept payments with a digital platform, at best, the entire society must have internet access and smart devices. If such an environment is provided, access to financial products and services will undoubtedly become easier, and the duration of international transfers will be reduced to a minimum. In this regard, survey participants differ in terms of sectors. It has been observed that the average of people in the financial sectors agreeing with the statements on this subject is high, while other sectors have a more indecisive attitude. This situation reveals how important the accumulation of knowledge is in order to foresee the opportunities and difficulties that will arise.

Apart from this, individuals as well as states are at risk in a poorly implemented CBDC model in terms of cyberattack and financial terrorism. The assurance that banks can provide up to 150 thousand TL in a possible disaster today will disappear

when central banks switch to digital systems, and a social advantage will arise. In financial crises, the first thing that comes to mind in the society is to what extent banks can provide these and similar assurances. But central banks are obligated to provide such assurances unconditionally to ensure financial stability. Therefore, CBDCs should serve as a complement to the national currency, not as an investment alternative, as suggested by the survey statements. When the question asked on this subject is examined between sectors, ages and genders, it is seen that the averages of the answers given are close to each other, while it is seen that only the people who do not have a financial knowledge background and the group working in the financial sector are separated.

The results of the survey and the models applied in the literature show that;

Countries that are transitioning to or considering CBDCs should analyze all the benefits and risks properly. First of all, the technically conventional wholesale CBDC structure; In terms of retail CBDC, its infrastructure should be well understood. A centralized structure should continue to be preferred as the ledger infrastructure. Afterwards, it needs to be adapted and analyzed in-depth with its financial and legal dimensions. Understanding the potential of CBDCs requires a review of an applied model such as the Bahamas Sand Dollar Project in Chapter 4.2. Because the CBDC system, by its nature, allows negative interest rates to be applied, the responsibilities of the Central Bank are reduced and it can directly respond to incoming cash needs. If CBDCs are offered on auction terms, they will be less in demand than Central Bank money. Countries expect the CBDCs they produce to maintain their efficiency in terms of making payments easily in international transfers.

Kumhof, M., & Noone, C., (2018) mentioned in their study some conditions for stabilizing the exchange rate between CBDC and deposits. If Central Banks fulfil the following conditions;

- Acting firmly and confidently in order to meet the targeted prices and demanded CBDC quantities correctly,

- Determining CBDC interest rates and financial assets that are suitable for exchange with CBDC, depending on a certain price and quantity rules,
- Eligible securities are traded in a liquid market specific to CBDCs,

Converting CBDC assets to cash and converting bank deposits to CBDC will be facilitated (Kumhof, M., & Noone, C., 2018).

In addition to its social benefits, there is also the possibility that privacy cannot be protected as the most important of some social risks. It seems that in the coming years, it will become a luxury for people to protect the privacy of their private lives. Perhaps intermediary institutions that will benefit in this field will emerge and a new profession will emerge.

As a result, it is not possible to see the effects of the retail CBDC model on the economy and monetary policies today. Insufficient examples create uncertainty. Clear decisions have to be made about whether to change the financial system in a revolutionary way or just to make regulations on payments. It is certain that thanks to new technologies, we will at least be transitioning to a very different financial order in the near future. All studies show that CBDCs will provide great economic and social benefits. Survey results and applied models show that CBDCs will provide great economic and social benefits. These benefits are directly proportional to the power and reliability of central banks.

In order to understand the scientific aspects of the subject, academicians and students working in this field should be brought together and working teams should be established. Considering the suggestions presented; Countries interested in CBDC should cooperate with private institutions that provide technological infrastructure and cybersecurity for the Global and Retail CBDC model. Most importantly, awareness should be created in the society on this issue, and disciplined studies should be carried out by gaining an international dimension in order to minimize the disadvantages or the risks that may turn into a disadvantage, and to increase the advantages.

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APPENDIX

1. Survey Questions;

Q1- Money transfer costs (EFT, Swift, etc.) will decrease thanks to the Central Bank Digital Currencies.

Q2- Transaction speed will increase thanks to the Central Bank Digital Coins.

Q3- Financial technologies will develop thanks to the Central Bank Digital Currencies.

Q4- Access to financial services and products will be easier thanks to the Central Bank Digital Currencies.

Q5-International transfer times will be minimal with the Central Bank Digital Currencies.

Q6- Since virtual transactions will be recorded with the Central Bank Digital Currencies, money laundering will not be possible and financial terrorism will be prevented.

Q7- With the issuance of Central Bank Digital Currencies, effective tax collection methods will come into play.

Q8- With the Central Bank Digital Currencies, counterfeiting of paper money will be prevented.

Q9- Today, deposit accounts in banks are under state guarantee only up to TL 150 thousand. With the Central Bank Digital Currencies, such limited assurance risks will be eliminated.

Q10- With the Central Bank Digital Currencies, the new concepts such as account management and smart contracts will enter our lives, thus increasing the average financial literacy of countries.

Q11- Central banks face many side costs as they will receive external expertise and consultancy support in order to establish a technological infrastructure.

Q12- The systems of central banks can be the target of cyberattacks.

Q13- With the blockchain technology, the need for intermediary companies will decrease over time.

Q14- Since Central Bank Digital Currencies are not a widely implemented system, there are many unknowns that do not inspire confidence.

Q15- There are not enough pilot schemes to reference Central Bank Digital Currencies.

Q16- In a system where Central Bank Digital Currencies are applied, all transactions regarding the income and expenses of the users will be recorded, and the right to privacy is at risk.

Q17- With the issuance of Central Bank Retail Digital Coins, the way for central authorities to perform perception management will be cleared.

Q18- With the issuance of Central Bank Digital Currencies, the purchasing behavior of users will be directed by central authorities.

Q19- With the Central Bank Digital Currencies, analyzes for sectors will be facilitated in order to revive the economy.

Q20- Central Bank Digital Currencies will provide a meaningful competitive environment for financial intermediaries providing traditional financial services such as bank deposits.

Q21- As the Central Bank Digital Currencies begin to be accepted, the banking system will disappear.

Q22- Central Bank Digital Currencies are not an investment alternative; should be presented as a complementary format of the national currency.

Q23- Fintech companies and commercial banks should not be authorized to operate independently of central banks so that the monetary policy of the states is not adversely affected.

2. Demographic Graphics;

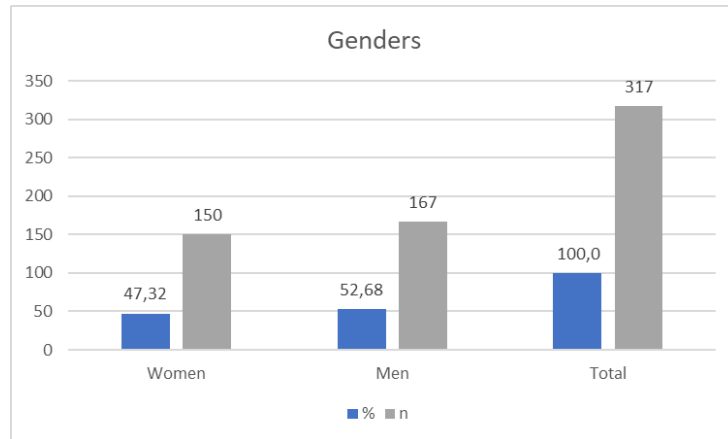


Figure 19.a. Distribution of Participants by Gender

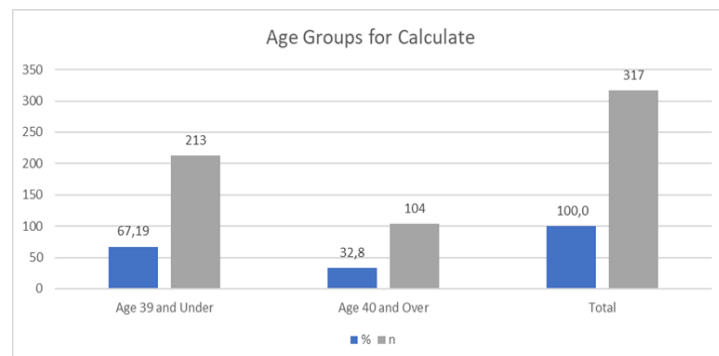


Figure 20.a. Distribution of Ages

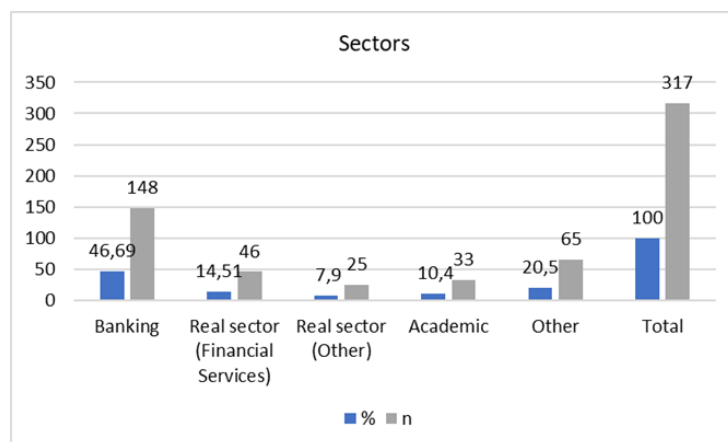


Figure 21.a. Distribution of Sectors

3. Independent Sample t-Test Analysis Results (For All Questions)

3.1. Perceptions of the Sample Group on the Advantages and Disadvantages of CBDCs by Gender

3.1.1. Independent Sample t-Test

		Independent Samples Test								
Genders: Women & Men		Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference		
									Lower	Upper
Question 1	Equal variances assumed	1,815	,179	,679	315	,497	,083	,122	-,157	,322
	Equal variances not assumed			,683	314,989	,495	,083	,121	-,155	,321
Question 2	Equal variances assumed	,004	,950	-,664	315	,507	-,074	,112	-,294	,146
	Equal variances not assumed			-,666	314,547	,506	-,074	,111	-,293	,145
Question 3	Equal variances assumed	,673	,413	-,236	315	,814	-,026	,111	-,244	,192
	Equal variances not assumed			-,237	314,978	,813	-,026	,110	-,243	,191
Question 4	Equal variances assumed	2,836	,093	,080	315	,937	,010	,120	-,227	,246
	Equal variances not assumed			,080	314,164	,936	,010	,119	-,225	,244
Question 5	Equal variances assumed	4,058	,045	-1,956	315	,051	-,218	,112	-,437	,001
	Equal variances not assumed			-1,950	306,947	,052	-,218	,112	-,438	,002
Question 6	Equal variances assumed	2,303	,130	1,298	315	,195	,167	,129	-,086	,421
	Equal variances not assumed			1,305	314,979	,193	,167	,128	-,085	,420
Question 7	Equal variances assumed	4,209	,041	2,504	315	,013	,303	,121	,065	,540
	Equal variances not assumed			2,523	314,719	,012	,303	,120	,067	,539
Question 8	Equal variances assumed	,070	,791	-,350	315	,726	-,040	,113	-,262	,183
	Equal variances not assumed			-,351	313,920	,726	-,040	,113	-,262	,183
Question 9	Equal variances assumed	1,626	,203	1,963	315	,051	,257	,131	-,001	,515
	Equal variances not assumed			1,972	314,881	,049	,257	,130	,001	,514
Question 10	Equal variances assumed	1,452	,229	1,166	315	,245	,144	,124	-,099	,388
	Equal variances not assumed			1,171	314,875	,242	,144	,123	-,098	,387
Question 11	Equal variances assumed	,346	,557	-,291	315	,771	-,033	,113	-,256	,190
	Equal variances not assumed			-,292	314,539	,770	-,033	,113	-,255	,189
Question 12	Equal variances assumed	1,068	,302	-1,270	315	,205	-,145	,114	-,370	,080
	Equal variances not assumed			-1,277	314,968	,203	-,145	,114	-,369	,079
Question 13	Equal variances assumed	2,782	,096	,518	315	,605	,062	,119	-,173	,297
	Equal variances not assumed			,522	314,643	,602	,062	,119	-,171	,295
Question 14	Equal variances assumed	1,065	,303	,250	315	,803	,028	,110	-,190	,245
	Equal variances not assumed			,249	309,161	,803	,028	,111	-,190	,245
Question 15	Equal variances assumed	,209	,648	,528	315	,598	,057	,108	-,155	,270
	Equal variances not assumed			,530	314,758	,596	,057	,108	-,155	,269
Question 16	Equal variances assumed	,096	,757	-,736	315	,462	-,090	,122	-,330	,150
	Equal variances not assumed			-,737	312,685	,462	-,090	,122	-,329	,150
Question 17	Equal variances assumed	,018	,893	,328	315	,743	,038	,116	-,189	,265
	Equal variances not assumed			,329	312,770	,743	,038	,115	-,189	,265
Question 18	Equal variances assumed	,070	,791	-,552	315	,581	-,065	,117	-,295	,166
	Equal variances not assumed			-,554	313,711	,580	-,065	,117	-,294	,165
Question 19	Equal variances assumed	4,498	,035	1,776	315	,077	,207	,117	-,022	,436
	Equal variances not assumed			1,788	314,879	,075	,207	,116	-,021	,435
Question 20	Equal variances assumed	3,722	,055	1,393	315	,165	,158	,114	-,065	,382
	Equal variances not assumed			1,401	315,000	,162	,158	,113	-,064	,381
Question 21	Equal variances assumed	,705	,402	1,624	315	,105	,221	,136	-,047	,488
	Equal variances not assumed			1,621	308,870	,106	,221	,136	-,047	,488
Question 22	Equal variances assumed	,042	,837	-,086	315	,932	-,010	,115	-,236	,216
	Equal variances not assumed			-,086	312,653	,932	-,010	,115	-,236	,216
Question 23	Equal variances assumed	2,377	,124	1,173	315	,242	,147	,125	-,100	,394
	Equal variances not assumed			1,180	314,994	,239	,147	,125	-,098	,392

Table 27.a. Independent Sample t-Test (For All Questions)

3.1.2. Group Statistics

Group Statistics					
Genders: Women & Men		N	Mean	Std. Deviation	Std. Error Mean
Question 1	Women	150	3,75	1,023	,084
	Men	167	3,67	1,132	,088
Question 2	Women	150	3,86	,956	,078
	Men	167	3,93	1,025	,079
Question 3	Women	150	3,92	,923	,075
	Men	167	3,95	1,037	,080
Question 4	Women	150	3,80	,976	,080
	Men	167	3,79	1,145	,089
Question 5	Women	150	3,74	1,019	,083
	Men	167	3,96	,965	,075
Question 6	Women	150	3,53	1,085	,089
	Men	167	3,36	1,199	,093
Question 7	Women	150	3,62	,994	,081
	Men	167	3,32	1,141	,088
Question 8	Women	150	3,79	,980	,080
	Men	167	3,83	1,030	,080
Question 9	Women	150	3,47	1,109	,091
	Men	167	3,21	1,212	,094
Question 10	Women	150	3,65	1,049	,086
	Men	167	3,51	1,145	,089
Question 11	Women	150	3,79	,971	,079
	Men	167	3,83	1,041	,081
Question 12	Women	150	3,93	,963	,079
	Men	167	4,07	1,062	,082
Question 13	Women	150	3,67	,981	,080
	Men	167	3,60	1,130	,087
Question 14	Women	150	3,80	,997	,081
	Men	167	3,77	,967	,075
Question 15	Women	150	3,91	,919	,075
	Men	167	3,86	,996	,077
Question 16	Women	150	3,71	1,072	,087
	Men	167	3,80	1,095	,085
Question 17	Women	150	3,67	1,014	,083
	Men	167	3,63	1,038	,080
Question 18	Women	150	3,60	1,017	,083
	Men	167	3,66	1,062	,082
Question 19	Women	150	3,74	,965	,079
	Men	167	3,53	1,096	,085
Question 20	Women	150	3,73	,953	,078
	Men	167	3,57	1,061	,082
Question 21	Women	150	2,81	1,228	,100
	Men	167	2,59	1,188	,092
Question 22	Women	150	3,73	1,009	,082
	Men	167	3,74	1,031	,080
Question 23	Women	150	3,62	1,047	,085
	Men	167	3,47	1,171	,091

Table 28.a. Group Statistics (For All Questions)

3.2. Perceptions of the Sample Group on the Advantages and Disadvantages of CBDCs by Ages
3.2.1. Independent Sample t-Test

Independent Samples Test										
Ages: Under & 40 and Over		Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 1	Equal variances assumed	,495	,482	-,573	315	,567	-,074	,129	-,329	,181
	Equal variances not assumed			-,556	189,528	,579	-,074	,133	-,337	,189
Question 2	Equal variances assumed	1,611	,205	,422	315	,673	,050	,119	-,184	,284
	Equal variances not assumed			,409	189,002	,683	,050	,122	-,192	,292
Question 3	Equal variances assumed	,194	,660	-,594	315	,553	-,070	,118	-,302	,162
	Equal variances not assumed			-,607	215,791	,545	-,070	,115	-,297	,157
Question 4	Equal variances assumed	,049	,824	,076	315	,940	,010	,128	-,242	,261
	Equal variances not assumed			,076	209,518	,939	,010	,127	-,240	,259
Question 5	Equal variances assumed	,087	,768	-,371	315	,711	-,044	,119	-,279	,190
	Equal variances not assumed			-,367	199,016	,714	-,044	,121	-,282	,193
Question 6	Equal variances assumed	,362	,548	,271	315	,787	,037	,137	-,233	,308
	Equal variances not assumed			,268	199,374	,789	,037	,139	-,236	,311
Question 7	Equal variances assumed	,342	,559	,761	315	,447	,099	,130	-,156	,354
	Equal variances not assumed			,749	196,033	,455	,099	,132	-,161	,359
Question 8	Equal variances assumed	4,406	,037	-1,073	315	,284	-,129	,120	-,365	,108
	Equal variances not assumed			-1,118	228,084	,265	-,129	,115	-,356	,098
Question 9	Equal variances assumed	,587	,444	1,377	315	,169	,192	,140	-,082	,467
	Equal variances not assumed			1,387	208,136	,167	,192	,139	-,081	,466
Question 10	Equal variances assumed	,586	,445	-,213	315	,832	-,028	,132	-,288	,232
	Equal variances not assumed			-,216	213,905	,829	-,028	,130	-,284	,228
Question 11	Equal variances assumed	,308	,580	-,200	315	,842	-,024	,121	-,262	,213
	Equal variances not assumed			-,206	221,280	,837	-,024	,117	-,255	,207
Question 12	Equal variances assumed	2,737	,099	-1,850	315	,065	-,224	,121	-,463	,014
	Equal variances not assumed			-1,969	241,017	,050	-,224	,114	-,449	,000
Question 13	Equal variances assumed	,696	,405	,106	315	,915	,013	,127	-,237	,264
	Equal variances not assumed			,109	219,419	,913	,013	,124	-,230	,257
Question 14	Equal variances assumed	2,624	,106	-,525	315	,600	-,062	,117	-,293	,169
	Equal variances not assumed			-,552	232,957	,581	-,062	,112	-,282	,158
Question 15	Equal variances assumed	8,466	,004	-1,391	315	,165	-,159	,115	-,385	,066
	Equal variances not assumed			-1,508	252,677	,133	-,159	,106	-,368	,049
Question 16	Equal variances assumed	4,513	,034	-,506	315	,613	-,066	,130	-,321	,190
	Equal variances not assumed			-,535	236,001	,593	-,066	,123	-,308	,176
Question 17	Equal variances assumed	1,354	,245	,030	315	,976	,004	,123	-,238	,245
	Equal variances not assumed			,031	228,017	,975	,004	,118	-,229	,236
Question 18	Equal variances assumed	,006	,937	,568	315	,570	,071	,125	-,174	,316
	Equal variances not assumed			,571	207,365	,568	,071	,124	-,173	,315
Question 19	Equal variances assumed	,379	,539	1,919	315	,056	,238	,124	-,006	,482
	Equal variances not assumed			1,922	205,154	,056	,238	,124	-,006	,482
Question 20	Equal variances assumed	,769	,381	,423	315	,673	,051	,121	-,187	,290
	Equal variances not assumed			,437	223,158	,663	,051	,117	-,180	,283
Question 21	Equal variances assumed	12,779	,000	2,137	315	,033	,308	,144	,024	,591
	Equal variances not assumed			2,280	242,285	,023	,308	,135	,042	,574
Question 22	Equal variances assumed	3,044	,082	-,104	315	,917	-,013	,122	-,253	,228
	Equal variances not assumed			-,108	229,082	,914	-,013	,117	-,243	,218
Question 23	Equal variances assumed	,525	,469	,367	315	,714	,049	,134	-,214	,312
	Equal variances not assumed			,359	192,852	,720	,049	,137	-,220	,318

Table 29.a. Independent Sample t-Test (For All Questions)

3.2.2. Group Statistics

Group Statistics					
Ages: Under & 40 and Over		N	Mean	Std. Deviation	Std. Error Mean
Question 1	Under 40	213	3,69	1,050	,072
	40 and Over	104	3,76	1,145	,112
Question 2	Under 40	213	3,92	,963	,066
	40 and Over	104	3,87	1,053	,103
Question 3	Under 40	213	3,91	1,003	,069
	40 and Over	104	3,98	,945	,093
Question 4	Under 40	213	3,80	1,078	,074
	40 and Over	104	3,79	1,049	,103
Question 5	Under 40	213	3,84	,987	,068
	40 and Over	104	3,88	1,017	,100
Question 6	Under 40	213	3,45	1,138	,078
	40 and Over	104	3,41	1,171	,115
Question 7	Under 40	213	3,49	1,067	,073
	40 and Over	104	3,39	1,118	,110
Question 8	Under 40	213	3,77	1,042	,071
	40 and Over	104	3,89	,923	,091
Question 9	Under 40	213	3,39	1,175	,081
	40 and Over	104	3,20	1,152	,113
Question 10	Under 40	213	3,57	1,121	,077
	40 and Over	104	3,60	1,066	,105
Question 11	Under 40	213	3,80	1,036	,071
	40 and Over	104	3,83	,950	,093
Question 12	Under 40	213	3,93	1,068	,073
	40 and Over	104	4,15	,890	,087
Question 13	Under 40	213	3,64	1,088	,075
	40 and Over	104	3,63	1,007	,099
Question 14	Under 40	213	3,77	1,024	,070
	40 and Over	104	3,83	,886	,087
Question 15	Under 40	213	3,83	1,023	,070
	40 and Over	104	3,99	,806	,079
Question 16	Under 40	213	3,73	1,136	,078
	40 and Over	104	3,80	,969	,095
Question 17	Under 40	213	3,65	1,065	,073
	40 and Over	104	3,64	,944	,093
Question 18	Under 40	213	3,66	1,046	,072
	40 and Over	104	3,59	1,030	,101
Question 19	Under 40	213	3,71	1,037	,071
	40 and Over	104	3,47	1,033	,101
Question 20	Under 40	213	3,67	1,045	,072
	40 and Over	104	3,62	,948	,093
Question 21	Under 40	213	2,80	1,271	,087
	40 and Over	104	2,49	1,052	,103
Question 22	Under 40	213	3,73	1,060	,073
	40 and Over	104	3,74	,935	,092
Question 23	Under 40	213	3,56	1,091	,075
	40 and Over	104	3,51	1,166	,114

Table 30.a. Group Statistics (For All Questions)

3.3. Perceptions of the Sample Group on the Advantages and Disadvantages of CBDCs by Sectors

3.3.1. Independent Sample t-Test

Independent Samples Test										
Sectors: Group A&B		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Question 1	Equal variances assumed	13,517	,000	3,749	315	,000	,4947	,1320	,2350	,7543
	Equal variances not assumed			3,391	135,318	,001	,4947	,1459	,2061	,7832
Question 2	Equal variances assumed	21,714	,000	4,518	315	,000	,5418	,1199	,3058	,7777
	Equal variances not assumed			3,973	129,205	,000	,5418	,1364	,2720	,8115
Question 3	Equal variances assumed	39,783	,000	6,314	315	,000	,7299	,1156	,5024	,9573
	Equal variances not assumed			5,271	119,560	,000	,7299	,1385	,4557	1,0040
Question 4	Equal variances assumed	28,847	,000	5,165	315	,000	,6602	,1278	,4087	,9116
	Equal variances not assumed			4,559	129,983	,000	,6602	,1448	,3737	,9466
Question 5	Equal variances assumed	16,085	,000	3,295	315	,001	,4025	,1221	,1622	,6428
	Equal variances not assumed			2,972	134,632	,004	,4025	,1354	,1346	,6704
Question 6	Equal variances assumed	,025	,874	3,019	315	,003	,4261	,1411	,1485	,7038
	Equal variances not assumed			2,956	156,556	,004	,4261	,1441	,1414	,7109
Question 7	Equal variances assumed	,419	,518	3,934	315	,000	,5190	,1319	,2594	,7786
	Equal variances not assumed			3,894	160,010	,000	,5190	,1333	,2558	,7823
Question 8	Equal variances assumed	30,319	,000	4,695	315	,000	,5692	,1212	,3306	,8077
	Equal variances not assumed			4,057	125,768	,000	,5692	,1403	,2915	,8468
Question 9	Equal variances assumed	,415	,520	4,476	315	,000	,6332	,1415	,3549	,9116
	Equal variances not assumed			4,249	147,466	,000	,6332	,1490	,3387	,9278
Question 10	Equal variances assumed	16,303	,000	5,949	315	,000	,7751	,1303	,5188	1,0315
	Equal variances not assumed			5,344	133,744	,000	,7751	,1451	,4882	1,0620
Question 11	Equal variances assumed	17,938	,000	4,860	315	,000	,5891	,1212	,3506	,8276
	Equal variances not assumed			4,394	135,239	,000	,5891	,1341	,3240	,8542
Question 12	Equal variances assumed	4,324	,038	3,655	315	,000	,4544	,1243	,2098	,6990
	Equal variances not assumed			3,419	143,456	,001	,4544	,1329	,1917	,7171
Question 13	Equal variances assumed	8,851	,003	3,349	315	,001	,4355	,1300	,1796	,6914
	Equal variances not assumed			3,101	140,949	,002	,4355	,1404	,1579	,7131
Question 14	Equal variances assumed	15,459	,000	3,993	315	,000	,4763	,1193	,2416	,7109
	Equal variances not assumed			3,584	133,549	,000	,4763	,1329	,2134	,7391
Question 15	Equal variances assumed	19,131	,000	2,957	315	,003	,3490	,1180	,1168	,5813
	Equal variances not assumed			2,599	129,086	,010	,3490	,1343	,0833	,6148
Question 16	Equal variances assumed	5,068	,025	2,416	315	,016	,3236	,1339	,0601	,5871
	Equal variances not assumed			2,276	145,374	,024	,3236	,1422	,0426	,6045
Question 17	Equal variances assumed	4,705	,031	3,614	315	,000	,4531	,1254	,2064	,6998
	Equal variances not assumed			3,399	144,949	,001	,4531	,1333	,1896	,7166
Question 18	Equal variances assumed	4,337	,038	3,546	315	,000	,4510	,1272	,2007	,7013
	Equal variances not assumed			3,350	146,148	,001	,4510	,1346	,1849	,7171
Question 19	Equal variances assumed	9,912	,002	4,540	315	,000	,5707	,1257	,3234	,8181
	Equal variances not assumed			4,204	140,945	,000	,5707	,1357	,3024	,8391
Question 20	Equal variances assumed	5,322	,022	5,179	315	,000	,6282	,1213	,3895	,8669
	Equal variances not assumed			5,003	152,454	,000	,6282	,1256	,3801	,8763
Question 21	Equal variances assumed	,191	,662	,797	315	,426	,1202	,1509	-,1766	,4170
	Equal variances not assumed			,795	162,775	,428	,1202	,1512	-,1783	,4186
Question 22	Equal variances assumed	10,633	,001	3,465	315	,001	,4324	,1248	,1869	,6779
	Equal variances not assumed			3,171	138,082	,002	,4324	,1363	,1628	,7020
Question 23	Equal variances assumed	,072	,788	3,625	315	,000	,4939	,1363	,2258	,7620
	Equal variances not assumed			3,572	158,565	,000	,4939	,1383	,2208	,7671

Table 31.a. Independent Sample t-Test (For All Question)

3.3.2. Group Statistics

Group Statistics					
Sectors: Group A & Group B		N	Mean	Std. Deviation	Std. Error Mean
Question 1	Group A	227	3,850	,9797	,0650
	Group B	90	3,356	1,2390	,1306
Question 2	Group A	227	4,053	,8657	,0575
	Group B	90	3,511	1,1731	,1237
Question 3	Group A	227	4,141	,7856	,0521
	Group B	90	3,411	1,2169	,1283
Question 4	Group A	227	3,982	,9263	,0615
	Group B	90	3,322	1,2437	,1311
Question 5	Group A	227	3,969	,9042	,0600
	Group B	90	3,567	1,1519	,1214
Question 6	Group A	227	3,559	1,1169	,0741
	Group B	90	3,133	1,1727	,1236
Question 7	Group A	227	3,608	1,0520	,0698
	Group B	90	3,089	1,0773	,1136
Question 8	Group A	227	3,969	,8591	,0570
	Group B	90	3,400	1,2160	,1282
Question 9	Group A	227	3,511	1,0945	,0726
	Group B	90	2,878	1,2346	,1301
Question 10	Group A	227	3,797	,9609	,0638
	Group B	90	3,022	1,2360	,1303
Question 11	Group A	227	3,978	,8996	,0597
	Group B	90	3,389	1,1386	,1200
Question 12	Group A	227	4,132	,9502	,0631
	Group B	90	3,678	1,1100	,1170
Question 13	Group A	227	3,758	,9859	,0654
	Group B	90	3,322	1,1787	,1242
Question 14	Group A	227	3,921	,8789	,0583
	Group B	90	3,444	1,1329	,1194
Question 15	Group A	227	3,982	,8517	,0565
	Group B	90	3,633	1,1558	,1218
Question 16	Group A	227	3,846	1,0297	,0683
	Group B	90	3,522	1,1825	,1246
Question 17	Group A	227	3,775	,9629	,0639
	Group B	90	3,322	1,1100	,1170
Question 18	Group A	227	3,762	,9802	,0651
	Group B	90	3,311	1,1182	,1179
Question 19	Group A	227	3,793	,9530	,0633
	Group B	90	3,222	1,1395	,1201
Question 20	Group A	227	3,828	,9508	,0631
	Group B	90	3,200	1,0299	,1086
Question 21	Group A	227	2,731	1,2095	,0803
	Group B	90	2,611	1,2150	,1281
Question 22	Group A	227	3,855	0,9365	,0622
	Group B	90	3,422	1,1512	,1214
Question 23	Group A	227	3,683	1,0832	,0719
	Group B	90	3,189	1,1207	,1181

Table 32.a. Group Statistics (ForAll Questions)

I. ETHICS BOARD APPROVAL

Ethics Board Approval is available in the printed version of this dissertation.