THE POTENTIAL IMPACTS OF THE IMPLEMENTATION OF CENTRAL BANK DIGITAL CURRENCY (CBDC) TOWARDS THE MALAYSIA'S ECONOMY

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Declaration

We hereby declare that:

(1) This undergraduate research project is the end result of our own work, and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the research project.

(4) The word count of this research report is 33,755.

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LIST OF ABBREVIATIONS

BNM	Bank Negara Malaysia
CBDC	Central Bank Digital Currency
DFS	Digital Financial Services
DOSM	Department of Statistics Malaysia
FI	Financial Inclusion
FS	Financial Stability
P	Payment
PDPA	Personal Data Protection Act
PhD	Doctor of Philosophy
PSD2	Payment Services Directive 2
SP	Security and Privacy
SPSS	Statistical Package for the Social Sciences
UTAR	Universiti Tunku Abdul Rahman

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Preface

The objective of this research is to study the potential impacts of the implementation of CBDC towards Malaysia's economy. The study focuses on Malaysia's commercial banks, private sector, and the general public. The second is to explore the stakeholders' understanding or perception on the concept of CBDC and to identify the gap of perspective between stakeholders and professionals. As the use of paper currency declines, central banks are attempting to spread the use of an electronic form of cash that is more widely accepted. In addition to being more effective, digital currency will be able to avoid the negative effects of private currencies. Hence, researchers are keen to find out the market expectation of different stakeholders such as commercial bankers, private sectors, and the general public.

On the other hands, this research study how the relationship between independent variables (Financial stability, Financial inclusion, Payment, Security and privacy) and dependent variables (The willingness of people to use CBDC). This study would be able to provide better understanding on the potential impacts of the implementation of CBDC towards Malaysia's economy.

Lastly, we hope that this study could provide better understanding and perception on the concept of CBDC.

Abstract

This paper attempts to study the potential impacts of the implementation of central bank digital currency (CBDC) towards Malaysia's economy, we specifically focus on analyzing the potential impact from different perspectives of the implementation of the CBDC in Malaysia to understand whether CBDC can act as a tool to achieve broader public policy outcomes. The research finds that there are four independent variables which are (1) financial stability (FS) - the efficacy of CBDC and its hazards are greatly influenced by the choices made regarding the architecture of CBCD since this novel idea of CBDC may have an impact on the fundamental operations of commercial banks and the role of the central bank. (2) financial inclusion (FI) - CBDC is a financial product and service that everyone can access (3) payment(P) - CBDC is associated with a payment system that enables users to conduct transactions using money that has been digitally issued as legal currency and (4) security & privacy (SP) - The value of CBDC classified material is self-evident, since it may entail national security, vital technologies, or trade secrets.

The finding shows the independent variables and dependent variables have a low relationship with the dependent variable which is the willingness of people to use CBDC. But from the view from the significance of the relationship, the independent variables and dependent variables have the significant relationship which all of them less than 0.01 level of significance thus we can reject all the null hypotheses

CHAPTER 1: INTRODUCTION

1.0 Introduction

This research is to study the potential impacts of the implementation of CBDC towards Malaysia's economy. In this chapter, we will discuss the background of the study, problem statement, research objectives, research questions and the significance of the study.

1.1 Background of the study

The 2022 Olympic Winter Games were held by the People's Republic of China in Beijing, the capital of China, from 4 February 2022 to 20 February 2022. During the Winter Olympics, China deputed its central bank digital currency (CBDC) known as the digital yuan to the world. In addition to cash, foreign visitors and athletes were allowed to use this digital yuan for retail payments in China (Light, 2022). The Digital yuan, China's CBDC, is a digital version of China's fiat money with legal tender status. Using digital yuan for payments only involves two simple steps. The first step is setting up a digital wallet through a mobile app created by China's central bank and transferring your money into this digital wallet. The second step is making payment for a transaction by showing the barcode to the sellers (Kharpal, 2021).

Due to the advanced development in technology, technology particularly the smartphone or mobile phone has been used in recent years by the majority of people. This stimulated innovation in the finance industry which changed the digital finance landscape very quickly. For instance, the rapid shift in focus from "Fintech" which emerged in the last decade and then to "cryptocurrency" and then to "CBDC" in today's (Ozili, 2022). Central Bank Digital Currency (CBDC) is literally a currency issued by a central bank in a country digitally. CBDC is a new or third form of central bank money alongside physical cash and central bank reserves. It is valid as legal tender for all transactions since it is backed by the credit of the government and intended to be a digital equivalent of cash for use by end users such as businesses and households (Boar & Wehrli, 2021). Nowadays, the emergence of digital currencies such as Bitcoin and the underlying blockchain has attracted a lot of attention. Hence, a new growing discussion appears which is the new payment technology: Central Bank Digital Currency (CBDC) receiving more attention than ever before since the current global Covid-19 pandemic.

In fact, China is not the only country that is working on CBDC. Many central banks are exploring their version of digital money intending to provide the same functions and features as existing central bank money such as cash. As of 2022, according to a survey from Bank for International Settlements (BIS), currently, 87 central banks in the world are working on CBDC, of which 15 of them are doing pilots for CBDC such as China and South Korea, and 9 of them have launched the CBCD such as Nigeria (Atlantic Council, 2022). Most central banks intend to provide CBDC for retail payment purposes (BIS, 2021). This indicates that most of the central banks intend to provide a central bank digital money that is available for public use rather than only allowing the use of this new digital money for wholesale payments such as interbank settlements.

In March 2021, Bank Negara Malaysia (BNM), Malaysia's central bank, stated that there were no immediate plans to issue a digital form of central bank money since Malaysia's current financial system is capable of meeting the needs of individuals and businesses effectively and efficiently. The existing monetary policy remains effective to safeguard Malaysia's economy and financial stability,

and existing payment systems continue to meet the needs of the economy. In June 2021, BNM announced that it would focus on developing and researching CBDC for wholesale payment rather than the retail CBDC (BNM, 2022).

In September 2021, BNM joined the first cross-border payment CBDC project called Dunbar, which is a project to explore the use of CBDC for cross-border payments between connected countries. This project involves parties namely Bank for International Settlements Innovation Hub Singapore Centre, central banks from Australia, Singapore, South Africa and Malaysia. This project attempts to develop a platform that allows the payments between countries using the CBDC issued by different central banks, and explore whether CBDC could achieve lower cost, safer, and more efficient cross-border payments (BNM, 2022).

The number of central banks exploring the use of CBDC is increasing, of which a total of 87 countries are working on CBDC as compared to only 35 countries in May 2020 (Atlantic Council, 2022). This indicates that CBDC has become a major concern of many countries around the world, and CBDC is likely to be issued by central banks shortly. This raises the question of why central banks are considering and actively working on CBDC. One possible reason is the threat from the emergence of privately issued assets such as private digital currencies (Writer, 2021).

According to Bank Negara Malaysia (BNM), private digital currencies are generally referred to as cryptocurrencies. This type of money is not widely used for retail payments due to its volatile nature. Cryptocurrency is volatile since its value depends on market forces, and it is subject to greater risks such as cyber threats due to a lack of governance (BNM, 2022). Thus, cryptocurrency is treated as a form of financial instrument rather than money that is used for payments. To overcome the high volatility nature of cryptocurrency, a new concept called Stablecoins has been introduced. Stablecoins is a new type of cryptocurrency that is similar to traditional cryptocurrency but with a major difference, which is backed by high liquidity and low-risk assets such as the country's currency and

commodities such as gold. Stablecoins have the potential to be accepted as a means of payment (BNM, 2022).

During an online interview conducted by Nikkei Asia, the director of the Bank for International Settlements Innovation Hub, Benoit Coeure, said that central banks all over the world did not pay enough attention to CBDC before the introduction of the Meta' Libra project. He mentioned that Central banks see the Libra project as a threat to the country's monetary system due to its large scale, which involves hundreds of millions of users (Writer, 2021).

Libra is Meta's Stablecoins project, which was introduced by Meta in June 2019. The goal behind the Libra project is to provide Facebook users with a stable digital currency that could be used globally. Most Governments around the world resist this new idea from Facebook and have put increasing pressure to prevent the launching of Libra. They believed it would heavily affect the global financial system and the position of country currencies. The reasons for that belief would be based on the popularity of Facebook. As of July 2019, Facebook has more than 2 billion monthly active users which makes Facebook an influential social media platform. Due to the legal challenges, Meta has changed Libra to Diem in December 2020 and plans to issue Diem Stablecoins shortly (Browne, 2019).

As of October 2021, according to Coinmetrics, the Stablecoins market has grown at an increasing rate, with the market capitalization of all stablecoins on average 25 times higher as compared to January 2020. 'Tether' and 'USD Coin' are the top two Stablecoins that are widely accepted and actively traded (Cecchetti & Schoenholtz, 2021). The wide adoption of private digital currencies such as Stablecoins could threaten financial stability and monetary sovereignty. Central banks may face losing control over the economy and financial system. Large-scale adoption of private digital currencies would impact the effectiveness of the monetary policy, and central banks could find traditional monetary policy tools are no longer effective (Echelpoel, 2020). In addition, large-scale adoption of private digital currencies may give the private digital currencies issuing companies excessive market power over the payment system, and thus potential

adverse impacts on the country's monetary system (Authority of the House of Lords, 2022).

As a saying goes 'If you cannot beat them, join them'. The emergence of these private digital currencies is pressuring central banks and governments all over the world to start to think about their version of digital currency or known as Central Bank Digital Currencies (CBDC). The Bank of England believes CBDC could help avoid the risk of private digital currencies and meet the future needs of digital payments (Authority of the House of Lords, 2022). China believes global Stablecoins could pose risk to the monetary system, payment system, and monetary policy, and intends to develop CBDC to cope with challenges posed by global Stablecoins (Kharpal, 2021b).

Threats from private digital currencies could be the motivation behind the development of CBDC. CBCD could be used to cope with challenges posed by private digital currencies, however, CBCD has its concerns. CBDC is generally defined as a digital form of a country's currency with legal tender status and backed fully by central banks. It could be used for retail payments among individuals, businesses, and public authorities and wholesale payments among financial institutions, wholesale financial market participants, and central banks (Bank for International Settlements Innovation Hub, 2022). CBDC is a new financial innovation, and this new financial innovation has raised concerns about how CBDC impacts financial stability, financial inclusion, payment system, customer privacy, and security.

1.2 Research Problem

The development of technology over the past decades have significantly improved the convenience and efficiency of digital forms of private-sector payment instruments. The rapidly evolving digital asset and the payment system in the financial market give rise to the central banks to evaluate and issue the CBDC.

However, it is difficult to build an efficient and complete system because it involves a lot of stakeholders where large amounts of money are circulating in the market which eventually has a significant impact on the economy of a country. Since it involved new technologies and infrastructure to build a new system, many countries mentioned earlier underwent a research stage where they tried to understand the problem statements, challenges, and benefits towards different stakeholders, proof-of-concept, and pilot stage. Hence, in our research project, we specifically focus on analysing the potential impact from different perspectives of the implementation of the CBDC in Malaysia to understand whether CBDC can act as a tool to achieve broader public policy outcomes or any objectives.

1.2.1 Financial stability

First and foremost, the decisions on the design and implementation of CBCD play a significant role in determining the effectiveness of CBDC and its risks. One of the importance of this CBDC is how it impacts a country's financial stability. This new concept of CBDC could impact commercial banks' basic functioning and central bank's function such as monetary policy, which CBDC would pose a risk to a country's financial stability. If the general public is required to have an account with the central bank to hold CBDC and the central bank pays interest on this CBDC account, this could cause a competition of public deposits with commercial banks. If there is a large-scale shift to CBDC from bank deposits, this shift would affect the basic functioning of the banking industry and thus lead to bank disintermediation. During a crisis time, this design would further lead to a massive bank run into CBDC since CBDC is a type of central bank money that is fully backed by central banks (Allen, 2020). In addition, CBDC could bring changes to how monetary policy works. Interest-bearing CBDC provides the central bank a channel to directly influence consumers' and businesses' spending behaviors, which

allows more direct control of the central bank over a country's economy (Koumbarakis & Dobrauz, 2019).

1.2.2 Financial inclusion

From the other point of view, many countries are interested in researching the feasibility of the CBDC. One of the reasons is because they want to realize and achieve financial inclusion in their country where CBDC allows people such as unbanked and underbanked who do not have bank accounts before or less benefit from the financial services to access the financial products and services. Since the design of the CBDC is forcing the people to account for the use of digital money, implementation of the CBDC seems to improve financial inclusion. However, it is difficult to construct a new CBDC system by considering the factor's impact on the implementation while improving financial inclusion. In fact, it has some constraints such as geographical barriers, technological barriers, literacy, and trust from the public. Lack of awareness of financial services, as well as the skills to understand the concept behind them may be a reason to refrain from using financial services. (Ozili, 2021; Didenko & Buckley, 2021; The World Bank, 2022)

1.2.3 Payment

From the perspective of payment, when we heard about the history of central banking, it always began with payment services. Therefore, the implementation of CBDC does give a significant impact on different stakeholders since the CBDC is related to a payment system where people can perform the transaction with their money digitally issued by the legal tender. For example, CBDC is making the payment process more efficient,

safer, and less costly. Companies or businesses can make the payment instantaneously with no limit to times and distances by using the CBDC since the money is in the data form and it is not necessary to get services from third parties such as banks to make payments. It seems like giving such benefits to the public because their money and payment transactions are backed by the Central Bank which the central bank would never go bankrupt. (BOG of the Federal Reserve System, 2022)

However, it created a challenge to other parties such as third parties who were involved in the process of payment such as commercial banks and private e-payment companies. For instance, third parties-providers need to innovate their products and services to attract more users in order to compete with the CBDC because the payment will become less costly since there is no need for services from third parties to be involved in the process of making payment. (Martin, 2021)

1.2.4 Security and Privacy

Privacy and security are one of the most crucial aspects of CBDC and national governments are focused on them. The value of CBDC classified material is self-evident, since it may entail national security, vital technologies, or trade secrets. CBDC suppliers must adhere to four major guidelines. The first is that legal duties take precedence. Unless forbidden by law, the CBDC provider will notify the relevant customers or people when Confidential Information is disclosed in accordance with legal requirements or contractual authorizations. (KASS International, 2015)

The second point is that employees should keep their job private. Staff should be aware that what they know should be kept confidential, and they

should not reveal any CBDC secrets. Thirdly, CBDC providers maintain consumer information private. Unless approved by the client in advance or proclaimed by the customer, any secrets collected by the supplier from the customer or developed during the test should be kept confidential by the customer and agreed upon by the customer before being made public. (Peng, 2021)

Fourth, CBDC providers maintain their clients' information private. Between the laboratory and the client, the supplier should maintain confidential the secrets of the client obtained from sources other than the client. Unless the source of the information agrees. (Laboratory Digital Integrated Service Provider, 2021) Determining the sort of information maintained in the system, who owns it, who has access to it, and how it is utilized are all privacy-related challenges. End-user security issues may be significant depending on the system's architecture. (Peng, 2021)

1.3 Research Objective

This project has four specific goals which are:

1. To study the potential impact of CBDC on commercial banks, private sector, and the general public.

2. To find out the market expectation of different stakeholders such as commercial bankers, private sectors, and the general public.

3. To explore the stakeholders' understanding or perception on the concept of CBDC.

4. To identify the gap of perspective between stakeholders and professionals.

1.4 Research Questions

Corresponding to the research objectives, this project is going to address the following research questions which are:

1. What is the perceived potential impact of CBDC on commercial banks, private sectors, and the general public?

2. What is the market expectation of different stakeholders?

3. What is the level of understanding or perception of stakeholders on the concept of CBDC?

4. What is the gap of perspective between stakeholders and professionals?

1.5 Hypothesis of the Study

In this research, four hypotheses will be address in this section which are:

1. It is expected people are more willing to use CBDC if the overall economic condition is stable.

2. It is assumed that people are more willing to use CBDC if they are more financially included.

3. It is believed that people are more willing to use CBDC if CBDC is able to facilitate the payment and reduce the costs of people.

4. It is expected that people are more willing to use CBDC if CBDC is designed to be more secure which reduces the breach of privacy.

1.6 Significance of the Study

In this research project, the findings of this study will provide valuable information about the awareness or perception among stakeholders such as the general public and professionals who are central bankers or commercial bankers. This is because the implementation of CBDC caused different potential impacts to different stakeholders. The expectation will also be different, and this will impact the outcome of CBDC whether the central bank will design the system to be more accepting to different stakeholders while achieving their objectives at the same time. Hence, this finding of the study could help to find the gap and eventually provide solutions to improve the expectation of implementation of CBDC of different users.

Also, this research seeks to identify and understand the potential impacts of CBDC on Malaysia's economy, more specifically the potential impacts of CBDC on different stakeholders in Malaysia namely central banks, commercial banks, the private sector, and the general public. This study would provide some insights to Bank Negara Malaysia (BNM) on the appropriateness of CBDC design. The

decision on the design of CBDC is closely linked to the potential risks of CBDC to Malaysia's financial stability. Decisions on the purposes of CBDC, the way of CBDC issuance, the types of CBDC, and the restrictions on CBDC would affect the role of the central bank in overseeing the financial systems and financial intermediation function of commercial banks, which in turn pose a risk to Malaysia's financial stability. Improper design of CBCD that significantly affects the intermediation role of commercial banks in the financial market would cause bank disintermediation and bank run in an extreme case. Understanding the designs of CBDC is therefore important to the central bank's functions in ensuring financial stability.

In addition, CBDC's development necessitates the input, involvement, and support of a wide variety of public and private sector partners, and it contributes significantly to market preparedness. Stakeholders may not be able to reach a perfect agreement, but inclusive conversations and overall consensus are required. Government agencies, financial institutions, technology and infrastructure providers, academics, and standards development groups, and end users are all important players. Given the many stakeholder interests and the number of complicated decisions that must be taken in system design and ecosystem development, broad stakeholder support will take time to emerge. Because universal CBDC must be created for individuals and organizations who use the money to acquire goods and services, accessibility will be critical. When it comes to creating CBDC, end-user concerns regarding privacy and availability are very significant (Peng, 2021). Hence, the study expects to find the acceptance of the implementation of CBDC from the user perspective.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

CBDC is a digital form of money with the status of legal tender. This indicates CBCD is treated as fiat money that could be used for daily transactions. So, CBDC serves the same general three functions of money which are unit of account, means of payments, and store of values. Unit of account function implies CBDC could be used as a standard measure of goods and services (Seth, 2022). Means of payment indicate CBDC could be used for payments for a transaction. Store of the value indicates the value of CBDC would retain its purchasing power over time. Like any other medium of exchange, CBDC would be involved in issues related to financial stability, financial inclusion, payment system, and security and privacy.

This literature review chapter would be designed in the form of questions and answers, which this chapter would pose and answer a series of questions raised by CBDC. The remainder of this chapter is organized into five major concerns, namely, questions related to the definition and design of CBDC, financial stability, financial inclusion, payment system, security, and privacy.

2.1 Definition and design of CBDC

In this Section 2.1, it is all about the discussion of the definition of CBDC and the design of CBDC such as token or account-based access or the primary requirement when the central bank decided to design. Also, architecture of CBDC whether indirect or direct claims would be explored.

2.1.1 What is CBDC?

CBDC can refer to the legal tender in the issuing central bank's jurisdiction which is trusted by the government. As cryptocurrencies are extremely volatile and lack government backing nowadays, the CBDC can overcome this concern by underlying distributed ledger technology of cryptocurrencies (BIS, 2018). The simplest way to understand the concept is that CBDC works as an electronic form of the central bank, and it has the function of making digital payments and as a store of value. The design of CBDC must balance the goals with the potential issues or risks created by CBDC and the concern thus the potential issue of the CBDC also.

The difference between traditional and CBDC payments is that CBDC makes the payment more efficient. In some countries, the frequency used of cash and cheque are high, the operational costs are elevated thus the digitals form of payment is also relatively expensive (Shirai, 2019). So, CBDC can use it as a potential policy tool to offer the digital form of payments that are cheaper to operate. Therefore, to understand the discussion on the requirements, goals, and potential benefits, it is necessary to explore the design of CBDC.

2.1.2 What is the design of CBDC?

The design of Central Bank Digital Currencies (CBDC) is meant to be cash-like safety and convenience for peer-to-peer payment for the users. To implement this design, the CBDC must be resilient and accessible because it is able to protect the user's privacy while allowing for effective law enforcement. There are many varieties of the technical designs to satisfy the varying degrees of the feature intermediaries, token-based access, and retail interlinkages across borders (Shirai, 2019).

The primary requirement of the consumer is that the CBDC represents a cash-like claim on the central bank, and it is transferable in peer-to-peer environments. Even consumers who generally prefer to pay electronically are now convinced that if a period of financial instability arises, they will be able to convert their electronic money holdings into cash. This flight to cash has been observed in several recent crisis occurrences. The biggest issue is that if cash is no longer widely accepted in the future, a catastrophic financial crisis might wreak even more havoc by interrupting day-to-day commercial and retail operations. The consumers are also unlikely to adopt the CBDC if the CBDC is less convenient than today's electronic payments (Auer, 2021).

2.1.3 What is the architecture of indirect and direct claims of CBDC?

When we mentioned the indirect CBDC model, the consumers can claim on the intermediary where the central bank can only keep track of the wholesale accounts. While in the direct claim, the CBDC represents the important roles of direct claim on the central bank where all the records and the balances of every transaction are recorded in the central bank. Consider the indirect CBDC model by Kumhof & Noone (2018) this term is equivalent to Adrian and Mancini- "synthetic Griffoli's CBDC" (2019).

Because of its similarities to the present two-tier banking system, this concept is also known as the two-tier CBDC where a token-based alternative is proposed as a multi-cell CBDC in Ali (2018). This sort of CBDC is not a direct claim on the central bank for customers.

Furthermore, the intermediary of a CBDC bank resembling a narrow payment bank is required to fully back each outstanding indirect CBDC-like liability to the consumer to retail consumers with actual CBDC deposited at the central bank. The direct CBDC is appealing due to its simplicity, as it minimizes the reliance on intermediaries. However, this necessitates trade-off due to the payment system's dependability, speed, and efficiency. One element is that, as shown in today's credit card networks, establishing, and operating technical capability on this scale is typically considered as a better fit for the private sector. Second, even if a central bank develops the required technological capabilities, the resulting CBDC may be less appealing to customers than today's retail payment systems (Allen, 2022). Electronic payments must deal with network disruptions or offline payments, which requires intermediaries to take risks to attract more consumers.

2.1.4 What is Distributed Ledger Technology (DLT) or Conventional based central bank infrastructure?

The DLT plays a role in the CBDC by giving the authority to update the database whether it is centralized or delegated to a network. Data of CBDC is mostly stored numerous times and in physically different locations in traditional and DLT-based systems. The key distinction between DLT and conventional based is in how data is updated. In traditional databases, resilience is often done by distributing data over

numerous physical nodes that are controlled by a single authoritative body at the top node of a hierarchy. In contrast, the ledger in many DLT-based systems is cooperatively administered by diverse entities in a decentralized way and without such a top node. As a result, each ledger update must be synchronized across all entity nodes. (Nurjannah & Sabrina, 2017)

The overhead required to run a consensus mechanism to identify why DLTs have poorer transaction throughput than traditional designs. The volume of data transfer shows the constraints imply the existing DLT could not be used for direct CBDC except in extremely small countries. However, DLT could be employed for the indirect CBDC architecture because the quantity of transactions in many wholesale payment systems is comparable to that handled by existing blockchain platforms, as shown in various wholesale CBDC experiments done by central banks. When it comes to ensuring resilience, the DLT-based and traditional system offers an obvious edge where the vulnerabilities are simply different. The failure of the top node through a targeted hacking assault is the primary vulnerability of a traditional architecture. The use of DLT is very costly but yet brings more benefits because this technology can essentially outsource to external validators the authority to adjust claims on the central bank balance sheets. (Nurjannah & Sabrina, 2017)

2.1.5 What is token or account-based access in the design of CBDC?

A token-based system can ensure universal access as anyone can obtain the digital signature thus by default, it can offer good privacy. This system can allow the CBDC to interface with communication protocols such as the micropayments on the internet. However, this token-based system also

has downsides which if the users fail to keep their private key secret, there is a high risk of losing funds. The law enforcement authorities are also difficult to search for the money flows and identify the claim owner so additional safeguards are needed to protect the users. (Auer & Boehme, 2020)

It is common that the transaction-level financial data reveal the sensitivity of one personal data. The first is the quantity of personal information that transaction partners acquire about one other when the system is in normal operation. The second danger is that large-scale breaches of data held by the system operator or intermediaries will occur. Hence, the CBDC should protect its users' privacy and their transaction partners where the transaction partners would interact via "unlikable pseudonyms", as envisaged in Chaum's (1985) pioneering work on electronic money.

2.1.6 What is cross boarder payments: Wholesale or retails linkages?

The demand for seamless and low-cost cross-border payments has increased in tandem with the expansion of international e-commerce, remittances, and tourism. A CBDC might offer the same wholesale interlinkage choices as the current system. The coordinated CBDC design can take the clean-slate perspective and incorporate the interlinkage to create the opportunity for easier cross boarder payments. CBDCs would also enable unique retail interconnections if they allowed users to retain different currencies. A cross-border transaction is inextricably related to a foreign exchange transaction in today's account-based economy. The transaction's intermediary may levy additional costs and use unfavourable exchange rates. In contrast, if consumers were offered the option of

purchasing foreign currency in advance, the cash payment would be separated from the foreign exchange transaction. (Adrian, 2019)

Lastly, these scopes for the retail interlinkages and design might need to depend on the national access framework. It will be open to international residents by default if a national system is built on digital tokens. Interoperability would be a design decision if it is account-based, and it could also be coordinated internationally. (Adrian, 2019)

2.2 Financial stability

Section 2.2 is about the financial stability which is one of the impacts of the implementations of CBDC. We will explore how is the issuance of CBDC affect financial stability or the function of commercial banks as an intermediation. Also, is CBDC impact the effectiveness of the monetary policy is also one of the concerned that will discuss in the following section.

2.2.1 Would the issuance of CBDC affect financial stability?

Generally, financial stability is one of the policy goals of central banks. According to Bank Negara Malaysia (2022), financial stability refers to the situation where a well-functioning financial intermediation process ensures smooth flowing of funds between suppliers of funds and demand of funds, and efficient allocation of funds. Disruption of the financial intermediation process and bank runs due to loss of public confidence would affect financial stability. CBDC is a new form of money that has very different features compared to existing money such as physical cash. This raises the concern about how these features of CBDC would affect financial stability.

Recently, several new financial innovations could bring potential adverse impacts on the financial system such as private electronic money (e-money) and cryptocurrency. These new financial innovations could pose new risks to financial stability. Private e-money is a new form of money that could be used in retail payments. An increase in the adoption of private e-money would cause a switch of money from commercial banks to nonbank electronic payment providers, and this would affect the bank intermediation functions. However, higher risk in e-money makes the switch of bank deposits to nonbank e-money providers less matter. This is because nonbank e-money providers are not heavily regulated as commercial banks do, and thus private e-money users face greater uncertainties than bank deposits users (Adrian & Mancini, 2019).

Cryptocurrency is unlikely to become money used in retail payments due to its high volatility in value. To solve the high volatility of cryptocurrency, Stablecoins is issued. Stablecoins is a type of cryptocurrency backed by certain reserve assets such as currency and commodities, which make Stablecoins stable in value and thus has the potential to be used as means of payment and store of value. There is also the possibility of switching from bank deposits to stable coins. There are no standards and regulations regarding the reserve assets and Stablecoins issuers are not obligated to disclose information about the reserve assets (U.S. Department Of The Treasury, 2021). This makes the reserves assets uncertain and thus demotivates the switch to Stablecoins

Private e-money and Stablecoins would not affect the bank intermediation functions significantly due to their higher risks as compared to bank deposits that could demotivate the public to switch from bank deposits to these alternatives. Due to the digitalization features, there is still a risk that

the public would replace bank deposits with these alternatives when they find it is cheaper and convenient to do so.

CBDC has a feature similar to these new financial innovations which are digitalization, features that make CBDC equally attractive as these new financial innovations. However, risks faced by e-money users and Stablecoins users that could limit the switch of bank deposits would not be faced by CBDC since CBDC is legal tender, and thus CBDC is free of default risk, liquidity risk, and credit risk (Schoenholtz, 2022). Thus, CBDC could pose a significant risk to financial stability, since CBDC could serve as a close substitute to bank deposits that have very low risks as compared to any other medium of exchange.

This competition for bank deposits would affect the structure of the banking industry and thus affect the process of financial intermediation. CBDC could pose two different challenges to the banking industry in both normal periods and periods of crisis. In a period where there is no crisis, the issuance of CBDC would undermine the major function in banking, which is bank intermediation, when the public switches its bank deposits to CBDC. In a period of crisis, increasing actions of the public to switch bank deposits to CBDC to secure their funds would cause runs from commercial banks to CBDC. Thus, CBDC would affect the financial system stability since it may cause bank disintermediation and bank runs (Auer, 2021).

2.2.2 Would CDBC affect the bank intermediation function of commercial banks?

Generally, intermediation is referred to the process a commercial bank obtains funds from the public either by borrowing or receiving deposits and uses the funds collected to acquire assets either by investing in securities or by issuing loans. Commercial banks make profits from the differential interest rate charge on assets and liabilities. These differential interest rates can be referred to as interest rate margins. Deposits are the primary source of funds for commercial banks, which account for more than 60% of bank liabilities (Mishkin, 2021). In a world where the public has an account with the central bank to hold CBDC. There is competition between the central banks and commercial banks for deposits. The reduction of deposits from the public is significantly affecting the liabilities' structure and risks of commercial banks**.** As stated by (Bindseil, 2021), due to the reduction of deposits from the public, commercial banks would increase their reliance on credit liabilities either funds from central banks' loans or funds from issuing bonds to the public. These changes in the structure of commercial banks would be costly to commercial banks and would increase vulnerability to banking industries.

Preferences of the public on CBDC over bank deposits depend on several potential factors such as capability in the allocation of funds, interest rates paid on deposits and fee charge on financial services, conveniences, and features of bank deposits and CBDC. The capability and performance of the central bank in performing the financial intermediation and maturity transformation functions do affect the position of commercial banks in sourcing deposits from the public and providing financial services to the public. According to Villaverde et al (2020) pointed out that optimal allocation of funds achieved with commercial banks can also be achieved with CBDC. They also assumed that in the process of maturity transformation the central bank only invests the long-term assets indirectly through issuing non-callable loans to investment banks due to political considerations, and this assumption reduces the possibility of bank runs. Thus, the capability of the central bank to achieve optimal allocation of

funds, provide liquidity insurance and at the same time reduce the bank runs can lead to the preference of the public for CBDC over bank deposits.

Like bank deposits, CBDC can be used as a means of payment due to its legal tender feature. Bian (2021) examines the effect of CBDC on bank deposits by looking at features of payment methods. They categorized the three payment methods which are cash, bank deposits, and CBDC into four features which are legal tender, anonymity, privacy, interest-bearing, and digitalization. The results show that preferences on the features do affect the choice of payment method, and the choice of individuals on CBDC due to preference for features of CBDC which are digital payment and legal tender over the features of bank deposits which are interest-bearing, and anonymity will lead to a crowding effect on bank deposits. The crowding out effect on bank deposits indicates that when individuals choose to hold CBDC, they will hold fewer bank deposits at the same time. This crowding effect on bank deposits might lead to bank disintermediation since individuals refuse to deposit their money into commercial banks.

By looking at how commercial banks may respond to the competition of bank deposits, one could understand the potential impacts of CBDC on commercial banks' structure and risks. When depositors prefer CDBC over bank deposits, they would switch their deposited funds in commercial banks to CBDC. Commercial banks would start to take action when this flow of bank deposits to CBDC affects its basic operations substantially (Bindseil, 2022). There are generally two possible actions taken by commercial banks, namely, to increase deposit rates and obtain funding from the financial market.

Commercial banks may start to increase the interest rates paid on deposits to make them look attractive. Alternatively, commercial banks may obtain funding from the financial market by issuing instruments such as commercial paper, certificates of deposit, or even bonds. Generally, sourcing funds from financial markets such as bonds are expensive as compared to funds from bank deposits. These two possible actions adopted by commercial banks are not mutually exclusive. These two actions are likely to yield the same results which is an increase in commercial banks' funding expenses. (Bindseil, 2022)

If lending rates remain unchanged, an increase in deposit interest rates and the cost of borrowing from the financial market would reduce commercial banks' interest margins. To compensate for the increase in the cost of funding, commercial banks may raise their lending rates at the cost of demand for loans (Furhmann, 2021). Hence, commercial banks face a trade-off between direct losses from the reduction of commercial banks' interest margins and indirect losses from the reduction of demand for loans. Commercial banks may also raise their transaction fees to cover the increase in funding expenses. An increase in lending rates and transaction fees increases the cost of borrowing and transaction costs for households and businesses, respectively. (Bindseil, 2022)

These funding methods are unstable relative to bank deposits that are low-cost and stable. These two methods of sourcing funds do not guarantee the commercial banks can always obtain sufficient funds to offer loans and thus may reduce credit availability for households and businesses. Commercial banks with a large percentage of funding from bank deposits may face greater instability and volatility in funding. As mentioned by Mancini (2019), commercial banks that rely heavily on bank deposits from the public may find the method of increasing deposit rates or obtaining funds from financial markets not useful in sourcing sufficient funds and in

preserving commercial banks' profitability due to greater competition of bank deposits faced. Unstable sources of funding and reliance of commercial banks on bank deposits would reduce credit availability in markets. Reducing the supply of credit to healthy borrowers would in turn lead to instability of financial markets (BIS, 2018)

CBDC could be designed in a way to avoid the risk of disintermediation. Firstly, Intermediated CBDC or dual-tier CBDC was suggested, a system similar to current two-tier distribution systems of physical cash in which central banks issue CBDC to the general public through an intermediary and have the intermediary handle the retail payments (Coats, 2021). Secondly, Impose restrictions on CBDC such as holdings on CBDC and interest rate paid on CBDC. Low or zero interest rates on CBDC would reduce the attractiveness of CBDC as a store of values. The maximum amount of CBDC holding would limit the ability of the public to replace their bank deposits with CBDC. Other indirect restrictions such as discouraging the conversion of bank deposits to CBDC by imposing higher fees in the process of conversion. (Bindseil, 2022)

In addition, central banks may lend the funds transferred from bank deposits back to commercial banks. For example, central banks may lend back these funds by offering collateralized loans to commercial banks. This method would ensure commercial banks obtain sufficient funds to supply credits to the markets, although the terms and costs of obtaining these funds would be different from bank deposits. This method would require central banks to take on additional credit risk and to perform one of the major functions of commercial banks, which is the allocation of funds (Schoenholtz, 2022).

However, Menand (2021) expects new competition of bank deposits from CBDC would not affect commercial banks' profitability and credit availability significantly. This is because commercial banks would not offer loans when they find these loans are unprofitable, and they would likely develop plans to face this new competition. Commercial banks with a greater market position would have a better ability to defend and respond to this new challenge from CBDC. Increasing its lending rates would not reduce the public demand for loans when commercial banks have better market power. Commercial banks with a better market position would have room to raise the interest rate on deposits; they can increase deposit rates to make them look attractive without facing significant consequences in their profitability (Adrian & Mancini, 2019).

2.2.3 Would CBDC cause massive runs from bank deposits to CBDC in a time of crisis? How would the runs to CBDC be different from runs to physical assets or financial assets?

When there is a safer option to use as a store of value than any other existing options such as bank deposits, the public would prefer to migrate their holdings from the relatively unsafe options to a safer option to protect their funds or save in a time of financial stress. According to Monnet (2021) pointed out that the availability of safer choices in the market does lead to a bank run from bank deposits. They confirm empirically the government-backed saving alternative can cause bank runs by looking back to the French Great depression of 1930-1931. The government-backed saving alternatives work as complements to commercial banks' deposits before the crisis, however, government-backed saving alternatives substituted commercial banks' deposits during the French Great depression.

CBDC has a similar feature to the government-backed saving alternative mentioned in the study from Monnet (2021), which is a default risk-free feature. In a time of crisis, this feature would raise the public incentive to run into CBDC since the public is generally a risk-averse user. CBDC with default risk-free features would make CBDC a safer option than other alternatives such as government securities, and thus facilities run into CBDC. In addition, Bian (2021) also states that the crowding-out effect of CBDC on bank deposits will be larger in a financial crisis, in which the preferences of individuals for features of CBDC which is legal tender will be stronger and thus this larger crowding out effect will cause bank runs into CBDC.

The probability of runs from bank deposits to safer alternatives such as physical cash or government securities could be reduced in the presence of deposit insurance authorities that insured the deposits from the public. Deposit insurance gives a sense of security of funds to the public and thus demotivating bank runs. However, in a CBDC world, deposit insurance may not be as effective as they were in limiting the bank runs. Due to the default risk-free nature of CBDC, makes CBDC a very safe alternative to bank deposits (BIS, 2018). The presence of deposit insurance would not be enough to discourage runs from bank deposits into CBDC, since there is a default risk-free alternative for the public.

CBDC would make the bank run more services due to its design. General-purpose CBDC or retail CBDC that is designed for retail payments allows runs from bank deposits into CBCD at unprecedented rate and scale. This is due to the feature of digitalization which allows the relatively high speed of convertibility of other form assets such as bank deposits into CBDC which makes the bank runs more severe. The digital form of CBDC makes the runs from bank deposits to CBDC unpredictable since the process of

transferring bank deposits to CBDC is conducted virtually instead of lining up at bank branches. This makes the signal of runs difficult to observe and thus raises a challenge in managing runs by the central bank (Mancini, 2019).

In addition, factors that limit the runs from commercial banks to cash and safer financial instruments may not limit the runs to CBDC and thus make runs to CBDC more severe. According to Bindseil, (2021) stated that in the case of runs from deposits into physical banknotes during a crisis, individuals are required to bear the costs and potential risks of holding large amounts of physical banknotes on hand. In the case of runs from deposits into financial assets with lower risk such as gold-related assets and government securities during the financial crisis, the prices of these financial assets will increase due to the sudden increase in demand. This increase in prices will discourage the runs into financial assets. Runs to CBDC are neither limited by the storing costs of physical banknotes due to the digital form of CBCD nor the high prices of financial assets during crises since CBDC is the digital form of money rather than a financial asset.

In the case of occurrence of bank runs, the central bank's role as lender of last resort would counter the bank runs through central bank lending. Other traditional measures such as deposit insurance and prudential supervision were used to counter bank runs. However, these measures would not be effective to cope with bank runs in a CDBC world. This is because the unprecedented rate and scale of bank runs to CBDC make these measures insufficient to cover the large flows of funds from commercial banks to CBDC (BOG of the Federal Reserve System, 2022).

Several ways have been suggested to cope with runs into CBDC. CBDC design could be designed in a way to avoid the bank running into CBDC. For example, pay no interest on CBDC to make CDBC unattractive. However, public preferences for securing their funds or savings at any cost in a financial stress time would make the initiatives to limit bank runs ineffective. Restrictions on the interest rate paid on CBDC would not limit the bank runs to CBCD when the public prefers the security of funds even if the interest rate paid on CBDC is less attractive. (Bindseil, 2022)

In addition, set restrictions on holdings of CBDC have been suggested to limit the amount that users could hold in CBDC to avoid massive transfer of funds to CDBC. However, Restrictions on CBDC holdings would also be ineffective when the public seeks due to the adoption of various forms of evasion (BIS, 2018). In fact, limits on the amount of CDBC in circulation would accelerate runs into CBDC as the public would compete to hold CBDC in a time of crisis. According to Schoenholtz, (2022), restrictions on CBDC holdings could limit runs into CDBC but would not stop runs into other safer alternatives as compared to bank deposits. Thus, restrictions on CBDC holdings would not stop the bank run effectively, but instead, redirect or encourage runs into other safer alternatives such as government securities

Some see bank runs should not be a major reason to reject the issuance of CBDC. Firstly, during a crisis, runs from all domestic assets including CBDC to foreign currencies would probably occur although there is a safer option available domestically. This is because fear of uncertainty in the domestic economy would prompt the capital outflow and thus the runs into foreign assets such as foreign currency. Hence, runs would occur irrespective of whether CBDC is being issued or not (Adrian & Mancini, 2019). Secondly, in the existence of very safe and liquid private or government assets relative to bank deposits in the market, bank runs would

happen anyway irrespective of the issuance of CDBC. For example, in a crisis, the public would run their bank deposit into various alternatives that they perceived to be safer such as treasury bills and money market funds. Thirdly, CBDC could facilitate the liquidity provision during bank runs and thus resolve the runs efficiently. For example, CDBC could be used in providing liquidity to commercial banks to avoid the costly and time-consuming process of transporting cash to commercial banks (Mancini, 2019).

2.2.4 How would CBDC impact the effectiveness of the monetary policy?

CBDC could be designed with interest-bearing features. When central banks pay interest rates to CBDC held by the public, this would allow central banks to transmit monetary policy rates directly to the public by either increasing or lowering the interest rates paid on CBDC. Thus, CBDC would increase the effectiveness of the monetary policy. In addition, Interest bearing CBDC held by the public would allow the central bank to impose negative monetary policy rates by reducing the interest rates on CBDC to the level below. This could be a new tool for central banks that is useful to cope with a deep economic recession since a negative interest rate would force the public to spend to avoid the negative rates. (Mancini, 2019)

However, these negative monetary policy rates would work effectively only when CBDC is adopted widely or when cash is completely replaced by CBDC. When CBDC is a complementary rather than a replacement to physical cash, massive runs from CDBC to physical assets to avoid the

negative interest rates could happen and thus pose additional risk to financial stability (Mancini, 2019).

Increasing competition of deposits faced by commercial banks due to the issuance of CBDC would cause financial disintermediation, in which commercial banks could fail to obtain stable and low-cost funds from public deposits and thus threaten commercial banks' position as an intermediary to channel the funds from savers to borrowers. This risk of financial disintermediation would undermine commercial banks as a channel of the transmission of monetary policy and thus affect the effectiveness of monetary policy (Schoenholtz, 2022).

Zero-interest rate is assumed to be the 'implicit floor of interest rate' since actions of converting bank deposits into physical cash by households and corporations to avoid the negative interest rate are expected to reduce the effectiveness of monetary policy until the first adoption of negative interest rate policy by the European Central Bank (ECB) to cope with macroeconomic challenges. A growing number of central banks have started to use this approach such as Sveriges Riksbank and the Swiss National Bank (Jobst & Lin, 2016). However, CBDC with zero interest rates could undermine the negative interest rate policy. The implementation of NIRP in any financial assets is not possible if there is a zero-interest rate CBDC backed by the central bank, since the holder of financial assets with a negative interest rate can substitute it with CBDC (Bian, 2021). Thus, it would affect the negative interest rate policy in European areas.

2.3 Financial inclusion

Followed by Section 2.3 is about the discussion on financial inclusion. Issuance of CBDC seems to be improve society welfare where all the unbanked and underbanked people to enjoy and access to financial services. However, there is also some arguments against the issuing of CBDC to improve financial inclusion which will study in the following sub-section.

2.3.1 What is financial inclusion?

According to The World Bank (2022), financial inclusion refers to all the users or citizens who are working-age adults or people at the age of 15 years old and above who have effective and quality access to, and usage of the financial services provided by formal institutions. In other words, all the citizens including those who are financially excluded, and underserved customers have the right to enjoy the convenient and responsible delivery of financial products and services at an affordable cost to meet their needs such as performing transactions, payments, savings, credit, and insurance. Financial inclusion is important and plays an important role because it has the potential to bolster economic growth while alleviating poverty. It is not only helping individuals and families, but collectively it develops entire communities and can help drive economic growth.

2.3.2 What is the challenge for financial inclusion?

Today, digital financial services (DFS) and commercial bank money have become more accessible to citizens. Based on the research and analysis from the board of governors of the federal reserve system, people in the US who remain unbanked have consisted of more than 7 million or

approximately over 5% of U.S households. Unbanked refers to those adults that without an account at a bank or other financial institution and are considered to be outside the mainstream for one reason or another. Generally, they pay for things in cash and typically do not have insurance, pensions, or any type of professional money-related service. In addition, they still depend on costly financial services to perform their daily transactions which are not affordable at all although approximately 20% more have bank accounts. Therefore, a large percentage of the world population remains financially underserved. (Didenko & Buckley, 2021)

Consideration of private services providers on profitability is one of the reasons that limit financial inclusion. The private services providers refuse to provide services in areas where it is not profitable to operate. For example, populations that live in remote areas remain financially underserved by private financial services providers (Soderberg, 2022). This problem is exacerbated by the geography of a country. In a country that consists of many islands like the Bahamas, the private sector often refuses to provide services to this type of population due to the high cost of operation (Soderberg, 2022). The technological capabilities of private services providers could limit their ability in providing services. In China, around 10 percent of the population lacks access to financial services, and one of the reasons is financial institutions face difficulty in providing digital financial services in certain areas due to their technological capabilities. Due to different concerns and capabilities between the central bank and the private sector, CBCD has the potential to resolve these factors. Profitability is not a major concern of the central bank in issuing CBDC. (Chen & Yuan, 2021)

2.3.3 Would the issuance of CBDC increase the financial inclusion?

CBDC was seen as a method of bringing more people into the financial net where it was able to give them access to digital payments at an affordable cost and convenient way. This is because the objective for some developing countries is to broaden financial inclusion (IMF, 2022).

Andolfatto (2018) mentioned that the implementation of CBDC will improve financial inclusion and reduce the government's implicit subsidy to banks. Also, it is likely to promote financial stability because CBDC resembles narrow banking in some regards. Besides, the paper mentioned that the way that CBDC can promote financial inclusion is to issue an interest-bearing CBDC which is able to diminish the demand for cash. The interest rate on CBDC can be set equal to an existing policy rate or be set at a different level to either encourage or discourage demand for CBDC. Retail or wholesale payment transactions could be used by both the interest-bearing and non-interest-bearing accounts. However, it is more attractive to the public if the central bank issued an interest-bearing CBDC because it can serve as a store of value compared to other financial products that have no extra value. Therefore, it is able to improve financial inclusion, especially in countries with underdeveloped financial systems and many unbanked citizens as the CBDC may be a means to support financial digitalization.

As mentioned early, the implementation of CBDC is able to bolster economic growth while alleviating poverty. This is because it brings more people into the financial system by digitizing the value chains in the economy (Ozili, 2021). How does this happen? As more businesses have the right to access the wholesale CBDC, this is able to encourage them to

bring their activities into the digital financial system and then stimulate the financial linkages in business activities from production, distribution, sales, and post-sales activities. This is able to create new market opportunities for the private sector as well as create more job opportunities to enhance GDP growth and reduce poverty.

Furthermore, the implementation of CBDC can offer a wide and variety of solutions to the financial inclusion problems in the Pacific region if it is a well-designed system to implement (Didenko and Buckley, 2021). They mentioned that Pacific island countries faced challenges on geographic remoteness, limited digital infrastructure, and insufficient financial literacy. This caused the financial inclusion in the Pacific island countries overall to remain low as the citizens use cash as the preferred payment method for most retail transactions. Therefore, designing and implementing CBDC seems like a choice for some central banks to address financial inclusion. For instance, CBDC helps the governments to make economic payments to individuals and businesses during the crisis or extend the insufficient reach of existing payment systems by implementing digital distribution channels and communication technology infrastructure.

2.3.4 What are the arguments against the issuing of CBDC to improve financial inclusion?

First and foremost, some arguments issuing CBDC cannot improve financial inclusion because it brings disadvantages to the public. Fan (2020) mentioned in a paper some thoughts on CBDC operations in China. In his opinion, it is difficult to achieve or improve financial inclusion in China if the People's Bank of China issued this CBDC in the country. This is because China is a large and populous country with significant regional

differences in economic development, natural resources, and public education. Therefore, it is very complex for China to design a national CBDC where they need to take into account the diversity and complexity of various systems and institutions.

For instance, they raised the question of the way or solution of a CBDC to be used in remote or rural areas where internet access is limited. CBDC is designed to bring convenience and act as a legal tender of currency in a country. However, CBDC is not acting as paper money, but it involved digitalization where the user required internet access to perform the daily transaction. In other words, CBDC is designed to be used over a smartphone and with an internet connection. Hence, it raises concern that if the user has no internet access in their area or he or she is a tech-illiterate person, they are not able to enjoy the benefit of CBDC, but it raises a problem of creating more unbanked or underbanked people in a country which is known as financial exclusion. This is because without access to the internet or a smartphone, then people may be unable to hold CBDC conveniently and remotely. This might harm the economic development of the country because the money is difficult to circulate in the country. (Fan, 2020)

From the other point of view, there is a paper that mentioned that CBDC would not have a material impact on financial inclusion (Schoenholtz, 2022). This is because they think that the most effective way to improve payment access for the unbanked and underbanked to enable them to enjoy the financial service or facilities is to provide subsidized no-frills bank accounts combined with zero-cost publicly provided identity verification mechanisms. The U.S government plays an important role to support this effort directly through subsidies and indirectly by providing a zero-fee biometric identification tool as the private Bank On initiative also promotes a low-cost, low-risk consumer checking account. In other

countries such as India, the Pradhan–Mantri Jan Dhan Yojana (PMJDY) also provides no-frills bank accounts without charge while using the country's universal biometric personal identification to lower costs. The success is that it was able to bring over 420 million people into the system and work hard to realize financial inclusion. Hence, this success proved that India did not require the issuance of CBDC (Schoenholtz, 2021).

2.4 Payment

Next, one of the impacts of the implementation of CBDC is the payment. As we know that CBDC is a money issued by central bank digitally. It is designed to be used via online platform or application downloaded through smartphone. Therefore, people will perform their daily transaction online by using this CBDC. Hence, this section which is section 2.4 will explore is the issuance of CBDC able to facilitate payment efficiency or spur competition in the payment and FinTech sectors.

2.4.1 How does the implementation of CBDC improve payment efficiency?

When internet finance evolves into financial science and technology, especially when information technology and financial innovation merge, the ability to comprehend and grasp the growth trend of this cross-regional business becomes increasingly crucial objectively, and responsibly. The inextricable question of how to establish a manner of stable development in the dynamic balance of mobile payment in the future is unavoidable. In a nutshell, the future of the mobile payment business will be determined by the interplay between efficiency and security. The most explicit

advantage of mobile payment is to increase payment efficiency and convenience, but the precondition is that it is secure and dependable (Bezhovski, 2016).

With the introduction of new payment methods, relevant regulatory frameworks must be developed and checked regularly to ensure that all key rules or standards are met, such as investor protection rules, financial market infrastructure principles, various criteria for transaction legitimacy, such as standards for combating terrorism financing, anti-money laundering, and other relevant regulations (Martin, 2021). Some new payment technologies go outside traditional judicial borders, necessitating collaboration between domestic and foreign regulatory organizations.

The cost of existing digital payment is one of the aspects that determine payment efficiency. Due to the high usage of existing payment services such as checks, the costs of these payment services are elevated. Unlike the private payment services provider, profitability is not a major concern of the central bank in providing the CBDC payment system. This indicates that the central bank has the potential to offer low-cost payment services as a public service. One of the disadvantages. For example, due to the high costs of making cash-based payments to unbanked citizens by government agencies, the central bank of the Bahamas intends to support digital government payments to citizens by integrating government agencies in the CBDC network to lower this cost (Soderberg, 2022).

According to the literature in Group of Thirty (2020), the logical choice of the central bank is to supply core infrastructure since the central bank provides settlement accounts for commercial banks and other payment service providers. In this situation, if the CBDC can increase the infrastructure's efficacy, the direct central bank's digital currency (CBDC)

may find a cause. In comparison to the alternatives, the risks and possible rewards are enormous. As a result, in certain jurisdictions, this document conducts a thorough study and determines if there is a net gain.

Moreover, central bank digital currency (CBDC) may find a rationale when the CBDC can enhance the effectiveness of that infrastructure. Before the implementation of the CBDC, payment service providers such as banks, central banks, and payment system utilities have been upgrading the speed and times of availability of conventional bank account-based payment systems (Bank of International Settlements, 2020). Today, the majority of the users have an online banking system and can pay and perform their transactions speedily. This has been given an advantage, especially to the retail application although they are involved in a small number of transactions. Also, according to the findings of the poll, the advent of CBDC has considerably boosted competitiveness and decreased costs for businesses and customers since available technology allows for speedier retail payment. As a result, it should be used more broadly.

2.4.2 How access to payment became one of the policy objectives of the CBDC project?

In most nations, central banks have a major purpose of assisting in the promotion of payments among the general public. Getting paid is a part of financial inclusion, but it is not the same thing. Some central banks are worried that private payment service providers may run out of money if they try to serve everyone, an issue that would be compounded by a drop in cash usage. Multiple impediments to receiving payments include cash shortages, company refusals to take cash and a lack of or frequent outages

in digital infrastructure (Martin, 2021). Regardless of age, socioeconomic background, or location, CBDC is one of the most essential aims.

Moreover, in nations where cash use is falling, some people still prefer or rely on cash payments, although they may face constraints. Specific organizations may have difficulty paying payments if available cash falls below a certain amount. Individuals in distant places where private firms have found no profit, low incomes, and many sorts of destruction are among these communities. As a result, one of the major aims of the Swedish central bank's e-krona initiative is to ensure universal access to payment services in the next few years (Barontini, 2019). While Riksbank is dedicated to ensuring that cash is available in the future, it is looking into how CBDC might help create digital payments that are specifically tailored to certain groups as a cash substitute.

2.4.3 Why making payments more efficient is one of the policy objectives of the CBDC project?

Operating expenses will rise in nations where checks and cash are widely used. Existing digital payment systems are also rather pricey in some nations. As a result, CBDC might be a policy instrument for providing digital payment at a reduced cost of operation. Because central banks are non-profit organizations, they may provide low-cost payment as a public good, but they may eventually need to recoup their costs. China is a wonderful example. PBOC has declared its aim to improve payment services, despite the fact that the present payment market in China's metropolitan regions is heavily computerized. Because it feels that, like the establishment of the quick payment platform, this is part of a global effort by central banks to improve public services (Martin, 2021).

2.4.4 Why resilient payment system is part of the policy objectives of the CBDC project?

The ability to make payments under severe circumstances determines the resilience of the CBDC payment system. The resilience of payment systems is important, especially in disaster-prone nations. This is because natural disasters such as hurricanes and volcanic eruptions could lead to the destruction of financial infrastructure, the destruction of physical infrastructure, and the disruption of the cash shipping process, which in turn may affect the whole payment system in the affected areas (Prasad, 2022). CBDC could be used as a backup to be existing digital payments systems and used in facilitating assistance payment to and in disaster-affected areas. Also, disruption to digital services and high concentration risk due to domination of a few large private payment operators are major concerns of a country with a highly digitalized payment industry. The reduced usage of cash in society exacerbated the problem of disruption of digital payments systems and high concentration risk in the payment sector and thus impaired payment resilience. This is because cash payments serve as a backup when disruption of digital payments systems and reducing cash usage indicates cash no longer serves as a backup when digital payments systems are non-functional. Thus, CBDC could be used as an additional backup to exciting digital payments systems to ensure the resilience of payment. For example, in China, Alipay and WeChat Pay are the two firms that dominate the mobile payment market, which has led to a high concentration risk to the Chinese payment system. The Central Bank of China intends to use CBDC as a backup to be existing digital payments systems to prevent the situation of serious disruption to China's digital payment system resulting from the failure of such dominant firms (Soderberg, 2022).

2.4.5 What effect might a CBDC have on competition and innovation in the payments and fintech sectors?

To investigate the possibility of the "retail" central bank, digital currency (CBDC), the Bank of England and the UK Treasury formed a joint working group. CBDC has a distinct retail market than privately issued encrypted currencies like Bitcoin. In the next decades, the design and implementation of CBDC in the UK will have far-reaching implications for consumers, companies, and the monetary system, and may pose major hazards. Some governments keep track of their citizens' spending habits. The other is that, in times of economic duress, individuals may convert bank deposits into CBDC money, resulting in financial instability. Third, the central bank's authority has been expanded without proper scrutiny. (Bank of England, 2022)

According to the Bank of England (2022), they announced that there must be concerned about the dangers posed by private capital. Because it has the potential to compete with central banks and their monetary system control. If large technological companies employ the same technology to create their own digital money, and the currency proves to be popular enough, the Bank of England will be impacted. The second is that the introduction of CBDC may result in a decrease in cash usage in the UK. After all, it is unclear if CBDC assets can match cash demand since the value of a currency is often determined by its physical assets and the level of privacy it can give. Cross-border payments have improved as a result of financial technology sector innovation and competition. (Adrian, 2019)

Then there's CBDC's influence on families and companies. Although the present domestic payment system in the UK is secure and efficient, the CBDC system may drive innovation and competition in the payment industry, as this will be in addition to the existing innovation and competition. Interoperable cross-border CBDC systems can reduce costs by removing some existing frictions. However, such a system must still comply with the monitoring framework, national legislation, and international technological standards, all of which are far from uniform. (Adrian, 2019)

Economic Affairs Committee (2020) mentioned that the implementation of CBDC can spur innovation and competition in payments. Due to the technology of CBDC, users are attracted to the feature of the CBDC because it brings benefits to the users. When the CBDC is widely used, it has the potential to increase the competition in the retail payment sector. This is because the retail payment sector or players in the market need to compete with CBDC to launch and promote more efficient and innovative products to attract users. Hence, this could lead to a reduction in card fees paid by merchants. This eventually could pass on to the consumer. For instance, today, the majority of people have stuck to the E-wallet or any other payment apps which are convenient for them to use in their daily life. Hence, the growing use of these payment apps creates competition with the major payment networks. This is because they can link directly to bank accounts rather than physical cards. It does bring benefits to improve the current payment system, especially CBDC involving a lot of technology such as open banking and PSD2. It was designed to increase competition in the banking sector because it required banks and other payment service providers to share the customer financial transaction data with the permission of the customers. Therefore, third parties' payment service providers are able to innovate and create new financial products that suit the preference of the customer today.

2.4.6 How does the implementation of CBDC promote domestic efficiency?

Barontini (2019) conducted a survey where they collected how the central bank works or the opinion regarding the potential of the central bank's digital currency. They mentioned that the majority of central banks that agree and are interested in implementing the CBDC are because of payment safety and domestic efficiency as well as other aspects of central banks' mandates. The reason behind this is that CBDC is a new technology where it can promote a domestic faster payment system available to the public. CBDC is able to provide complementary central bank money to the public which supports a more resilient and diverse domestic payment system that promotes more opportunities to spur innovation in the market. From the other viewpoint, the majority of the central bank is interested in the benefit of domestic efficiency because CBDC systems will be entering a crowded field of domestic payment systems aimed to bring convenience and benefit to the local users. Not only provide benefits to the user itself but also the central bank. This is because the central bank may reduce the risk of alternative units of account dominating by offering an efficient and convenient CBDC itself. To ensure that the domestic payment system is as efficient and meets the objective itself as possible, the central bank could collaborate with domestic private payment providers.

2.5 Security and Privacy

Next, the other impacts of the implementation of the CBDC are the security and privacy. Since the CBDC is designed to be used online whether through application or any platform, people will be more concerned on the breach of

privacy whether there is any protection on data privacy since central bank hold all the personal information if people registered an account directly via central bank. Besides of breach of privacy, benefit such as track illegal activities will also be discussed on section 2.5 security and privacy.

2.5.1 What are the effects of the implementation of CBDC on consumer protection and data privacy?

The Consumer Protection Law, as defined by the Malaysian Consumer Protection Act 1999 (Act 599), refers to the legal rights and advantages that consumers have. Consumer rights are at the heart of the industry, and they are divided into two categories: personal and economic rights (2018 KASS International, 2015).

As central banks and finance ministries throughout the world ponder how to cope with the quickly growing digital payment trend, they may want to reconsider some of the more fundamental monetary arrangements. Included are the central bank's core responsibilities, as well as more specific policy decisions on how to assure the ongoing operation of monetary policy transmission channels, increase payment system efficiency, particularly cross-border efficiency, and preserve financial stability (BIS, 2020). It also includes measures to increase financial inclusion, promote investor protection, and combat unlawful activity. Government departments are often non-interventionist in the early stages of digital currency development and are hesitant to meddle in technical innovation. Although technical advancement remains a priority, it is past time for the government to take a more active role in development.

Private stablecoins are a type of digital currency that can exist in the CBDC market. The entities that make stablecoins try to limit price volatility by tying their value to a basket of assets or external assets, often known as traded products or legal money (Higginson, 2021). The legal aspects of stable money and accompanying technological arrangements may vary greatly depending on the design. The important characteristics will be whether the stable currency has a known issuer if it is linked to assets or money outside the platform and if the underlying arrangement is unlicensed or license based. The classification of stable currencies as contractual claims or property rights is an essential legal criterion. As a result, regulators must decide on the property rights framework and guarantee that the requisite legal power is in place to put it in place. (Group of Thirty, 2020)

The policy on compliance with digital currency and payment service providers is one of them, and it aims to regulate private sector stablecoins in order to safeguard consumers and investors. Consumers and investors may not completely comprehend the dangers associated with digital assets due to their novelty and complexity. These dangers are related to product and service security, which includes security and fraud protection, correct and relevant information for customers, as well as misleading marketing and other nefarious tactics. The relevant authorities' policy is to limit the number of similar instances. (Group of Thirty, 2020)

When stable currencies get large enough, they have the ability to challenge antitrust and competition legislation. Due to substantial network effects, revenue from creating large-scale corporate data, and exponential rise in fixed costs, a worldwide reliable money supplier might become a natural monopolist. There are several issues with data privacy and sharing. This problem is intertwined with a slew of current technological challenges. The conclusion is that the central bank and the Ministry of Finance must

take a proactive role in establishing payment rules and providing public infrastructure, rather than relying on market forces. To be completely tested, new technologies may require a suitably extended phase-in time. A range of payment options should be introduced to ensure that the payment system is flexible and competitive. (Group of Thirty, 2020)

Data privacy is defined by confidentiality, often known as secrecy, which implies that information about persons or groups is not available to non-recipients, according to the Malaysia Personal Data Protection Act 2010 Protect. With the advancement of science and technology, various software, such as email software and web browsers, may now be found in electronic items such as mobile phones and PCs. Although these include privacy-related settings to protect user information, there are still certain things that might compromise privacy, such as spyware files or hackers (2018 KASS International, 2015).

With the launch of innovative payment methods, regulatory frameworks must be developed and reviewed to cover all key standards, such as the Investor Protection Rules, the Payment and Market Infrastructure Committee, the CPMI, the PFMI, and various criteria for transaction legitimacy to codify policies on compliance with digital currency and payment service providers. The global stablecoins suppliers may become natural monopolies due to the strong network effect, the high fixed costs of setting up a large-scale firm, and the exponential revenue from gathering data. Simultaneously, the firm may be able to strengthen its dominant position in key departments that may share the same data collection. Many considerations concerning data sharing and data privacy are intertwined with today's slew of technological issues (Auer, 2021).

As the data custodian, the stablecoins supplier, particularly the Bigtech provider, shall adhere to the norms of notice, consent, protection, data leakage, and data sharing. Data privacy is challenging to coordinate across borders, especially when regulations and law differ by location, and perspectives on data protection and privacy differ as well. It is critical to improving international collaboration. In conclusion, private stablecoins are a significant breakthrough in CBDC, but it is unclear if they can truly remain stable in all ostensibly potential situations in the long run without government assistance. The central bank can be a storehouse of transaction-level data for the whole economy in this article, depending on the architecture. Furthermore, the central bank's obligation to protect privacy and data, including that of other government agencies, might be onerous (Auer, 2021).

The central bank's motive to issue CBDCs stems mostly from microeconomic issues such as operation, technology, and privacy. They want to make payments more accessible and efficient, while still ensuring competition, data privacy, and payment system integrity. The subversion of the financial system caused by the platform-based business model and big data is becoming increasingly common as more large-scale technology businesses enter the payment market. The central banks of many nations have faced several issues as a result of the vast volume of personal data acquired and processed as input to the activities of big-scale science and technology firms. This has resulted in significant issues with CBDC business design, associated public-private sector cooperation, and the impact on customer welfare, as well as data privacy concerns. In these cases, relevant literature has aided in the establishment of CBDC research and development plans, as well as clarifying the potential influence of CBDC on consumers (Auer, 2021).

As a result, it must guarantee that both the main principles of competition and data governance are satisfied, while also ensuring the payment system's security and integrity to avoid money laundering, ransomware attacks, and other criminal activities. As a result, the central bank's triple mandate as the monetary system's core for digital innovation includes competition, data privacy, and payment system integrity (Group of Thirty, 2020).

2.5.2 Does the security and privacy affect the implementation of CBDC?

Two effects are mentioned which are information efficiency and tracking illegal activities. The worldwide trend is the driving force behind CBDC retail research and development. CBDC should be considered in the context of economic digitization and the growing centralization of data, particularly personal data, in the financial system. Data, on the other hand, poses new threats to privacy, competitiveness, and integrity. New private actors may swiftly dominate the monetary system due to the intrinsic network effect of money, producing major competition difficulties and breaching the public interest. (Allen, 2020)

Aside from payment efficiency, CBDC also provides information efficiency. Information is critical when it comes to preventing manageable circumstances from becoming uncontrollable, according to banking regulators. Banks, on the other hand, have an incentive to withhold information about their predicament in the hopes of receiving advantages such as bailouts if things spiral out of control. Commercial bank deposits are moved to CBDC when households rely on the financial system. The source of the monies moved can then be determined by the central bank. With such real-time data, the central bank may respond swiftly and take

steps to prevent capital withdrawals, such as announcing holidays or financing to financial institutions that are experiencing runs. (Auer, 2021)

Finally, CBDC's increased payment and information efficiency in both normal and crises should prompt regulators to reconsider current policies to address the problem of being too big to fail and improve the banking industry's resilience, including deposit insurance. These frameworks are far from free and tackling the systemically significant issue of bank subsidies remains a key focus of international policy initiatives. Payments are progressively becoming digitized, resulting in "data leads" of information on individual transactions that can be readily transmitted between counterparties and utilized for several purposes. Because of their digital character, community-based developing nations give information that central banks might employ to strengthen financial systems. The Monetary Authority's toolset has been substantially expanded by these additions. CBDC can modify the monetary policy implementation framework in addition to being programmable and allowing money to be sent for specified information. (Coat, 2021; Echelpoel, 2021)

People have suggested numerous designs and use for CBDCs and the payment system that goes, but all have one thing in common which is to allow consumers and small businesses to utilize electronic central bank money. Digital payments based on central bank money are already available to financial organizations. Getting electronic money from the central bank can make payments safer for customers. Central banks have the ability to issue money at any time, therefore they are not as bankrupt as the private sector, which handles consumer digital payments at the moment. During the payback time, the latter may become bankrupt, resulting in a capital loss.

However, the benefits of CBDCs in this regard may not be significant for consumers in nations such as the United States and China. People in these nations do not lose money when financial firms collapse because of good rules and government backing. It is too early to say what the new CBDCs will look like because the data is not full enough. Emerging markets, after all, have features that set them apart from conventional kinds of money and payment. (Group of Thirty, 2020; Prasad, 2022)

CHAPTER 3: METHODOLOGY

3.0 Introduction

In this section, our methodology research is to understand the market expectations of different stakeholders. This is to explore stakeholders' understanding of the concept of CBDC and study the potential impact of CBDC on the different stakeholders. In this section, we will conduct a survey of stakeholders to collect our data and conduct a more detailed study of the data. In the following, we will explain our research design, data collection method, design of sampling, research instrument, and data description.

3.1 Research Design

Continuously, we will proceed to the method description action section. This survey investigates the underlying principles or techniques of a problem and the specific applications used to identify, select, and process it, and analyses the data used to understand the problem, allowing the reader to critically understand and assess the overall reliability and effectiveness of the study. In addition, how to obtain or generate the data, how to analyses the data and how to check the data are all the key questions that should be answered in the methodology part of the research paper (SAGE, 2022).

Moreover, as we know, quantitative analysis is frequently utilized by academics that adhere to the scientific paradigm. This strategy aims to quantify the data and summarize the findings from the target population's samples. It collects data in a systematic manner and converts it to digital format. On the other hand, quantitative research also uses statistical techniques to conduct objective analysis (Rich, 2018).

In this section, we will focus on quantitative research methods that emphasize objective measurements and statistical or numerical analysis of data collected through polls, questionnaires and surveys, as well as the use of computer technology to process existing statistics (LibGuides, 2022). Therefore, we choose to adopt a quantitative method, which is the survey.

The goal of our quantitative survey is to explore the stakeholders' understanding or cognition of the CBDC concept. The quantitative research design is descriptive and aims to study the potential impact of CBDC and to understand the market expectations of different stakeholders. It also includes identifying gaps in perspectives between stakeholders and professionals.

We will create CBDC-related topics using a Google Form. As well as the questions will be in the style of multiple-choice or rating scale, depending on the topic. Our participants will be a diverse range of stakeholders to acquire enough data. The poll will be done by telephone, email, and social media. We may ask individuals to respond within one week after receiving the questionnaire. The sample size and response rate, on the other hand, were provisionally set at 385 which explained the 3.3 Design of sampling. We will include the entire questionnaire as an appendix after our project so that our readers may examine the collected data in detail.

3.2 Data Collection Method

In methodology, the basis of statistical research is data collection. Data collection is a process to gather useful information related to the topic of research (DissertationHelp, 2013). It was very important in a research project because it helps us to make decisions related to the information available and assists in carrying forward the research work. As mentioned in the research design, a quantitative approach has been selected to conduct the study. This is because quantitative research is useful to attain an understanding of the social world or estimate the size of phenomena of interest (Williams, 2021). In this research, quantitative methods such as online surveys are suitable for measuring, categorizing, and identifying patterns of the research as it acts as a tool to collect the information and data from respondents (McCombes, 2021). Also, it saves time for researchers and can reach a huge number of respondents in a specific given time.

3.2.1 Primary data

In this project, we will be collecting our data by conducting surveys though primary data collection. Primary data are obtained in many ways such as through questionnaires, surveys, and experiments. The reason that we have chosen to collect primary data to carry out this study is because fewer journals or articles are related to CBDC, especially in terms of Malaysia since this new technology has yet to be implemented in our country. Also, we would like to collect information from stakeholders that are tailored to elicit the data that will help us to meet the specific purposes of our research (IWH, 2015).

3.2.2 Surveys

There are different types of data collection methods like in-person interviews, phone surveys, mail surveys, and online surveys (Bhat, 2021). Survey research is typically a systematic investigation conducted or carried out by administering surveys to respondents (Formplus Blog, 2021).

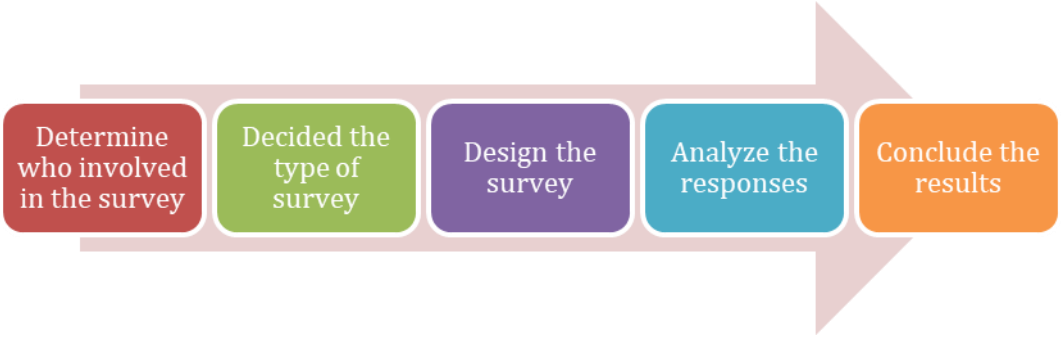
To fulfil the objectives of the study, we have decided to conduct an online survey of different stakeholders such as financial institution employees, non-financial institutions employees, university students, academics or retirees. The questionnaire survey with the different stakeholders has been focused on finding out the market expectation of the implementation of CBDC, exploring their motivations or preferences, and their understanding of the concept of CBDC. Hence, primary data collection is more suitable instead of secondary since we are trying to collect the opinions from stakeholders and analyses the potential impact on the implementation of CBDC in Malaysia.

In addition, we have chosen to conduct online surveys because it allows us to collect a large amount of the data in a relatively shorter period, especially in times of pandemic Covid-19. The survey will be conducted by using Google Forms as it allows researchers to build different forms of questions that cater to different needs and use cases. The distribution of the survey will be delivered to target respondents via an online platform as it allows for faster, better results and has more opportunities to reach potential target stakeholders easily and effectively. From the perspective of the period, the surveys will be organized for 2 to 3 weeks which has enough time for respondents to access the surveys. The whole process of

the way to conduct the survey for this study can be demonstrated by the help of figure 3.1.

Figure 3.1

Process of the survey conducted



3.3 Design of Sampling

The design of sampling is a process or framework to obtain a sample from a given population in order to allow researchers to adopt surveys to address research questions. Therefore, the sampling frame is important to the design of sampling as it represents the population of interest, from which a sample is to be drawn in order to meet the research objectives.

3.3.1 Targeted population

The target population is the group of people that the researcher desired to know more about. As mentioned above, the objectives of this research are to find out the market expectation of the implementation of CBDC in

Malaysia and explore their motivations and understanding of the concept of CBDC. Since CBDC has yet to be implemented in Malaysia, the targeted population of this research is the Malaysian who is used to perform daily transaction by using cash payment, debit and credit card or someone who is familiar with online banking or performing financial transactions using online platforms such as e-wallet users. This is because CBDC is known as the legal e-money and makes transactions online by using smartphones. It has a similar concept and mechanism behind it where they transact money via online platforms. Due to the advancement of technology, most people have the experience of using online banking and it is impossible to cover all the online banking users in all states in Malaysia. Thus, the target group of stakeholders or representative sample included

1. Financial institution employee
2. Non-financial institution employee
3. University student and academic
4. Citizen included retiree

3.3.2 Technique of sampling

In simple words, sampling is the process of selecting a sample. There are various sampling techniques which are grouped into probability sampling and non-probability sampling. In this research, the sampling strategy is probability sampling which uses randomization to make sure every element of the population gets an equal chance to be involved in the selected sample (Singh, 2018). The reason for selecting probability sampling techniques is because it is suitable to be used in quantitative research and suited for the research that is required to produce the results that are representative of the whole population (McCombes, 2022). Also, this study used stratified sampling which is the basic technique to divide a large population into smaller groups of samples.

3.3.3 Size of sampling

A research term used for defining the number of individuals included in a research study to represent a population is referred to as sample size (Kibuacha, 2021). In survey research, determining the sample size is the crucial factor as appropriate sample size reflects the accuracy and validity of the data and results. If the sample size is small, it will not show an adequately representative of the population being studied whereas it takes more time to conduct the survey if the sample size is too large to estimate. The formula to calculate the sample size will be shown as below:

$$\text{Sample size} = \frac{\frac{Z^2\ p(1-p)}{e^2}}{1+(\frac{Z^2\ p(1-p)}{e^2 N})}$$

Where N = population size; Z = z-score; e = margin of error; p = standard of deviation

Based on the Department of Statistics Malaysia (DOSM), the current population in Malaysia in 2021 is estimated to be 32.7 million. Therefore, the sample size will be 385 where it is constructed based on a 95% confidence level with a margin of error of 5% in order to cover up the invalid response that may get through the process. Therefore, 385 surveys will be distributed and to be collected in this research study.

3.4 Research Instrument

In the Section 3.4 which is research instrument, it will be discussed about the tool used to collect, measure, and analyses data related to the research interests. For instance, the way of the survey design, survey reliability, validity, and pilot test.

3.4.1 Survey design

This survey uses the close-ended question and rating scale to identify the response to this CBDC questionnaire. The close-ended questions can be defined as the question that asks the respondents to choose from a distinct set of predefined responses. In the survey, there will be options of Yes/No/ Maybe or list of opinions among the set of multiple-choice questions to let the respondent choose where the responses are used to gather the quantitative data from respondents. For instance, it is suitable to use and to find the expectation of people of their willingness to use the CBDC in the future. Close-ended question is easy to understand, and the respondent does not need to spend more time reading the question because it is very straightforward and easy to respond to. It also provides better insight when the data need to be compared.

Rating scales are also a type of closed-ended survey question used to represent respondent feedback in a comparative form of the questionnaire. In this questionnaire, a numerical rating scale will be used to conduct this questionnaire. For instance, there will be matrix questions with a series of Likert scale questions which are composed of five items. The rating scale given was a 5-point Likert scale with 1 (strongly disagree), 2 (Disagree), 3 (Neutral), 4 (Agree), and 5 beings (strongly agree). It was used in section

C where it was divided into 4 parts such as financial instability, financial inclusion, payment and security and privacy to investigate the potential impacts of implementation of CBDC.

In this survey, it consists of 4 sections which are Section A, B, C and D. In the Section A, demographic background will be asked to better understand the situation and characteristics in terms of the age group, income level, job field, education level, and the types of payment they used daily to perform transactions. In Section B, level of understanding or perception of the concept will be asked to understand the awareness of or heard of any CBDC concept. Followed by Section C, there will be 4 parts as mentioned in the last paragraph to investigate the potential impacts of implementation of CBDC while Section D collects data on the market expectation whether they are willing or reluctant to use CBDC if being successfully implemented *(Refer Appendix A)*.

3.4.2 Questionnaire reliability

Questionnaire surveys are a valuable technique for gathering information from respondents in a range of contexts, including self-reported outcomes in healthcare, customer insight/ satisfaction, and product preferences in market research. To ensure the consistency of the questionnaire, one of the estimates of reliability is test-retest reliability. This entails administering the survey to a group of respondents and then repeating the poll to the same group later. The responses at the two timepoints will be compared to determine the percentage of agreement between the test and retest result. The comparison of the value at the two timepoints with a correlation will also be constructed on a scale to get the continuous variables.

3.4.3 Questionnaire validity

To ensure the accuracy of the questionnaire, establishing a face validity will be a good choice to check the accuracy. First, having a person who is an expert and go through the questionnaire by effectively investigating the topic and checking the questionnaire for double, confusing, and leading questions.

3.4.4 Pilot Test

Pilot test has been conducted to rehearse the research survey in order to examine the accuracy and improve the consistency of the survey. In this case, 56 respondents have been collected in our pilot test. The response was collected by distributing the survey via online platforms and social media. After that, we gather the feedback from the respondent for data analysis and adjust the questions asked in the survey in order to improve the results collected so that it fits our objectives better.

3.5 Data Description

The data description is all about the way to summarize the findings and data in this research project. The tools that we used in the data description is the ANOVA test and the descriptive analysis. By performing these two analyses, we will be able to make our data findable, understandable and reusable.

3.5.1 ANOVA test

In statistics, there is a tool that we used purposely to split observed aggregate variability inside the data set into two parts which are random factors and systematic factors is known as ANOVA test. There is also some difference between random factors and systematic factors. For instance, systematic factors have a statistical influence on the given data set while the random factors do not. In regression research, researchers used ANOVA in their test in order to understand and investigate how the dependent variable can be impacted by the independent variables. Hence, the ANOVA test is a statistical method that separates observed variance data into different components to use for additional tests. For three or more groups of data, a one-way ANOVA is used to learn about the relationship between the dependent and independent variables. So, if there is no true variance between the groups, the ANOVA's F-ratio will be equal to 1. The ANOVA test also allows the analysis of multiple groups of data to determine the variability between samples and within samples. So, if there are no real differences between the tested group, this result is called the null hypothesis.

Therefore, in Chapter 4, we are going to go through this ANOVA test where we have dependent variables (willingness of people to use CBDC) and 4 independent variables (potential impact of implementation of CBDC such as financial stability, financial inclusion, payment, and security and privacy). In the end, we wanted to know whether the relationship between the willingness of people to use CBDC is affected or dependent on the potential impact of implementation of CBDC. This is all that we are interested in studying about.

3.5.2 Descriptive analysis

There is also a data analysis known as descriptive analysis which is used to summarize or present the data points in a constructive way that patterns can develop that satisfy all the data's conditions. Descriptive analysis is one of the most crucial procedures in statistical data analysis where it provides the conclusion about the distribution of the data, assists in detecting typos and outliers, and allows to spot commonalities among variables, preparing for additional statistical analysis. Descriptive analysis is more vast than other quantitative methods because it can provide a broader picture of an event or phenomenon and a single number of variables to conduct descriptive research. This style of analysis is thought to be a better approach for gathering information since it defines relationships as natural and depicts the world as it is. Hence, this analysis is very real and close to mankind because all trends are based on a study of the real-life behaviors of the data (Rawat, 2021).

CHAPTER 4 ANALYSIS AND INTERPRETATION OF RESULTS

4.0 Introduction

In chapter 4, it contains the analysis, presentation, findings, and discussion of the data collected from the survey conducted. The data were collected through primary which distributed the survey for 3 weeks and collected more than 380 respondents. By performing the analysis and interpretation of results, statistical tools such as SPSS software were used in order to explain our findings according to the themes and sub-themes derived from the objectives and research questions stated in Chapter one.

4.1 Sample profile

For the survey, we have distributed more than 450 surveys via different channels such as social media, emailing, or physically to our targeted audience which is university students, academics, non-financial institutions employees, and financial institution employees. A total number of 383 respondents was collected and received completed. Table 4.1 is the summary of the respondents. We can observe that there is an 85.11% of response rate and the total collected number is 383. Hence, the number of surveys used for the data analysis is 383 responses since there is no missing data in raw data.

Table 4.1

Frequency of total surveys collected

Items	Total survey
Number of surveys that distributed	450
Number of surveys collected	383
Response rate	85.11%
Missing data	0

4.2 Descriptive Analysis on Demography

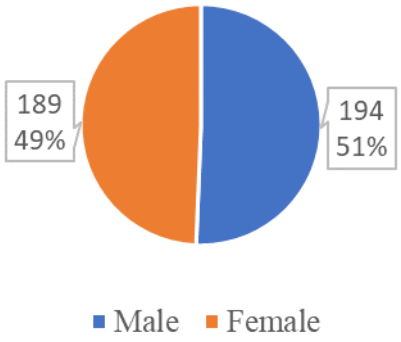
In this section, we will perform descriptive analysis on demography which is a type of analysis of data to help us describe, show and summarize the characteristics of the sample used in this research. All of the information collected from the respondents will be presented in a chart to make us clearly see the findings and results.

4.2.1 What is your gender identity?

The respondents were asked to indicate their gender. Figure 4.2.1 below shows that our survey consists of 194 or 50.7% male respondents and 189 or 49.3% female respondents. All of the surveys were distributed randomly, and the number of males is more than females indicating that males are more willing to participate in the research and answer the question.

Figure 4.2.1

Descriptive Analysis for Gender

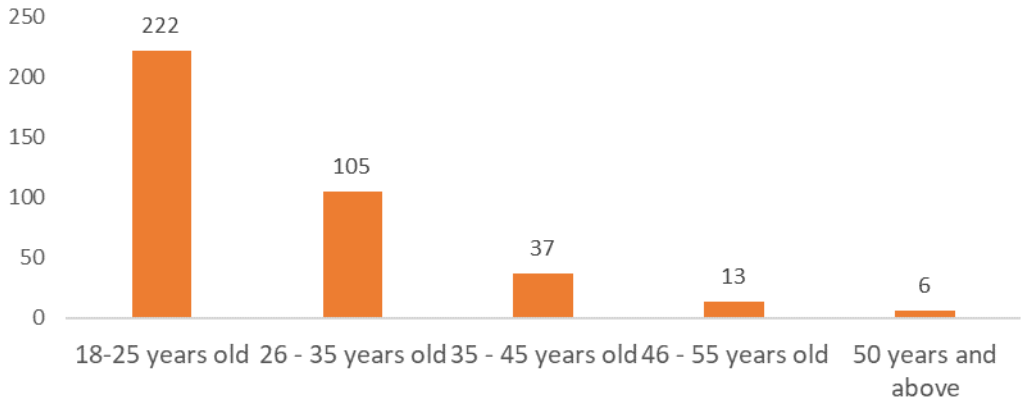


4.2.2 What is your age group?

Figure 4.2.2 below shows the frequency of the age group. We can observe that the majority of the respondents fall belong 18 to 25 years old age group which consists of 58% or more than half of the total respondents collected. Next, there are 105 or 27.4% of respondents categorized into 26 to 35 years old followed by 36 - 45 years old and 46 - 55 years old groups who contributed 9.7% and 3.4% in the research, respectively. While 56 years and above contributed 6 or 1.6% of the respondents which shows that there was less involvement in our research.

Figure 4.2.2

Descriptive Analysis for Age Group

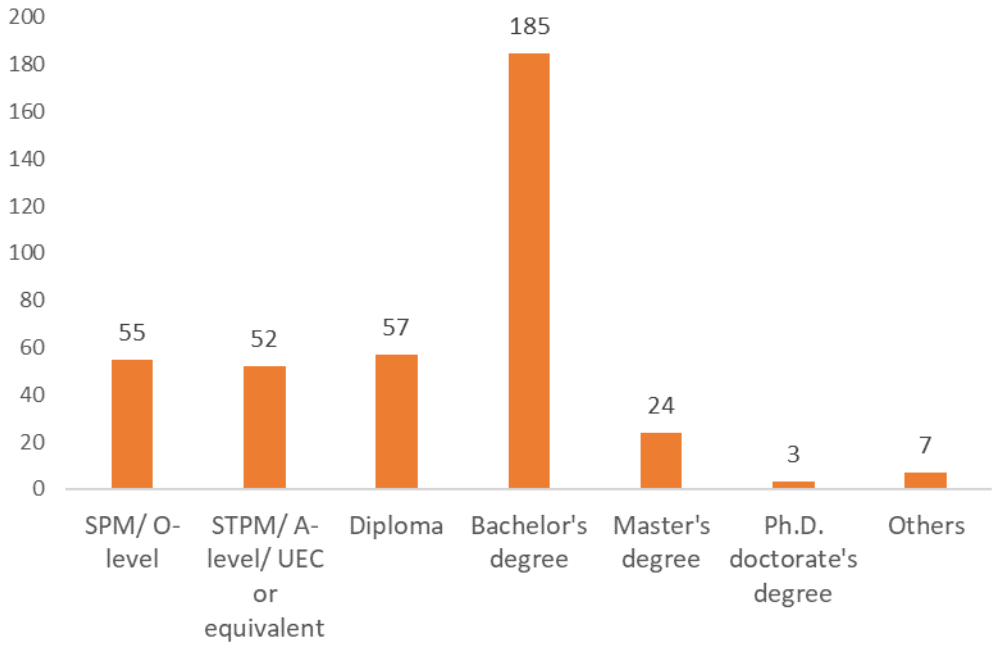


4.2.3 What is you highest education level attained?

Figure 4.2.3 reveals the frequency of the highest level of education attained. We can analyse that the majority of the respondents in the study have a bachelor's degree holder which consists of 185 or 48.3% of the total participants. Followed by diploma holders, SPM/ O-level holders, and STPM/ A-level/ UEC or equivalent comprise 14.9%, 14.4%, and 13.6% respectively which is similar in terms of the total number of highest education levels attained. In addition, respondents with a master's degree and Ph.D. doctorate degree comprise 6.3% and 0.8% respectively. Interestingly, there are also 7 respondents or 1.8% of the participants who selected others as their education level which may indicate that there is another selection that is not included in the options the researcher provided.

Figure 4.2.3

Descriptive Analysis for Education Level

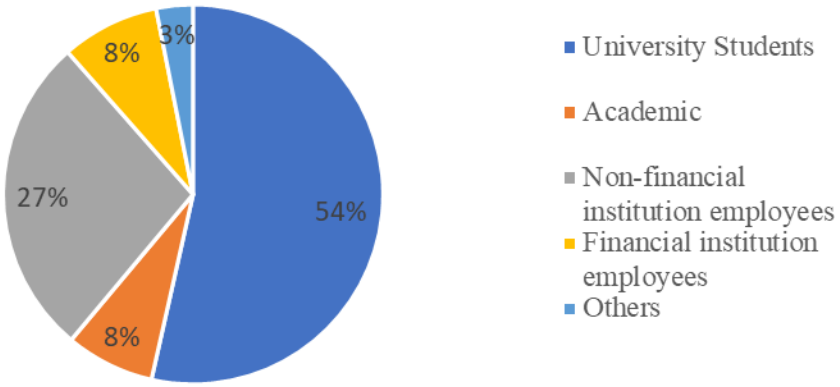


4.2.4 Are you a?

Based on figure 4.2.4 below, university students contributed the greater amount which consists of 205 or 53.52% of respondents. Followed by non-financial institution employees has the second highest percentage which is 27.42% or with 105 responses. Whereas financial institution employees and academics have 8.36% and 7.57% accordingly. Respondents who selected others are the majority of retirees, mechanics, university fresh graduates, and from 6 students.

Figure 4.2.4

Descriptive Analysis of Occupation



4.2.5 What is your monthly income level?

The frequency of the monthly income of participants was summarized below Figure 4.2.5. The highest category of respondents comes from monthly income below RM1,000 which is 128 or 33.4%. We can observe that it tallies with the number of the occupations in Figure 4.2.4 as we have 205 or 53.52% of respondents are university students and they might not have any income or have a part-time job that less than a monthly income of RM1,000 to support their daily expenses. Next, we have the monthly income of RM1,001 - RM3,000 and RM3,001 - RM5,000 comprising 99 (25.8%) and 93 (24.3%) respectively. Followed by respondents who fall in RM5,001 - RM8,000 monthly income categories, which have 47 respondents (12.3%). Last but not least, the monthly income group of RM8,001 - RM10,000 and RM10,001 and above shows 11 respondents (2.9%) and 5 respondents (1.3%) sequentially.

Figure 4.2.5

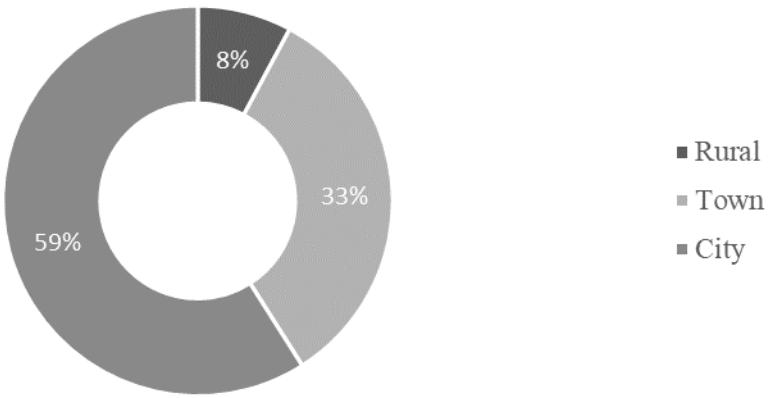
Descriptive Analysis for Monthly Income Level

4.2.6 Where is your living area?

Figure 4.2.6 reveals the frequency of the living area of the participants in the study. We can notice that the majority of the respondents who come from the city areas contributed the highest number which is 226 or 59.0% of the respondents. Followed by 127 respondents (33.2%) who live in the town areas and 30 respondents (7.8%) in the rural areas.

Figure 4.2.6

Descriptive Analysis for Living Area

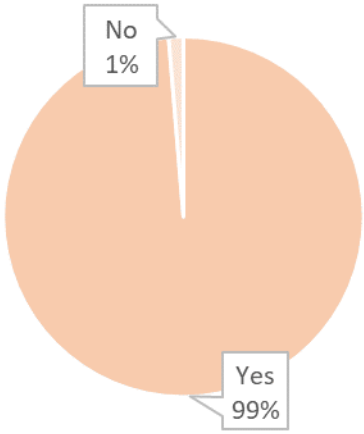


4.2.7 Do you own a smartphone?

Figure 4.2.7 appears the frequency of the respondents owning a smartphone. It recorded that there are 378 respondents (98.7%) who have a smartphone and 5 respondents (1.3%) who do not have it.

Figure 4.2.7

Descriptive Analysis for Owning a Smartphone



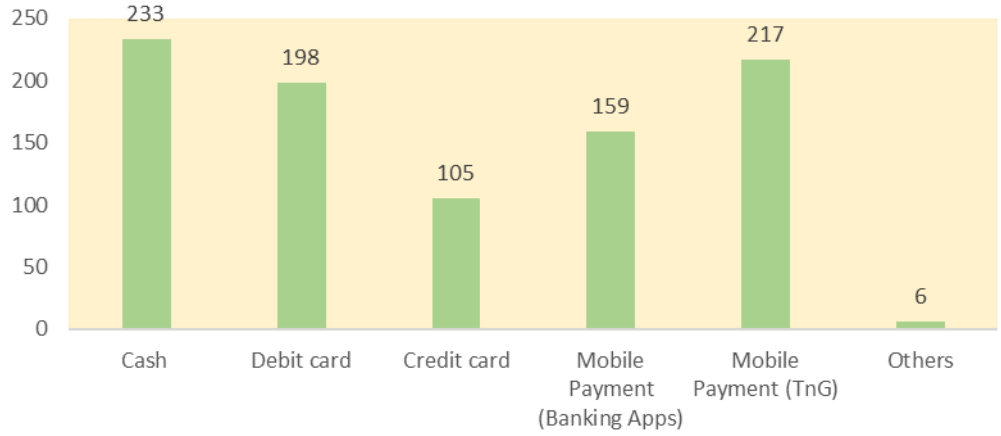
4.2.8 What types of payments method do you prefer to use? (More than 1 option allowed)

Figure 4.2.8 below shows the types of payment methods respondents prefer to use in daily transactions and they are allowed to choose more than one option because they might use different payment methods to do transactions. Interestingly, although we are living in a technology era and there is an outbreak of the pandemic in recent years, there are 233 respondents (60.8%) still using cash which contributed to the highest amount of payment used. The second highest belongs to mobile payment such as E-wallets TnG has 217 respondents selected (56.7%) as it is

convenient to use. Followed by debit cards has 198 respondents (51.7%), mobile payment (banking apps) has 159 respondents (41.5%), and credit cards have 105 respondents (27.4%). Other payment methods contributed 6 (1.6%) of the total respondents.

Figure 4.2.8

Descriptive Analysis for Types of Payments Preferred to Use



4.3 Descriptive Analysis for Level of Understanding or Perception of the Concept of CBDC

Followed by this section discussed about the descriptive analysis on the level of understanding of the respondents or their perception on the concept of CBDC. By summarize into graph or bar chart, we will be able to know how the awareness is of heard of the CBDC by the respondents.

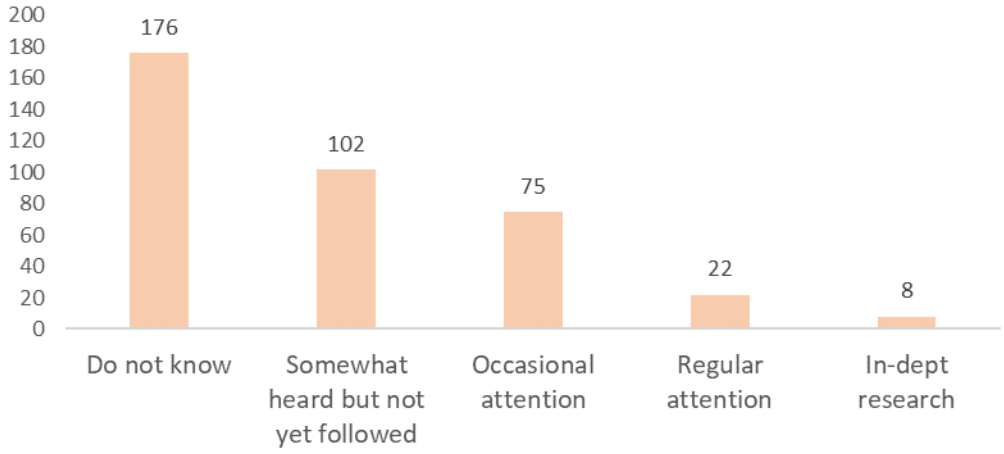
4.3.1 How far to what extend do you heard and know the CBDC?

According to the descriptive analysis of Figure 4.3.1, we can detect that the majority of the respondents have not heard about the CBDC before as

it consists of the highest frequency which is 176 respondents (46.0%). Approximately one-fourth of respondents (26.6%) somewhat heard it but are not interested in or followed the news. 19.6% of respondents occasionally observe the trend of CBDC, followed by 22 respondents (5.7%) regularly attention and lastly 8 respondents (2.1%) in-depth research of CBDC.

Figure 4.3.1

Descriptive Analysis for Awareness of Knowing CBDC



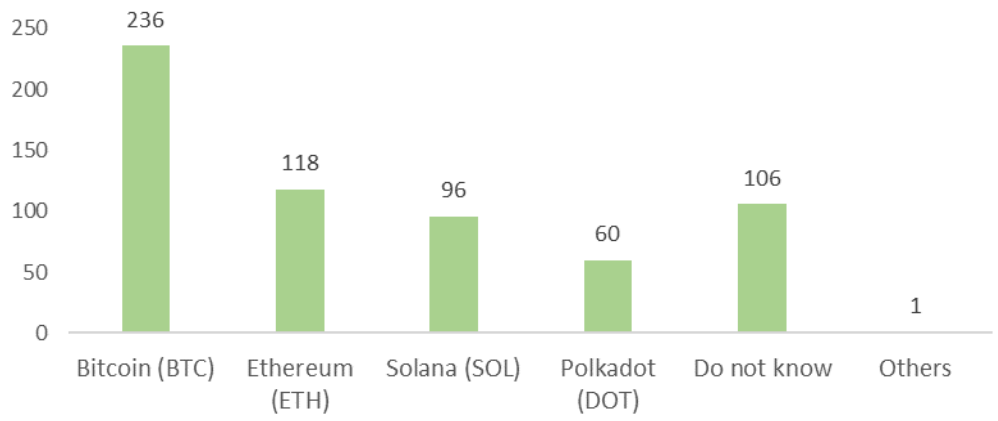
4.3.2 What kind of digital currency do you know? (More than one option allowed)

In this survey question, the respondents were allowed to choose more than one option as they might know several types of the digital currency. Although in previous descriptive analysis which is Figure 4.3.1, we notice that the majority of participants (46.0%) do not know CBDC before as it is a new topic in the recent 5 years, there are 236 respondents (61.6%) aware of bitcoin (BTC). Followed by Ethereum (ETH) has respondents of 118 (30.8%). Based on the Figure 4.3.2, we also can detect there are 106 respondents (27.7%) who do not know about any digital currency as they might probably not be aware of electronic currency or any financial

technology and blockchain. Besides, other cryptocurrencies like Solana (SOL) and Polkadot (DOT) obtained results of 96 (25.1%) and 60 (15.7%) correspondingly. Unexpectedly, in this survey, a respondent gave a different answer, which is Moreno.

Figure 4.3.2

Descriptive Analysis for Awareness of knowing the digital currency

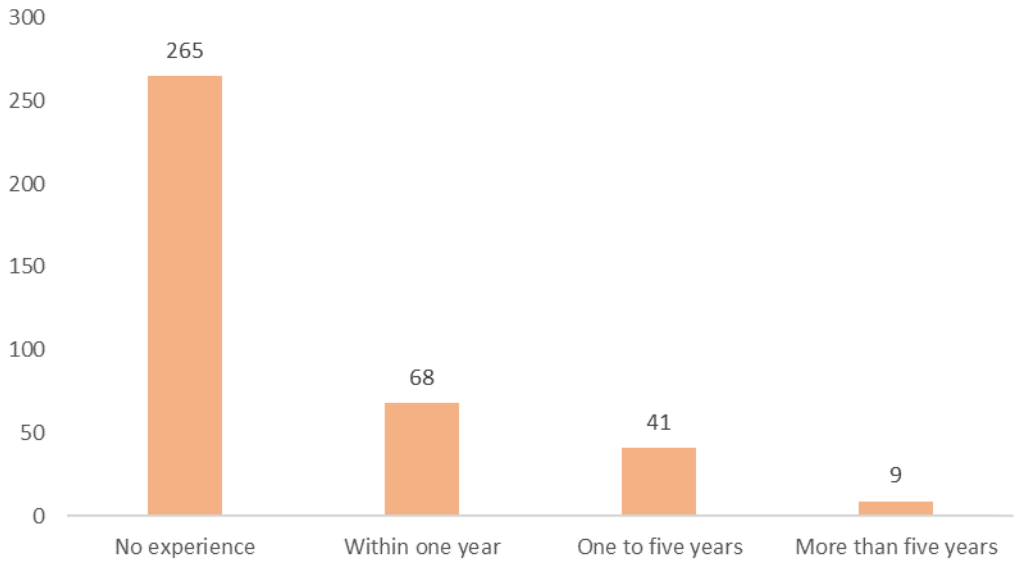


4.3.3 What is your investment experience in digital currency?

Based on the Figure 4.3.3, 265 respondents (69.2%) do not have any experience with investment in digital currency which contributed the most in the survey. Followed by 68 respondents (17.8%) has an experience within one year. Whereas 41 respondents (10.7%) and 9 respondents (2.3%) have an investment experience of one to five years and more than five years, respectively.

Figure 4.3.3

Descriptive Analysis for Investment Experience in Digital Currency

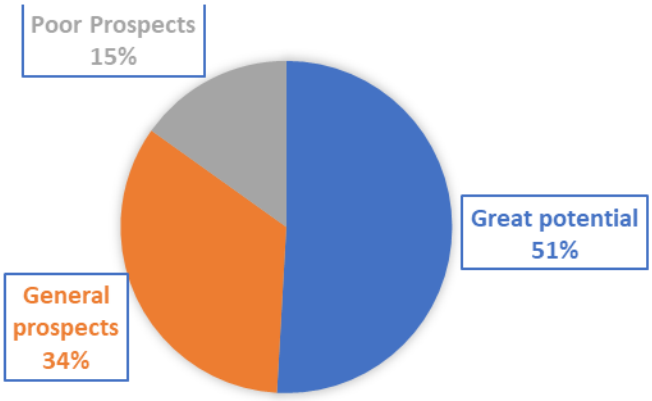


4.3.4 What do you think of the development prospects of digital currency?

Figure 4.3.4 below shows the frequency of the development prospects of digital currency in this study. Approximately half of the respondents (50.9%) have an opinion that digital currency is a great potential for development, followed by 130 respondents (33.9%) who select general prospects, whereas 58 respondents (15.1%) do not have confidence in the prospect's development of the digital currency.

Figure 4.3.4

Descriptive Analysis for Development Prospects of Digital Currency



4.3.5 What is the reason you do not think digital currency will be useful as medium of exchange or investment option? [More than 1 option allowed]

Based on Figure 4.3.5, we can see that most of the participants believe volatility in value and speculative risk (221 responses) is the strong reason that digital currency cannot be used to serve as the medium of exchange or investment option. Next, 200 respondents (53.2%) were afraid it is likely to be hacked followed by trading platforms having operational risk and inadequate regulation, and vulnerability to financial fraud. In addition, 182 participants believe that the trading platform has operational risks. Among them, related risks can be defined in diverse ways, such as policy risk, system risk, transaction risk, circulation risk, business risk and so on. Lastly, one of the reasons why the remaining 165 participants do not think digital currency is useful as a trading medium or investment choice is that it is vulnerable to financial fraud due to inadequate supervision.

Figure 4.3.5

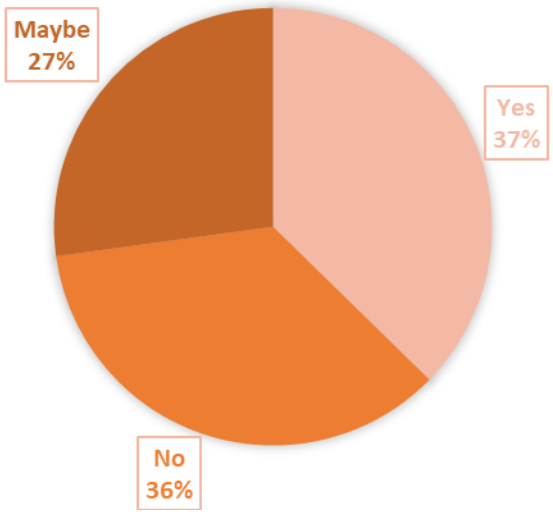
Descriptive Analysis for Reason digital currency not suitable to use

4.3.6 Do you think a CBDC is a type of cryptocurrency?

In this question, we would like to explore the respondents on their understanding of the nature of CBDC. We can notice 143 respondents (37.3%) agree CBDC is a type of cryptocurrency which is the highest amount followed by 136 respondents (35.5%) who do not think it is a cryptocurrency whereas 104 respondents are not sure of their answer. This reveals that probably they might not understand what CBDC is and in the previous question, we were able to see that the majority of respondents do not hear it before.

Figure 4.3.6

Descriptive Analysis of Understanding the Nature of CBDC



4.4 Descriptive Analysis on Market Expectation

Section 4.4 discusses the descriptive analysis on market expectation. We expect to collect the opinion of respondents and their expectation of the implementation of CBDC by the central bank in Malaysia in order to find out desired solution when comes to the stage of designing the CBDC.

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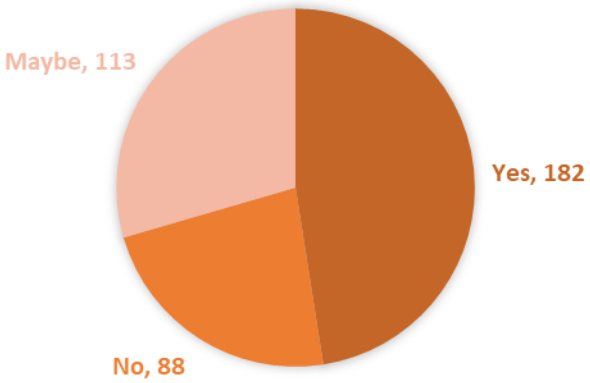
4.4.1 Do you expect to use CBDC?

The Figure 4.4.1 shows the respondents' expectations of using the central bank's digital currency. The record shows that 182 respondents expect to use the central bank digital currency, 88 respondents do not expect to use the central bank digital currency, and 113 respondents are uncertain about their expectation of using the central bank digital currency.

Figure 4.4.1

Descriptive Analysis for Willingness to Use CBDC

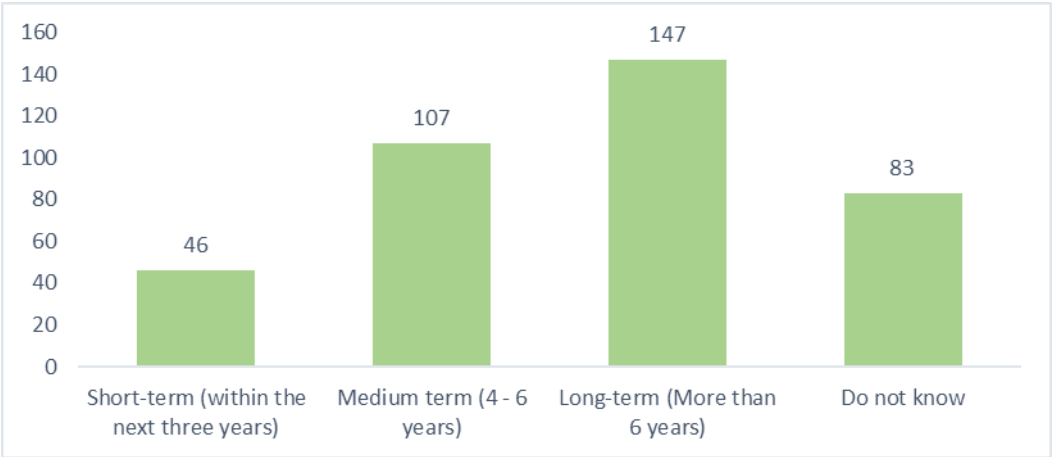


4.4.2 How likely central bank will use a CBDC in the following time horizons?

The figure 4.4.2 shows how likely respondents are that the central bank will use CBDC in the next period. According to the records, 147 respondents thought it was possible for more than 6 years, 107 respondents thought it was possible within 4-6 years, 46 respondents thought it could be achieved within 3 years, and the remaining 83 respondents had no idea about this.

Figure 4.4.2

Descriptive Analysis for time horizons for the central bank to launch CBDC

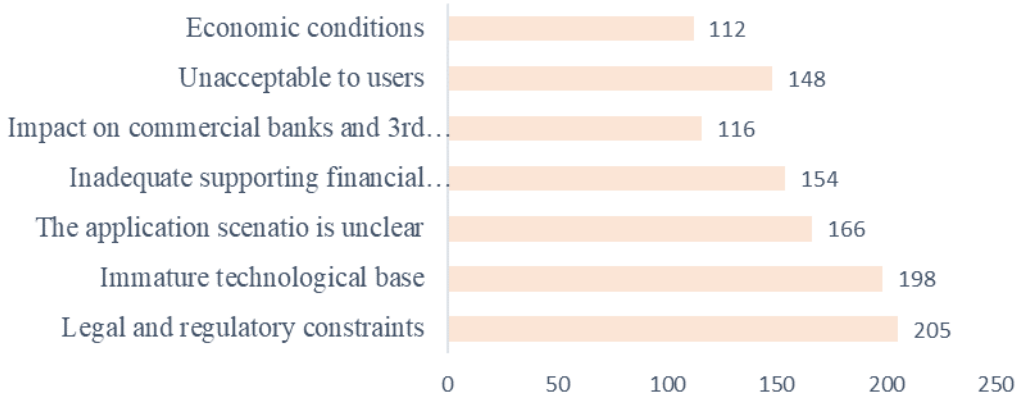


4.4.3 What do you think are the main obstacles to the launch of the central bank digital currency in Malaysia? [More than 1 option allowed]

According to the Figure 4.4.3, respondents believe that the first major obstacle to the introduction of the central bank digital currency in Malaysia is legal and regulatory restrictions, and this option has been approved by more than half of the people, that is, 205 respondents. Secondly, the second obstacle that respondents think of is the immature technical foundation, and a total of 198 respondents agree. Third, maybe CBDC has not gained people's attention in Malaysia, so 166 respondents think that the application scenario of CBDC is not clear enough. Secondly, the respondents think that Malaysia's supportive financial infrastructure is not enough, and this option was approved by 154 respondents. In addition, as mentioned before, the CBDC concept in Malaysia is not so common, so 146 respondents think that users cannot accept CBDC. Finally, such as the impact on commercial banks and third-party payment services, the resistance of commercial banks and third-party payment institutions, and the economic situation, 116 and 114 respondents respectively agreed.

Figure 4.4.3

Descriptive Analysis for the Main obstacles to launch the CBDC in Malaysia



4.4.4 What are the features that attract you to use CBDC if being successfully implemented? [More than 1 option allowed]

According to the Figure 4.4.4 below, if CBDC is successfully implemented, the interviewee thinks that the biggest feature that can attract him to use CBDC is faster payment, which is approved by more than half of the people, that is, 186 interviewees. Secondly, the second characteristic that respondents think is interest-bearing, and a total of 172 respondents agree. Third, 166 respondents thought CBDC made them feel more secure. Then, the interviewee thinks that CBDC can reduce the cost, which is one of the characteristics of his use of CBDC. This option was approved by 152 interviewees. Besides, as mentioned before, CBDC in Malaysia makes them feel safer, so 140 respondents think that legal inclination is one of its characteristics. Finally, 129, 126 respondents and 71 respondents respectively agreed to improve convenience and transparency, transparency and privacy of CBDC and reduce illegal and criminal activities.

Figure 4.4.4

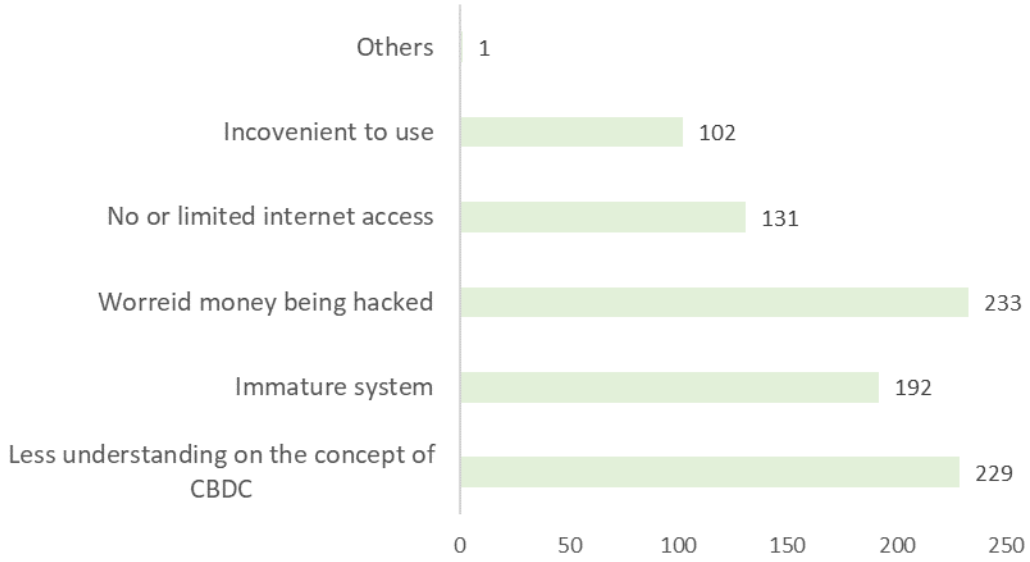
Descriptive Analysis for Features Attract Respondents to use CBDC

4.4.5 What are the features that discourage you to use CBDC if being successfully implementation? [More than 1 option allowed]

According to the Figure 4.4.5, if CBDC is successfully implemented, respondents think that the main feature that will hinder their use of CBDC is their fear of money being hacked. This option has been approved by more than half of the people, that is, 233 respondents. Secondly, the interviewees think that the second characteristic is that they do not understand the concept of debt. A total of 229 interviewees agrees with it. The reason may be that CBDC's attention among Malaysian people is not strong enough. Thirdly, 192 respondents think that the CBDC system in Malaysia is not mature enough (immature system). Then, respondents thought that the lack or limited Internet access was one of the characteristics that prevented them from using CBDC. This option was approved by 131 respondents. Finally, 102 respondents thought CBDC was inconvenient to use.

Figure 4.4.5

Descriptive Analysis for Features Discourage Respondents to Use

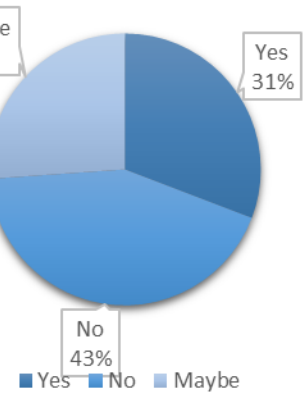


4.4.6 If CBDC is non-interest bearing but is still protected by the central bank, will you be willing to use it?

The Figure 4.4.6 shows the willingness of respondents to use CBDC if it is interest-free but still protected by the central bank. According to the records, 165 respondents thought they would not use it, 116 respondents thought they would use it, and 100 respondents thought both options were possible.

Figure 4.4.6

Descriptive Analysis for Willingness to Use CBDC If It is Launched as Non-Interest Bearing

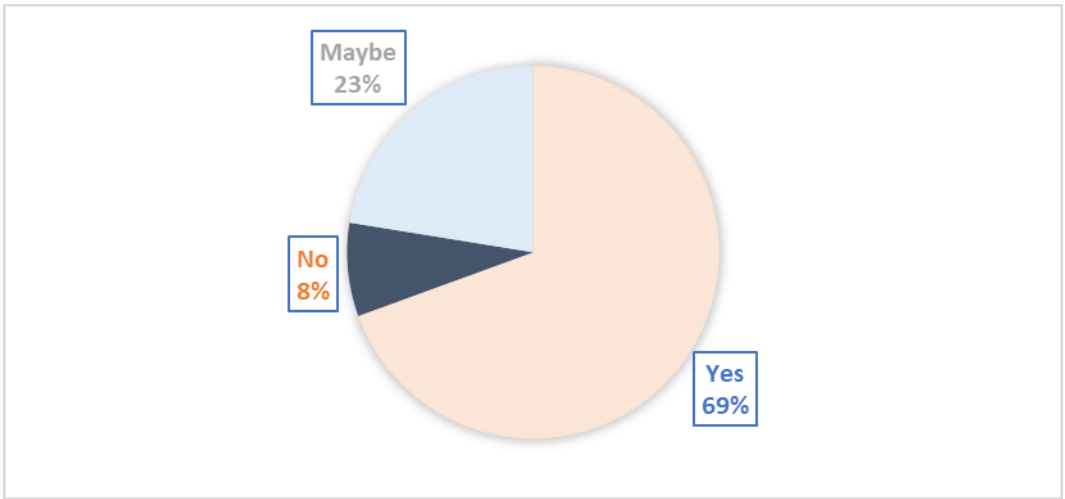


4.4.7 Do you expect a CBDC have "offline" capabilities?

The Figure 4.4.7 shows whether respondents think CBDC has the "offline" capability. According to the records, 266 respondents think there is which is the highest, 31 respondents think there is no, and 86 respondents think that both options are possible.

Figure 4.4.7

Descriptive Analysis for Expectation of "offline" features



4.5 Descriptive Analysis on Likert Scale Data

In section 4.5, it is all about the descriptive analysis on Likert scale data for the survey in Section C which is the potential impacts on implementation of CBDC. There are four parts in this Section C in the survey which are financial stability, financial inclusion, payments, and security and privacy. All the part in the section has some few items which composed of 5-point rating scale with 1 (strongly disagree), 2 (Disagree), 3 (Neutral), 4 (Agree) to 5 beings (strongly agree).

4.5.1 Descriptive Analysis on Financial Stability (FS)

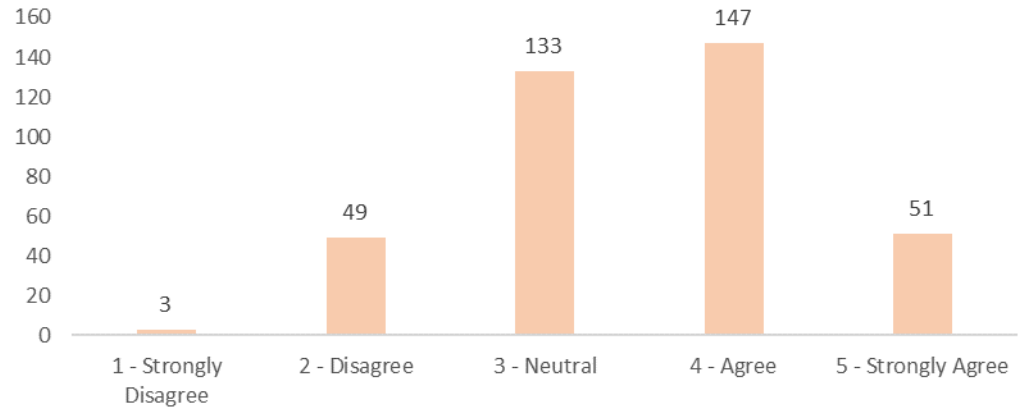
There are 7 items under Financial Stability which discussed about the financial stability when the implementation of CBDC such as bank run or affect to the bank's profitability. Hence, section 4.5.1 describes and summarize the descriptive analysis on Financial Stability (FS).

4.5.1.1 CBDC is safer instrument then other payment methods to protect funds or save in a time of financial stress. (FS1)

According to the Figure 4.5.1.1, the score of 4 indicates that this option is approved by 147 participants out of 383 participants, which is 38.4% in the responses which the highest responses in FS1. They agree that compared with other payment methods, CBDC is a safer tool to protect funds or make saving during the financial crisis.

Figure 4.5.1.1

Descriptive Analysis for FS1

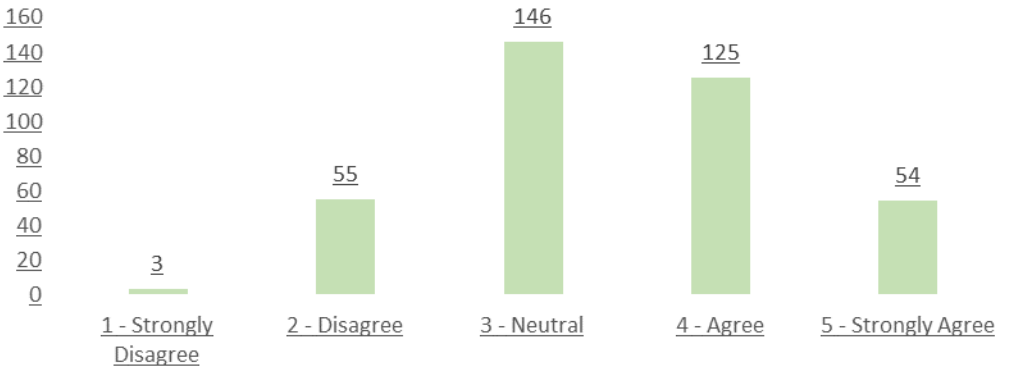


4.5.1.2 CBDC will negatively affect the structure of the current banking industry and the process of financial intermediation. (FS2)

According to the bar chart in Figure 4.5.1.2, the highest frequency selected by the respondents is 3 which is neutral. There is about 146 or 38.1% of the participants selected where indicated that CBDC will have a negative impact on the current banking structure and financial intermediation process. The lowest frequency is belonging to 1 – "Strongly Disagree".

Figure 4.5.1.2

Descriptive Analysis for FS2

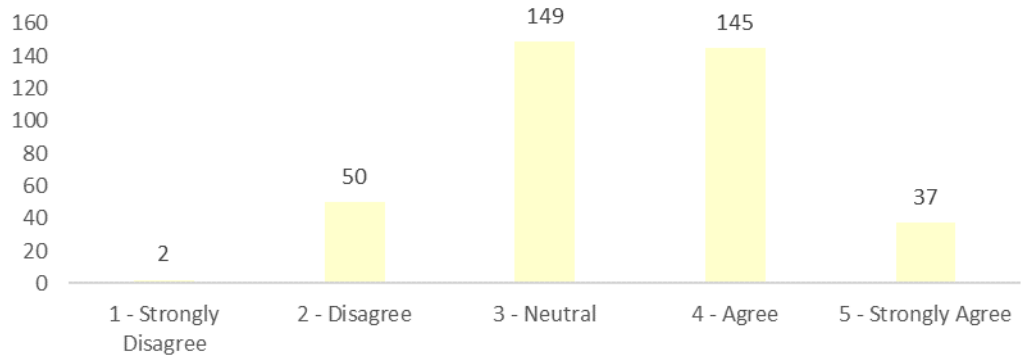


4.5.1.3 Depositors will withdraw money from the traditional bank and switch bank deposits to CBDC. (FS3)

Based on Figure 4.5.1.3, the scores of 3 and 4 are remarkably close, which means most of the participants are neutral and agree. The option 3 "Neutral" recognized by 149 participants among 383 participants, while the option 4 "Agree" is recognized by 145 participants. Therefore, 294 participants think that when CBDC is implemented, depositors will withdraw money from traditional banks and transfer bank deposits to CBDC.

Figure 4.5.1.3

Descriptive Analysis for FS3



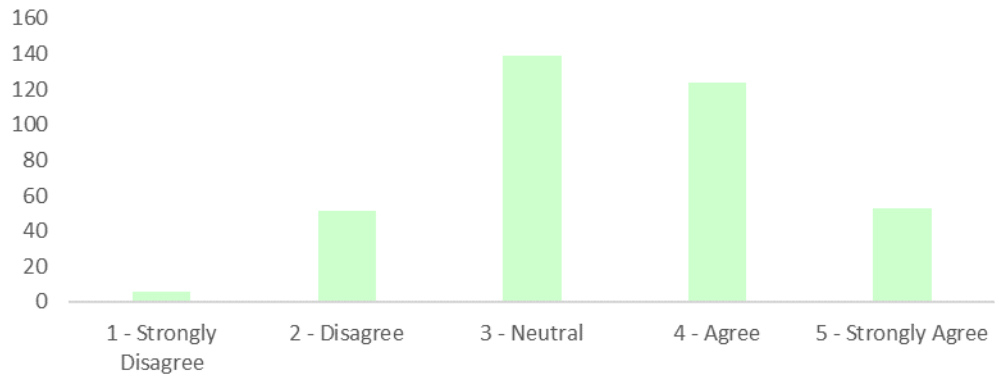
4.5.1.4 There is an increased possibility of a bank run (people rush to withdraw money from deposit account) happening. (FS4)

Based on the Figure 4.5.1.4, the score of 3 shows that most participants are neutral, and this option 3 is recognized by 149 of 383 respondents. The lowest score will be option 1 which is strongly disagree. Participants may think that when CBDC comes into effect, people are scrambling to

withdraw money from deposit accounts, that is, the possibility of bank run will be increasing.

Figure 4.5.1.4

Descriptive Analysis for FS4

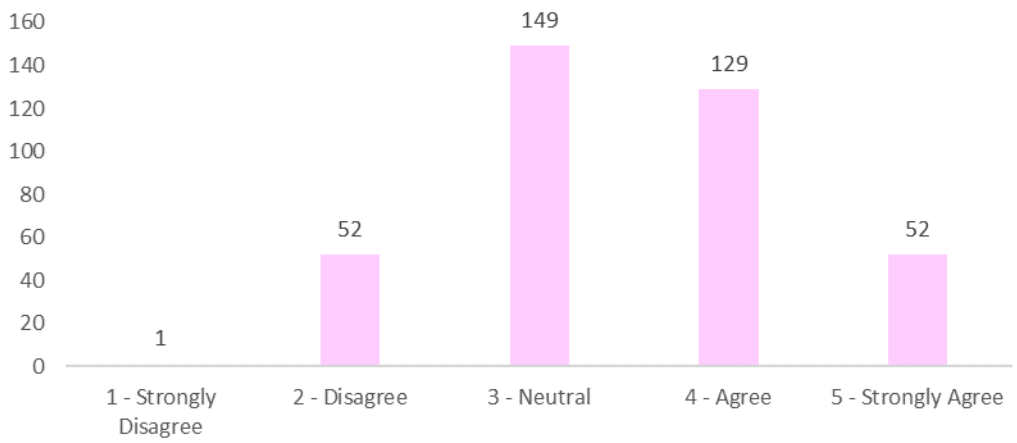


4.5.1.5 CBDC will cause deposit withdrawal from the commercial bank, reducing the bank's ability to lend loans and bank profitability. (FS5)

According to the Figure 4.5.1.5, the score of 3 shows that most participants are neutral, and this option 3 is recognized by 149 of 383 participants. Participants believe that CBDC will lead to the deposit backflow of commercial banks and reduce the bank's loan granting ability and profitability.

Figure 4.5.1.5

Descriptive Analysis for FS5

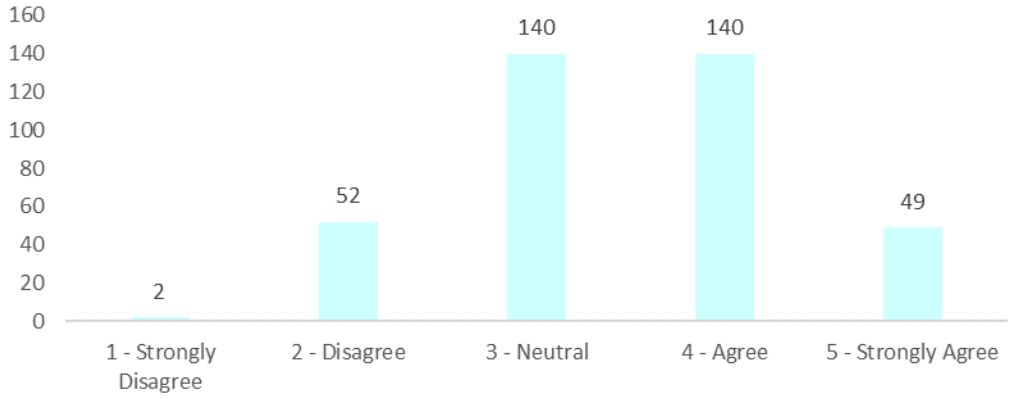


4.5.1.6 With the increase in market capital flows, the risk of financial instability of CBDC will also increase. (FS6)

In this statement, we have two identical scores. According to the Figure 4.5.1.6, scores 3 and 4 were shown, and each score was also supported by 140 participants. This means that most participants remain neutral and agree with each other. Participants believe that with the increase of market capital flows, the risk of CBDC financial instability will also increase.

Figure 4.5.1.6

Descriptive Analysis for FS6

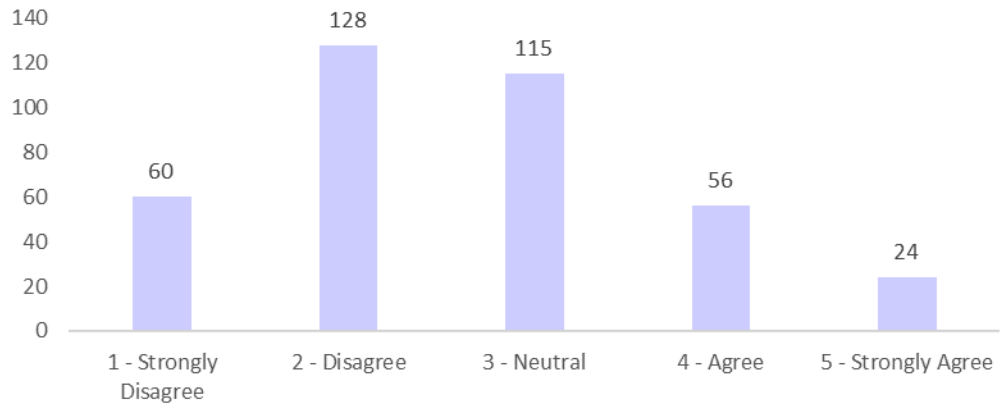


4.5.1.7 It is possible for the CBDC to replace all the existing payment methods (E.g., E-wallets/ paper currency/ credit card) in the future. (FS7)

Based on Figure 4.5.1.7, score 2 was recognized by the most participants, with 128 out of 383 participants. This indicated that most participants hold different views. Participants do not think it is possible for CBDC to replace all existing payment methods in the future, such as e-wallet, paper money, credit card, etc.

Figure 4.5.1.7

Descriptive Analysis for FS7



4.5.2 Descriptive Analysis for Financial Inclusion (FI)

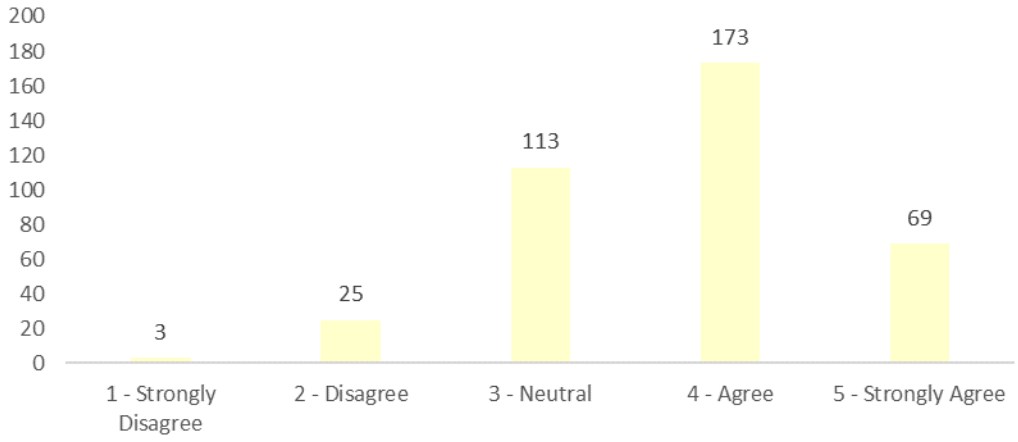
There are 4 items under Financial Inclusion which discussed about the willingness of people to use CBDC if they are more financially included. Hence, section 4.5.2 describes and summarize the descriptive analysis on Financial Inclusion (FI).

4.5.2.1 CBDC allows more people (including unbanked and underbanked) to enjoy and access financial services. (FI1)

By looking at the Figure 4.5.2.1, the score of 4 was recognized by the most participants, with 173 out of 383 participants. This means that most of the participants agree. Most participants believe that CBDC allows more people, including those without bank accounts and with insufficient banking services, to enjoy and obtain financial services.

Figure 4.5.2.1

Descriptive Analysis for FI1

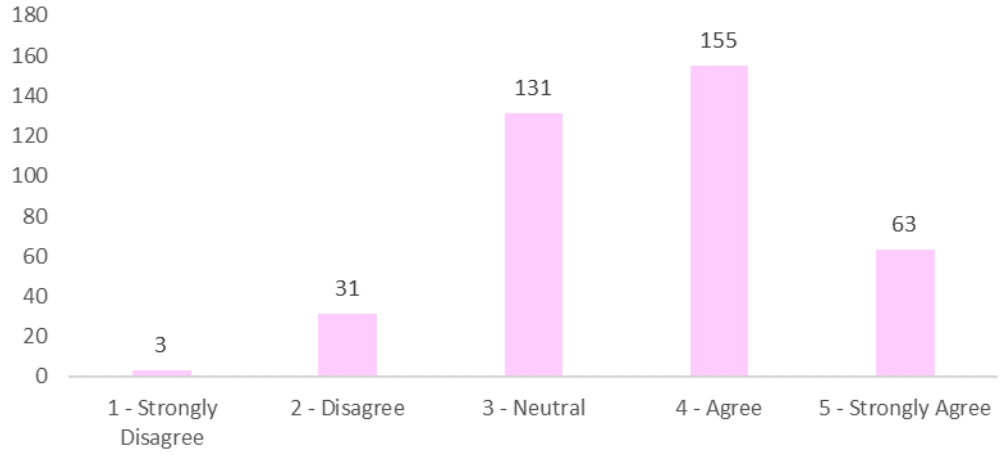


4.5.2.2 Issuance of CBDC is able to boost economic growth while alleviating poverty. (FI2)

Based on Figure 4.5.2.2, the score of 4 was recognized by the most participants, with 155 out of 383 participants. This means that most of the participants agree with this statement. Most participants believe that issuing CBDC can alleviate poverty while promoting economic growth.

Figure 4.5.2.2

Descriptive Analysis for FI2

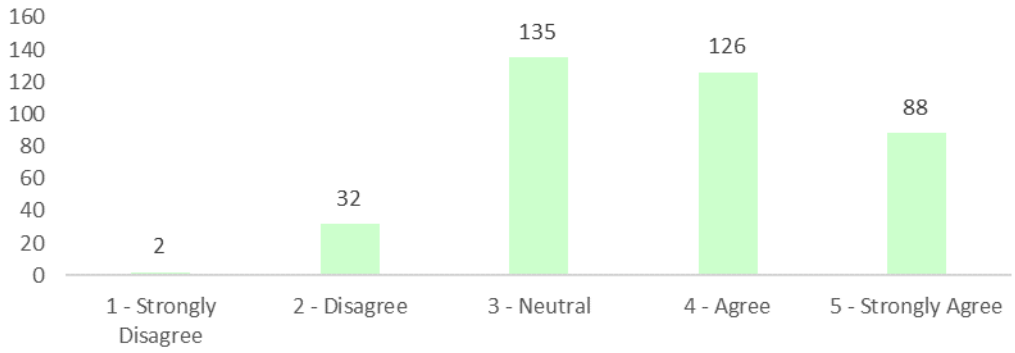


4.5.2.3 Limited internet access or infrastructure is the barrier to improving financial inclusion. (FI3)

The highest score for this statement is score of 3 which 135 out of 383 participants has neutral with it. The second highest belongs to score of 4 which 126 participants agree in the view that limited internet access or infrastructure is an obstacle to improving financial inclusion.

Figure 4.5.2.3

Descriptive Analysis for FI3

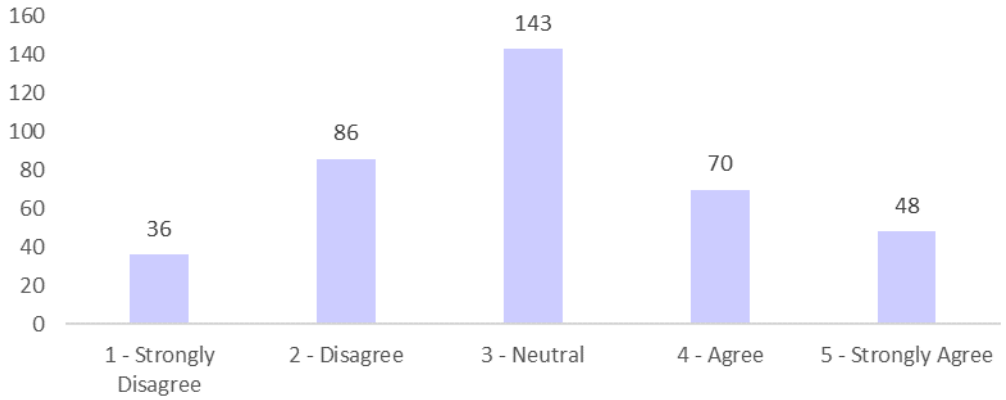


4.5.2.4 Financial inclusion is not an important factor in the issuance of CBDC. (FI4)

Below shows the figure 4.5.2.4 which notice that majority respondents think neutral to this statement which comprise of 143 out of 383 respondents. The second highest belongs to score of 2 which is disagree with this statement. Based on Figure 4.5.2.1, 45.2% of the respondents agree that CBDC allows more people enjoy and access to financial services. Hence, to ensure the consistency of the survey, it is expected that majority people select disagree or neutral for this statement (FI4).

Figure 4.5.2.4

Descriptive Analysis for FI4



4.5.3 Descriptive Analysis on Payment (P)

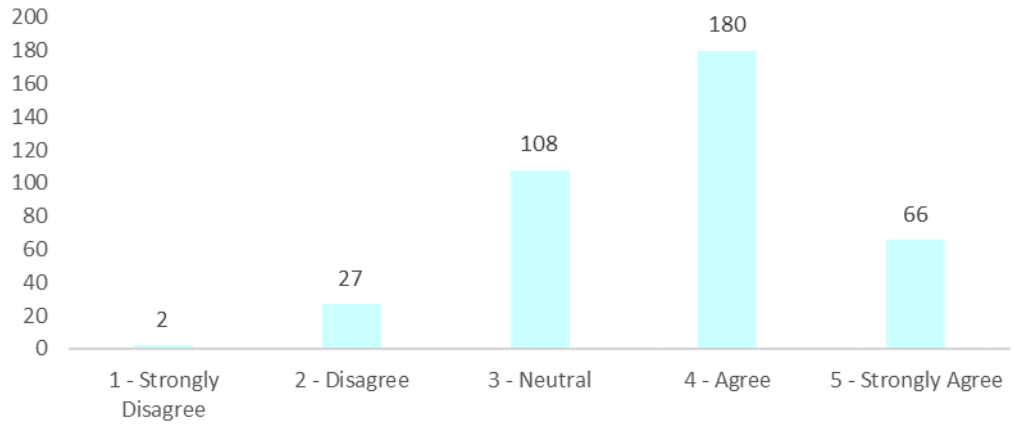
There are 6 items under Payment which discussed about the willingness of people to use CBDC if the CBDC is designed to facilitate payment and reduce cost of people. Hence, section 4.5.3 describes and summarize the descriptive analysis on Payment (P).

4.5.3.1 CBDC is able to improve payment efficiency for domestic and cross-border and make it more convenient for users. (P1)

Below Figure 4.5.3.1 shows the frequency for this statement where we can observe the highest score belongs to score 4. There are 180 participants or 47% agree that CBDC able to facilitate payment efficiency which make it more convenience to users. Besides, 108 participants feel neutral, and 66 respondents strongly agree with this statement.

Figure 4.5.3.1

Descriptive Analysis for P1

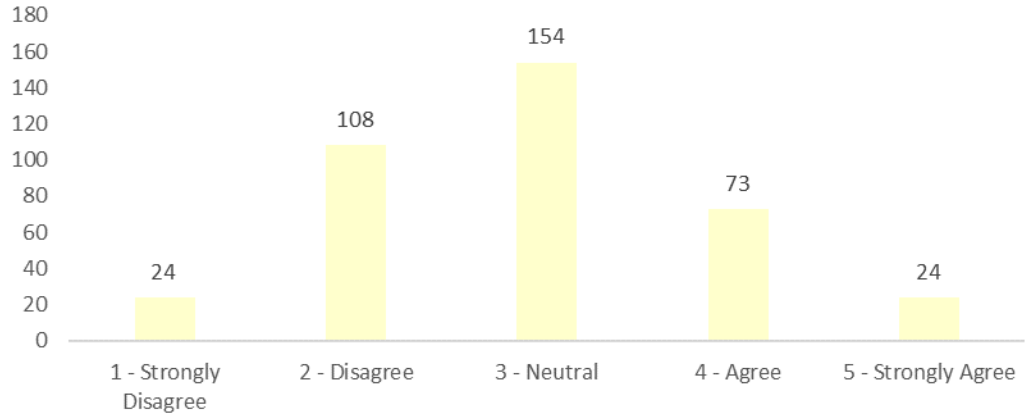


4.5.3.2 CBDC has no potential to offer low-cost payment services as a public service. (P2)

Based on Figure 4.5.3.2, majority of respondents feel neutral with this statement which consists of 154 or 40.2% of total responses. While 108 or 28.2% respondents disagree CBDC has no potential to offer low-cost payment services as a public service. Interestingly, people strongly agree and strongly disagree consists of same value of number which is 24 respondents out of 383.

Figure 4.5.3.2

Descriptive Analysis for P2



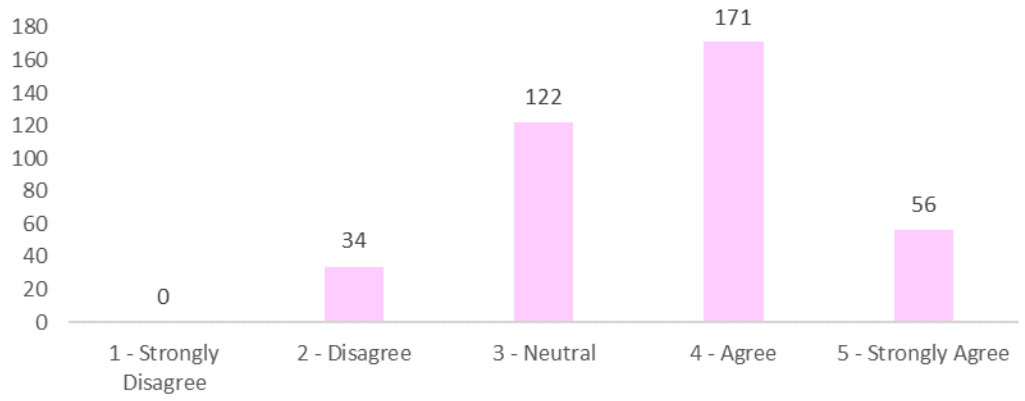
4.5.3.3 CBDC allows for speedier retail payment which boosts competitiveness and decrease costs for businesses and customers. (P3)

Figure 4.5.3.3 below reveals that 171 or 44.6 respondents agree CBDC allows to make payment faster which bring more benefits such as decrease costs for businesses and customers. The second highest belongs to neutral

opinion where 122 or 31.9% respondents select this option. Also, there is no respondents strongly disagree with this statement.

Figure 4.5.3.3

Descriptive Analysis for P3

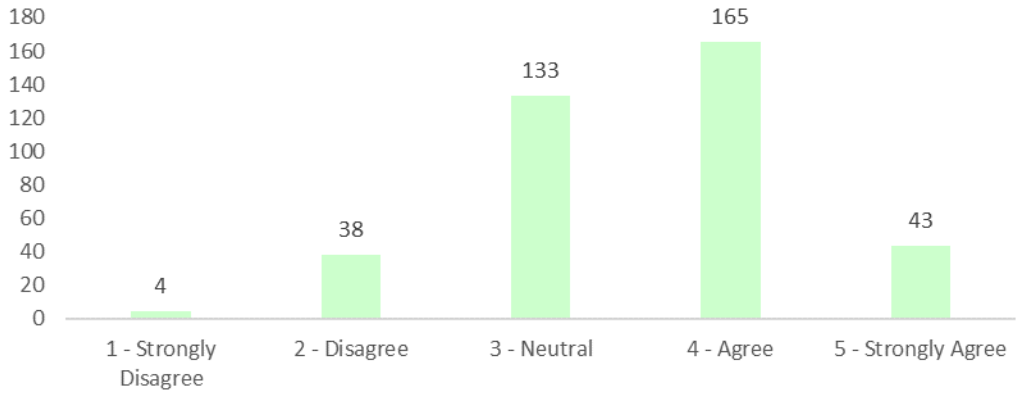


4.5.3.4 CBDC can be used as an alternative to be existing digital payment systems and used in facilitating assistance payment. (P4)

Similar as previous responses, majority of respondents feel agree that CBDC able to use as an alternative to be existing digital payment systems which shown at Figure 4.5.3.4. Next, 133 respondents or 34.7% neutral with this statement.

Figure 4.5.3.4

Descriptive Analysis for P4

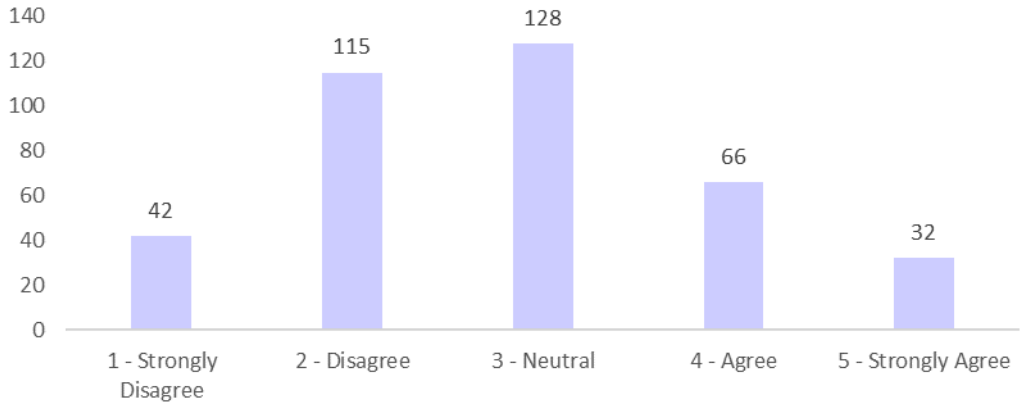


4.5.3.5 Cash payment can be eliminated if CBDC is being successfully implemented. (P5)

Figure 4.5.3.5 reveals 128 or 33.4% of respondents has a score of 3 which is neutral with this statement. Whereas the second highest score is 2 which is disagree with this statement which consists of 115 or 30% of respondents.

Figure 4.5.3.5

Descriptive Analysis for P5

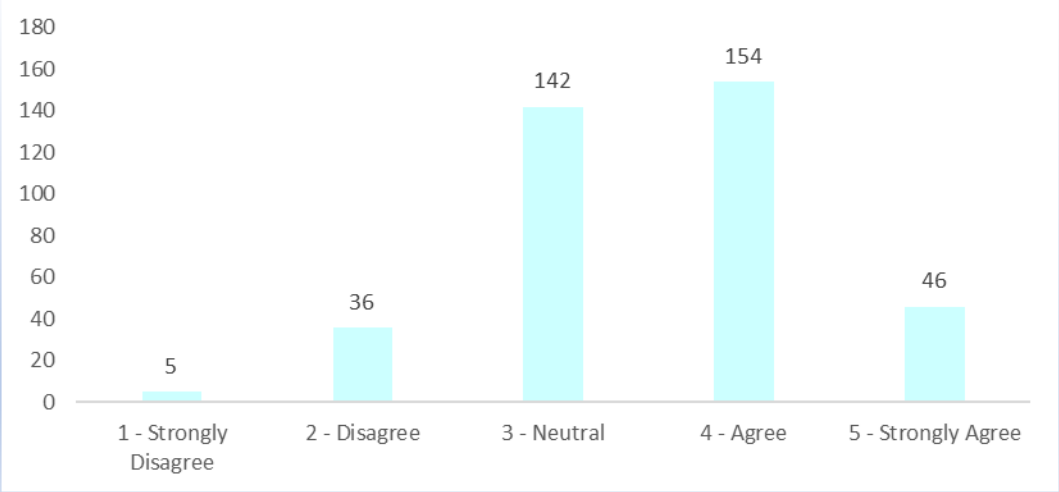


4.5.3.6 Implementation of CBDC is able to spur innovation and competition in payments. (P6)

There are 154 or 40.2% of respondents agree that CBDC that issued by central bank able to spur innovation and competition for other payment providers. There are also 142 or 37.1% of respondents out of 383 respondents neutral with this statement. Majority of participants were in between the range of neutral, agree, and strongly agree.

Figure 4.5.3.6

Descriptive Analysis for P6



4.5.4 Descriptive Analysis for Security and Privacy (SP)

There are 4 items under Security and Privacy which discussed about the willingness of people to use CBDC if CBDC is designed to be more safety which reduce the breach of privacy and able to trace illegal activities. Hence, section

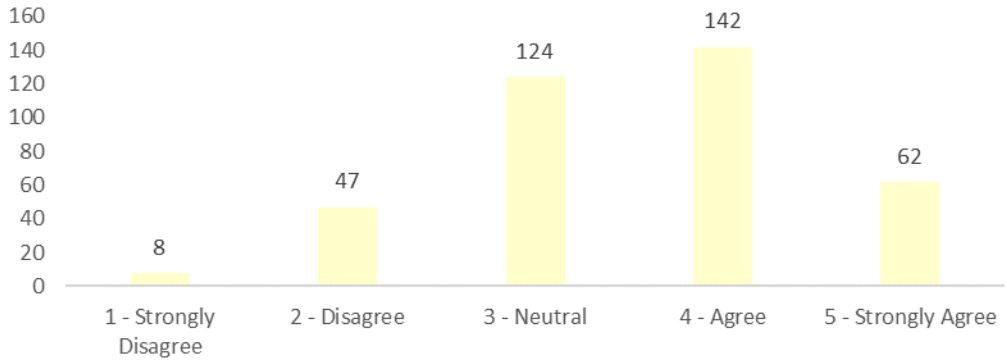
4.5.4 describes and summarize the descriptive analysis on Security and Privacy (SP).

4.5.4.1 Under the control and monitoring of the centra bank, CBDC is more secure than other payment methods. (SP1)

There are 142 respondents out of 383 agree that under the control and monitoring of the central bank, CBDC is safer than other payment methods. Also, 124 or 32.4% of respondents have a view of neutral with this statement. Followed by strongly agree (62 respondents), Disagree (47 respondents) and Strongly Disagree (8 respondents).

Figure 4.5.4.1

Descriptive Analysis for SP1



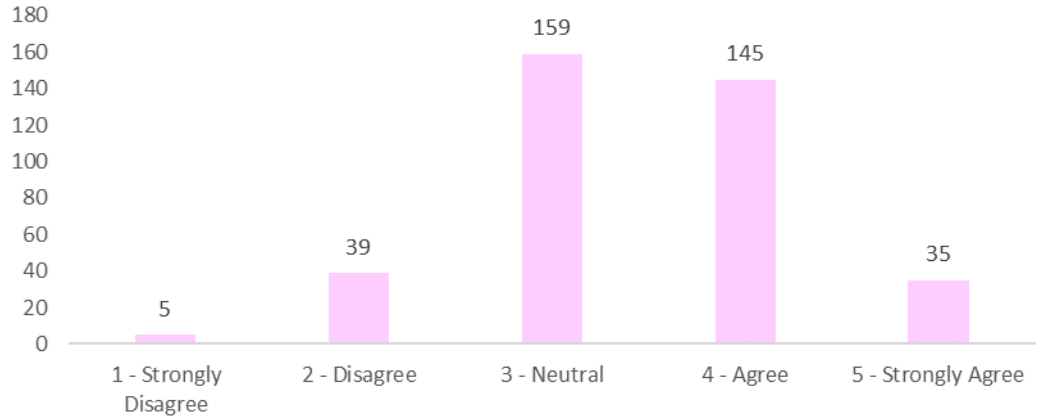
4.5.4.2 A CBDC is able to track illegal activities due to digitalization and the growing centralization of data. (SP2)

Based on Figure 4.5.4.2, the score of 3 was recognized by the most participants, with 159 out of 383 respondents. This means that due to the

digitalization and increasing concentration of data, CBDC can track illegal activities, and most participants remain neutral about this view.

Figure 4.5.4.2

Descriptive Analysis for SP2

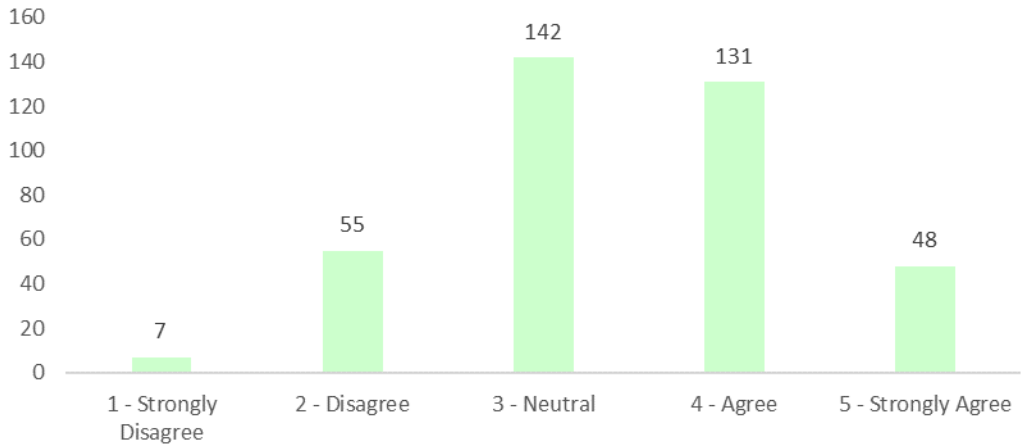


4.5.4.3 CBDC is more likely to pose new threats to the breach of privacy (personal information being stolen). (SP3)

The most participants recognized score 3, with 142 out of 383 respondents. This means that CBDC is more likely to pose a new threat to the invasion privacy, that is, the theft of personal information. Most participants remain neutral about this view. All of the results show in Figure 4.5.4.3.

Figure 4.5.4.3

Descriptive Analysis for SP3

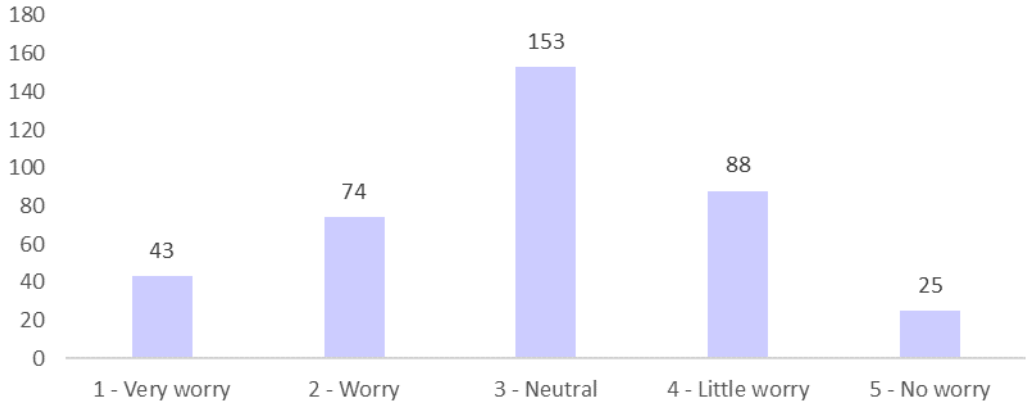


4.5.4.4 How concerned are you about the privacy breach when using the digital payment system? (SP4)

According to the Figure 4.5.4.4, the score of 3 was recognized by the most participants, with 153 out of 383 participants. This means that when most participants use digital payment systems, users' opinion's on how worried they are about privacy leakage remain neutral.

Figure 4.5.4.4

Descriptive Analysis for SP4



4.6 Central Tendencies Measurement of Construct

In this section, we have used statistical software like SPSS to assist in calculating the central tendencies measurement of the data collected. In our survey, we have included Likert scale data starting from Section C: Potential Impact on Implementation, and the series of Likert scale questions has composed of five items which was a 5-point Likert scale with 1 (strongly disagree), 2 (Disagree), 3 (Neutral), 4 (Agree), and 5 (Strongly Agree). The central tendency is used such as mean, median, and mode in the Likert scale as it is able to be analyzed as interval data. Finding the model able to tell use the most frequently occurring number or the most common response to each statement whereas the mean able to give use the overall average response. Also, standard deviation is being calculated to examine how is the data spread in a normal distribution *(Refer Appendix B)*.

4.6.1 Financial Stability (FS)

The table 4.6.1 shows the central tendency measurement of Financial Stability. We can observe the mean score range fall in the range from 2.62 to 3.51 where FS1 contributed the highest-ranking mean which is 3.51 and FS7 has the lowest mean. In terms of mode, FS1 has a mode of 4 indicating the majority of the respondents agree with the statement whereas FS2 to FS6 has a mode of 3 where respondents feel neutral to the statement. FS7 ("It is possible for the CBDC to replace all the existing payment methods") has the lowest mode which is 2 which shows respondents disagree with the statement. From the perspective of standard deviation, the lowest standard deviation of financial stability belongs to the question FS3 which is 0.856 and the highest standard deviation belongs to the FS7.

Table 4.6.1

Central Tendencies of Financial Stability

No.	Question	Sample size	Mean	Median	Mode	Std. Deviation
FS1	CBDC is a more safer instrument than other payment methods to protect funds or save in a time of financial stress.	383	3.51	4	4	0.906
FS2	CBDC will negatively affect the structure of the current banking industry and the process of financial intermediation.	383	3.45	3	3	0.931
FS3	Depositors will withdraw money from the traditional bank and switch bank deposits to CBDC.	383	3.43	3	3	0.856
FS4	There is an increased possibility of a bank run (people rush to withdraw money from deposit account) happening.	383	3.44	3	3	0.941
FS5	CBDC will cause deposit withdrawal from the commercial bank, reducing the bank's ability to lend loans and bank profitability.	383	3.47	3	3	0.900

FS6	With the increase in market capital flows, the risk of financial instability of CBDC will also increases	383	3.48	3	3	0.900
FS7	It is possible for the CBDC to replace all the existing payment methods (E.g., E-wallets/ paper currency/ credit card) in the future.	383	2.62	3	2	1.104

4.6.2 Financial Inclusion (FI)

Table 4.6.2 reveals the central tendencies of financial inclusion. The mean range is between 3.02 and 3.73 whereas the standard deviation range is between 0.858 to 1.135. The question "CBDC allows more people (including unbanked and underbanked) to enjoy and access financial services." (FI1) has the highest mean and lowest standard deviation which are 3.73 and 0.858 respectively followed by "Limited internet access or infrastructure is the barrier to improving financial inclusion." (FI3) is the second highest mean score which is 3.69 over other two questions. The lowest mean and highest standard deviation belong to "Financial inclusion is not an important factor in the issuance of CBDC." (FC4) which are 3.02 and 1.135, respectively.

Table 4.6.2

Central Tendencies of Financial Inclusion

No.	Question	Sample size	Mean	Median	Mode	Std. Deviation
FI1	CBDC allows more people (including unbanked and underbanked) to enjoy and access financial services.	383	3.73	4	4	0.858
FI2	Issuance of CBDC is able to boost economic growth while alleviating poverty.	383	3.64	4	4	0.878
FI3	Limited internet access or infrastructure is the barrier to improving financial inclusion.	383	3.69	4	3	0.934
FI4	Financial inclusion is not an important factor in the issuance of CBDC.	383	3.02	3	3	1.135

4.6.3 Payment (P)

For table 4.6.3 below, we can notice the summary table of the central tendency's measurement of payment. We can detect the mean score range is between 2.82 to 3.73 whereas the standard deviation range is between 0.836 and 1.103. The highest mean belongs to the question "CBDC is able to improve payment efficiency for domestic and cross-border and make it

more convenient for users." (P1) which is 3.73, whereas the highest standard deviation falls under the statement "Cash payment can be eliminated if CBDC is being successfully implemented." (P5) which is 1.103. Besides, the second highest of mean is P3 (3.65), followed by P4 (3.54), P6 (3.52), and P2 (2.91). Statement P5 has the lowest mean score which is 2.82. Apart from that, the second highest standard deviation belongs to P2 which is 0.984 and P3 has the lowest standard deviation which is 0.836. In terms of mode, P1, P3, P4 and P6 has a mode of 4 whereas P2 and P5 has a mode of 3.

Table 4.6.3

Central Tendencies of Payment

No.	Question	Sample size	Mean	Median	Mode	Std. Deviation
P1	CBDC is able to improve payment efficiency for domestic and cross-border and make it more convenient for users.	383	3.73	4	4	0.845
P2	CBDC has no potential to offer low-cost payment services as a public service.	383	2.91	3	3	0.984
P3	CBDC allows for speedier retail payment which boosts competitiveness and decreases costs for businesses and customers.	383	3.65	4	4	0.836

P4	CBDC can be used as an alternative to be existing digital payment systems and used in facilitating assistance payment.	383	3.54	4	4	0.858
P5	Cash payment can be eliminated if CBDC is being successfully implemented.	383	2.82	3	3	1.103
P6	Implementation of CBDC is able to spur innovation and competition in payments.	383	3.52	4	4	0.871

4.6.4 Security and Privacy (SP)

Table 4.6.4 shows the security and privacy central tendencies. The statement S1 ("Under the control and monitoring of the central bank, CBDC is more secure than other payment methods.") has the highest mean score, which is 3.53, followed by S2 (3.43), S3 (3.41) and S4 (2.94). S4 has the lowest mean which is 2.94. Besides, for the ranking of standard deviation, we noted that S4 has the highest standard deviation which is 1.064 followed by S1 (0.973), S3 (0.945), and S2 (0.844). S1 has the mode of 4 whereas the rest of the three statements have a mode of 3.

Table 4.6.4

Central Tendencies of Security and Privacy

No.	Question	Sample size	Mean	Median	Mode	Std. Deviation
S1	Under the control and monitoring of the central bank, CBDC is more secure than other payment methods.	383	3.53	4	4	0.973
S2	A CBDC is able to track illegal activities due to digitalization and the growing centralization of data.	383	3.43	3	3	0.844
S3	CBDC is more likely to pose new threats to the breach of privacy (personal information being stolen).	383	3.41	3	3	0.945
S4	How concerned are you about the privacy breach when using the digital payment system?	383	2.94	3	3	1.064

4.7 Reliability Testing

Table 4.7 shows the summary table of the reliability analysis for each variable. We have conducted Cronbach's Alpha Reliability Analysis which helps us to determine whether the variable especially for multiple question Likert scale surveys is reliable to conduct the test. This is because they are exceedingly

difficult to measure in real life as they might be hidden or unobservable variables. Hence, in order to determine how closely related a set of test items are as a group, we conducted Cronbach's alpha.

Based on the result in Table 4.7 and rule of thumb in Table 4.7.1, we can observe that Financial Stability (FS) has the highest Cronbach's alpha coefficient, which is 0.734 and it indicated that FS has an acceptable internal consistency as it has a score of more than 0.7. Followed by the value of Payment is 0.563, Security and Privacy (0.517) and the lowest value is financial inclusion which is 0.178. Both Payment (P) and Security and Privacy (PI) has poor internal consistency *(Refer Appendix C)*. In this situation, we are looking for a score of over 0.5 for high internal consistency because our items are not more than 10. The value for Financial Inclusion (FI) is not acceptable and we decided to calculate Cronbach's Alpha again by dropping 1 item from it.

Table 4.7

Cronbach's Alpha Reliability Analysis

Variables	Number of items	Cronbach's Alpha Value	Remarks
Financial Stability (FS)	7	0.734	Acceptable
Financial Inclusion (FI)	4	0.178	Unacceptable
Payment (P)	6	0.563	Poor

Security and Privacy (SP)	4	0.517	Poor

Table 4.7.1

Rule of Thumb of Cronbach's Alpha Value

Cronbach's Alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$\alpha \geq 0.8$	Good
$\alpha \geq 0.7$	Acceptable
$\alpha \geq 0.6$	Questionable
$\alpha \geq 0.5$	Poor
$\alpha \leq 0.5$	Unacceptable

Since the Cronbach alpha value of Financial Inclusion (FI) is less than 0.20, we decided to drop the item that has negative average covariance among items. After moving to FI4 in Financial Inclusion, we were able to get a Cronbach alpha value of more than 0.7 which is acceptable to proceed with the test. Below Table 4.7.2 is the summary table of Cronbach's alpha reliability analysis.

Table 4.7.2

Cronbach's Alpha Reliability Analysis After Removing FC4

Variables	Number of items	Cronbach's Alpha Value	Remarks
Financial Stability (FS)	7	0.734	Acceptable
Financial Inclusion (FI)	3	0.785	Acceptable
Payment (P)	6	0.563	Poor
Security and Privacy (SP)	4	0.517	Poor

4.8 Inferential Analysis

Before performing inferential analysis, which is Pearson Correlation Coefficient and multiple regression analysis, we need to deal with the dependent variable and independent variable. The independent variable (Y) which is the willingness of people to use CBDC is nominal data where we assign a dummy variable for the data. For instance, respondents who answer yes (they are willing to use) = 1, otherwise = 0.

Next, for the independent variables (Xs), we have performed Likert scale data for each of the Xs where 1 = "Strongly Disagree", 2 = "Disagree", 3 = "Neutral", 4 = "Agree", and 5 = "Strongly Agree". Also, for each of the independent variables, we have a different number of items under each section. For instance, there are 7

items under financial stability, 3 items under financial inclusion, 6 items under payment, and 4 items under security and privacy.

In order to run multiple regression analysis and also to estimate the correlation between each other, we need to combine the items under each of the independent variables and sections. Hence, the median is the preferred central tendency to perform. The reason that we do not use means to combine the items of the survey is that data for Likert items produce is not continuous. Likert data is a type of ordinal data that is not interval or ratio where it is more suitable to use the median to calculate our data.

For instance, we have 7 items under financial stability (FS1 to FS7). By using the SPSS to transform the variable in order to calculate the median, we will have commands like MEDIAN (FS1, FS2, FS3, FS4, FS5, FS6, FS7) entered in the numeric expression. Hence, we will have 383 observations of X1 (financial stability) where 7 items of each respondent have been transformed into 1 item which is the median of their answer. In simple word, if they have the selection like FS1 = 3, FS2 = 3, FS3 = 3, FS4 = 4, FS5 = 4, FS6 = 4, FS7 = 4, the median of this observation is 4. The same goes with the other 3 independent variables (financial inclusion, payment, and security and privacy), the same step has been performed.

4.8.1 Pearson Correlation Coefficient

In 4.8.1, Pearson correlation coefficient has been conducted in order to estimate the relationship between 2 variables are linearly related. By looking at the result, we are also able to determine whether there is any multicollinearity occurred if two independent variables are highly correlated which one another. Multicollinearity problem happened when

there might be two variables contain same information which make our estimate of a predictor on the response variable less precise and less reliable (Rekha, 2019). Hence, if the independent variable has correlation of more than 0.7, we might suspect there is multicollinearity problem in our model. According to Statisticstechs (2018), the rules of thumb of correlation coefficient was shown below as Table 4.8.1.

Table 4.8.1

Rule of Thumb of correlation coefficient

r	Strength of relationship
< 0.2	Negligible Relationship
0.2 - 0.4	Low relationship
0.4 - 0.7	Moderate relationship
0.7 - 0.9	High relationship
> 0.9	Very high relationship

Table 4.8.1.1 below shows the Pearson Correlation Coefficient test for each of the variables and also the rules of thumb of the correlation coefficient. Based on the results, we can observe that the correlation range falls between 0.222 and 0.302 which the 4 independent variables (financial stability, financial inclusion, payment, and security and privacy) have a low relationship with the dependent variable (Willingness of people to use CBDC).

The highest correlation between x and y is the payment which has a 0.302 correlation with the independent variable. Followed by financial inclusion has a value of 0.298 and financial stability has a value of 0.245. The least correlation coefficient between x and y is security and privacy which shows 0.222 based on the result. Also, correlation coefficient between independent variables is less than 0.7 indicated there might not be multicollinearity problem happened in our model.

From the view of the significance of the relationship, there is a significant relationship between all the independent variables and dependent variables which is lesser than the 0.01 level of significance. Hence, in the research, we are able to reject the null hypothesis and conclude there is a significant relationship between each of the independent variables with the dependent variables *(Refer Appendix D).*

Table 4.8.1.1

The results of the Pearson Correlation Coefficient test

Variable	Willingness	Financial stability	Financial Inclusion	Payment	Security and Privacy

Willingness	Pearson Correlation	1	0.250**	0.298**	0.302**	0.222**
	Sig. (2-tailed)		< 0.001	< 0.001	<0.001	< 0.001
	N	383	383	383	383	383
Financial stability	Pearson Correlation	0.250**	1	0.476**	0.509**	0.493**
	Sig. (2-tailed)	< 0.001		< 0.001	< 0.001	< 0.001
	N	383	383	383	383	383
Financial Inclusion	Pearson Correlation	0.298**	0.476**	1	0.607**	0.527**
	Sig. (2-tailed)	< 0.001	< 0.001		< 0.001	< 0.001
	N	383	383	383	383	383
Payment	Pearson Correlation	0.302**	0.509**	0.607**	1	0.584**
	Sig. (2-tailed)	< 0.001	< 0.001	< 0.001		< 0.001
	N	383	383	383	383	383

Security and privacy	Pearson Correlation	0.222**	0.493**	0.527**	0.584**	1
	Sig. (2-tailed)	< 0.001	< 0.001	< 0.001	< 0.001	
	N	383	383	383	383	383

Noted: ** Correlation is significant at the 0.01 level (2-tailed)

4.8.2 Multiple Linear Regression Analysis

In this section, we will perform a multiple linear regression analysis to investigate how the dependent variable depends on independent variables which means how the willingness of people to use CBDC depends on the potential impact of the implementation of CBDC such as financial stability, financial inclusion, payment, and security and privacy. Hence, we will be able to achieve our objectives of study which is

i. To find out the market expectation of different stakeholders whether they are willing to use CBDC.

Also, we will run 3 models of multiple regression analysis which differentiate the result of overall responses (383 observations), financial institution employees' responses (32 observations), and responses excluding financial institution employees (351 observations). The purpose is to achieve our objective which is

ii. To identify the gap of perspective between professionals like financial institution employees and non-professional respondents such as university students, academics, non-financial institution employees, and retirees.

In this section, we will show 3 different multiple regression models by using SPSS software to calculate. The equation will be

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \mu$$

Where Y denotes willingness of people to use CBDC, X_1 is financial stability (FS), X_2 is financial inclusion (FI), X_3 is payment (P) and X_4 is security and privacy.

It is expected that people are willing to use CBDC if CBDC is designed to make more people financial included, to facilitate payment, and provide more safety measure.

4.8.2.1 Multiple Regression Model Results

Below is the equation of these 3 multiple regression models *(Refer Appendix D)*.

i. Model 1: Included all respondents (383 observations)

$$Y = -0.516 + 0.095 X_1 + 0.156 X_2 + 0.159 X_3 + 0.001 X_4 + \mu$$

(0.146) *** (0.038) (0.040)** (0.051)** (0.045)

ii. Model 2 = Include respondents who is a financial institution employee (32 observations)

$$Y = -1.030 - 0.110\,X_1 + 0.363\,X_2 + 0.368\,X_3 - 0.043\,X_4 + \mu$$

(0.435)** (0.164) (0.150) (0.164) (0.155)

iii. Model 3 = Included all respondents but excluded respondents who is a financial institution employee (351 observations)

$$Y = -0.473 + 0.067\,X_1 + 0.087\,X_2 + 0.107\,X_3 + 0.007\,X_4 + \mu$$

(0.155)*** (0.039)* (0.042)** (0.054)** (0.047)

Below Table 4.8.2 reveals the summary table of comparison between 3 models where we have the independent variables of financial stability, financial inclusion, payment and security and privacy. For model 1, Financial Stability (FS) has a coefficient of positive but insignificant at 1%, 5%, and 10%. It shows a result that a positive result in financial stability, people are more willing to use CBDC. This is what we expected but it has no relationship with dependent variable. Financial inclusion (FI) has positive coefficient of 0.156 and significant at 5%. This indicated that when people are more financial included, people are more willing to use CBDC. Hence, there is a relationship between financial inclusion and willingness of people to use CBDC.

In terms of payment, it has positive coefficient of 0.159 and significant at 5% level which means people are more willing to use CBDC if CBDC is designed to be facilitate the payment. Also, security and privacy have

positive coefficient but no relationship at whether 1%, 5% and 10% alpha level which indicated H_0 cannot be reject.

From the perspective of Model 2, it is about to determine the perspective of professional in terms of their willingness to use CBDC. In Table 31, we can notice there is negative coefficient of financial stability and security and privacy which have a value of -0.429 and -0.177 respectively. For this model, there is no independent variables significant at 1%, 5%, and 10%. Hence, we can conclude there is no relationship between independent variables and dependent variable.

Next, Model 3 is the model that excluded only financial institution employees from the data. Hence, it has 352 observations where the regression show four positive coefficients and they are significant at 5% or 10% expect security and privacy. FS is significant at 10% and has a coefficient of 0.106. Financial inclusion (FI) and Payment (P) is significant at 5% where we able to reject H_0 and conclude there is a relationship between these variables with the dependent variables. However, security and privacy have a p-value of 0.875 where it is not significant at all.

Table 4.8.2

Summary table of comparison between 3 models

Variable	Model 1	Model 2	Model 3
C	-0.516 ***	-1.030 **	-0.473 ***
	(0.146)	(0.435)	(0.155)
Financial Stability	0.095	-0.110	0.106 *
	(0.038)	(0.164)	(0.039)

Financial Inclusion	0.156 **	0.363	0.138 **
	(0.040)	(0.150)	(0.042)
Payment	0.159 **	0.368	0.140 **
	(0.051)	(0.164)	(0.054)
Security and Privacy	0.001	-0.043	0.010
	(0.045)	(0.155)	(0.047)
R^2	0.118	0.340	0.106
F-statistic	1.9429E-9 ***	0.021**	7.1374E-8 ***

Note: * P-value (< 10%), ** P-value (< 5%), *** P-value (< 1%)

Model 1 = Included all respondents (383 observations)

Model 2 = Include respondents who is a financial institution employee (32 observations)

Model 3 = Included all respondents but excluded respondents who is a financial institution employee (351 observations)

4.8.2.2 Measure of Goodness Fit

R-square or known as goodness of fit is an important indicator to show how well the dependent variable can be explained by independent variables. Hence, by looking at the summary output in Table 4.8.2, Model 1 has a R-squared of 0.118 which indicated that 11.8% of the total variation of willingness of people to use CBDC is explained by independent variables such as FS, FI, P, and SP whereas 88.2% is explained by other independent variables which are not included in the model. Same goes with the Model 2 where the R-squared is 34% which

means 34% of variables fits the model well. Also, Model 3 only has 10.6% of R-squared which is lowest compared to other 2 models.

4.8.2.3 F-test Hypothesis Testing

F-test hypothesis testing has been conducted to estimate the overall significancy of the model. For F test, it assumed that at least one slope of coefficient is not equal to zero. Below are the hypotheses:

H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$

H_1: At least one $\beta_i \neq 0$, where i = 1, 2, 3, 4

Based on Table 4.8.2 above, both three models are significant where Model 1 and Model 3 is significant at 1%, 5%, and 10%. Model 2 has a value of 0.021 which significant at 1% and 5%. We are able to reject the null hypothesis and conclude there is a relationship between all of the independent variables with the dependent variables.

4.9 Conclusion

In short, this chapter present the overall findings and analysis of the data collected from respondents via the survey distributed. All of the data has been summarized and analyzed using the SPSS software to examine the validity of the variables assessed in the study and the significant relationship between the independent and dependent variables. Also, by using descriptive statistics, we are able to see clearly the overall demographic profile of the data collected and the central tendency measurements of construct also being assessed.

CHAPTER 5 DISCUSSION AND CONCLUSION

5.0 Introduction

In this chapter, we will discuss the summary of our findings and some statistical analysis. Also, we will try to reach out to some recommendations for further research, challenges, limitation of this study, and implications based on our discussion and findings.

5.1 Summary of Statistic Analysis

Section 5.1 will summarize the summary of statistical analysis which is descriptive analysis and inferential analysis such as Pearson correlation coefficient and multiple regression analysis that implemented in Chapter 4 analysis and interpretation of results.

5.1.1 Summary of descriptive analysis

In our survey, we have collected 383 responses who are our targeted stakeholders. Under demographic profile, we have 50.7% of male and 49.2% female who all comes from different of age group. The 18 to 25 years old age group is the majority which comprises 58% followed by 26 to 35 years

old which contributed 27.4%. The remaining 14.6% of the respondents belong to the 36 to 45 years old group, 46 to 55 years old group, and 56 years and above age group.

From the perspective of education, approximately half of the respondents have attained a bachelor's degree level. 14.9% of respondents graduated with a diploma, 13.6% graduated from SPM, while a small percentage of respondents attained a master's degree and Ph.D. which comprises 6.3% and 0.8% respectively.

Followed by occupation, a university student has a greater percentage which is 53.5%. 27.4% of respondents come from non-financial institution employees, 8.4% belong to financial institution employees and 7.6% come from academics whereas the rest of the remaining is from other occupations. For monthly income level, there is 33.4% of respondents have income below RM1,000 due to a greater percentage of university students. 25.8% of respondents have a monthly income between RM1,001 to RM3,000. The income range between RM3,001 to RM5,000 has 24.3% whereas 12.3% of respondents have an income of RM5,001 to RM8,000.

Followed by the living area, 59% of respondents live in the city area, 33.2% live in the town area whereas 7.8% live in the rural area. In terms of owning a smartphone, 98.7% own it while 1.3% of respondents do not have it. In addition, 60.8% of respondents still preferred to use cash in their daily transactions, followed by 56.7% of people who used E-wallets and 51.7% of people who used debit cards. Some respondents also preferred to use mobile banking apps and credit cards which comprised 41.5% and 27.4% respectively.

Also, approximately half of the respondents do not know and heard of CBDC. 26.6% somewhat heard it but not yet followed the news, 19.6% of respondents have occasional attention to CBDC, whereas a small percentage of respondents have some regular attention and in-depth research. Furthermore, 69.2% of respondents do not have any investment experience in digital currency although, there is a large percentage of respondents know different kinds of digital currency. Interestingly, a huge percentage of respondents (50.9%) think that digital currency has greater potential for development, 33.9% of respondents feel general development prospects whereas 15.1% believed it has poor prospects for development.

5.1.2 Summary of Inferential Analysis

In Chapter 4, we did two inferential analysis which is Pearson correlation coefficient and multiple regression analysis. All of the result and interpretation will be summarized in the following Section 5.1.2.1 and 5.1.2.2 respectively.

5.1.2.1 Pearson Correlation Coefficient

By using the SPSS software to calculate the Pearson correlation coefficient, all 4 independent variables (financial stability, financial inclusion, payment, and security and privacy) have a positive relationship with the dependent variable (willingness of people to use CBDC). First and foremost, the relationship between financial stability with the willingness of people to use CBDC is 0.250, followed by financial inclusion is 0.298. Payment has a correlation of 0.302 whereas security and privacy have a 0.222 Pearson correlation coefficient.

5.1.2.2 Multiple Regression Analysis

We have performed three models of the multiple regression analysis where Model 1 discusses overall respondents, Model 2 included financial institution employees, and Model 3 excluded financial institution employees.

For the first model. all of the independent variables have a positive coefficient where the highest coefficient value belonged to payment which is 0.159 whereas the lowest coefficient value is security and privacy which is 0.001. In addition, there are two variables (financial inclusion and payment) has a significant relationship with dependent variables as it has a p-value of less than 0.05. Financial stability and security and privacy are not significant at an alpha value of 0.05. In terms of R-square, 11.8% of the variation of the independent variables can affect the dependent variable.

In terms of Model 2, R-square is approximately 34% and the overall F-statistic is significant at 5% and 10%. By looking at the coefficient, financial stability and security and privacy has a negative coefficient which it has a value of - 0.110 and - 0.043, respectively. The other two independent variables (financial inclusion and security and privacy) have a positive coefficient. However, T-statistic for four independent variables is not significant at 1%, 5%, and 10%.

By excluding financial institution employees from the observation, we have an R-square of 10.6% and the F-statistic is significant at 1%, 5%, and 10%. Overall coefficients are similar to Model 1 where we have positive coefficients for all the variables and T-statistic for financial inclusion and payment is significant at 5%. The difference is that the T-statistic of

financial stability for Model 3 is significant at 10% where it has a value of 0.087.

5.2 Discussion of significant findings

Based on our study, there is a relationship between a dependent (willingness of people to use CBDC) and independent variables (financial stability, financial inclusion, payment, security and privacy).

Based on the summary table of the ANOVA test which is Table 4.8.2 shown before, we clearly understand the importance of the P value for financial stability and security, and when we assume that the alpha value (error percentage) is 5% or 0.05, we get the result that privacy is not important. The p-value of financial stability is 0.112 and the p-value of security and privacy is 0.990, both of which are greater than 5%. This means that there is not enough evidence to conclude there is a significant relationship at 5% significance level.

In addition, according to the Table 5.2, we can know that the P-value of financial inclusion and payment are 0.015 and 0.020, respectively, and these two independent variables are obviously less than 5%. So, we can conclude from here that financial inclusion and payment are significantly related to people's willingness to use CBDC because it is significant at the level of 5%.

Finally, the P value between all independent variables (financial stability, financial inclusion, payment, security, and privacy) and dependent variables (people's willingness to use CBDC) is 0.000, which is less than our assumed alpha value of 5%. Therefore, we can conclude that the overall model is important when there is a relationship between dependent variables and independent variables.

Table 5.2

Summary table of significance findings for 383 observations

Relationships Findings	Alpha < 0.05	Conclusion
There is no relationship between the willingness of people to use CBDC and financial stability.	0.112 > 0.05	Insignificant
There is a relationship between the willingness of people to use CBDC and financial inclusion.	0.015 < 0.05	Significant
There is a relationship between the willingness of people to use CBDC and payment.	0.020 < 0.05	Significant
There is no relationship between the willingness of people to use CBDC and security and privacy.	0.990 > 0.05	Insignificant
There is a relationship between a dependent (willingness of people to use CBDC) and independent variables (financial stability, financial inclusion, payment, and security and privacy).	0.000 < 0.05	Significant

5.3 Implication of the study

The CBDC is also known as the digital form of a country's fiat currency which is also claimed by the central bank. This CBDC is not issuing on printing money but

issues on the electronic coin or accounts where all the accounts are full faith and credited by the governments. The major difference between cryptocurrencies and the CBDC is that cryptocurrencies are private money whereas the CBDC is a government-backed form of money that is safer and trustier to buy. Moreover, the cryptocurrencies use the permissionless open network while the CBDC uses a private permissioned open network to operate.

From the result of the survey, Malaysia's citizens are not that familiar with the concept of the CBDC and the difference between CBDC and cryptocurrencies. Also, the majority of them do not know what CBDC all is about. But glad to know that Malaysian citizens are eagerly wanting to know how the CBDC works and will give a try on using the digital currencies that are carried out by the government. So, if the government wants to implement these CBDC systems in Malaysia, much work has to be done to make sure the citizens of Malaysia know these systems and the concept before so that people are willing to trust them. Moreover, much education and advertisement need to be done to give the users of the CBDC payment systems more confidence and security in the system provided by the government.

For the current conditions in Malaysia nowadays, the technical problems and financial problems are not yet mature enough to implement this CBDC payments system in a short period. The country which implemented the CBDC systems and digital currencies depends on its economic situation. Bahamas, Nigeria, China, Sweden, and other 16 countries currently use the CBDC payment system because of some motivation which is to provide an easy and safest way to access money for the unbanked and underbanked population to introduce competition in the domestic payments market which provide people cheaper and better options access to money. These CBDC payment systems also provide cheaper and better access to money thus increasing the efficiency in payment and lowering the transaction costs. Malaysia as a developing country needs to focus more on its

domestic products and after the economy is more stable then can enter the CBDC digital currencies for more efficiency of users in Malaysia.

The CBDC that have the innovation and competitions also supporting future payment systems that people required since the digital payments are rapidly changing in response to an increasing integration into evolving digital services. These changes will make the future day more depend on novel of use cases and payments requirement for today. So, the Malaysia's government may need to consider the current and possible future demands in their CBDC design thus knowing which the technology will be harnessed such as programmable money and encouraging innovation and competition among intermediaries to evolve with these digital economies.

From the other view of perspective, we are able to find that a professional person who is working in a financial institution has the opinion that the issue of CBDC by the central bank has a negative impact on them. Whether it will affect the profitability of banks or reduce the ability of lending loans and bank disintermediation may occur. Based on the result, we able to notice there is negative coefficient for financial stability and security and privacy which proved there is a negative relationship. They might do not have confidence on the prospect of the CBDC launched by central bank.

5.4 Limitations of the study

Throughout the study of this survey, there is a significant relationship between the potential impact of the implementation of CBDC and the Malaysian economy. While conducting this research, there are a few limitations occurred in this research.

The first limitation of this research topic is the study has a big sampling size. This big sampling size is based on the citizens in Malaysia covered with the university student, academic, non-financial institution employees, financial institution employees, retirees, university fresh graduates, mechanics, and form 6 students. Because the coverage of this sampling size is too big for us when doing the research in Kampar, we only get limited respondents which are different from the categories of university students and university fresh graduates. Most of the financial employees and non-financial institution employees are from our relatives and cousins who are working in the related field; thus, the majority are university students. There is also limited time consuming for getting more of the respondent to get a better result.

Furthermore, since the research is very new and not so popular in Malaysia, many of the citizens do not understand the problem of this study while some of them just know little knowledge about the CBDC and heard of it only. This caused the result of the survey to have many neutral responses, and this also showed that the citizens in Malaysia have less awareness about the potential impact of the implementation of CBDC in Malaysia.

5.5 Recommendations of the study

There are some recommendations and solutions to solve the limitation of research to make this research more precise and more accurate.

5.5.1 Limitation of the sample size

Since the research topic's potential impact of the implementation of CBDC in Malaysia's economy involves many different levels of people conducting research, the data collection may be too big, and the difficulties of collecting all the data precisely. Hence, the suggestion for future research may be to conduct the survey form in the smaller circle such as conducting this survey in Kampar, Perak citizens first, then after collecting all the data from Kampar's citizens can move forward to the next country as well. Hopefully, this suggestion can be considered for future research.

5.5.2 Lack of popularity

In Malaysia, the CBDC can be considered as a new term because majority did not know what the CBDC is and what CBDC does. Most of the people are confused a security and privacy bout CBDC and cryptocurrency and they might know about cryptocurrency more than CBDC. These problems happened when we were conducting the survey form and many respondents required explanations about what CBDC is and got confused about CBDC and cryptocurrency. Therefore, the government should create more awareness of the CBDC since Malaysia has the intention to launch this CBDC in the future. Social media such as YouTube, Facebook, television, broadcasting and radio stations can be the tools to create awareness of people in Malaysia to let them know about the function of CBDC. If the public knows about the CBDC, they will have their own opinion about this implementation, and this will also be helpful for future research.

5.6 Conclusion

From the result, we can conclude that there are four independent variables which are financial stability, financial inclusion, payment, and security and privacy have a low relationship with the dependent variable which is the willingness of people to use CBDC. But from the view from the significance of the relationship, the independent variables and dependent variables have the significant relationship which all of them less than 0.01 level of significance thus we can reject all the null hypotheses.

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Appendixes

Appendix A: Questionnaire

Title: Potential Impact of the Implementation of Central Bank Digital Currency (CBDC) Towards Malaysia's Economy

Dear respondents,

Good day to you. We are students from Universiti Tunku Abdul Rahman (UTAR). Thank you for your valuable time to complete this survey. This survey is available for all respondents in Malaysia. We are trying to conduct a final year project on the potential impacts of the implementation of central bank digital currencies (CBDC) towards Malaysia's economy.

Central Bank Digital Currencies (CBDC) is a currency issued and governed by the central bank digitally and valid as legal tender. Bank Negara Malaysia had undertaken a multi-year CBDC exploration and that the Finance Sector Blueprint 2022-2026 had highlighted the road map for it. Recently, a Dunbar project which joined by BIS Innovation Hub and central banks of Australia, Malaysia, Singapore, and South Africa has completed where this project identified challenges of implementing a multi-CBDC platform shared across central banks and proposes practical solution designs to address them.

Hence, the purpose of the survey is to collect data on the level of understanding or perception and the market expectation of different stakeholders about the potential impact of the implementation of CBDC. We appreciate your participation as it will help us understand better and clearly on our research project.

The entire survey is expected to take no more than 10 minutes and all questions in this survey are provided with a multi-choice answer. Before you start, here is something you should know.

This survey consists of 4 sections which are:
Section A: Background
Section B: Level of Understanding or Perception of the Concept
Section C: Potential Impacts on Implementation
Section D: Market Expectation

All information provided by the respondents will be kept confidential and will be used only for educational purposes. You will not be identified as no names are required for participating in this research. The data collected will only be accessed by the researchers and the supervisor of the researchers.

This is an anonymous survey, and you are not required to provide your name anywhere in this survey. Also, please be informed that this survey will be conducted in accordance with Personal Data Protection Act 2010 ("PDPA").

By continuing to complete the following survey, you are indicating that you agree with the terms above. If you do not agree with any terms above, you may withdraw from this survey. Thanks for your participation.

Should you meet any problems or have any relevant quires, feel free to contact us.

Cheng Hong Bee (2004182)
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Section A: Background

This section collects basic background information of the respondent in order to better understand the situation and characteristics in terms of the gender, age group, income level, job fields, education level, and the types of payment used daily to perform transactions.

1) What is your gender identity?

( ) Male

( ) Female

2) What is your age group?

( ) 18-25

( ) 26-35

( ) 36-45

( ) 46-55

( ) 56 years and above

3) What is your highest education level attained?

( ) SPM/ O-level

( ) STPM/ A-level/ UEC and equivalents

( ) Diploma

( ) Bachelor's Degree

( ) Master's Degree

( ) Ph.D. Doctorate's Degree

( ) Others

4) Are you a?

( ) University student

( ) Academic

( ) Non-financial institution employees

( ) Financial institution employees

( ) Retiree

( ) Others

5) What is your monthly income level?

( ) Below RM1,000
( ) RM1,001 – RM3,000
( ) RM3,001 – RM5,000
( ) RM5,001 – RM8,000
( ) RM8,001 – RM10,000
( ) RM10,001 and above

6) Where is your living area?

( ) Rural
( ) Town
( ) City

7) Do you own a smartphone?

( ) Yes
( ) No

8) What types of payment methods do you prefer to use? [More than 1 option allowed]

( ) Cash
( ) Debit card
( ) Credit card
( ) Mobile payment (Banking Apps)
( ) Mobile payment (E-wallet such as TNG)
( ) Others

Section B: Level of Understanding or Perception of the Concept of CBDC

This section collects information regarding the level of understanding or perception of the concept of CBDC. There will be a multiple-choice question to understand the awareness of or heard of any CBDC concept.

1) How far to what extent do you heard and know the CBDC?

( ) Do not know
( ) Somewhat heard but not yet followed

( ) Occasional attention
( ) Regular attention
( ) In-dept research

2) What kind of digital currency do you know? [More than 1 option allowed]
( ) Bitcoin (BTC)
( ) Ethereum (ETH)
( ) Solana (SOL)
( ) Polkadot (DOT)
( ) Do not know

3) What is your investment experience in digital currency?
( ) No experience
( ) Within one year
( ) One to five years
( ) More than five years

4) What do you think of the development prospects of digital currency?
( ) Great potential for development
( ) General development prospects
( ) Poor prospects for development

5) What is the reason you do not think digital currency will be useful as medium of exchange or investment option? [More than 1 option allowed]
( ) Volatility in value and speculative risks
( ) Likely to be hacked
( ) The trading platform has operational risks
( ) Inadequate regulation and vulnerability to financial fraud
( ) Other

6) Do you think a CBDC is a type of cryptocurrency?
( ) Yes
( ) No
( ) Maybe

Section C: Potential Impacts on Implementation

This section collects data on the potential impacts of the implementation of CBDC towards the different stakeholders. There will be 4 parts in this section which are potential impacts on financial stability, financial inclusion, payments, and security and privacy. There will be matrix questions with a series of Likert scale questions which composed of five items. The rating scale given was a 5-point Likert scale with 1 (strongly disagree) and 5 beings (strongly agree).

Part I: Financial Stability

Financial stability refers to the process where there is a smoothly flowing of funds between suppliers of funds and demand of funds and efficient allocation of funds. This is one of the policy goals of central banks to achieve soundness financial system.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1) CBDC is a more safer instrument than other payment methods to protect funds or save in a time of financial stress.	1	2	3	4	5
2) CBDC will negatively affect the structure of the current banking industry and the process of financial intermediation.	1	2	3	4	5
3) Depositors will withdraw money from the traditional bank and switch bank deposits to CBDC.	1	2	3	4	5
4) There is an increased possibility of bank run	1	2	3	4	5

(people rush to withdraw money from deposit account) happening.					
5) CBDC will cause deposit withdrawal from the commercial bank, reducing the bank's ability to lend loans and bank profitability.	1	2	3	4	5
6) With the increase in market capital flows, the risk of financial instability of CBDC will also increases.	1	2	3	4	5
7) It is possible for the CBDC to replace all the existing payment methods (E.g., E-wallets/ paper currency/ credit card) in the future.	1	2	3	4	5

Part II: Financial Inclusion

Financial Inclusion refers to all the citizens (people at the age of 15 years old and above) who have the right to access convenient and affordable financial products and services. They are effective and have quality access to perform daily transactions and payments, savings, credit, and insurance.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1) CBDC allows more people (including unbanked and underbanked) to enjoy and access financial	1	2	3	4	5

services.					
2) Issuance of CBDC is able to boost economic growth while alleviating poverty.	1	2	3	4	5
3) Limited internet access or infrastructure is the barrier to improving financial inclusion.	1	2	3	4	5
4) Financial inclusion is not an important factor in the issuance of CBDC.	1	2	3	4	5

Part III: Payment

Due to the advancement of technology, mobile payment or internet payment in the future is unavoidable. The future of the mobile payment business will be determined by the interplay between efficiency and security.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1) CBDC is able to improve payment efficiency for domestic and cross-border and make it more convenient for users.	1	2	3	4	5
2) CBDC has no potential to offer low-cost payment services as public service.	1	2	3	4	5
3) CBDC allows for speedier retail payment which boosts competitiveness and decreases costs for	1	2	3	4	5

businesses and customers.					
4) CBDC can be used as an alternative to be existing digital payment systems and used in facilitating assistance payment.	1	2	3	4	5
5) Cash payment can be eliminated if CBDC is being successfully implemented.	1	2	3	4	5
6) Implementation of CBDC is able to spur innovation and competition in payments.	1	2	3	4	5

Part IV: Security and Privacy

Since CBDC is a type of digital payment which involved mobile payment, it involved the use of the technology framework to perform transactions. Security and privacy refer to information confidentiality which not available to non-recipients and protection of the money saved in accounts.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1) Under the control and monitoring of the central bank, CBDC is more secure than other payment methods.	1	2	3	4	5
2) A CBDC is able to track illegal activities due to digitalization and the growing centralization of	1	2	3	4	5

data.					
3) CBDC is more likely to pose new threats to the breach of privacy (personal information being stolen).	1	2	3	4	5
4) How concerned are you about the privacy breach when using the digital payment system?	1	2	3	4	5

Section D: Market expectation

This section collects data on the market expectation of different stakeholders. There will be a multiple-choice question to choose from (some questions allow you to choose more than 1) in order to collect your opinion and expectation of the implementation of CBDC by the central bank in Malaysia.

1) Do you expect to use central bank digital currency (CBDC)?

( ) Yes

( ) No

( ) Maybe

2) How likely central bank will use a CBDC in the following time horizons?

( ) Short term (Within the next there years)

( ) Medium-term (4-6 years)

( ) Long-term (More than 6 years)

( ) Do not know

3) What do you think are the main obstacles to the launch of the central bank digital currency in Malaysia? [More than 1 option allowed]

( ) Legal and regulatory constraints

( ) Immature technological base

( ) The application scenario is unclear

( ) Inadequate supporting financial infrastructure
( ) Impact on commercial banks and third-party payment businesses and resistance from commercial banks and third-party payment institutions
( ) Unacceptable to users
( ) Economic conditions
( ) Other

4) What are the features that attract you to use CBDC if being successfully implemented? [More than 1 option allowed]
( ) Interest-bearing
( ) More secure
( ) Faster payment
( ) Lower cost
( ) Improve convenience and transparency
( ) Legal tendency
( ) Transparency and privacy
( ) Reduce illegal and criminal activities
( ) Others

5) What are the features that discourage you to use CBDC if being successfully implementation? [More than 1 option allowed]
( ) Less understanding on the concept of debt
( ) Immature system
( ) Worried money being hacked
( ) No or limited internet access
( ) Inconvenience to use
( ) Other

6) If CBDC is non-interest-bearing but is still protected by the central bank, will you be willing to use it?
( ) Yes
( ) No
( ) Maybe

7) Do you expect a CBDC have "offline" capabilities?

( ) Yes

( ) No

( ) Maybe

That's all for the survey. Thank you for your participation and we appreciate your effort and time.

Appendix B: Central Tendencies Measurement of Construct

Financial stability:

Statistics

		FS1	FS2	FS3	FS4	FS5	FS6	FS7
N	Valid	383	383	383	383	383	383	383
	Missing	0	0	0	0	0	0	0
Mean		3.51	3.45	3.43	3.44	3.47	3.48	2.62
Median		4.00	3.00	3.00	3.00	3.00	3.00	3.00
Mode		4	3	3	3	3	3[a]	2
Std. Deviation		.906	.931	.856	.941	.900	.900	1.104

a. Multiple modes exist. The smallest value is shown

Financial Inclusion:

Statistics

		FI1	FI2	FI3	FI4
N	Valid	383	383	383	383
	Missing	0	0	0	0
Mean		3.73	3.64	3.69	3.02
Median		4.00	4.00	4.00	3.00
Mode		4	4	3	3
Std. Deviation		.858	.878	.934	1.135

Payment:

Statistics

		P1	P2	P3	P4	P5	P6
N	Valid	383	383	383	383	383	383
	Missing	0	0	0	0	0	0
Mean		3.73	2.91	3.65	3.54	2.82	3.52
Median		4.00	3.00	4.00	4.00	3.00	4.00
Mode		4	3	4	4	3	4
Std. Deviation		.845	.984	.836	.858	1.103	.871

Security and Privacy:

Statistics

		S1	S2	S3	S4
N	Valid	383	383	383	383
	Missing	0	0	0	0
Mean		3.53	3.43	3.41	2.94
Median		4.00	3.00	3.00	3.00
Mode		4	3	3	3
Std. Deviation		.973	.844	.945	1.064

Appendix C: Reliability Analysis

Scale: Financial stability

Case Processing Summary

		N	%
Cases	Valid	383	100.0
	Excluded[a]	0	.0
	Total	383	100.0

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

Reliability Statistics

Cronbach's Alpha	N of Items
.734	7

Scale: Financial inclusion

Case Processing Summary

		N	%
Cases	Valid	383	100.0
	Excluded[a]	0	.0
	Total	383	100.0

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

Reliability Statistics

Cronbach's Alpha	N of Items
.178	4

Scale: Payment

Case Processing Summary

		N	%
Cases	Valid	383	100.0
	Excluded[a]	0	.0
	Total	383	100.0

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

Reliability Statistics

Cronbach's Alpha	N of Items
.563	6

Scale: Security and Privacy

Case Processing Summary

		N	%
Cases	Valid	383	100.0
	Excluded[a]	0	.0
	Total	383	100.0

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

Reliability Statistics

Cronbach's Alpha	N of Items
.517	4

Appendix D: Pearson Correlation Coefficient Test

Correlations

		Y	FSMed	FIMed	PMed	SMed
Y	Pearson Correlation	1	.250**	.298**	.302**	.222**
	Sig. (2-tailed)		<.001	<.001	<.001	<.001
	N	383	383	383	383	383
FSMed	Pearson Correlation	.250**	1	.476**	.509**	.493**
	Sig. (2-tailed)	<.001		<.001	<.001	<.001
	N	383	383	383	383	383
FIMed	Pearson Correlation	.298**	.476**	1	.607**	.527**
	Sig. (2-tailed)	<.001	<.001		<.001	<.001
	N	383	383	383	383	383
PMed	Pearson Correlation	.302**	.509**	.607**	1	.584**
	Sig. (2-tailed)	<.001	<.001	<.001		<.001
	N	383	383	383	383	383
SMed	Pearson Correlation	.222**	.493**	.527**	.584**	1
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	
	N	383	383	383	383	383

**. Correlation is significant at the 0.01 level (2-tailed).

Appendix E: Multiple Regression Analysis

Model 1 (Included All Respondents):

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	SMed, FSMed, FIMed, PMed[b]	.	Enter

a. Dependent Variable: Dum1

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.344[a]	.118	.109	.47201

a. Predictors: (Constant), SMed, FSMed, FIMed, PMed

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.299	4	2.825	12.679	.000[b]
	Residual	84.215	378	.223		
	Total	95.514	382			

a. Dependent Variable: Dum1

b. Predictors: (Constant), SMed, FSMed, FIMed, PMed

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	-.516	.146		-3.543	.000	-.803	-.230
	FSMed	.060	.038	.095	1.592	.112	-.014	.135
	FIMed	.099	.040	.156	2.436	.015	.019	.178
	PMed	.119	.051	.159	2.345	.020	.019	.219
	SMed	.001	.045	.001	.012	.990	-.087	.088

a. Dependent Variable: Dum1

Model 2 (Financial Institution Employees Only):

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	SPMed, FIMed, PMed, FSMed[b]	.	Enter

a. Dependent Variable: Y

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.583[a]	.340	.242	.439

a. Predictors: (Constant), SPMed, FIMed, PMed, FSMed

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.674	4	.669	3.470	.021[b]
	Residual	5.201	27	.193		
	Total	7.875	31			

a. Dependent Variable: Y

b. Predictors: (Constant), SPMed, FIMed, PMed, FSMed

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	-1.030	.435		-2.369	.025	-1.922	-.138
	FSMed	-.070	.164	-.110	-.429	.672	-.406	.266
	FIMed	.244	.150	.363	1.627	.115	-.064	.551
	PMed	.248	.164	.368	1.514	.142	-.088	.584
	SPMed	-.027	.155	-.043	-.177	.861	-.346	.291

a. Dependent Variable: Y

Model 3 (Exclude Financial Institution Employees Only):

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	SPMed, FSMed, FIMed, PMed[b]	.	Enter

a. Dependent Variable: Y

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.326[a]	.106	.096	.476

a. Predictors: (Constant), SPMed, FSMed, FIMed, PMed

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.300	4	2.325	10.275	.000[b]
	Residual	78.290	346	.226		
	Total	87.590	350			

a. Dependent Variable: Y

b. Predictors: (Constant), SPMed, FSMed, FIMed, PMed

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	-.473	.155		-3.052	.002	-.777	-.168
	FSMed	.067	.039	.106	1.714	.087	-.010	.144
	FIMed	.087	.042	.138	2.053	.041	.004	.170
	PMed	.107	.054	.140	1.972	.049	.000	.213
	SPMed	.007	.047	.010	.157	.875	-.086	.100

a. Dependent Variable: Y

(APPENDIX I)

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Yours truly,

hongbee

_____

(*Cheng Hong Bee*)

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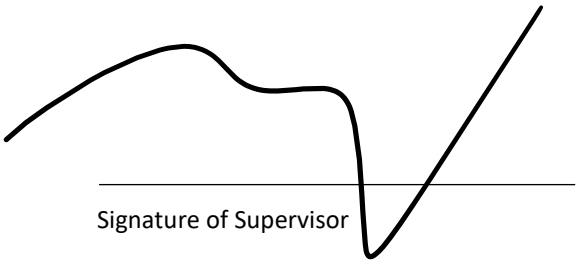

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CHAPTER 1: INTRODUCTION

1.0 Introduction

This research is to study the potential impacts of the implementation of CBDC towards Malaysia's economy. In this chapter, we will discuss the background of the study, problem statement, research objectives, research questions and the significance of the study.

1.1 Background of the study

The 2022 Olympic Winter Games were held by the People's Republic of China in Beijing, the capital of China, from 4 February 2022 to 20 February 2022. During the Winter Olympics, China deputed its central bank digital currency (CBDC) known as the digital yuan to the world. In addition to cash, foreign visitors and athletes were allowed to use this digital yuan for retail payments in China (Light, 2022). The Digital yuan, China's CBDC, is a digital version of China's fiat money with legal tender status. Using digital yuan for payments only involves two simple steps. The first step is setting up a digital wallet through a mobile app created by China's central bank and transferring your money into this digital wallet. The second step is making payment for a transaction by showing the barcode to the sellers (Kharpal, 2021).

Due to the advanced development in technology, technology particularly the smartphone or mobile phone has been used in recent years by the majority of people. This stimulated innovation in the finance industry which changed the digital finance landscape very quickly. For instance, the rapid shift in focus from "Fintech" which

emerged in the last decade and then to “cryptocurrency” and then to “CBDC" in today's (Ozili, 2022). Central Bank Digital Currency (CBDC) is literally a currency issued by a central bank in a country digitally. CBDC is a new or third form of central bank money alongside physical cash and central bank reserves. It is valid as legal tender for all transactions since it is backed by the credit of the government and intended to be a digital equivalent of cash for use by end users such as businesses and households (Boar & Wehrli, 2021). Nowadays, the emergence of digital currencies such as Bitcoin and the underlying blockchain has attracted a lot of attention. Hence, a new growing discussion appears which is the new payment technology: Central Bank Digital Currency (CBDC) receiving more attention than ever before since the current global Covid-19 pandemic.

In fact, China is not the only country that is working on CBDC. Many central banks are exploring their version of digital money intending to provide the same functions and features as existing central bank money such as cash. As of 2022, according to a survey from Bank for International Settlements (BIS), currently, 87 central banks in the world are working on CBDC, of which 15 of them are doing pilots for CBDC such as China and South Korea, and 9 of them have launched the CBCD such as Nigeria (Atlantic Council, 2022). Most central banks intend to provide CBDC for retail payment purposes (BIS, 2021). This indicates that most of the central banks intend to provide a central bank digital money that is available for public use rather than only allowing the use of this new digital money for wholesale payments such as interbank settlements.

In March 2021, Bank Negara Malaysia (BNM), Malaysia’s central bank, stated that there were no immediate plans to issue a digital form of central bank money since Malaysia's current financial system is capable of meeting the needs of individuals and businesses effectively and efficiently. The existing monetary policy remains effective to safeguard Malaysia's economy and financial stability, and existing payment systems continue to meet the needs of the economy. In June 2021, BNM announced that it would focus on developing and researching CBDC for wholesale payment rather than the retail CBDC (BNM, 2022).

In September 2021, BNM joined the first cross-border payment CBDC project called Dunbar, which is a project to explore the use of CBDC for cross-border payments between connected countries. This project involves parties namely Bank for International Settlements Innovation Hub Singapore Centre, central banks from Australia, Singapore, South Africa and Malaysia. This project attempts to develop a platform that allows the payments between countries using the CBDC issued by different central banks, and explore whether CBDC could achieve lower cost, safer, and more efficient cross-border payments (BNM, 2022).

The number of central banks exploring the use of CBDC is increasing, of which a total of 87 countries are working on CBDC as compared to only 35 countries in May 2020 (Atlantic Council, 2022). This indicates that CBDC has become a major concern of many countries around the world, and CBDC is likely to be issued by central banks shortly. This raises the question of why central banks are considering and actively working on CBDC. One possible reason is the threat from the emergence of privately issued assets such as private digital currencies (Writer, 2021).

According to Bank Negara Malaysia (BNM), private digital currencies are generally referred to as cryptocurrencies. This type of money is not widely used for retail payments due to its volatile nature. Cryptocurrency is volatile since its value depends on market forces, and it is subject to greater risks such as cyber threats due to a lack of governance (BNM, 2022). Thus, cryptocurrency is treated as a form of financial instrument rather than money that is used for payments. To overcome the high volatility nature of cryptocurrency, a new concept called Stablecoins has been introduced. Stablecoins is a new type of cryptocurrency that is similar to traditional cryptocurrency but with a major difference, which is backed by high liquidity and low-risk assets such as the country's currency and commodities such as gold. Stablecoins have the potential to be accepted as a means of payment (BNM, 2022).

During an online interview conducted by Nikkei Asia, the director of the Bank for International Settlements Innovation Hub, Benoit Coeure, said that central banks all over the world did not pay enough attention to CBDC before the introduction of the

Meta' Libra project. He mentioned that Central banks see the Libra project as a threat to the country's monetary system due to its large scale, which involves hundreds of millions of users (Writer, 2021).

Libra is Meta's Stablecoins project, which was introduced by Meta in June 2019. The goal behind the Libra project is to provide Facebook users with a stable digital currency that could be used globally. Most Governments around the world resist this new idea from Facebook and have put increasing pressure to prevent the launching of Libra. They believed it would heavily affect the global financial system and the position of country currencies. The reasons for that belief would be based on the popularity of Facebook. As of July 2019, Facebook has more than 2 billion monthly active users which makes Facebook an influential social media platform. Due to the legal challenges, Meta has changed Libra to Diem in December 2020 and plans to issue Diem Stablecoins shortly (Browne, 2019).

As of October 2021, according to Coinmetrics, the Stablecoins market has grown at an increasing rate, with the market capitalization of all stablecoins on average 25 times higher as compared to January 2020. 'Tether' and 'USD Coin' are the top two Stablecoins that are widely accepted and actively traded (Cecchetti & Schoenholtz, 2021). The wide adoption of private digital currencies such as Stablecoins could threaten financial stability and monetary sovereignty. Central banks may face losing control over the economy and financial system. Large-scale adoption of private digital currencies would impact the effectiveness of the monetary policy, and central banks could find traditional monetary policy tools are no longer effective (Echelpoel, 2020). In addition, large-scale adoption of private digital currencies may give the private digital currencies issuing companies excessive market power over the payment system, and thus potential adverse impacts on the country's monetary system (Authority of the House of Lords, 2022).

As a saying goes 'If you cannot beat them, join them'. The emergence of these private digital currencies is pressuring central banks and governments all over the world to start to think about their version of digital currency or known as Central Bank Digital Currencies (CBDC). The Bank of England believes CBDC could help

avoid the risk of private digital currencies and meet the future needs of digital payments (Authority of the House of Lords, 2022). China believes global Stablecoins could pose risk to the monetary system, payment system, and monetary policy, and intends to develop CBDC to cope with challenges posed by global Stablecoins (Kharpal, 2021b).

Threats from private digital currencies could be the motivation behind the development of CBDC. CBCD could be used to cope with challenges posed by private digital currencies, however, CBCD has its concerns. CBDC is generally defined as a digital form of a country's currency with legal tender status and backed fully by central banks. It could be used for retail payments among individuals, businesses, and public authorities and wholesale payments among financial institutions, wholesale financial market participants, and central banks (Bank for International Settlements Innovation Hub, 2022). CBDC is a new financial innovation, and this new financial innovation has raised concerns about how CBDC impacts financial stability, financial inclusion, payment system, customer privacy, and security.

1.2 Research Problem

The development of technology over the past decades have significantly improved the convenience and efficiency of digital forms of private-sector payment instruments. The rapidly evolving digital asset and the payment system in the financial market give rise to the central banks to evaluate and issue the CBDC. However, it is difficult to build an efficient and complete system because it involves a lot of stakeholders where large amounts of money are circulating in the market which eventually has a significant impact on the economy of a country. Since it involved new technologies and infrastructure to build a new system, many countries mentioned earlier underwent a research stage where they tried to understand the problem statements, challenges, and benefits towards different stakeholders, proof-of-concept, and pilot stage. Hence, in our research project, we specifically focus on

analysing the potential impact from different perspectives of the implementation of the CBDC in Malaysia to understand whether CBDC can act as a tool to achieve broader public policy outcomes or any objectives.

1.2.1 Financial stability

First and foremost, the decisions on the design and implementation of CBCD play a significant role in determining the effectiveness of CBDC and its risks. One of the importance of this CBDC is how it impacts a country's financial stability. This new concept of CBDC could impact commercial banks' basic functioning and central bank's function such as monetary policy, which CBDC would pose a risk to a country's financial stability. If the general public is required to have an account with the central bank to hold CBDC and the central bank pays interest on this CBDC account, this could cause a competition of public deposits with commercial banks. If there is a large-scale shift to CBDC from bank deposits, this shift would affect the basic functioning of the banking industry and thus lead to bank disintermediation. During a crisis time, this design would further lead to a massive bank run into CBDC since CBDC is a type of central bank money that is fully backed by central banks (Allen, 2020). In addition, CBDC could bring changes to how monetary policy works. Interest-bearing CBDC provides the central bank a channel to directly influence consumers' and businesses' spending behaviours, which allows more direct control of the central bank over a country's economy (Koumbarakis & Dobrauz, 2019).

1.2.2 Financial inclusion

From the other point of view, many countries are interested in researching the feasibility of the CBDC. One of the reasons is because they want to

realize and achieve financial inclusion in their country where CBDC allows people such as unbanked and underbanked who do not have bank accounts before or less benefit from the financial services to access the financial products and services. Since the design of the CBDC is forcing the people to account for the use of digital money, implementation of the CBDC seems to improve financial inclusion. However, it is difficult to construct a new CBDC system by considering the factor's impact on the implementation while improving financial inclusion. In fact, it has some constraints such as geographical barriers, technological barriers, literacy, and trust from the public. Lack of awareness of financial services, as well as the skills to understand the concept behind them may be a reason to refrain from using financial services. (Ozili, 2021; Didenko & Buckley, 2021; The World Bank, 2022)

1.2.3 Payment

From the perspective of payment, when we heard about the history of central banking, it always began with payment services. Therefore, the implementation of CBDC does give a significant impact on different stakeholders since the CBDC is related to a payment system where people can perform the transaction with their money digitally issued by the legal tender. For example, CBDC is making the payment process more efficient, safer, and less costly. Companies or businesses can make the payment instantaneously with no limit to times and distances by using the CBDC since the money is in the data form and it is not necessary to get services from third parties such as banks to make payments. It seems like giving such benefits to the public because their money and payment transactions are backed by the Central Bank which the central bank would never go bankrupt. (BOG of the Federal Reserve System, 2022)

However, it created a challenge to other parties such as third parties who were involved in the process of payment such as commercial banks and private e-payment companies. For instance, third parties-providers need to innovate their products and services to attract more users in order to compete with the CBDC because the payment will become less costly since there is no need for services from third parties to be involved in the process of making payment. (Martin, 2021)

1.2.4 Security and Privacy

Privacy and security are one of the most crucial aspects of CBDC and national governments are focused on them. The value of CBDC classified material is self-evident, since it may entail national security, vital technologies, or trade secrets. CBDC suppliers must adhere to four major guidelines. The first is that legal duties take precedence. Unless forbidden by law, the CBDC provider will notify the relevant customers or people when Confidential Information is disclosed in accordance with legal requirements or contractual authorizations. (KASS International, 2015)

The second point is that employees should keep their job private. Staff should be aware that what they know should be kept confidential, and they should not reveal any CBDC secrets. Thirdly, CBDC providers maintain consumer information private. Unless approved by the client in advance or proclaimed by the customer, any secrets collected by the supplier from the customer or developed during the test should be kept confidential by the customer and agreed upon by the customer before being made public. (Peng, 2021)

Fourth, CBDC providers maintain their clients' information private. Between the laboratory and the client, the supplier should maintain confidential the secrets of the client obtained from sources other than the client. Unless the source of the information agrees. (Laboratory Digital Integrated Service Provider, 2021) Determining the sort of information maintained in the system, who owns it, who has access to it, and how it is utilized are all privacy-related challenges. End-user security issues may be significant depending on the system's architecture. (Peng, 2021)

1.3 Research Objective

This project has four specific goals which are:

1. To study the potential impact of CBDC on commercial banks, private sector, and the general public.

2. To find out the market expectation of different stakeholders such as commercial bankers, private sectors, and the general public.

3. To explore the stakeholders' understanding or perception on the concept of CBDC.

4. To identify the gap of perspective between stakeholders and professionals.

1.4 Research Questions

Corresponding to the research objectives, this project is going to address the following research questions which are:

1. What is the perceived potential impact of CBDC on commercial banks, private sectors, and the general public?

2. What is the market expectation of different stakeholders?

3. What is the level of understanding or perception of stakeholders on the concept of CBDC?

4. What is the gap of perspective between stakeholders and professionals?

1.5 Hypothesis of the Study

In this research, four hypotheses will be address in this section which are:

1. It is expected people are more willing to use CBDC if the overall economic condition is stable.

2. It is assumed that people are more willing to use CBDC if they are more financially included.

3. It is believed that people are more willing to use CBDC if CBDC is able to facilitate the payment and reduce the costs of people.

4. It is expected that people are more willing to use CBDC if CBDC is designed to be more secure which reduces the breach of privacy.

1.6 Significance of the Study

In this research project, the findings of this study will provide valuable information about the awareness or perception among stakeholders such as the general public and professionals who are central bankers or commercial bankers. This is because the implementation of CBDC caused different potential impacts to different stakeholders. The expectation will also be different, and this will impact the outcome of CBDC whether the central bank will design the system to be more accepting to different stakeholders while achieving their objectives at the same time. Hence, this finding of the study could help to find the gap and eventually provide solutions to improve the expectation of implementation of CBDC of different users.

Also, this research seeks to identify and understand the potential impacts of CBDC on Malaysia's economy, more specifically the potential impacts of CBDC on different stakeholders in Malaysia namely central banks, commercial banks, the private sector, and the general public. This study would provide some insights to Bank Negara Malaysia (BNM) on the appropriateness of CBDC design. The decision on the design of CBDC is closely linked to the potential risks of CBDC to Malaysia's financial stability. Decisions on the purposes of CBDC, the way of CBDC issuance, the types of CBDC, and the restrictions on CBDC would affect the role of the central bank in overseeing the financial systems and financial intermediation function of commercial banks, which in turn pose a risk to Malaysia's financial stability. Improper design of CBCD that significantly affects the intermediation role of commercial banks in the financial market would cause bank disintermediation and bank run in an extreme case. Understanding the designs

of CBDC is therefore important to the central bank's functions in ensuring financial stability.

In addition, CBDC's development necessitates the input, involvement, and support of a wide variety of public and private sector partners, and it contributes significantly to market preparedness. Stakeholders may not be able to reach a perfect agreement, but inclusive conversations and overall consensus are required. Government agencies, financial institutions, technology and infrastructure providers, academics, and standards development groups, and end users are all important players. Given the many stakeholder interests and the number of complicated decisions that must be taken in system design and ecosystem development, broad stakeholder support will take time to emerge. Because universal CBDC must be created for individuals and organizations who use the money to acquire goods and services, accessibility will be critical. When it comes to creating CBDC, end-user concerns regarding privacy and availability are very significant (Peng, 2021). Hence, the study expects to find the acceptance of the implementation of CBDC from the user perspective.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

CBDC is a digital form of money with the status of legal tender. This indicates CBCD is treated as fiat money that could be used for daily transactions. So, CBDC serves the same general three functions of money which are unit of account, means of payments, and store of values. Unit of account function implies CBDC could be used as a standard measure of goods and services (Seth, 2022). Means of payment indicate CBDC could be used for payments for a transaction. Store of the value indicates the value of CBDC would retain its purchasing power over time. Like any other medium of exchange, CBDC would be involved in issues related to financial stability, financial inclusion, payment system, and security and privacy.

This literature review chapter would be designed in the form of questions and answers, which this chapter would pose and answer a series of questions raised by CBDC. The remainder of this chapter is organized into five major concerns, namely, questions related to the definition and design of CBDC, financial stability, financial inclusion, payment system, security, and privacy.

2.1 Definition and design of CBDC

In this Section 2.1, it is all about the discussion of the definition of CBDC and the design of CBDC such as token or account-based access or the primary requirement when the central bank decided to design. Also, architecture of CBDC whether indirect or direct claims would be explored.

2.1.1 What is CBDC?

CBDC can refer to the legal tender in the issuing central bank's jurisdiction which is trusted by the government. As cryptocurrencies are extremely volatile and lack government backing nowadays, the CBDC can overcome this concern by underlying distributed ledger technology of cryptocurrencies (BIS, 2018). The simplest way to understand the concept is that CBDC works as an electronic form of the central bank, and it has the function of making digital payments and as a store of value. The design of CBDC must balance the goals with the potential issues or risks created by CBDC and the concern thus the potential issue of the CBDC also.

The difference between traditional and CBDC payments is that CBDC makes the payment more efficient. In some countries, the frequency used of cash and cheque are high, the operational costs are elevated thus the digitals form of payment is also relatively expensive (Shirai, 2019). So, CBDC can use it as a potential policy tool to offer the digital form of payments that are cheaper to operate. Therefore, to understand the discussion on the requirements, goals, and potential benefits, it is necessary to explore the design of CBDC.

2.1.2 What is the design of CBDC?

The design of Central Bank Digital Currencies (CBDC) is meant to be cash-like safety and convenience for peer-to-peer payment for the users. To implement this design, the CBDC must be resilient and accessible because it is able to protect the user's privacy while allowing for effective law

enforcement. There are many varieties of the technical designs to satisfy the varying degrees of the feature intermediaries, token-based access, and retail interlinkages across borders (Shirai, 2019).

The primary requirement of the consumer is that the CBDC represents a cash-like claim on the central bank, and it is transferable in peer-to-peer environments. Even consumers who generally prefer to pay electronically are now convinced that if a period of financial instability arises, they will be able to convert their electronic money holdings into cash. This flight to cash has been observed in several recent crisis occurrences. The biggest issue is that if cash is no longer widely accepted in the future, a catastrophic financial crisis might wreak even more havoc by interrupting day-to-day commercial and retail operations. The consumers are also unlikely to adopt the CBDC if the CBDC is less convenient than today's electronic payments (Auer, 2021).

2.1.3 What is the architecture of indirect and direct claims of CBDC?

When we mentioned the indirect CBDC model, the consumers can claim on the intermediary where the central bank can only keep track of the wholesale accounts. While in the direct claim, the CBDC represents the important roles of direct claim on the central bank where all the records and the balances of every transaction are recorded in the central bank. Consider the indirect CBDC model by Kumhof & Noone (2018) this term is equivalent to Adrian and Mancini- "synthetic Griffoli's CBDC" (2019). Because of its similarities to the present two-tier banking system, this concept is also known as the two-tier CBDC where a token-based alternative is proposed as a multi-cell CBDC in Ali (2018). This sort of CBDC is not a direct claim on the central bank for customers.

Furthermore, the intermediary of a CBDC bank resembling a narrow payment bank is required to fully back each outstanding indirect CBDC-like liability to the consumer to retail consumers with actual CBDC deposited at the central bank. The direct CBDC is appealing due to its simplicity, as it minimizes the reliance on intermediaries. However, this necessitates trade-off due to the payment system's dependability, speed, and efficiency. One element is that, as shown in today's credit card networks, establishing, and operating technical capability on this scale is typically considered as a better fit for the private sector. Second, even if a central bank develops the required technological capabilities, the resulting CBDC may be less appealing to customers than today's retail payment systems (Allen, 2022) . Electronic payments must deal with network disruptions or offline payments, which requires intermediaries to take risks to attract more consumers.

2.1.4 What is Distributed Ledger Technology (DLT) or Conventional based central bank infrastructure?

The DLT plays a role in the CBDC by giving the authority to update the database whether it is centralized or delegated to a network. Data of CBDC is mostly stored numerous times and in physically different locations in traditional and DLT-based systems. The key distinction between DLT and conventional based is in how data is updated. In traditional databases, resilience is often done by distributing data over numerous physical nodes that are controlled by a single authoritative body at the top node of a hierarchy. In contrast, the ledger in many DLT-based systems is cooperatively administered by diverse entities in a decentralized way and without such a top node. As a result, each ledger update must be synchronized across all entity nodes. (Nurjannah & Sabrina, 2017)

The overhead required to run a consensus mechanism to identify why DLTs have poorer transaction throughput than traditional designs. The volume of data transfer shows the constraints imply the existing DLT could not be used for direct CBDC except in extremely small countries. However, DLT could be employed for the indirect CBDC architecture because the quantity of transactions in many wholesale payment systems is comparable to that handled by existing blockchain platforms, as shown in various wholesale CBDC experiments done by central banks. When it comes to ensuring resilience, the DLT-based and traditional system offers an obvious edge where the vulnerabilities are simply different. The failure of the top node through a targeted hacking assault is the primary vulnerability of a traditional architecture. The use of DLT is very costly but yet brings more benefits because this technology can essentially outsource to external validators the authority to adjust claims on the central bank balance sheets. (Nurjannah & Sabrina, 2017)

2.1.5 What is token or account-based access in the design of CBDC?

A token-based system can ensure universal access as anyone can obtain the digital signature thus by default, it can offer good privacy. This system can allow the CBDC to interface with communication protocols such as the micropayments on the internet. However, this token-based system also has downsides which if the users fail to keep their private key secret, there is a high risk of losing funds. The law enforcement authorities are also difficult to search for the money flows and identify the claim owner so additional safeguards are needed to protect the users. (Auer & Boehme, 2020)

It is common that the transaction-level financial data reveal the sensitivity of one personal data. The first is the quantity of personal information that transaction partners acquire about one other when the system is in normal operation. The second danger is that large-scale breaches of data held by the system operator or intermediaries will occur. Hence, the CBDC should protect its users' privacy and their transaction partners where the transaction partners would interact via "unlikable pseudonyms", as envisaged in Chaum's (1985) pioneering work on electronic money.

2.1.6 What is cross boarder payments: Wholesale or retails linkages?

The demand for seamless and low-cost cross-border payments has increased in tandem with the expansion of international e-commerce, remittances, and tourism. A CBDC might offer the same wholesale interlinkage choices as the current system. The coordinated CBDC design can take the clean-slate perspective and incorporate the interlinkage to create the opportunity for easier cross boarder payments. CBDCs would also enable unique retail interconnections if they allowed users to retain different currencies. A cross-border transaction is inextricably related to a foreign exchange transaction in today's account-based economy. The transaction's intermediary may levy additional costs and use unfavourable exchange rates. In contrast, if consumers were offered the option of purchasing foreign currency in advance, the cash payment would be separated from the foreign exchange transaction. (Adrian, 2019)

Lastly, these scopes for the retail interlinkages and design might need to depend on the national access framework. It will be open to international residents by default if a national system is built on digital tokens.

Interoperability would be a design decision if it is account-based, and it could also be coordinated internationally. (Adrian, 2019)

2.2 Financial stability

Section 2.2 is about the financial stability which is one of the impacts of the implementations of CBDC. We will explore how is the issuance of CBDC affect financial stability or the function of commercial banks as an intermediation. Also, is CBDC impact the effectiveness of the monetary policy is also one of the concerned that will discuss in the following section.

2.2.1 Would the issuance of CBDC affect financial stability?

Generally, financial stability is one of the policy goals of central banks. According to Bank Negara Malaysia (2022), financial stability refers to the situation where a well-functioning financial intermediation process ensures smooth flowing of funds between suppliers of funds and demand of funds, and efficient allocation of funds. Disruption of the financial intermediation process and bank runs due to loss of public confidence would affect financial stability. CBDC is a new form of money that has very different features compared to existing money such as physical cash. This raises the concern about how these features of CBDC would affect financial stability.

Recently, several new financial innovations could bring potential adverse impacts on the financial system such as private electronic money (e-money) and cryptocurrency. These new financial innovations could pose new risks to financial stability. Private e-money is a new form of money that could be used in retail payments. An increase in the adoption of private e-money

would cause a switch of money from commercial banks to nonbank electronic payment providers, and this would affect the bank intermediation functions. However, higher risk in e-money makes the switch of bank deposits to nonbank e-money providers less matter. This is because nonbank e-money providers are not heavily regulated as commercial banks do, and thus private e-money users face greater uncertainties than bank deposits users (Adrian & Mancini, 2019).

Cryptocurrency is unlikely to become money used in retail payments due to its high volatility in value. To solve the high volatility of cryptocurrency, Stablecoin is issued. Stablecoin is a type of cryptocurrency backed by certain reserve assets such as currency and commodities, which make Stablecoin stable in value and thus has the potential to be used as means of payment and store of value. There is also the possibility of switching from bank deposits to stable coins. There are no standards and regulations regarding the reserve assets and Stablecoin issuers are not obligated to disclose information about the reserve assets (U.S. Department Of The Treasury, 2021). This makes the reserves assets uncertain and thus demotivates the switch to Stablecoin

Private e-money and Stablecoin would not affect the bank intermediation functions significantly due to their higher risks as compared to bank deposits that could demotivate the public to switch from bank deposits to these alternatives. Due to the digitalization features, there is still a risk that the public would replace bank deposits with these alternatives when they find it is cheaper and convenient to do so.

CBDC has a feature similar to these new financial innovations which are digitalization, features that make CBDC equally attractive as these new financial innovations. However, risks faced by e-money users and

Stablecoin users that could limit the switch of bank deposits would not be faced by CBDC since CBDC is legal tender, and thus CBDC is free of default risk, liquidity risk, and credit risk (Schoenholtz, 2022). Thus, CBDC could pose a significant risk to financial stability, since CBDC could serve as a close substitute to bank deposits that have very low risks as compared to any other medium of exchange.

This competition for bank deposits would affect the structure of the banking industry and thus affect the process of financial intermediation. CBDC could pose two different challenges to the banking industry in both normal periods and periods of crisis. In a period where there is no crisis, the issuance of CBDC would undermine the major function in banking, which is bank intermediation, when the public switches its bank deposits to CBDC. In a period of crisis, increasing actions of the public to switch bank deposits to CBDC to secure their funds would cause runs from commercial banks to CBDC. Thus, CBDC would affect the financial system stability since it may cause bank disintermediation and bank runs (Auer, 2021).

2.2.2 Would CDBC affect the bank intermediation function of commercial banks?

Generally, intermediation is referred to the process a commercial bank obtains funds from the public either by borrowing or receiving deposits and uses the funds collected to acquire assets either by investing in securities or by issuing loans. Commercial banks make profits from the differential interest rate charge on assets and liabilities. These differential interest rates can be referred to as interest rate margins. Deposits are the primary source of funds for commercial banks, which account for more than 60% of bank liabilities (Mishkin, 2021). In a world where the public has an account with

the central bank to hold CBDC. There is competition between the central banks and commercial banks for deposits. The reduction of deposits from the public is significantly affecting the liabilities' structure and risks of commercial banks**.** As stated by (Bindseil, 2021), due to the reduction of deposits from the public, commercial banks would increase their reliance on credit liabilities either funds from central banks' loans or funds from issuing bonds to the public. These changes in the structure of commercial banks would be costly to commercial banks and would increase vulnerability to banking industries.

Preferences of the public on CBDC over bank deposits depend on several potential factors such as capability in the allocation of funds, interest rates paid on deposits and fee charge on financial services, conveniences, and features of bank deposits and CBDC. The capability and performance of the central bank in performing the financial intermediation and maturity transformation functions do affect the position of commercial banks in sourcing deposits from the public and providing financial services to the public. According to Villaverde et al (2020) pointed out that optimal allocation of funds achieved with commercial banks can also be achieved with CBDC. They also assumed that in the process of maturity transformation the central bank only invests the long-term assets indirectly through issuing non-callable loans to investment banks due to political considerations, and this assumption reduces the possibility of bank runs. Thus, the capability of the central bank to achieve optimal allocation of funds, provide liquidity insurance and at the same time reduce the bank runs can lead to the preference of the public for CBDC over bank deposits.

Like bank deposits, CBDC can be used as a means of payment due to its legal tender feature. Bian (2021) examines the effect of CBDC on bank deposits by looking at features of payment methods. They categorized the three payment methods which are cash, bank deposits, and CBDC into four

features which are legal tender, anonymity, privacy, interest-bearing, and digitalization. The results show that preferences on the features do affect the choice of payment method, and the choice of individuals on CBDC due to preference for features of CBDC which are digital payment and legal tender over the features of bank deposits which are interest-bearing, and anonymity will lead to a crowding effect on bank deposits. The crowding out effect on bank deposits indicates that when individuals choose to hold CBDC, they will hold fewer bank deposits at the same time. This crowding effect on bank deposits might lead to bank disintermediation since individuals refuse to deposit their money into commercial banks.

By looking at how commercial banks may respond to the competition of bank deposits, one could understand the potential impacts of CBDC on commercial banks' structure and risks. When depositors prefer CDBC over bank deposits, they would switch their deposited funds in commercial banks to CBDC. Commercial banks would start to take action when this flow of bank deposits to CBDC affects its basic operations substantially (Bindseil, 2022). There are generally two possible actions taken by commercial banks, namely, to increase deposit rates and obtain funding from the financial market.

Commercial banks may start to increase the interest rates paid on deposits to make them look attractive. Alternatively, commercial banks may obtain funding from the financial market by issuing instruments such as commercial paper, certificates of deposit, or even bonds. Generally, sourcing funds from financial markets such as bonds are expensive as compared to funds from bank deposits. These two possible actions adopted by commercial banks are not mutually exclusive. These two actions are likely to yield the same results which is an increase in commercial banks' funding expenses. (Bindseil, 2022)

If lending rates remain unchanged, an increase in deposit interest rates and the cost of borrowing from the financial market would reduce commercial banks' interest margins. To compensate for the increase in the cost of funding, commercial banks may raise their lending rates at the cost of demand for loans (Furhmann, 2021). Hence, commercial banks face a trade-off between direct losses from the reduction of commercial banks' interest margins and indirect losses from the reduction of demand for loans. Commercial banks may also raise their transaction fees to cover the increase in funding expenses. An increase in lending rates and transaction fees increases the cost of borrowing and transaction costs for households and businesses, respectively. (Bindseil, 2022)

These funding methods are unstable relative to bank deposits that are low-cost and stable. These two methods of sourcing funds do not guarantee the commercial banks can always obtain sufficient funds to offer loans and thus may reduce credit availability for households and businesses. Commercial banks with a large percentage of funding from bank deposits may face greater instability and volatility in funding. As mentioned by Mancini (2019), commercial banks that rely heavily on bank deposits from the public may find the method of increasing deposit rates or obtaining funds from financial markets not useful in sourcing sufficient funds and in preserving commercial banks' profitability due to greater competition of bank deposits faced. Unstable sources of funding and reliance of commercial banks on bank deposits would reduce credit availability in markets. Reducing the supply of credit to healthy borrowers would in turn lead to instability of financial markets (BIS, 2018)

CBDC could be designed in a way to avoid the risk of disintermediation. Firstly, Intermediated CBDC or dual-tier CBDC was suggested, a system similar to current two-tier distribution systems of physical cash in which central banks issue CBDC to the general public through an intermediary and

have the intermediary handle the retail payments (Coats, 2021). Secondly, Impose restrictions on CBDC such as holdings on CBDC and interest rate paid on CBDC. Low or zero interest rates on CBDC would reduce the attractiveness of CBDC as a store of values. The maximum amount of CBDC holding would limit the ability of the public to replace their bank deposits with CBDC. Other indirect restrictions such as discouraging the conversion of bank deposits to CBDC by imposing higher fees in the process of conversion. (Bindseil, 2022)

In addition, central banks may lend the funds transferred from bank deposits back to commercial banks. For example, central banks may lend back these funds by offering collateralized loans to commercial banks. This method would ensure commercial banks obtain sufficient funds to supply credits to the markets, although the terms and costs of obtaining these funds would be different from bank deposits. This method would require central banks to take on additional credit risk and to perform one of the major functions of commercial banks, which is the allocation of funds (Schoenholtz, 2022).

However, Menand (2021) expects new competition of bank deposits from CBDC would not affect commercial banks' profitability and credit availability significantly. This is because commercial banks would not offer loans when they find these loans are unprofitable, and they would likely develop plans to face this new competition. Commercial banks with a greater market position would have a better ability to defend and respond to this new challenge from CBDC. Increasing its lending rates would not reduce the public demand for loans when commercial banks have better market power. Commercial banks with a better market position would have room to raise the interest rate on deposits; they can increase deposit rates to make them look attractive without facing significant consequences in their profitability (Adrian & Mancini, 2019).

2.2.3 Would CBDC cause massive runs from bank deposits to CBDC in a time of crisis? How would the runs to CBDC be different from runs to physical assets or financial assets?

When there is a safer option to use as a store of value than any other existing options such as bank deposits, the public would prefer to migrate their holdings from the relatively unsafe options to a safer option to protect their funds or save in a time of financial stress. According to Monnet (2021) pointed out that the availability of safer choices in the market does lead to a bank run from bank deposits. They confirm empirically the government-backed saving alternative can cause bank runs by looking back to the French Great depression of 1930-1931. The government-backed saving alternatives work as complements to commercial banks' deposits before the crisis, however, government-backed saving alternatives substituted commercial banks' deposits during the French Great depression.

CBDC has a similar feature to the government-backed saving alternative mentioned in the study from Monnet (2021), which is a default risk-free feature. In a time of crisis, this feature would raise the public incentive to run into CBDC since the public is generally a risk-averse user. CBDC with default risk-free features would make CBDC a safer option than other alternatives such as government securities, and thus facilities run into CBDC. In addition, Bian (2021) also states that the crowding-out effect of CBDC on bank deposits will be larger in a financial crisis, in which the preferences of individuals for features of CBDC which is legal tender will be stronger and thus this larger crowding out effect will cause bank runs into CBDC.

The probability of runs from bank deposits to safer alternatives such as physical cash or government securities could be reduced in the presence of deposit insurance authorities that insured the deposits from the public. Deposit insurance gives a sense of security of funds to the public and thus demotivating bank runs. However, in a CBDC world, deposit insurance may not be as effective as they were in limiting the bank runs. Due to the default risk-free nature of CBDC, makes CBDC a very safe alternative to bank deposits (BIS, 2018). The presence of deposit insurance would not be enough to discourage runs from bank deposits into CBDC, since there is a default risk-free alternative for the public.

CBDC would make the bank run more services due to its design. General-purpose CBDC or retail CBDC that is designed for retail payments allows runs from bank deposits into CBCD at unprecedented rate and scale. This is due to the feature of digitalization which allows the relatively high speed of convertibility of other form assets such as bank deposits into CBDC which makes the bank runs more severe. The digital form of CBDC makes the runs from bank deposits to CBDC unpredictable since the process of transferring bank deposits to CBDC is conducted virtually instead of lining up at bank branches. This makes the signal of runs difficult to observe and thus raises a challenge in managing runs by the central bank (Mancini, 2019).

In addition, factors that limit the runs from commercial banks to cash and safer financial instruments may not limit the runs to CBDC and thus make runs to CBDC more severe. According to Bindseil, (2021) stated that in the case of runs from deposits into physical banknotes during a crisis, individuals are required to bear the costs and potential risks of holding large amounts of physical banknotes on hand. In the case of runs from deposits into financial assets with lower risk such as gold-related assets and government securities during the financial crisis, the prices of these financial assets will increase due to the sudden increase in demand. This

increase in prices will discourage the runs into financial assets. Runs to CBDC are neither limited by the storing costs of physical banknotes due to the digital form of CBCD nor the high prices of financial assets during crises since CBDC is the digital form of money rather than a financial asset.

In the case of occurrence of bank runs, the central bank's role as lender of last resort would counter the bank runs through central bank lending. Other traditional measures such as deposit insurance and prudential supervision were used to counter bank runs. However, these measures would not be effective to cope with bank runs in a CDBC world. This is because the unprecedented rate and scale of bank runs to CBDC make these measures insufficient to cover the large flows of funds from commercial banks to CBDC (BOG of the Federal Reserve System, 2022).

Several ways have been suggested to cope with runs into CBDC. CBDC design could be designed in a way to avoid the bank running into CBDC. For example, pay no interest on CBDC to make CDBC unattractive. However, public preferences for securing their funds or savings at any cost in a financial stress time would make the initiatives to limit bank runs ineffective. Restrictions on the interest rate paid on CBDC would not limit the bank runs to CBCD when the public prefers the security of funds even if the interest rate paid on CBDC is less attractive. (Bindseil, 2022)

In addition, set restrictions on holdings of CBDC have been suggested to limit the amount that users could hold in CBDC to avoid massive transfer of funds to CDBC. However, Restrictions on CBDC holdings would also be ineffective when the public seeks due to the adoption of various forms of evasion (BIS, 2018). In fact, limits on the amount of CDBC in circulation would accelerate runs into CBDC as the public would compete to hold CBDC in a time of crisis. According to Schoenholtz, (2022), restrictions on

CBDC holdings could limit runs into CDBC but would not stop runs into other safer alternatives as compared to bank deposits. Thus, restrictions on CBDC holdings would not stop the bank run effectively, but instead, redirect or encourage runs into other safer alternatives such as government securities

Some see bank runs should not be a major reason to reject the issuance of CBDC. Firstly, during a crisis, runs from all domestic assets including CBDC to foreign currencies would probably occur although there is a safer option available domestically. This is because fear of uncertainty in the domestic economy would prompt the capital outflow and thus the runs into foreign assets such as foreign currency. Hence, runs would occur irrespective of whether CBDC is being issued or not (Adrian & Mancini, 2019). Secondly, in the existence of very safe and liquid private or government assets relative to bank deposits in the market, bank runs would happen anyway irrespective of the issuance of CDBC. For example, in a crisis, the public would run their bank deposit into various alternatives that they perceived to be safer such as treasury bills and money market funds. Thirdly, CBDC could facilitate the liquidity provision during bank runs and thus resolve the runs efficiently. For example, CDBC could be used in providing liquidity to commercial banks to avoid the costly and time-consuming process of transporting cash to commercial banks (Mancini, 2019).

2.2.4 How would CBDC impact the effectiveness of the monetary policy?

CBDC could be designed with interest-bearing features. When central banks pay interest rates to CBDC held by the public, this would allow central

banks to transmit monetary policy rates directly to the public by either increasing or lowering the interest rates paid on CBDC. Thus, CBDC would increase the effectiveness of the monetary policy. In addition, Interest bearing CBDC held by the public would allow the central bank to impose negative monetary policy rates by reducing the interest rates on CBDC to the level below. This could be a new tool for central banks that is useful to cope with a deep economic recession since a negative interest rate would force the public to spend to avoid the negative rates. (Mancini, 2019)

However, these negative monetary policy rates would work effectively only when CBDC is adopted widely or when cash is completely replaced by CBDC. When CBDC is a complementary rather than a replacement to physical cash, massive runs from CDBC to physical assets to avoid the negative interest rates could happen and thus pose additional risk to financial stability (Mancini, 2019).

Increasing competition of deposits faced by commercial banks due to the issuance of CBDC would cause financial disintermediation, in which commercial banks could fail to obtain stable and low-cost funds from public deposits and thus threaten commercial banks' position as an intermediary to channel the funds from savers to borrowers. This risk of financial disintermediation would undermine commercial banks as a channel of the transmission of monetary policy and thus affect the effectiveness of monetary policy (Schoenholtz, 2022).

Zero-interest rate is assumed to be the 'implicit floor of interest rate' since actions of converting bank deposits into physical cash by households and corporations to avoid the negative interest rate are expected to reduce the effectiveness of monetary policy until the first adoption of negative interest rate policy by the European Central Bank (ECB) to cope with

macroeconomic challenges. A growing number of central banks have started to use this approach such as Sveriges Riksbank and the Swiss National Bank (Jobst & Lin, 2016). However, CBDC with zero interest rates could undermine the negative interest rate policy. The implementation of NIRP in any financial assets is not possible if there is a zero-interest rate CBDC backed by the central bank, since the holder of financial assets with a negative interest rate can substitute it with CBDC (Bian, 2021). Thus, it would affect the negative interest rate policy in European areas.

2.3 Financial inclusion

Followed by Section 2.3 is about the discussion on financial inclusion. Issuance of CBDC seems to be improve society welfare where all the unbanked and underbanked people to enjoy and access to financial services. However, there is also some arguments against the issuing of CBDC to improve financial inclusion which will study in the following sub-section.

2.3.1 What is financial inclusion?

According to The World Bank (2022), financial inclusion refers to all the users or citizens who are working-age adults or people at the age of 15 years old and above who have effective and quality access to, and usage of the financial services provided by formal institutions. In other words, all the citizens including those who are financially excluded, and underserved customers have the right to enjoy the convenient and responsible delivery of financial products and services at an affordable cost to meet their needs such as performing transactions, payments, savings, credit, and insurance.

Financial inclusion is important and plays an important role because it has the potential to bolster economic growth while alleviating poverty. It is not only helping individuals and families, but collectively it develops entire communities and can help drive economic growth.

2.3.2 What is the challenge for financial inclusion?

Today, digital financial services (DFS) and commercial bank money have become more accessible to citizens. Based on the research and analysis from the board of governors of the federal reserve system, people in the US who remain unbanked have consisted of more than 7 million or approximately over 5% of U.S households. Unbanked refers to those adults that without an account at a bank or other financial institution and are considered to be outside the mainstream for one reason or another. Generally, they pay for things in cash and typically do not have insurance, pensions, or any type of professional money-related service. In addition, they still depend on costly financial services to perform their daily transactions which are not affordable at all although approximately 20% more have bank accounts. Therefore, a large percentage of the world population remains financially underserved. (Didenko & Buckley, 2021)

Consideration of private services providers on profitability is one of the reasons that limit financial inclusion. The private services providers refuse to provide services in areas where it is not profitable to operate. For example, populations that live in remote areas remain financially underserved by private financial services providers (Soderberg, 2022). This problem is exacerbated by the geography of a country. In a country that consists of many islands like the Bahamas, the private sector often refuses to provide services to this type of population due to the high cost of operation (Soderberg, 2022). The technological capabilities of private services

providers could limit their ability in providing services. In China, around 10 percent of the population lacks access to financial services, and one of the reasons is financial institutions face difficulty in providing digital financial services in certain areas due to their technological capabilities. Due to different concerns and capabilities between the central bank and the private sector, CBCD has the potential to resolve these factors. Profitability is not a major concern of the central bank in issuing CBDC. (Chen & Yuan, 2021)

2.3.3 Would the issuance of CBDC increase the financial inclusion?

CBDC was seen as a method of bringing more people into the financial net where it was able to give them access to digital payments at an affordable cost and convenient way. This is because the objective for some developing countries is to broaden financial inclusion (IMF, 2022).

Andolfatto (2018) mentioned that the implementation of CBDC will improve financial inclusion and reduce the government's implicit subsidy to banks. Also, it is likely to promote financial stability because CBDC resembles narrow banking in some regards. Besides, the paper mentioned that the way that CBDC can promote financial inclusion is to issue an interest-bearing CBDC which is able to diminish the demand for cash. The interest rate on CBDC can be set equal to an existing policy rate or be set at a different level to either encourage or discourage demand for CBDC. Retail or wholesale payment transactions could be used by both the interest-bearing and non-interest-bearing accounts. However, it is more attractive to the public if the central bank issued an interest-bearing CBDC because it can serve as a store of value compared to other financial products that have

no extra value. Therefore, it is able to improve financial inclusion, especially in countries with underdeveloped financial systems and many unbanked citizens as the CBDC may be a means to support financial digitalization.

As mentioned early, the implementation of CBDC is able to bolster economic growth while alleviating poverty. This is because it brings more people into the financial system by digitizing the value chains in the economy (Ozili, 2021). How does this happen? As more businesses have the right to access the wholesale CBDC, this is able to encourage them to bring their activities into the digital financial system and then stimulate the financial linkages in business activities from production, distribution, sales, and post-sales activities. This is able to create new market opportunities for the private sector as well as create more job opportunities to enhance GDP growth and reduce poverty.

Furthermore, the implementation of CBDC can offer a wide and variety of solutions to the financial inclusion problems in the Pacific region if it is a well-designed system to implement (Didenko and Buckley, 2021). They mentioned that Pacific island countries faced challenges on geographic remoteness, limited digital infrastructure, and insufficient financial literacy. This caused the financial inclusion in the Pacific island countries overall to remain low as the citizens use cash as the preferred payment method for most retail transactions. Therefore, designing and implementing CBDC seems like a choice for some central banks to address financial inclusion. For instance, CBDC helps the governments to make economic payments to individuals and businesses during the crisis or extend the insufficient reach of existing payment systems by implementing digital distribution channels and communication technology infrastructure.

2.3.4 What are the arguments against the issuing of CBDC to improve financial inclusion?

First and foremost, some arguments issuing CBDC cannot improve financial inclusion because it brings disadvantages to the public. Fan (2020) mentioned in a paper some thoughts on CBDC operations in China. In his opinion, it is difficult to achieve or improve financial inclusion in China if the People's Bank of China issued this CBDC in the country. This is because China is a large and populous country with significant regional differences in economic development, natural resources, and public education. Therefore, it is very complex for China to design a national CBDC where they need to take into account the diversity and complexity of various systems and institutions.

For instance, they raised the question of the way or solution of a CBDC to be used in remote or rural areas where internet access is limited. CBDC is designed to bring convenience and act as a legal tender of currency in a country. However, CBDC is not acting as paper money, but it involved digitalization where the user required internet access to perform the daily transaction. In other words, CBDC is designed to be used over a smartphone and with an internet connection. Hence, it raises concern that if the user has no internet access in their area or he or she is a tech-illiterate person, they are not able to enjoy the benefit of CBDC, but it raises a problem of creating more unbanked or underbanked people in a country which is known as financial exclusion. This is because without access to the internet or a smartphone, then people may be unable to hold CBDC conveniently and remotely. This might harm the economic development of the country because the money is difficult to circulate in the country. (Fan, 2020)

From the other point of view, there is a paper that mentioned that CBDC would not have a material impact on financial inclusion (Schoenholtz, 2022). This is because they think that the most effective way to improve payment access for the unbanked and underbanked to enable them to enjoy the financial service or facilities is to provide subsidized no-frills bank accounts combined with zero-cost publicly provided identity verification mechanisms. The U.S government plays an important role to support this effort directly through subsidies and indirectly by providing a zero-fee biometric identification tool as the private Bank On initiative also promotes a low-cost, low-risk consumer checking account. In other countries such as India, the Pradhan-Mantri Jan Dhan Yojana (PMJDY) also provides no-frills bank accounts without charge while using the country's universal biometric personal identification to lower costs. The success is that it was able to bring over 420 million people into the system and work hard to realize financial inclusion. Hence, this success proved that India did not require the issuance of CBDC (Schoenholtz, 2021).

2.4 Payment

Next, one of the impacts of the implementation of CBDC is the payment. As we know that CBDC is a money issued by central bank digitally. It is designed to be used via online platform or application downloaded through smartphone. Therefore, people will perform their daily transaction online by using this CBDC. Hence, this section which is section 2.4 will explore is the issuance of CBDC able to facilitate payment efficiency or spur competition in the payment and FinTech sectors.

2.4.1 How does the implementation of CBDC improve payment efficiency?

When internet finance evolves into financial science and technology, especially when information technology and financial innovation merge, the ability to comprehend and grasp the growth trend of this cross-regional business becomes increasingly crucial objectively, and responsibly. The inextricable question of how to establish a manner of stable development in the dynamic balance of mobile payment in the future is unavoidable. In a nutshell, the future of the mobile payment business will be determined by the interplay between efficiency and security. The most explicit advantage of mobile payment is to increase payment efficiency and convenience, but the precondition is that it is secure and dependable (Bezhovski, 2016).

With the introduction of new payment methods, relevant regulatory frameworks must be developed and checked regularly to ensure that all key rules or standards are met, such as investor protection rules, financial market infrastructure principles, various criteria for transaction legitimacy, such as standards for combating terrorism financing, anti-money laundering, and other relevant regulations (Martin, 2021). Some new payment technologies go outside traditional judicial borders, necessitating collaboration between domestic and foreign regulatory organizations.

The cost of existing digital payment is one of the aspects that determine payment efficiency. Due to the high usage of existing payment services such as checks, the costs of these payment services are elevated. Unlike the private payment services provider, profitability is not a major concern of the central bank in providing the CBDC payment system. This indicates that the central bank has the potential to offer low-cost payment services as a public service. One of the disadvantages. For example, due to the high costs of making cash-based payments to unbanked citizens by government agencies, the central bank of the Bahamas intends to support digital government payments to citizens by integrating government agencies in the CBDC network to lower this cost (Soderberg, 2022).

According to the literature in Group of Thirty (2020), the logical choice of the central bank is to supply core infrastructure since the central bank provides settlement accounts for commercial banks and other payment service providers. In this situation, if the CBDC can increase the infrastructure's efficacy, the direct central bank's digital currency (CBDC) may find a cause. In comparison to the alternatives, the risks and possible rewards are enormous. As a result, in certain jurisdictions, this document conducts a thorough study and determines if there is a net gain.

Moreover, central bank digital currency (CBDC) may find a rationale when the CBDC can enhance the effectiveness of that infrastructure. Before the implementation of the CBDC, payment service providers such as banks, central banks, and payment system utilities have been upgrading the speed and times of availability of conventional bank account-based payment systems (Bank of International Settlements, 2020). Today, the majority of the users have an online banking system and can pay and perform their transactions speedily. This has been given an advantage, especially to the retail application although they are involved in a small number of transactions. Also, according to the findings of the poll, the advent of CBDC has considerably boosted competitiveness and decreased costs for businesses and customers since available technology allows for speedier retail payment. As a result, it should be used more broadly.

2.4.2 How access to payment became one of the policy objectives of the CBDC project?

In most nations, central banks have a major purpose of assisting in the promotion of payments among the general public. Getting paid is a part of financial inclusion, but it is not the same thing. Some central banks are worried that private payment service providers may run out of money if they try to serve everyone, an issue that would be compounded by a drop in cash usage. Multiple impediments to receiving payments include cash shortages, company refusals to take cash and a lack of or frequent outages in digital infrastructure (Martin, 2021). Regardless of age, socioeconomic background, or location, CBDC is one of the most essential aims.

Moreover, in nations where cash use is falling, some people still prefer or rely on cash payments, although they may face constraints. Specific organizations may have difficulty paying payments if available cash falls below a certain amount. Individuals in distant places where private firms have found no profit, low incomes, and many sorts of destruction are among these communities. As a result, one of the major aims of the Swedish central bank's e-krona initiative is to ensure universal access to payment services in the next few years (Barontini, 2019). While Riksbank is dedicated to ensuring that cash is available in the future, it is looking into how CBDC might help create digital payments that are specifically tailored to certain groups as a cash substitute.

2.4.3 Why making payments more efficient is one of the policy objectives of the CBDC project?

Operating expenses will rise in nations where checks and cash are widely used. Existing digital payment systems are also rather pricey in some nations. As a result, CBDC might be a policy instrument for providing digital payment at a reduced cost of operation. Because central banks are non-profit

organizations, they may provide low-cost payment as a public good, but they may eventually need to recoup their costs. China is a wonderful example. PBOC has declared its aim to improve payment services, despite the fact that the present payment market in China's metropolitan regions is heavily computerized. Because it feels that, like the establishment of the quick payment platform, this is part of a global effort by central banks to improve public services (Martin, 2021).

2.4.4 Why resilient payment system is part of the policy objectives of the CBDC project?

The ability to make payments under severe circumstances determines the resilience of the CBDC payment system. The resilience of payment systems is important, especially in disaster-prone nations. This is because natural disasters such as hurricanes and volcanic eruptions could lead to the destruction of financial infrastructure, the destruction of physical infrastructure, and the disruption of the cash shipping process, which in turn may affect the whole payment system in the affected areas (Prasad, 2022). CBDC could be used as a backup to be existing digital payments systems and used in facilitating assistance payment to and in disaster-affected areas. Also, disruption to digital services and high concentration risk due to domination of a few large private payment operators are major concerns of a country with a highly digitalized payment industry. The reduced usage of cash in society exacerbated the problem of disruption of digital payments systems and high concentration risk in the payment sector and thus impaired payment resilience. This is because cash payments serve as a backup when disruption of digital payments systems and reducing cash usage indicates cash no longer serves as a backup when digital payments systems are non-functional. Thus, CBDC could be used as an additional backup to exciting digital payments systems to ensure the resilience of payment. For example,

in China, Alipay and WeChat Pay are the two firms that dominate the mobile payment market, which has led to a high concentration risk to the Chinese payment system. The Central Bank of China intends to use CBDC as a backup to be existing digital payments systems to prevent the situation of serious disruption to China's digital payment system resulting from the failure of such dominant firms (Soderberg, 2022).

2.4.5 What effect might a CBDC have on competition and innovation in the payments and fintech sectors?

To investigate the possibility of the "retail" central bank, digital currency (CBDC), the Bank of England and the UK Treasury formed a joint working group. CBDC has a distinct retail market than privately issued encrypted currencies like Bitcoin. In the next decades, the design and implementation of CBDC in the UK will have far-reaching implications for consumers, companies, and the monetary system, and may pose major hazards. Some governments keep track of their citizens' spending habits. The other is that, in times of economic duress, individuals may convert bank deposits into CBDC money, resulting in financial instability. Third, the central bank's authority has been expanded without proper scrutiny. (Bank of England, 2022)

According to the Bank of England (2022), they announced that there must be concerned about the dangers posed by private capital. Because it has the potential to compete with central banks and their monetary system control. If large technological companies employ the same technology to create their own digital money, and the currency proves to be popular enough, the Bank of England will be impacted. The second is that the introduction of CBDC may result in a decrease in cash usage in the UK. After all, it is unclear if

CBDC assets can match cash demand since the value of a currency is often determined by its physical assets and the level of privacy it can give. Cross-border payments have improved as a result of financial technology sector innovation and competition. (Adrian, 2019)

Then there's CBDC's influence on families and companies. Although the present domestic payment system in the UK is secure and efficient, the CBDC system may drive innovation and competition in the payment industry, as this will be in addition to the existing innovation and competition. Interoperable cross-border CBDC systems can reduce costs by removing some existing frictions. However, such a system must still comply with the monitoring framework, national legislation, and international technological standards, all of which are far from uniform. (Adrian, 2019)

Economic Affairs Committee (2020) mentioned that the implementation of CBDC can spur innovation and competition in payments. Due to the technology of CBDC, users are attracted to the feature of the CBDC because it brings benefits to the users. When the CBDC is widely used, it has the potential to increase the competition in the retail payment sector. This is because the retail payment sector or players in the market need to compete with CBDC to launch and promote more efficient and innovative products to attract users. Hence, this could lead to a reduction in card fees paid by merchants. This eventually could pass on to the consumer. For instance, today, the majority of people have stuck to the E-wallet or any other payment apps which are convenient for them to use in their daily life. Hence, the growing use of these payment apps creates competition with the major payment networks. This is because they can link directly to bank accounts rather than physical cards. It does bring benefits to improve the current payment system, especially CBDC involving a lot of technology such as open banking and PSD2. It was designed to increase competition in the banking sector because it required banks and other payment service

providers to share the customer financial transaction data with the permission of the customers. Therefore, third parties' payment service providers are able to innovate and create new financial products that suit the preference of the customer today.

2.4.6 How does the implementation of CBDC promote domestic efficiency?

Barontini (2019) conducted a survey where they collected how the central bank works or the opinion regarding the potential of the central bank's digital currency. They mentioned that the majority of central banks that agree and are interested in implementing the CBDC are because of payment safety and domestic efficiency as well as other aspects of central banks' mandates. The reason behind this is that CBDC is a new technology where it can promote a domestic faster payment system available to the public. CBDC is able to provide complementary central bank money to the public which supports a more resilient and diverse domestic payment system that promotes more opportunities to spur innovation in the market. From the other viewpoint, the majority of the central bank is interested in the benefit of domestic efficiency because CBDC systems will be entering a crowded field of domestic payment systems aimed to bring convenience and benefit to the local users. Not only provide benefits to the user itself but also the central bank. This is because the central bank may reduce the risk of alternative units of account dominating by offering an efficient and convenient CBDC itself. To ensure that the domestic payment system is as efficient and meets the objective itself as possible, the central bank could collaborate with domestic private payment providers.

2.5 Security and Privacy

Next, the other impacts of the implementation of the CBDC are the security and privacy. Since the CBDC is designed to be used online whether through application or any platform, people will be more concerned on the breach of privacy whether there is any protection on data privacy since central bank hold all the personal information if people registered an account directly via central bank. Besides of breach of privacy, benefit such as track illegal activities will also be discussed on section 2.5 security and privacy.

2.5.1 What are the effects of the implementation of CBDC on consumer protection and data privacy?

The Consumer Protection Law, as defined by the Malaysian Consumer Protection Act 1999 (Act 599), refers to the legal rights and advantages that consumers have. Consumer rights are at the heart of the industry, and they are divided into two categories: personal and economic rights (2018 KASS International, 2015).

As central banks and finance ministries throughout the world ponder how to cope with the quickly growing digital payment trend, they may want to reconsider some of the more fundamental monetary arrangements. Included are the central bank's core responsibilities, as well as more specific policy decisions on how to assure the ongoing operation of monetary policy transmission channels, increase payment system efficiency, particularly cross-border efficiency, and preserve financial stability (BIS, 2020). It also includes measures to increase financial inclusion, promote investor protection, and combat unlawful activity. Government departments are often non-interventionist in the early stages of digital currency development and are hesitant to meddle in technical innovation. Although technical

advancement remains a priority, it is past time for the government to take a more active role in development.

Private stablecoins are a type of digital currency that can exist in the CBDC market. The entities that make stablecoins try to limit price volatility by tying their value to a basket of assets or external assets, often known as traded products or legal money (Higginson, 2021). The legal aspects of stable money and accompanying technological arrangements may vary greatly depending on the design. The important characteristics will be whether the stable currency has a known issuer if it is linked to assets or money outside the platform and if the underlying arrangement is unlicensed or license based. The classification of stable currencies as contractual claims or property rights is an essential legal criterion. As a result, regulators must decide on the property rights framework and guarantee that the requisite legal power is in place to put it in place. (Group of Thirty, 2020)

The policy on compliance with digital currency and payment service providers is one of them, and it aims to regulate private sector stablecoins in order to safeguard consumers and investors. Consumers and investors may not completely comprehend the dangers associated with digital assets due to their novelty and complexity. These dangers are related to product and service security, which includes security and fraud protection, correct and relevant information for customers, as well as misleading marketing and other nefarious tactics. The relevant authorities' policy is to limit the number of similar instances. (Group of Thirty, 2020)

When stable currencies get large enough, they have the ability to challenge antitrust and competition legislation. Due to substantial network effects, revenue from creating large-scale corporate data, and exponential rise in fixed costs, a worldwide reliable money supplier might become a natural

monopolist. There are several issues with data privacy and sharing. This problem is intertwined with a slew of current technological challenges. The conclusion is that the central bank and the Ministry of Finance must take a proactive role in establishing payment rules and providing public infrastructure, rather than relying on market forces. To be completely tested, new technologies may require a suitably extended phase-in time. A range of payment options should be introduced to ensure that the payment system is flexible and competitive. (Group of Thirty, 2020)

Data privacy is defined by confidentiality, often known as secrecy, which implies that information about persons or groups is not available to non-recipients, according to the Malaysia Personal Data Protection Act 2010 Protect. With the advancement of science and technology, various software, such as email software and web browsers, may now be found in electronic items such as mobile phones and PCs. Although these include privacy-related settings to protect user information, there are still certain things that might compromise privacy, such as spyware files or hackers (2018 KASS International, 2015).

With the launch of innovative payment methods, regulatory frameworks must be developed and reviewed to cover all key standards, such as the Investor Protection Rules, the Payment and Market Infrastructure Committee, the CPMI, the PFMI, and various criteria for transaction legitimacy to codify policies on compliance with digital currency and payment service providers. The global stablecoins suppliers may become natural monopolies due to the strong network effect, the high fixed costs of setting up a large-scale firm, and the exponential revenue from gathering data. Simultaneously, the firm may be able to strengthen its dominant position in key departments that may share the same data collection. Many considerations concerning data sharing and data privacy are intertwined with today's slew of technological issues (Auer, 2021).

As the data custodian, the stablecoins supplier, particularly the Bigtech provider, shall adhere to the norms of notice, consent, protection, data leakage, and data sharing. Data privacy is challenging to coordinate across borders, especially when regulations and law differ by location, and perspectives on data protection and privacy differ as well. It is critical to improving international collaboration. In conclusion, private stablecoins are a significant breakthrough in CBDC, but it is unclear if they can truly remain stable in all ostensibly potential situations in the long run without government assistance. The central bank can be a storehouse of transaction-level data for the whole economy in this article, depending on the architecture. Furthermore, the central bank's obligation to protect privacy and data, including that of other government agencies, might be onerous (Auer, 2021).

The central bank's motive to issue CBDCs stems mostly from microeconomic issues such as operation, technology, and privacy. They want to make payments more accessible and efficient, while still ensuring competition, data privacy, and payment system integrity. The subversion of the financial system caused by the platform-based business model and big data is becoming increasingly common as more large-scale technology businesses enter the payment market. The central banks of many nations have faced several issues as a result of the vast volume of personal data acquired and processed as input to the activities of big-scale science and technology firms. This has resulted in significant issues with CBDC business design, associated public-private sector cooperation, and the impact on customer welfare, as well as data privacy concerns. In these cases, relevant literature has aided in the establishment of CBDC research and development plans, as well as clarifying the potential influence of CBDC on consumers (Auer, 2021).

As a result, it must guarantee that both the main principles of competition and data governance are satisfied, while also ensuring the payment system's security and integrity to avoid money laundering, ransomware attacks, and other criminal activities. As a result, the central bank's triple mandate as the monetary system's core for digital innovation includes competition, data privacy, and payment system integrity (Group of Thirty, 2020).

2.5.2 Does the security and privacy affect the implementation of CBDC?

Two effects are mentioned which are information efficiency and tracking illegal activities. The worldwide trend is the driving force behind CBDC retail research and development. CBDC should be considered in the context of economic digitization and the growing centralization of data, particularly personal data, in the financial system. Data, on the other hand, poses new threats to privacy, competitiveness, and integrity. New private actors may swiftly dominate the monetary system due to the intrinsic network effect of money, producing major competition difficulties and breaching the public interest. (Allen, 2020)

Aside from payment efficiency, CBDC also provides information efficiency. Information is critical when it comes to preventing manageable circumstances from becoming uncontrollable, according to banking regulators. Banks, on the other hand, have an incentive to withhold information about their predicament in the hopes of receiving advantages such as bailouts if things spiral out of control. Commercial bank deposits are moved to CBDC when households rely on the financial system. The source of the monies moved can then be determined by the central bank. With such real-time data, the central bank may respond swiftly and take

steps to prevent capital withdrawals, such as announcing holidays or financing to financial institutions that are experiencing runs. (Auer, 2021)

Finally, CBDC's increased payment and information efficiency in both normal and crises should prompt regulators to reconsider current policies to address the problem of being too big to fail and improve the banking industry's resilience, including deposit insurance. These frameworks are far from free and tackling the systemically significant issue of bank subsidies remains a key focus of international policy initiatives. Payments are progressively becoming digitized, resulting in "data leads" of information on individual transactions that can be readily transmitted between counterparties and utilized for several purposes. Because of their digital character, community-based developing nations give information that central banks might employ to strengthen financial systems. The Monetary Authority's toolset has been substantially expanded by these additions. CBDC can modify the monetary policy implementation framework in addition to being programmable and allowing money to be sent for specified information. (Coat, 2021; Echelpoel, 2021)

People have suggested numerous designs and use for CBDCs and the payment system that goes, but all have one thing in common which is to allow consumers and small businesses to utilize electronic central bank money. Digital payments based on central bank money are already available to financial organizations. Getting electronic money from the central bank can make payments safer for customers. Central banks have the ability to issue money at any time, therefore they are not as bankrupt as the private sector, which handles consumer digital payments at the moment. During the payback time, the latter may become bankrupt, resulting in a capital loss.

However, the benefits of CBDCs in this regard may not be significant for consumers in nations such as the United States and China. People in these nations do not lose money when financial firms collapse because of good rules and government backing. It is too early to say what the new CBDCs will look like because the data is not full enough. Emerging markets, after all, have features that set them apart from conventional kinds of money and payment. (Group of Thirty, 2020; Prasad, 2022)

CHAPTER 3: METHODOLOGY

3.0 Introduction

In this section, our methodology research is to understand the market expectations of different stakeholders. This is to explore stakeholders' understanding of the concept of CBDC and study the potential impact of CBDC on the different stakeholders. In this section, we will conduct a survey of stakeholders to collect our data and conduct a more detailed study of the data. In the following, we will explain our research design, data collection method, design of sampling, research instrument, and data description.

3.1 Research Design

Continuously, we will proceed to the method description action section. This survey investigates the underlying principles or techniques of a problem and the specific applications used to identify, select, and process it, and analyses the data used to understand the problem, allowing the reader to critically understand and assess the overall reliability and effectiveness of the study. In addition, how to obtain or generate the data, how to analyse the data and how to check the data are all the key questions that should be answered in the methodology part of the research paper (SAGE, 2022).

Moreover, as we know, quantitative analysis is frequently utilized by academics that adhere to the scientific paradigm. This strategy aims to quantify the data and

summarize the findings from the target population's samples. It collects data in a systematic manner and converts it to digital format. On the other hand, quantitative research also uses statistical techniques to conduct objective analysis (Rich, 2018).

In this section, we will focus on quantitative research methods that emphasize objective measurements and statistical or numerical analysis of data collected through polls, questionnaires and surveys, as well as the use of computer technology to process existing statistics (LibGuides, 2022). Therefore, we choose to adopt a quantitative method, which is the survey.

The goal of our quantitative survey is to explore the stakeholders' understanding or cognition of the CBDC concept. The quantitative research design is descriptive and aims to study the potential impact of CBDC and to understand the market expectations of different stakeholders. It also includes identifying gaps in perspectives between stakeholders and professionals.

We will create CBDC-related topics using a Google Form. As well as the questions will be in the style of multiple-choice or rating scale, depending on the topic. Our participants will be a diverse range of stakeholders to acquire enough data. The poll will be done by telephone, email, and social media. We may ask individuals to respond within one week after receiving the questionnaire. The sample size and response rate, on the other hand, were provisionally set at 385 which explained the 3.3 Design of sampling. We will include the entire questionnaire as an appendix after our project so that our readers may examine the collected data in detail.

3.2 Data Collection Method

In methodology, the basis of statistical research is data collection. Data collection is a process to gather useful information related to the topic of research (DissertationHelp, 2013). It was very important in a research project because it helps us to make decisions related to the information available and assists in carrying forward the research work. As mentioned in the research design, a quantitative approach has been selected to conduct the study. This is because quantitative research is useful to attain an understanding of the social world or estimate the size of phenomena of interest (Williams, 2021). In this research, quantitative methods such as online surveys are suitable for measuring, categorizing, and identifying patterns of the research as it acts as a tool to collect the information and data from respondents (McCombes, 2021). Also, it saves time for researchers and can reach a huge number of respondents in a specific given time.

3.2.1 Primary data

In this project, we will be collecting our data by conducting surveys though primary data collection. Primary data are obtained in many ways such as through questionnaires, surveys, and experiments. The reason that we have chosen to collect primary data to carry out this study is because fewer journals or articles are related to CBDC, especially in terms of Malaysia since this new technology has yet to be implemented in our country. Also, we would like to collect information from stakeholders that are tailored to elicit the data that will help us to meet the specific purposes of our research (IWH, 2015).

3.2.2 Surveys

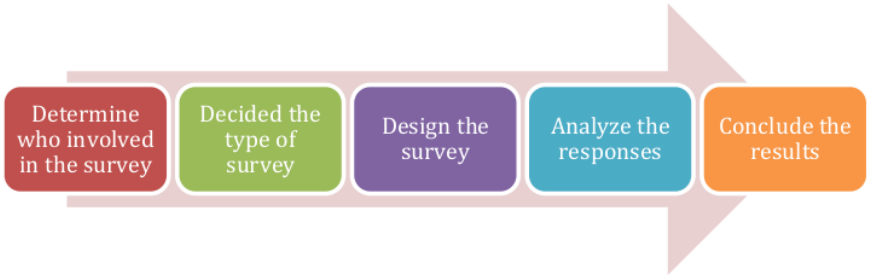
There are different types of data collection methods like in-person interviews, phone surveys, mail surveys, and online surveys (Bhat, 2021). Survey research is typically a systematic investigation conducted or carried out by administering surveys to respondents (Formplus Blog, 2021).

To fulfil the objectives of the study, we have decided to conduct an online survey of different stakeholders such as financial institution employees, non-financial institutions employees, university students, academics or retirees. The questionnaire survey with the different stakeholders has been focused on finding out the market expectation of the implementation of CBDC, exploring their motivations or preferences, and their understanding of the concept of CBDC. Hence, primary data collection is more suitable instead of secondary since we are trying to collect the opinions from stakeholders and analyse the potential impact on the implementation of CBDC in Malaysia.

In addition, we have chosen to conduct online surveys because it allows us to collect a large amount of the data in a relatively shorter period, especially in times of pandemic Covid-19. The survey will be conducted by using Google Forms as it allows researchers to build different forms of questions that cater to different needs and use cases. The distribution of the survey will be delivered to target respondents via an online platform as it allows for faster, better results and has more opportunities to reach potential target stakeholders easily and effectively. From the perspective of the period, the surveys will be organized for 2 to 3 weeks which has enough time for respondents to access the surveys. The whole process of the way to conduct the survey for this study can be demonstrated by the help of figure 3.1.

Figure 3.1

Process of the survey conducted



3.3 Design of Sampling

The design of sampling is a process or framework to obtain a sample from a given population in order to allow researchers to adopt surveys to address research questions. Therefore, the sampling frame is important to the design of sampling as it represents the population of interest, from which a sample is to be drawn in order to meet the research objectives.

3.3.1 Targeted population

The target population is the group of people that the researcher desired to know more about. As mentioned above, the objectives of this research are to find out the market expectation of the implementation of CBDC in Malaysia and explore their motivations and understanding of the concept of CBDC. Since CBDC has yet to be implemented in Malaysia, the targeted population of this research is the Malaysian who is used to perform daily transaction by using cash payment, debit and credit card or someone who is familiar with online banking or performing financial transactions using

online platforms such as e-wallet users. This is because CBDC is known as the legal e-money and makes transactions online by using smartphones. It has a similar concept and mechanism behind it where they transact money via online platforms. Due to the advancement of technology, most people have the experience of using online banking and it is impossible to cover all the online banking users in all states in Malaysia. Thus, the target group of stakeholders or representative sample included

1. Financial institution employee
2. Non-financial institution employee
3. University student and academic
4. Citizen included retiree

3.3.2 Technique of sampling

In simple words, sampling is the process of selecting a sample. There are various sampling techniques which are grouped into probability sampling and non-probability sampling. In this research, the sampling strategy is probability sampling which uses randomization to make sure every element of the population gets an equal chance to be involved in the selected sample (Singh, 2018). The reason for selecting probability sampling techniques is because it is suitable to be used in quantitative research and suited for the research that is required to produce the results that are representative of the whole population (McCombes, 2022). Also, this study used stratified sampling which is the basic technique to divide a large population into smaller groups of samples.

3.3.3 Size of sampling

A research term used for defining the number of individuals included in a research study to represent a population is referred to as sample size (Kibuacha, 2021). In survey research, determining the sample size is the crucial factor as appropriate sample size reflects the accuracy and validity of the data and results. If the sample size is small, it will not show an adequately representative of the population being studied whereas it takes more time to conduct the survey if the sample size is too large to estimate. The formula to calculate the sample size will be shown as below:

$$\text{Sample size} = \frac{\frac{Z^2\, p(1-p)}{e^2}}{1+\left(\frac{Z^2\, p(1-p)}{e^2 N}\right)}$$

Where N = population size; Z = z-score; e = margin of error; p = standard of deviation

Based on the Department of Statistics Malaysia (DOSM), the current population in Malaysia in 2021 is estimated to be 32.7 million. Therefore, the sample size will be 385 where it is constructed based on a 95% confidence level with a margin of error of 5% in order to cover up the invalid response that may get through the process. Therefore, 385 surveys will be distributed and to be collected in this research study.

3.4 Research Instrument

In the Section 3.4 which is research instrument, it will be discussed about the tool used to collect, measure, and analyse data related to the research interests. For instance, the way of the survey design, survey reliability, validity, and pilot test.

3.4.1 Survey design

This survey uses the close-ended question and rating scale to identify the response to this CBDC questionnaire. The close-ended questions can be defined as the question that asks the respondents to choose from a distinct set of predefined responses. In the survey, there will be options of Yes/No/ Maybe or list of opinions among the set of multiple-choice questions to let the respondent choose where the responses are used to gather the quantitative data from respondents. For instance, it is suitable to use and to find the expectation of people of their willingness to use the CBDC in the future. Close-ended question is easy to understand, and the respondent does not need to spend more time reading the question because it is very straightforward and easy to respond to. It also provides better insight when the data need to be compared.

Rating scales are also a type of closed-ended survey question used to represent respondent feedback in a comparative form of the questionnaire. In this questionnaire, a numerical rating scale will be used to conduct this questionnaire. For instance, there will be matrix questions with a series of Likert scale questions which are composed of five items. The rating scale given was a 5-point Likert scale with 1 (strongly disagree), 2 (Disagree), 3 (Neutral), 4 (Agree), and 5 beings (strongly agree). It was used in section C where it was divided into 4 parts such as financial instability, financial inclusion, payment and security and privacy to investigate the potential impacts of implementation of CBDC.

In this survey, it consists of 4 sections which are Section A, B, C and D. In the Section A, demographic background will be asked to better understand the situation and characteristics in terms of the age group, income level, job field, education level, and the types of payment they used daily to perform transactions. In Section B, level of understanding or perception of the concept will be asked to understand the awareness of or heard of any CBDC concept. Followed by Section C, there will be 4 parts as mentioned in the last paragraph to investigate the potential impacts of implementation of CBDC while Section D collects data on the market expectation whether they are willing or reluctant to use CBDC if being successfully implemented.

3.4.2 Questionnaire reliability

Questionnaire surveys are a valuable technique for gathering information from respondents in a range of contexts, including self-reported outcomes in healthcare, customer insight/ satisfaction, and product preferences in market research. To ensure the consistency of the questionnaire, one of the estimates of reliability is test-retest reliability. This entails administering the survey to a group of respondents and then repeating the poll to the same group later. The responses at the two timepoints will be compared to determine the percentage of agreement between the test and retest result. The comparison of the value at the two timepoints with a correlation will also be constructed on a scale to get the continuous variables.

3.4.3 Questionnaire validity

To ensure the accuracy of the questionnaire, establishing a face validity will be a good choice to check the accuracy. First, having a person who is an expert and go through the questionnaire by effectively investigating the topic and checking the questionnaire for double, confusing, and leading questions.

3.4.4 Pilot Test

Pilot test has been conducted to rehearse the research survey in order to examine the accuracy and improve the consistency of the survey. In this case, 56 respondents have been collected in our pilot test. The response was collected by distributing the survey via online platforms and social media. After that, we gather the feedback from the respondent for data analysis and adjust the questions asked in the survey in order to improve the results collected so that it fits our objectives better.

3.5 Data Description

The data description is all about the way to summarize the findings and data in this research project. The tools that we used in the data description is the ANOVA test and the descriptive analysis. By performing these two analyses, we will be able to make our data findable, understandable and reusable.

3.5.1 ANOVA test

In statistics, there is a tool that we used purposely to split observed aggregate variability inside the data set into two parts which are random factors and systematic factors is known as ANOVA test. There is also some difference between random factors and systematic factors. For instance, systematic factors have a statistical influence on the given data set while the random factors do not. In regression research, researchers used ANOVA in their test in order to understand and investigate how the dependent variable can be impacted by the independent variables. Hence, the ANOVA test is a statistical method that separates observed variance data into different components to use for additional tests. For three or more groups of data, a one-way ANOVA is used to learn about the relationship between the dependent and independent variables. So, if there is no true variance between the groups, the ANOVA's F-ratio will be equal to 1. The ANOVA test also allows the analysis of multiple groups of data to determine the variability between samples and within samples. So, if there are no real differences between the tested group, this result is called the null hypothesis.

Therefore, in Chapter 4, we are going to go through this ANOVA test where we have dependent variables (willingness of people to use CBDC) and 4 independent variables (potential impact of implementation of CBDC such as financial stability, financial inclusion, payment, and security and privacy). In the end, we wanted to know whether the relationship between the willingness of people to use CBDC is affected or dependent on the potential impact of implementation of CBDC. This is all that we are interested in studying about.

3.5.2 Descriptive analysis

There is also a data analysis known as descriptive analysis which is used to summarize or present the data points in a constructive way that patterns can develop that satisfy all the data's conditions. Descriptive analysis is one of the most crucial procedures in statistical data analysis where it provides the conclusion about the distribution of the data, assists in detecting typos and outliers, and allows to spot commonalities among variables, preparing for additional statistical analysis. Descriptive analysis is more vast than other quantitative methods because it can provide a broader picture of an event or phenomenon and a single number of variables to conduct descriptive research. This style of analysis is thought to be a better approach for gathering information since it defines relationships as natural and depicts the world as it is. Hence, this analysis is very real and close to mankind because all trends are based on a study of the real-life behaviours of the data (Rawat, 2021).

CHAPTER 4 ANALYSIS AND INTERPRETATION OF RESULTS

4.0 Introduction

In chapter 4, it contains the analysis, presentation, findings, and discussion of the data collected from the survey conducted. The data were collected through primary which distributed the survey for 3 weeks and collected more than 380 respondents. By performing the analysis and interpretation of results, statistical tools such as SPSS software were used in order to explain our findings according to the themes and sub-themes derived from the objectives and research questions stated in Chapter one.

4.1 Sample profile

For the survey, we have distributed more than 450 surveys via different channels such as social media, emailing, or physically to our targeted audience which is university students, academics, non-financial institutions employees, and financial institution employees. A total number of 383 respondents was collected and received completed. Table 4.1 is the summary of the respondents. We can observe that there is an 85.11% of response rate and the total collected number is 383. Hence, the number of surveys used for the data analysis is 383 responses since there is no missing data in raw data.

Table 4.1

Frequency of total surveys collected

Items	Total survey
Number of surveys that distributed	450
Number of surveys collected	383
Response rate	85.11%
Missing data	0

4.2 Descriptive Analysis on Demography

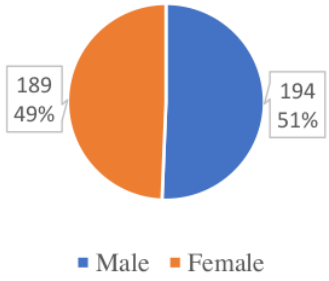
In this section, we will perform descriptive analysis on demography which is a type of analysis of data to help us describe, show and summarize the characteristics of the sample used in this research. All of the information collected from the respondents will be presented in a chart to make us clearly see the findings and results.

4.2.1 What is your gender identity?

The respondents were asked to indicate their gender. Figure 4.2.1 below shows that our survey consists of 194 or 50.7% male respondents and 189 or 49.3% female respondents. All of the surveys were distributed randomly, and the number of males is more than females indicating that males are more willing to participate in the research and answer the question.

Figure 4.2.1

Descriptive Analysis for Gender

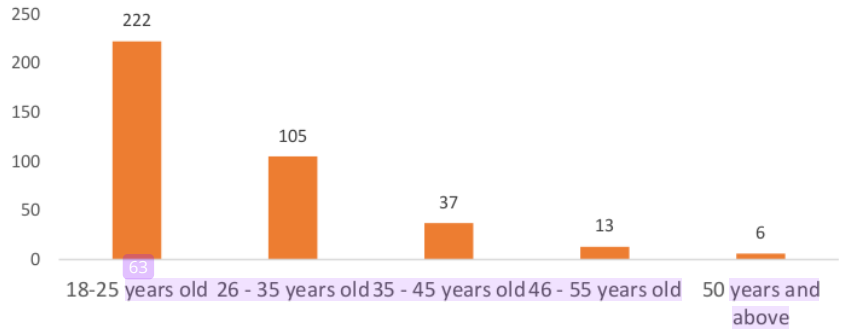


4.2.2 What is your age group?

Figure 4.2.2 below shows the frequency of the age group. We can observe that the majority of the respondents fall belong 18 to 25 years old age group which consists of 58% or more than half of the total respondents collected. Next, there are 105 or 27.4% of respondents categorized into 26 to 35 years old followed by 36 - 45 years old and 46 - 55 years old groups who contributed 9.7% and 3.4% in the research, respectively. While 56 years and above contributed 6 or 1.6% of the respondents which shows that there was less involvement in our research.

Figure 4.2.2

Descriptive Analysis for Age Group

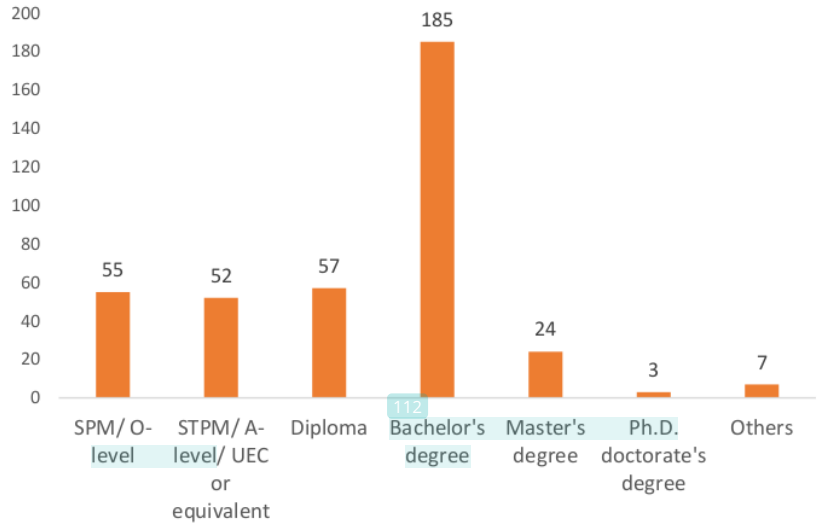


4.2.3 What is you highest education level attained?

Figure 4.2.3 reveals the frequency of the highest level of education attained. We can analyse that the majority of the respondents in the study have a bachelor's degree holder which consists of 185 or 48.3% of the total participants. Followed by diploma holders, SPM/ O-level holders, and STPM/ A-level/ UEC or equivalent comprise 14.9%, 14.4%, and 13.6% respectively which is similar in terms of the total number of highest education levels attained. In addition, respondents with a master's degree and Ph.D. doctorate degree comprise 6.3% and 0.8% respectively. Interestingly, there are also 7 respondents or 1.8% of the participants who selected others as their education level which may indicate that there is another selection that is not included in the options the researcher provided.

Figure 4.2.3

Descriptive Analysis for Education Level

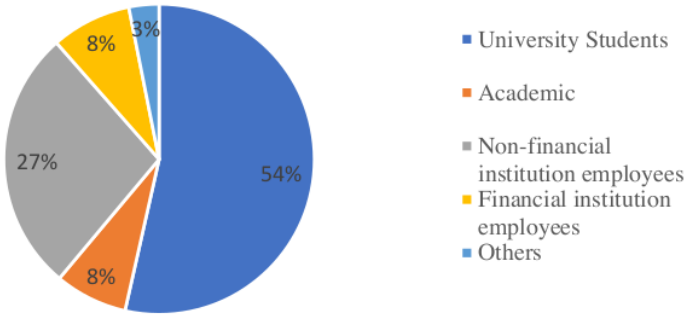


4.2.4 Are you a?

Based on figure 4.2.4 below, university students contributed the greater amount which consists of 205 or 53.52% of respondents. Followed by non-financial institution employees has the second highest percentage which is 27.42% or with 105 responses. Whereas financial institution employees and academics have 8.36% and 7.57% accordingly. Respondents who selected others are the majority of retirees, mechanics, university fresh graduates, and from 6 students.

Figure 4.2.4

Descriptive Analysis of Occupation



4.2.5 What is your monthly income level?

The frequency of the monthly income of participants was summarized below Figure 4.2.5. The highest category of respondents comes from monthly income below RM1,000 which is 128 or 33.4%. We can observe that it tallies with the number of the occupations in Figure 4.2.4 as we have 205 or 53.52% of respondents are university students and they might not have any income or have a part-time job that less than a monthly income of

RM1,000 to support their daily expenses. Next, we have the monthly income of RM1,001 - RM3,000 and RM3,001 - RM5,000 comprising 99 (25.8%) and 93 (24.3%) respectively. Followed by respondents who fall in RM5,001 - RM8,000 monthly income categories, which have 47 respondents (12.3%). Last but not least, the monthly income group of RM8,001 - RM10,000 and RM10,001 and above shows 11 respondents (2.9%) and 5 respondents (1.3%) sequentially.

Figure 4.2.5

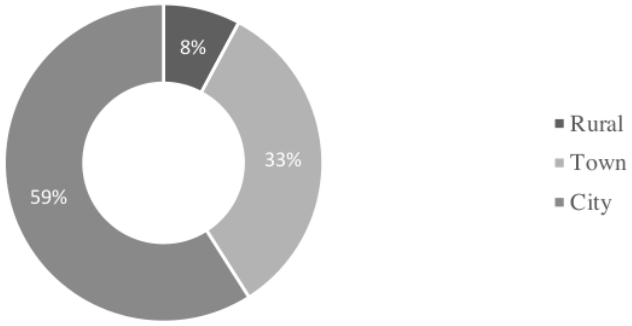
Descriptive Analysis for Monthly Income Level

4.2.6 Where is your living area?

Figure 4.2.6 reveals the frequency of the living area of the participants in the study. We can notice that the majority of the respondents who come from the city areas contributed the highest number which is 226 or 59.0% of the respondents. Followed by 127 respondents (33.2%) who live in the town areas and 30 respondents (7.8%) in the rural areas.

Figure 4.2.6

Descriptive Analysis for Living Area

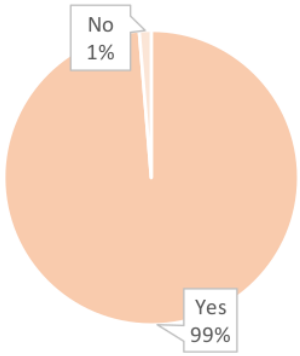


4.2.7 Do you own a smartphone?

Figure 4.2.7 appears the frequency of the respondents owning a smartphone. It recorded that there are 378 respondents (98.7%) who have a smartphone and 5 respondents (1.3%) who do not have it.

Figure 4.2.7

Descriptive Analysis for Owning a Smartphone

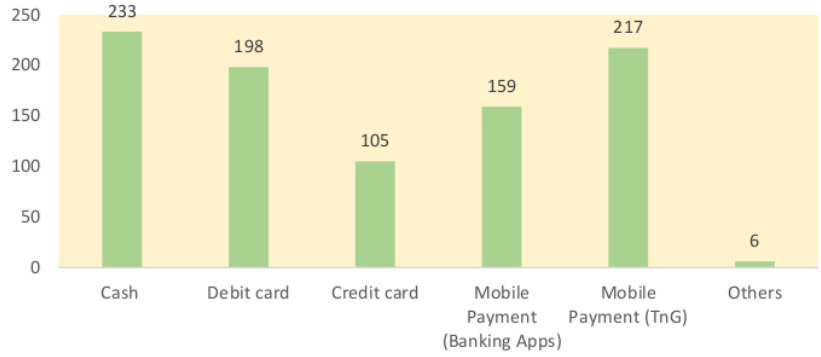


4.2.8 What types of payments method do you prefer to use? (More than 1 option allowed)

Figure 4.2.8 below shows the types of payment methods respondents prefer to use in daily transactions and they are allowed to choose more than one option because they might use different payment methods to do transactions. Interestingly, although we are living in a technology era and there is an outbreak of the pandemic in recent years, there are 233 respondents (60.8%) still using cash which contributed to the highest amount of payment used. The second highest belongs to mobile payment such as E-wallets TnG has 217 respondents selected (56.7%) as it is convenient to use. Followed by debit cards has 198 respondents (51.7%), mobile payment (banking apps) has 159 respondents (41.5%), and credit cards have 105 respondents (27.4%). Other payment methods contributed 6 (1.6%) of the total respondents.

Figure 4.2.8

Descriptive Analysis for Types of Payments Preferred to Use



4.3 Descriptive Analysis for Level of Understanding or Perception of the Concept of CBDC

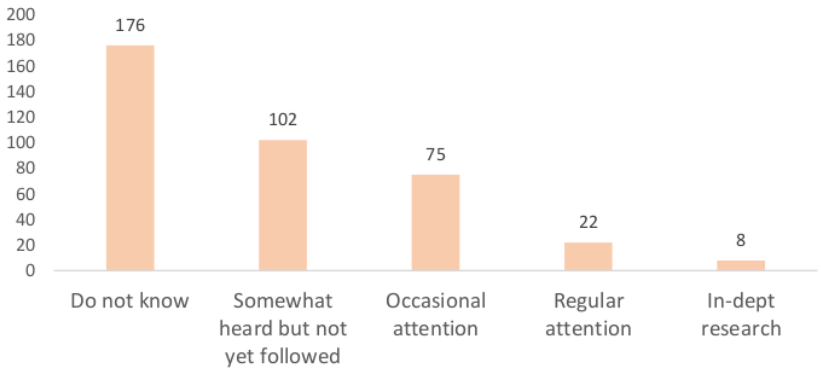
Followed by this section discussed about the descriptive analysis on the level of understanding of the respondents or their perception on the concept of CBDC. By summarize into graph or bar chart, we will be able to know how the awareness is of heard of the CBDC by the respondents.

4.3.1 How far to what extend do you heard and know the CBDC?

According to the descriptive analysis of Figure 4.3.1, we can detect that the majority of the respondents have not heard about the CBDC before as it consists of the highest frequency which is 176 respondents (46.0%). Approximately one-fourth of respondents (26.6%) somewhat heard it but are not interested in or followed the news. 19.6% of respondents occasionally observe the trend of CBDC, followed by 22 respondents (5.7%) regularly attention and lastly 8 respondents (2.1%) in-depth research of CBDC.

Figure 4.3.1

Descriptive Analysis for Awareness of Knowing CBDC

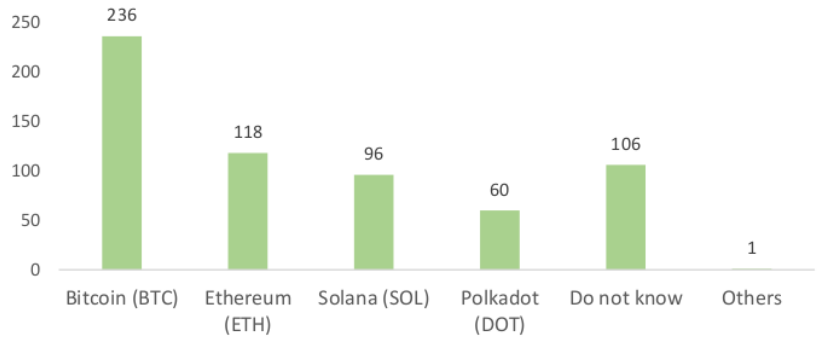


4.3.2 What kind of digital currency do you know? (More than one option allowed)

In this survey question, the respondents were allowed to choose more than one option as they might know several types of the digital currency. Although in previous descriptive analysis which is Figure 4.3.1, we notice that the majority of participants (46.0%) do not know CBDC before as it is a new topic in the recent 5 years, there are 236 respondents (61.6%) aware of bitcoin (BTC). Followed by Ethereum (ETH) has respondents of 118 (30.8%). Based on the Figure 4.3.2, we also can detect there are 106 respondents (27.7%) who do not know about any digital currency as they might probably not be aware of electronic currency or any financial technology and blockchain. Besides, other cryptocurrencies like Solana (SOL) and Polkadot (DOT) obtained results of 96 (25.1%) and 60 (15.7%) correspondingly. Unexpectedly, in this survey, a respondent gave a different answer, which is Moreno.

Figure 4.3.2

Descriptive Analysis for Awareness of knowing the digital currency

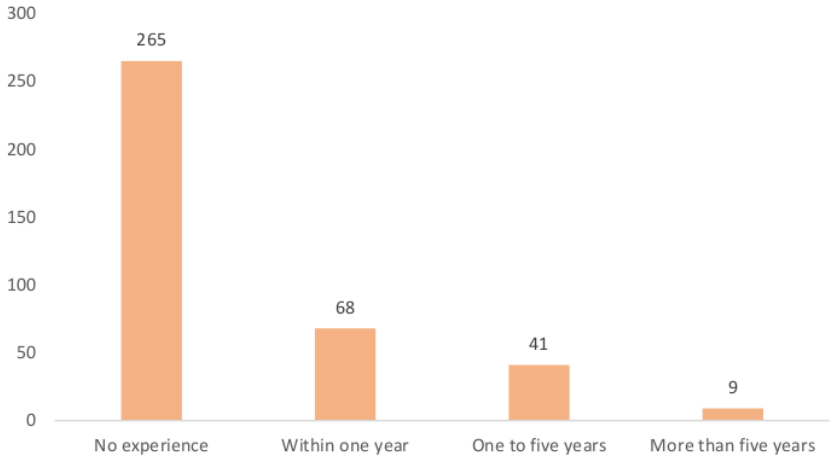


4.3.3 What is your investment experience in digital currency?

Based on the Figure 4.3.3, 265 respondents (69.2%) do not have any experience with investment in digital currency which contributed the most in the survey. Followed by 68 respondents (17.8%) has an experience within one year. Whereas 41 respondents (10.7%) and 9 respondents (2.3%) have an investment experience of one to five years and more than five years, respectively.

Figure 4.3.3

Descriptive Analysis for Investment Experience in Digital Currency



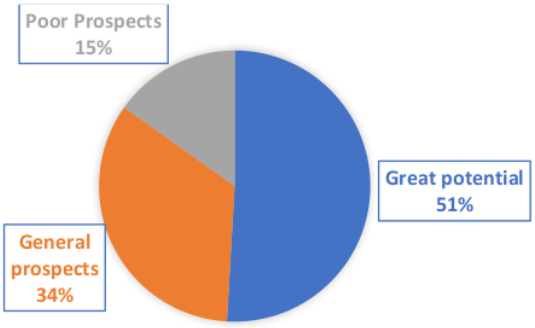
4.3.4 What do you think of the development prospects of digital currency?

Figure 4.3.4 below shows the frequency of the development prospects of digital currency in this study. Approximately half of the respondents (50.9%) have an opinion that digital currency is a great potential for development, followed by 130 respondents (33.9%) who select general prospects, whereas

58 respondents (15.1%) do not have confidence in the prospect's development of the digital currency.

Figure 4.3.4

Descriptive Analysis for Development Prospects of Digital Currency



4.3.5 What is the reason you do not think digital currency will be useful as medium of exchange or investment option? [More than 1 option allowed]

Based on Figure 4.3.5, we can see that most of the participants believe volatility in value and speculative risk (221 responses) is the strong reason that digital currency cannot be used to serve as the medium of exchange or investment option. Next, 200 respondents (53.2%) were afraid it is likely to be hacked followed by trading platforms having operational risk and inadequate regulation, and vulnerability to financial fraud. In addition, 182 participants believe that the trading platform has operational risks. Among them, related risks can be defined in diverse ways, such as policy risk, system risk, transaction risk, circulation risk, business risk and so on. Lastly, one of the reasons why the remaining 165 participants do not think digital

currency is useful as a trading medium or investment choice is that it is vulnerable to financial fraud due to inadequate supervision.

Figure 4.3.5

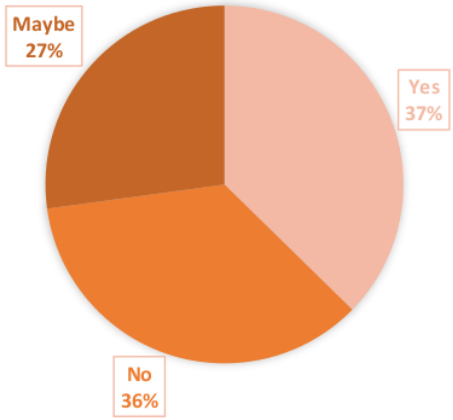
Descriptive Analysis for Reason digital currency not suitable to use

4.3.6 Do you think a CBDC is a type of cryptocurrency?

In this question, we would like to explore the respondents on their understanding of the nature of CBDC. We can notice 143 respondents (37.3%) agree CBDC is a type of cryptocurrency which is the highest amount followed by 136 respondents (35.5%) who do not think it is a cryptocurrency whereas 104 respondents are not sure of their answer. This reveals that probably they might not understand what CBDC is and in the previous question, we were able to see that the majority of respondents do not hear it before.

Figure 4.3.6

Descriptive Analysis of Understanding the Nature of CBDC



4.4 Descriptive Analysis on Market Expectation

Section 4.4 discusses the descriptive analysis on market expectation. We expect to collect the opinion of respondents and their expectation of the implementation of CBDC by the central bank in Malaysia in order to find out desired solution when comes to the stage of designing the CBDC.

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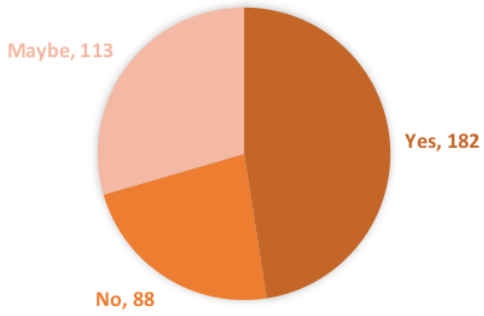
4.4.1 Do you expect to use CBDC?

The Figure 4.4.1 shows the respondents' expectations of using the central bank's digital currency. The record shows that 182 respondents expect to use the central bank digital currency, 88 respondents do not expect to use the central bank digital currency, and 113 respondents are uncertain about their expectation of using the central bank digital currency.

Figure 4.4.1

Descriptive Analysis for Willingness to Use CBDC

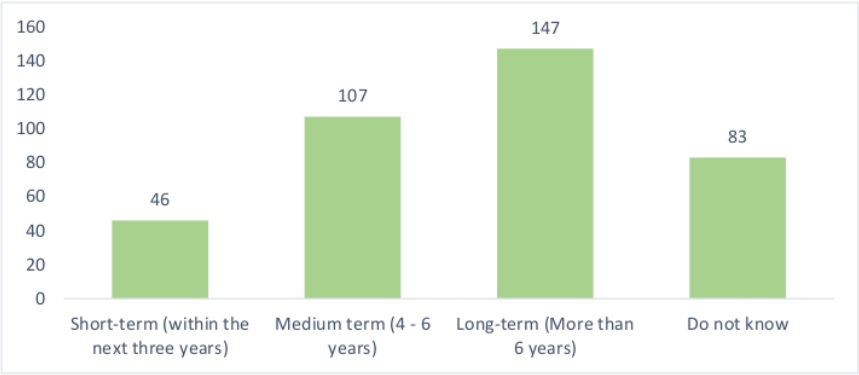


4.4.2 How likely central bank will use a CBDC in the following time horizons?

The figure 4.4.2 shows how likely respondents are that the central bank will use CBDC in the next period. According to the records, 147 respondents thought it was possible for more than 6 years, 107 respondents thought it was possible within 4-6 years, 46 respondents thought it could be achieved within 3 years, and the remaining 83 respondents had no idea about this.

Figure 4.4.2

Descriptive Analysis for time horizons for the central bank to launch CBDC

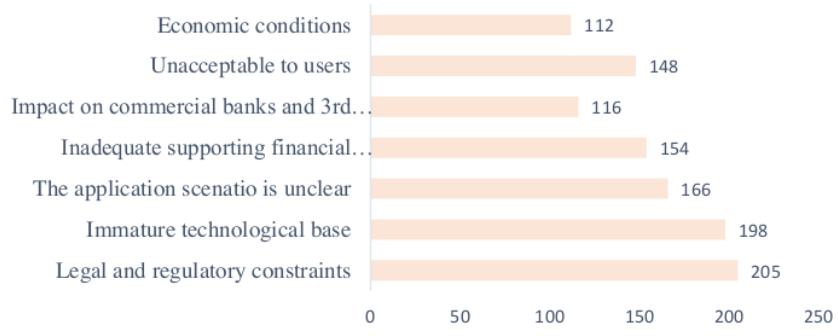


4.4.3 What do you think are the main obstacles to the launch of the central bank digital currency in Malaysia? [More than 1 option allowed]

According to the Figure 4.4.3, respondents believe that the first major obstacle to the introduction of the central bank digital currency in Malaysia is legal and regulatory restrictions, and this option has been approved by more than half of the people, that is, 205 respondents. Secondly, the second obstacle that respondents think of is the immature technical foundation, and a total of 198 respondents agree. Third, maybe CBDC has not gained people's attention in Malaysia, so 166 respondents think that the application scenario of CBDC is not clear enough. Secondly, the respondents think that Malaysia's supportive financial infrastructure is not enough, and this option was approved by 154 respondents. In addition, as mentioned before, the CBDC concept in Malaysia is not so common, so 146 respondents think that users cannot accept CBDC. Finally, such as the impact on commercial banks and third-party payment services, the resistance of commercial banks and third-party payment institutions, and the economic situation, 116 and 114 respondents respectively agreed.

Figure 4.4.3

Descriptive Analysis for the Main obstacles to launch the CBDC in Malaysia

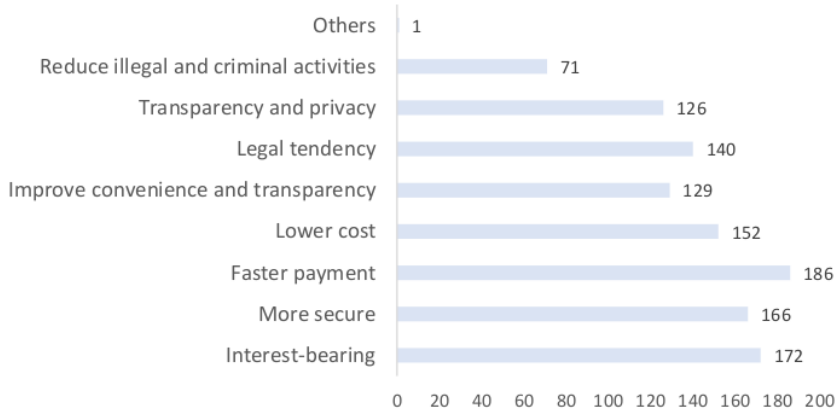


4.4.4 What are the features that attract you to use CBDC if being successfully implemented? [More than 1 option allowed]

According to the Figure 4.4.4 below, if CBDC is successfully implemented, the interviewee thinks that the biggest feature that can attract him to use CBDC is faster payment, which is approved by more than half of the people, that is, 186 interviewees. Secondly, the second characteristic that respondents think is interest-bearing, and a total of 172 respondents agree. Third, 166 respondents thought CBDC made them feel more secure. Then, the interviewee thinks that CBDC can reduce the cost, which is one of the characteristics of his use of CBDC. This option was approved by 152 interviewees. Besides, as mentioned before, CBDC in Malaysia makes them feel safer, so 140 respondents think that legal inclination is one of its characteristics. Finally, 129, 126 respondents and 71 respondents respectively agreed to improve convenience and transparency, transparency and privacy of CBDC and reduce illegal and criminal activities.

Figure 4.4.4

Descriptive Analysis for Features Attract Respondents to use CBDC

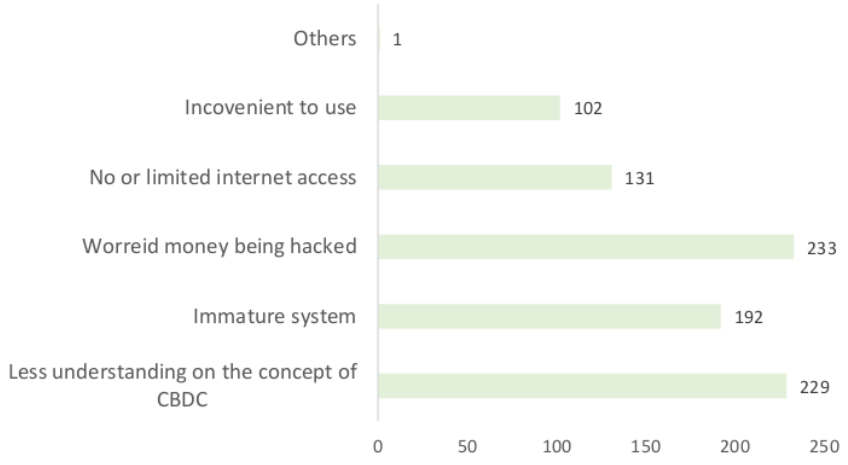


4.4.5 What are the features that discourage you to use CBDC if being successfully implementation? [More than 1 option allowed]

According to the Figure 4.4.5, if CBDC is successfully implemented, respondents think that the main feature that will hinder their use of CBDC is their fear of money being hacked. This option has been approved by more than half of the people, that is, 233 respondents. Secondly, the interviewees think that the second characteristic is that they do not understand the concept of debt. A total of 229 interviewees agrees with it. The reason may be that CBDC's attention among Malaysian people is not strong enough. Thirdly, 192 respondents think that the CBDC system in Malaysia is not mature enough (immature system). Then, respondents thought that the lack or limited Internet access was one of the characteristics that prevented them from using CBDC. This option was approved by 131 respondents. Finally, 102 respondents thought CBDC was inconvenient to use.

Figure 4.4.5

Descriptive Analysis for Features Discourage Respondents to Use

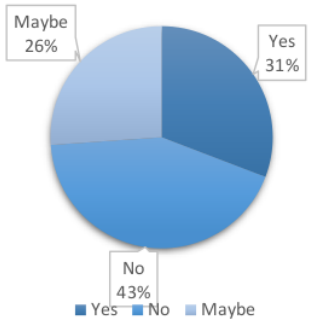


4.4.6 If CBDC is non-interest bearing but is still protected by the central bank, will you be willing to use it?

The Figure 4.4.6 shows the willingness of respondents to use CBDC if it is interest-free but still protected by the central bank. According to the records, 165 respondents thought they would not use it, 116 respondents thought they would use it, and 100 respondents thought both options were possible.

Figure 4.4.6

Descriptive Analysis for Willingness to Use CBDC If It is Launched as Non-Interest Bearing

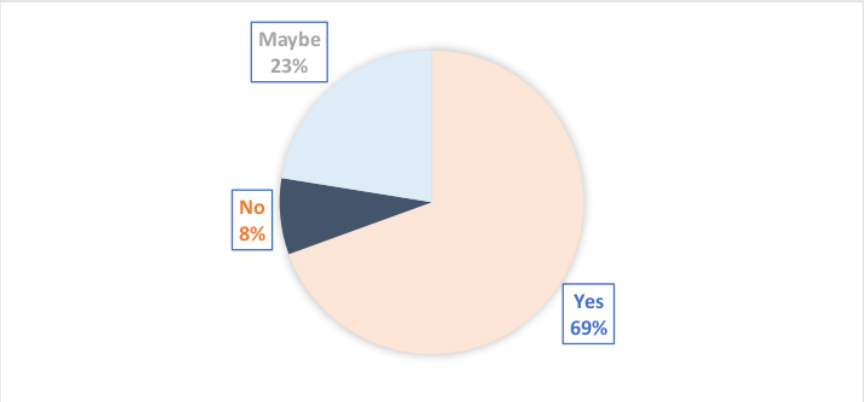


4.4.7 Do you expect a CBDC have “offline” capabilities?

The Figure 4.4.7 shows whether respondents think CBDC has the "offline" capability. According to the records, 266 respondents think there is which is the highest, 31 respondents think there is no, and 86 respondents think that both options are possible.

Figure 4.4.7

Descriptive Analysis for Expectation of "offline" features



4.5 Descriptive Analysis on Likert Scale Data

In section 4.5, it is all about the descriptive analysis on Likert scale data for the survey in Section C which is the potential impacts on implementation of CBDC. There are four parts in this Section C in the survey which are financial stability, financial inclusion, payments, and security and privacy. All the part in the section has some few items which composed of 5-point rating scale with 1 (strongly disagree), 2 (Disagree), 3 (Neutral), 4 (Agree) to 5 beings (strongly agree).

4.5.1 Descriptive Analysis on Financial Stability (FS)

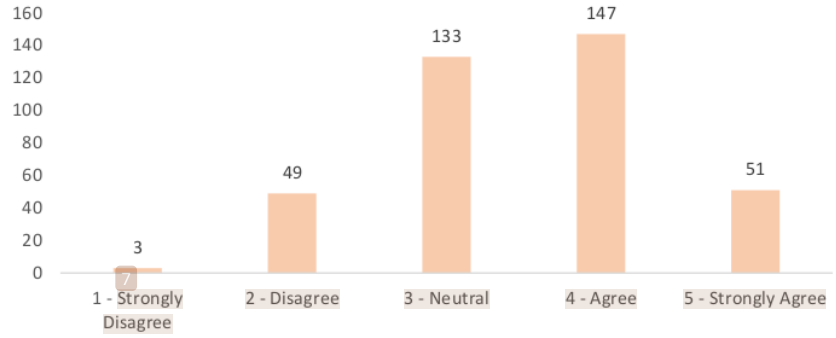
There are 7 items under Financial Stability which discussed about the financial stability when the implementation of CBDC such as bank run or affect to the bank's profitability. Hence, section 4.5.1 describes and summarize the descriptive analysis on Financial Stability (FS).

4.5.1.1 CBDC is safer instrument then other payment methods to protect funds or save in a time of financial stress. (FS1)

According to the Figure 4.5.1.1, the score of 4 indicates that this option is approved by 147 participants out of 383 participants, which is 38.4% in the responses which the highest responses in FS1. They agree that compared with other payment methods, CBDC is a safer tool to protect funds or make saving during the financial crisis.

Figure 4.5.1.1

Descriptive Analysis for FS1

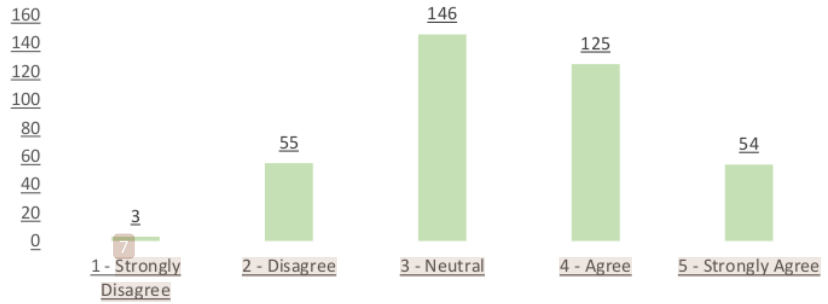


4.5.1.2 CBDC will negatively affect the structure of the current banking industry and the process of financial intermediation. (FS2)

According to the bar chart in Figure 4.5.1.2, the highest frequency selected by the respondents is 3 which is neutral. There is about 146 or 38.1% of the participants selected where indicated that CBDC will have a negative impact on the current banking structure and financial intermediation process. The lowest frequency is belonging to 1 – "Strongly Disagree".

Figure 4.5.1.2

Descriptive Analysis for FS2

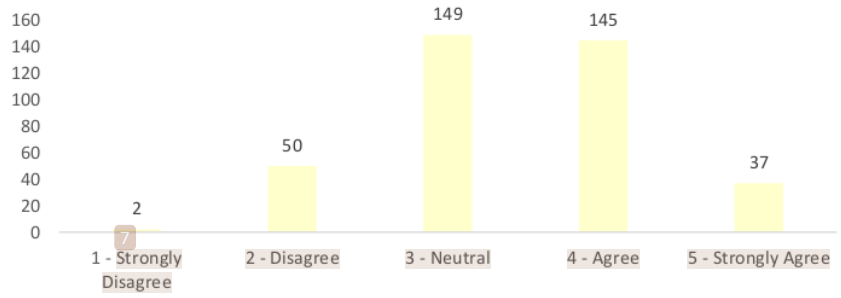


4.5.1.3 Depositors will withdraw money from the traditional bank and switch bank deposits to CBDC. (FS3)

Based on Figure 4.5.1.3, the scores of 3 and 4 are remarkably close, which means the most of the participants are neutral and agree. The option 3 "Neutral" recognized by 149 participants among 383 participants, while the option 4 "Agree" is recognized by 145 participants. Therefore, 294 participants think that when CBDC is implemented, depositors will withdraw money from traditional banks and transfer bank deposits to CBDC.

Figure 4.5.1.3

Descriptive Analysis for FS3

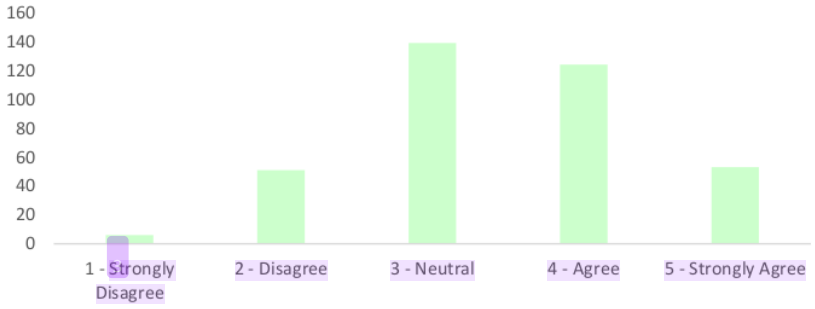


4.5.1.4 There is an increased possibility of a bank run (people rush to withdraw money from deposit account) happening. (FS4)

Based on the Figure 4.5.1.4, the score of 3 shows that most participants are neutral, and this option 3 is recognized by 149 of 383 respondents. The lowest score will be option 1 which is strongly disagree. Participants may think that when CBDC comes into effect, people are scrambling to withdraw money from deposit accounts, that is, the possibility of bank run will be increasing.

Figure 4.5.1.4

Descriptive Analysis for FS4



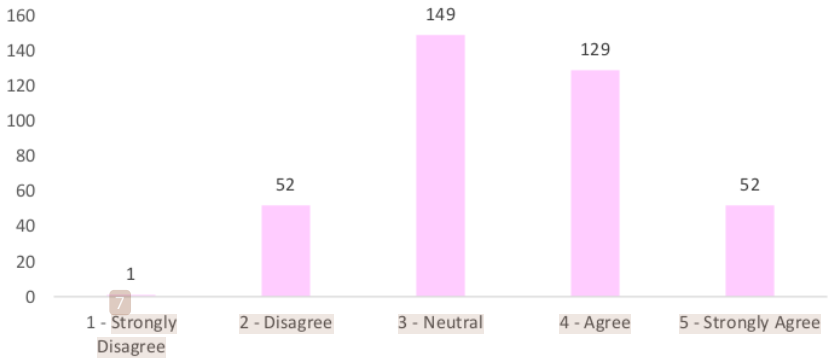
4.5.1.5 CBDC will cause deposit withdrawal from the commercial bank, reducing the bank's ability to lend loans and bank profitability. (FS5)

According to the Figure 4.5.1.5, the score of 3 shows that most participants are neutral, and this option 3 is recognized by 149 of 383 participants. Participants believe that CBDC will lead to the deposit backflow of

commercial banks and reduce the bank's loan granting ability and profitability.

Figure 4.5.1.5

Descriptive Analysis for FS5

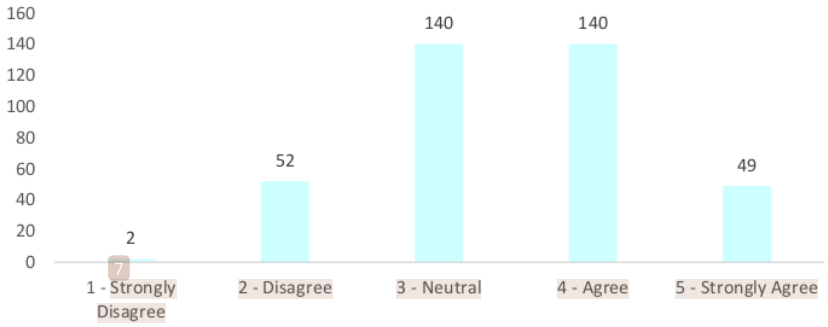


4.5.1.6 With the increase in market capital flows, the risk of financial instability of CBDC will also increase. (FS6)

In this statement, we have two identical scores. According to the Figure 4.5.1.6, scores 3 and 4 were shown, and each score was also supported by 140 participants. This means that most participants remain neutral and agree with each other. Participants believe that with the increase of market capital flows, the risk of CBDC financial instability will also increase.

Figure 4.5.1.6

Descriptive Analysis for FS6

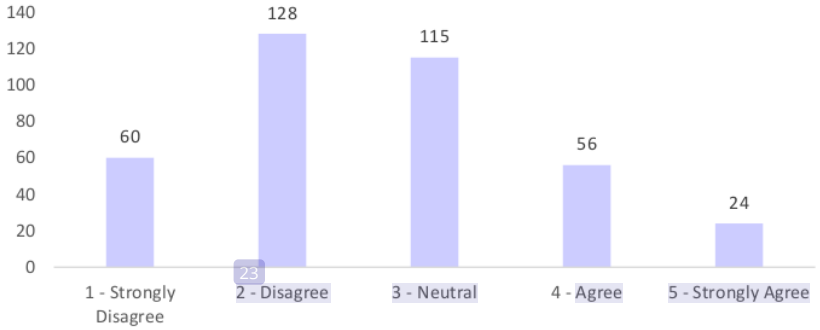


4.5.1.7 It is possible for the CBDC to replace all the existing payment methods (E.g. E-wallets/ paper currency/ credit card) in the future. (FS7)

Based on Figure 4.5.1.7, score 2 was recognized by the most participants, with 128 out of 383 participants. This indicated that most participants hold different views. Participants do not think it is possible for CBDC to replace all existing payment methods in the future, such as e-wallet, paper money, credit card, etc.

Figure 4.5.1.7

Descriptive Analysis for FS7



4.5.2 Descriptive Analysis for Financial Inclusion (FI)

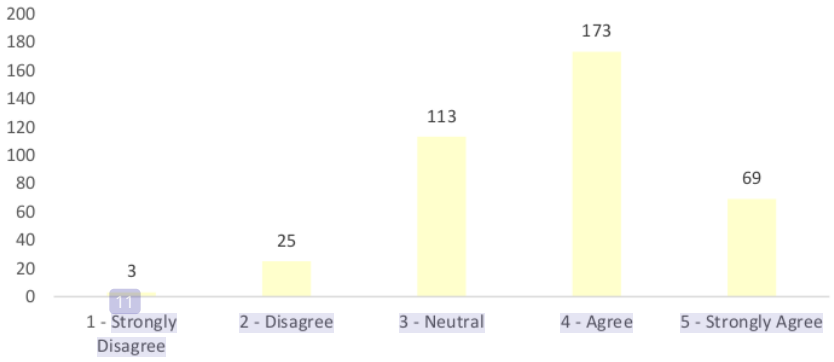
There are 4 items under Financial Inclusion which discussed about the willingness of people to use CBDC if they are more financially included. Hence, section 4.5.2 describes and summarize the descriptive analysis on Financial Inclusion (FI).

4.5.2.1 CBDC allows more people (including unbanked and underbanked) to enjoy and access financial services. (FI1)

By looking at the Figure 4.5.2.1, the score of 4 was recognized by the most participants, with 173 out of 383 participants. This means that most of the participants agree. Most participants believe that CBDC allows more people, including those without bank accounts and with insufficient banking services, to enjoy and obtain financial services.

Figure 4.5.2.1

Descriptive Analysis for FI1

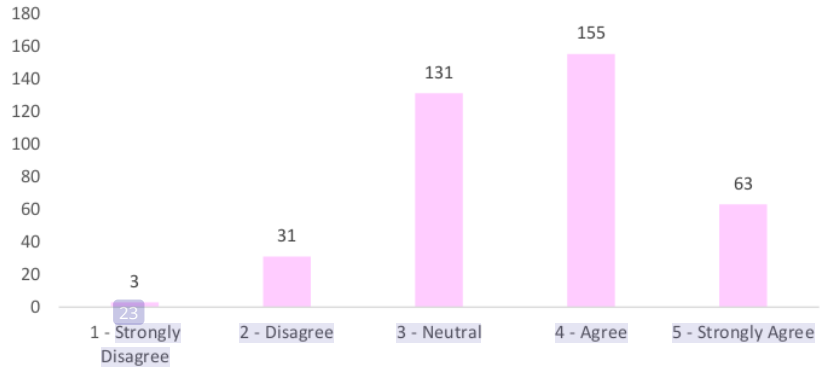


4.5.2.2 Issuance of CBDC is able to boost economic growth while alleviating poverty. (FI2)

Based on Figure 4.5.2.2, the score of 4 was recognized by the most participants, with 155 out of 383 participants. This means that most of the participants agree with this statement. Most participants believe that issuing CBDC can alleviate poverty while promoting economic growth.

Figure 4.5.2.2

Descriptive Analysis for FI2

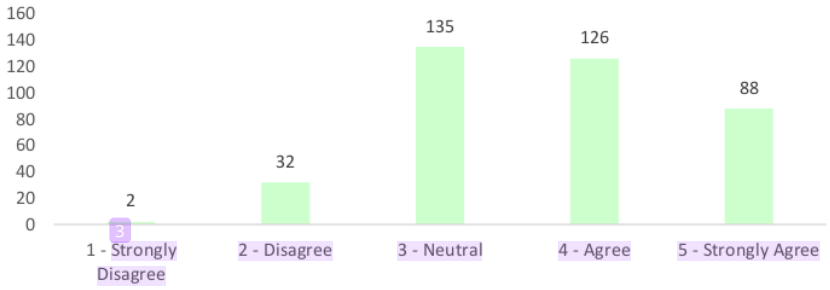


4.5.2.3 Limited internet access or infrastructure is the barrier to improving financial inclusion. (FI3)

The highest score for this statement is score of 3 which 135 out of 383 participants has neutral with it. The second highest belongs to score of 4 which 126 participants agree in the view that limited internet access or infrastructure is an obstacle to improving financial inclusion.

Figure 4.5.2.3

Descriptive Analysis for FI3

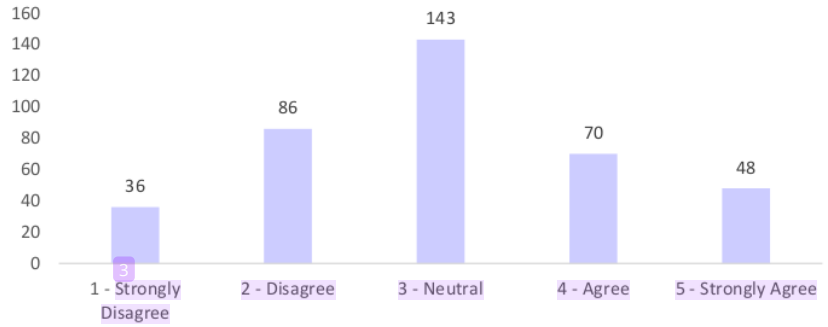


4.5.2.4 Financial inclusion is not an important factor in the issuance of CBDC. (FI4)

Below shows the figure 4.5.2.4 which notice that majority respondents think neutral to this statement which comprise of 143 out of 383 respondents. The second highest belongs to score of 2 which is disagree with this statement. Based on Figure 4.5.2.1, 45.2% of the respondents agree that CBDC allows more people enjoy and access to financial services. Hence, to ensure the consistency of the survey, it is expected that majority people select disagree or neutral for this statement (FI4).

Figure 4.5.2.4

Descriptive Analysis for FI4



4.5.3 Descriptive Analysis on Payment (P)

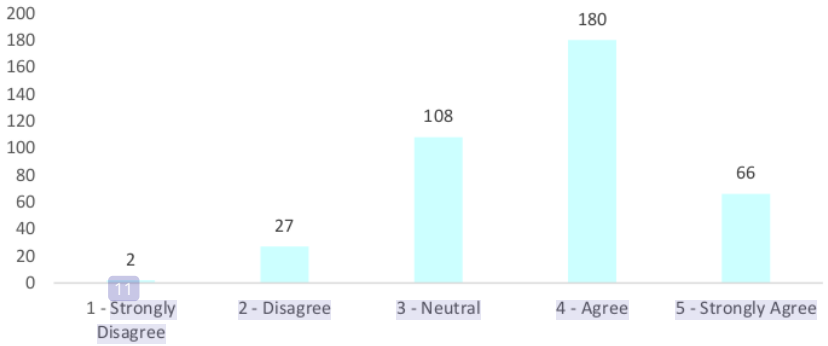
There are 6 items under Payment which discussed about the willingness of people to use CBDC if the CBDC is designed to facilitate payment and reduce cost of people. Hence, section 4.5.3 describes and summarize the descriptive analysis on Payment (P).

4.5.3.1 CBDC is able to improve payment efficiency for domestic and cross-border and make it more convenient for users. (P1)

Below Figure 4.5.3.1 shows the frequency for this statement where we can observe the highest score belongs to score 4. There are 180 participants or 47% agree that CBDC able to facilitate payment efficiency which make it more convenience to users. Besides, 108 participants feel neutral, and 66 respondents strongly agree with this statement.

Figure 4.5.3.1

Descriptive Analysis for P1

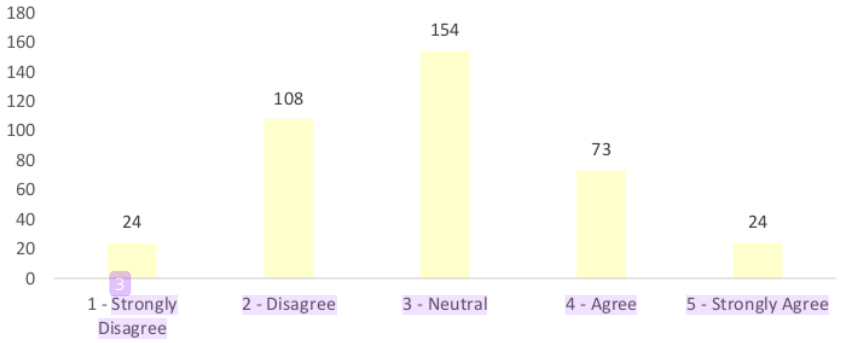


4.5.3.2 CBDC has no potential to offer low-cost payment services as a public service. (P2)

Based on Figure 4.5.3.2, majority of respondents feel neutral with this statement which consists of 154 or 40.2% of total responses. While 108 or 28.2% respondents disagree CBDC has no potential to offer low-cost payment services as a public service. Interestingly, people strongly agree and strongly disagree consists of same value of number which is 24 respondents out of 383.

Figure 4.5.3.2

Descriptive Analysis for P1

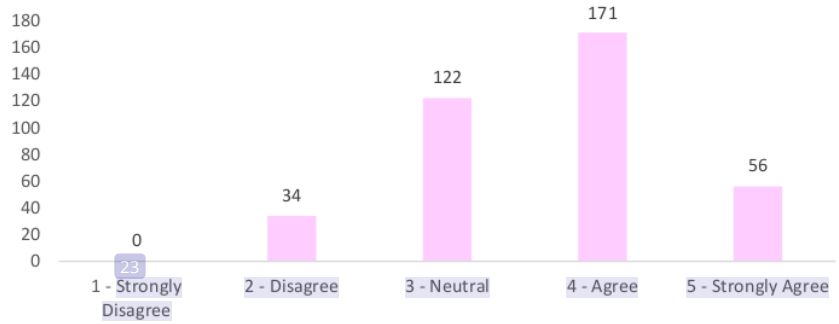


4.5.3.3 CBDC allows for speedier retail payment which boosts competitiveness and decrease costs for businesses and customers. (P3)

Figure 4.5.3.3 below reveals that 171 or 44.6 respondents agree CBDC allows to make payment faster which bring more benefits such as decrease costs for businesses and customers. The second highest belongs to neutral opinion where 122 or 31.9% respondents select this option. Also, there is no respondents strongly disagree with this statement.

Figure 4.5.3.3

Descriptive Analysis for P3

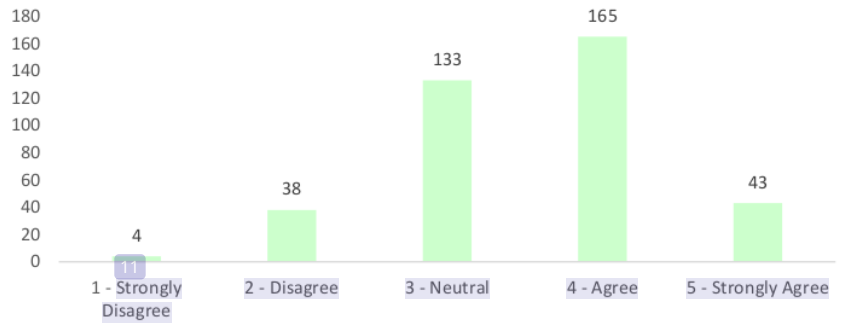


4.5.3.4 CBDC can be used as an alternative to be existing digital payment systems and used in facilitating assistance payment. (P4)

Similar as previous responses, majority of respondents feel agree that CBDC able to use as an alternative to be existing digital payment systems which shown at Figure 4.5.3.4. Next, 133 respondents or 34.7% neutral with this statement.

Figure 4.5.3.4

Descriptive Analysis for P4

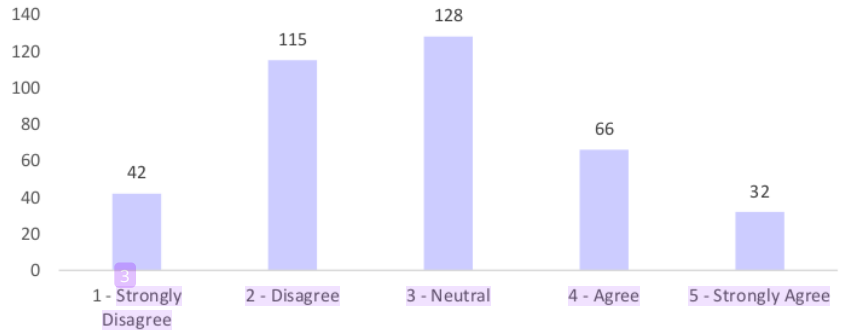


4.5.3.5 Cash payment can be eliminated if CBDC is being successfully implemented. (P5)

Figure 4.5.3.5 reveals 128 or 33.4% of respondents has a score of 3 which is neutral with this statement. Whereas the second highest score is 2 which is disagree with this statement which consists of 115 or 30% of respondents.

Figure 4.5.3.5

Descriptive Analysis for P5

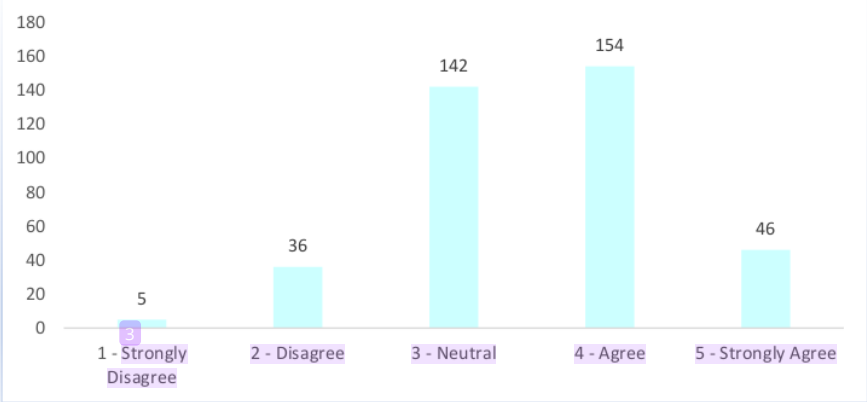


4.5.3.6 Implementation of CBDC is able to spur innovation and competition in payments. (P6)

There are 154 or 40.2% of respondents agree that CBDC that issued by central bank able to spur innovation and competition for other payment providers. There are also 142 or 37.1% of respondents out of 383 respondents neutral with this statement. Majority of participants were in between the range of neutral, agree, and strongly agree.

Figure 4.5.3.6

Descriptive Analysis for P6



4.5.4 Descriptive Analysis for Security and Privacy (SP)

There are 4 items under Security and Privacy which discussed about the willingness of people to use CBDC if CBDC is designed to be more safety which reduce the

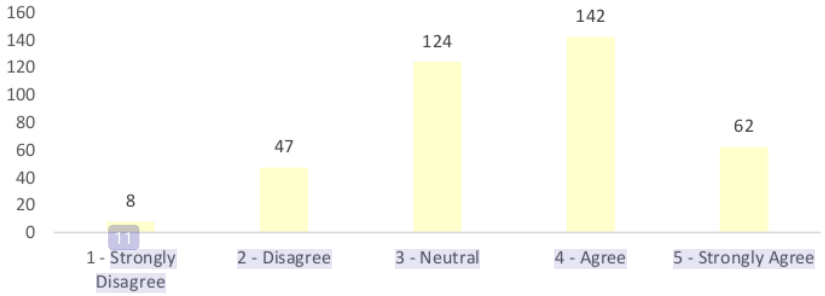
breach of privacy and able to trace illegal activities. Hence, section 4.5.4 describes and summarize the descriptive analysis on Security and Privacy (SP).

4.5.4.1 Under the control and monitoring of the centra bank, CBDC is more secure than other payment methods. (SP1)

There are 142 respondents out of 383 agree that under the control and monitoring of the central bank, CBDC is safer than other payment methods. Also, 124 or 32.4% of respondents have a view of neutral with this statement. Followed by strongly agree (62 respondents), Disagree (47 respondents) and Strongly Disagree (8 respondents).

Figure 4.5.4.1

Descriptive Analysis for SP1



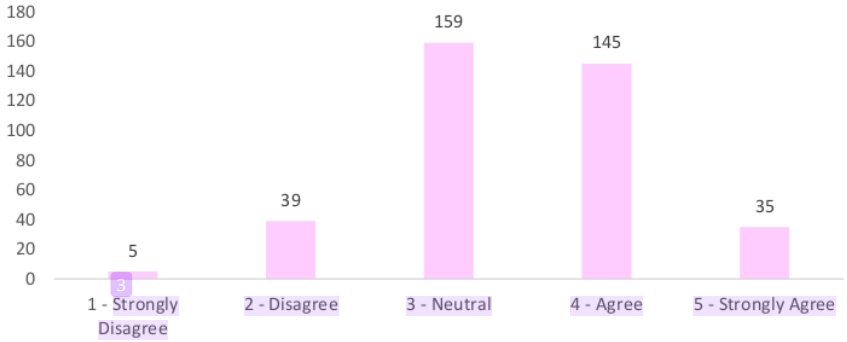
4.5.4.2 A CBDC is able to track illegal activities due to digitalization and the growing centralization of data. (SP2)

Based on Figure 4.5.4.2, the score of 3 was recognized by the most participants, with 159 out of 383 respondents. This means that due to the

digitalization and increasing concentration of data, CBDC can track illegal activities, and most participants remain neutral about this view.

Figure 4.5.4.2

Descriptive Analysis for SP2

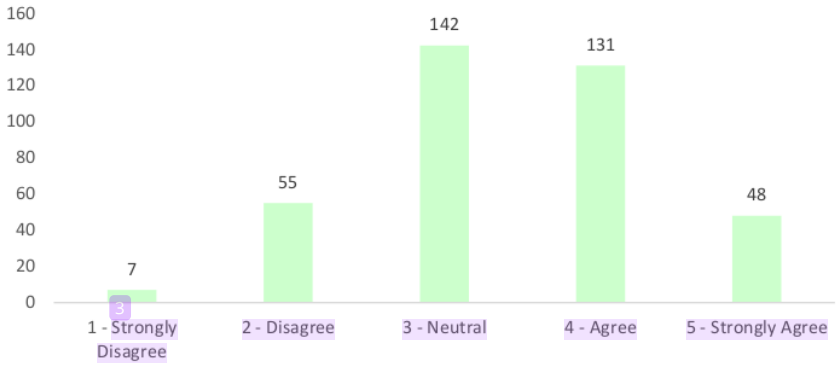


4.5.4.3 CBDC is more likely to pose new threats to the breach of privacy (personal information being stolen). (SP3)

The most participants recognized score 3, with 142 out of 383 respondents. This means that CBDC is more likely to pose a new threat to the invasion privacy, that is, the theft of personal information. Most participants remain neutral about this view. All of the results show in Figure 4.5.4.3.

Figure 4.5.4.3

Descriptive Analysis for SP3

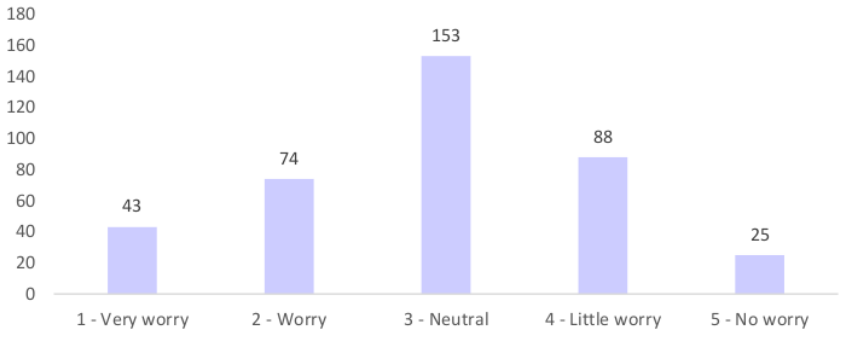


4.5.4.4 How concerned are you about the privacy breach when using the digital payment system? (SP4)

According to the Figure 4.5.4.4, the score of 3 was recognized by the most participants, with 153 out of 383 participants. This means that when most participants use digital payment systems, users' opinion's on how worried they are about privacy leakage remain neutral.

Figure 4.5.4.4

Descriptive Analysis for SP4



4.6 Central Tendencies Measurement of Construct

In this section, we have used statistical software like SPSS to assist in calculating the central tendencies measurement of the data collected. In our survey, we have included Likert scale data starting from Section C: Potential Impact on Implementation, and the series of Likert scale questions has composed of five items which was a 5-point Likert scale with 1 (strongly disagree), 2 (Disagree), 3 (Neutral), 4 (Agree), and 5 (Strongly Agree). The central tendency is used such as mean, median, and mode in the Likert scale as it is able to be analysed as interval data. Finding the model able to tell use the most frequently occurring number or the most common response to each statement whereas the mean able to give use the overall average response. Also, standard deviation is being calculated to examine how is the data spread in a normal distribution.

4.6.1 Financial Stability (FS)

The table 4.6.1 shows the central tendency measurement of Financial Stability. We can observe the mean score range fall in the range from 2.62 to 3.51 where FS1 contributed the highest-ranking mean which is 3.51 and FS7 has the lowest mean. In terms of mode, FS1 has a mode of 4 indicating the majority of the respondents agree with the statement whereas FS2 to FS6 has a mode of 3 where respondents feel neutral to the statement. FS7 ("It is possible for the CBDC to replace all the existing payment methods") has the lowest mode which is 2 which shows respondents disagree with the statement. From the perspective of standard deviation, the lowest standard deviation of financial stability belongs to the question FS3 which is 0.856 and the highest standard deviation belongs to the FS7.

Table 4.6.1

Central Tendencies of Financial Stability

No.	Question	Sample size	Mean	Median	Mode	Std. Deviation
FS1	CBDC is a more safer instrument than other payment methods to protect funds or save in a time of financial stress.	383	3.51	4	4	0.906
FS2	CBDC will negatively affect the structure of the current banking industry and the process of financial intermediation.	383	3.45	3	3	0.931
FS3	Depositors will withdraw money from the traditional bank and switch bank deposits to CBDC.	383	3.43	3	3	0.856
FS4	There is an increased possibility of a bank run (people rush to withdraw money from deposit account) happening.	383	3.44	3	3	0.941
FS5	CBDC will cause deposit withdrawal from the commercial bank, reducing the bank's ability to lend loans and bank profitability.	383	3.47	3	3	0.900

FS6	With the increase in market capital flows, the risk of financial instability of CBDC will also increases	383	3.48	3	3	0.900
FS7	It is possible for the CBDC to replace all the existing payment methods (E.g. E-wallets/ paper currency/ credit card) in the future.	383	2.62	3	2	1.104

4.6.2 Financial Inclusion (FI)

Table 4.6.2 reveals the central tendencies of financial inclusion. The mean range is between 3.02 and 3.73 whereas the standard deviation range is between 0.858 to 1.135. The question "CBDC allows more people (including unbanked and underbanked) to enjoy and access financial services." (FI1) has the highest mean and lowest standard deviation which are 3.73 and 0.858 respectively followed by "Limited internet access or infrastructure is the barrier to improving financial inclusion." (FI3) is the second highest mean score which is 3.69 over other two questions. The lowest mean and highest standard deviation belong to "Financial inclusion is not an important factor in the issuance of CBDC." (FC4) which are 3.02 and 1.135, respectively.

Table 4.6.2

Central Tendencies of Financial Inclusion

No.	Question	Sample size	Mean	Median	Mode	Std. Deviation
FI1	CBDC allows more people (including unbanked and underbanked) to enjoy and access financial services.	383	3.73	4	4	0.858
FI2	Issuance of CBDC is able to boost economic growth while alleviating poverty.	383	3.64	4	4	0.878
FI3	Limited internet access or infrastructure is the barrier to improving financial inclusion.	383	3.69	4	3	0.934
FI4	Financial inclusion is not an important factor in the issuance of CBDC.	383	3.02	3	3	1.135

4.6.3 Payment (P)

For table 4.6.3 below, we can notice the summary table of the central tendency's measurement of payment. We can detect the mean score range is between 2.82 to 3.73 whereas the standard deviation range is between 0.836 and 1.103. The highest mean belongs to the question "CBDC is able to improve payment efficiency for domestic and cross-border and make it

more convenient for users." (P1) which is 3.73, whereas the highest standard deviation falls under the statement "Cash payment can be eliminated if CBDC is being successfully implemented." (P5) which is 1.103. Besides, the second highest of mean is P3 (3.65), followed by P4 (3.54), P6 (3.52), and P2 (2.91). Statement P5 has the lowest mean score which is 2.82. Apart from that, the second highest standard deviation belongs to P2 which is 0.984 and P3 has the lowest standard deviation which is 0.836. In terms of mode, P1, P3, P4 and P6 has a mode of 4 whereas P2 and P5 has a mode of 3.

Table 4.6.3

Central Tendencies of Payment

No.	Question	Sample size	Mean	Median	Mode	Std. Deviation
P1	CBDC is able to improve payment efficiency for domestic and cross-border and make it more convenient for users.	383	3.73	4	4	0.845
P2	CBDC has no potential to offer low-cost payment services as a public service.	383	2.91	3	3	0.984
P3	CBDC allows for speedier retail payment which boosts competitiveness and decreases costs for businesses and customers.	383	3.65	4	4	0.836

P4	CBDC can be used as an alternative to be existing digital payment systems and used in facilitating assistance payment.	383	3.54	4	4	0.858
P5	Cash payment can be eliminated if CBDC is being successfully implemented.	383	2.82	3	3	1.103
P6	Implementation of CBDC is able to spur innovation and competition in payments.	383	3.52	4	4	0.871

4.6.4 Security and Privacy (SP)

Table 4.6.4 shows the security and privacy central tendencies. The statement S1 ("Under the control and monitoring of the central bank, CBDC is more secure than other payment methods.") has the highest mean score, which is 3.53, followed by S2 (3.43), S3 (3.41) and S4 (2.94). S4 has the lowest mean which is 2.94. Besides, for the ranking of standard deviation, we noted that S4 has the highest standard deviation which is 1.064 followed by S1 (0.973), S3 (0.945), and S2 (0.844). S1 has the mode of 4 whereas the rest of the three statements have a mode of 3.

Table 4.6.4

Central Tendencies of Security and Privacy

No.	Question	Sample size	Mean	Median	Mode	Std. Deviation
S1	Under the control and monitoring of the central bank, CBDC is more secure than other payment methods.	383	3.53	4	4	0.973
S2	A CBDC is able to track illegal activities due to digitalization and the growing centralization of data.	383	3.43	3	3	0.844
S3	CBDC is more likely to pose new threats to the breach of privacy (personal information being stolen).	383	3.41	3	3	0.945
S4	How concerned are you about the privacy breach when using the digital payment system?	383	2.94	3	3	1.064

4.7 Reliability Testing

Table 4.7 shows the summary table of the reliability analysis for each variable. We have conducted Cronbach's Alpha Reliability Analysis which helps us to determine

whether the variable especially for multiple question Likert scale surveys is reliable to conduct the test. This is because they are exceedingly difficult to measure in real life as they might be hidden or unobservable variables. Hence, in order to determine how closely related a set of test items are as a group, we conducted Cronbach's alpha.

Based on the result in Table 4.7 and rule of thumb in Table 4.7.1, we can observe that Financial Stability (FS) has the highest Cronbach's alpha coefficient, which is 0.734 and it indicated that FS has an acceptable internal consistency as it has a score of more than 0.7. Followed by the value of Payment is 0.563, Security and Privacy (0.517) and the lowest value is financial inclusion which is 0.178. Both Payment (P) and Security and Privacy (PI) has poor internal consistency. In this situation, we are looking for a score of over 0.5 for high internal consistency because our items are not more than 10. The value for Financial Inclusion (FI) is not acceptable and we decided to calculate Cronbach's Alpha again by dropping 1 item from it.

Table 4.7

Cronbach's Alpha Reliability Analysis

Variables	Number of items	Cronbach's Alpha Value	Remarks
Financial Stability (FS)	7	0.734	Acceptable
Financial Inclusion (FI)	4	0.178	Unacceptable
Payment (P)	6	0.563	Poor

Security and Privacy (SP)	4	0.517	Poor

Table 4.7.1

Rule of Thumb of Cronbach's Alpha Value

Cronbach's Alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$\alpha \geq 0.8$	Good
$\alpha \geq 0.7$	Acceptable
$\alpha \geq 0.6$	Questionable
$\alpha \geq 0.5$	Poor
$\alpha \leq 0.5$	Unacceptable

Since the Cronbach alpha value of Financial Inclusion (FI) is less than 0.20, we decided to drop the item that has negative average covariance among items. After moving to FI4 in Financial Inclusion, we were able to get a Cronbach alpha value of more than 0.7 which is acceptable to proceed with the test. Below Table 4.7.2 is the summary table of Cronbach's alpha reliability analysis.

Table 4.7.2

Cronbach's Alpha Reliability Analysis After Removing FC4

Variables	Number of items	Cronbach's Alpha Value	Remarks
Financial Stability (FS)	7	0.734	Acceptable
Financial Inclusion (FI)	3	0.785	Acceptable
Payment (P)	6	0.563	Poor
Security and Privacy (SP)	4	0.517	Poor

4.8 Inferential Analysis

Before performing inferential analysis, which is Pearson Correlation Coefficient and multiple regression analysis, we need to deal with the dependent variable and independent variable. The independent variable (Y) which is the willingness of people to use CBDC is nominal data where we assign a dummy variable for the data. For instance, respondents who answer yes (they are willing to use) = 1, otherwise = 0.

Next, for the independent variables (Xs), we have performed Likert scale data for each of the Xs where 1 = "Strongly Disagree", 2 = "Disagree", 3 = "Neutral", 4 = "Agree", and 5 = "Strongly Agree". Also, for each of the independent variables, we have a different number of items under each section. For instance, there are 7 items under financial stability, 3 items under financial inclusion, 6 items under payment, and 4 items under security and privacy.

In order to run multiple regression analysis and also to estimate the correlation between each other, we need to combine the items under each of the independent variables and sections. Hence, the median is the preferred central tendency to perform. The reason that we do not use means to combine the items of the survey is that data for Likert items produce is not continuous. Likert data is a type of ordinal data that is not interval or ratio where it is more suitable to use the median to calculate our data.

For instance, we have 7 items under financial stability (FS1 to FS7). By using the SPSS to transform the variable in order to calculate the median, we will have commands like MEDIAN (FS1, FS2, FS3, FS4, FS5, FS6, FS7) entered in the numeric expression. Hence, we will have 383 observations of X1 (financial stability) where 7 items of each respondent have been transformed into 1 item which is the median of their answer. In simple word, if they have the selection like FS1 = 3, FS2 = 3, FS3 = 3, FS4 = 4, FS5 = 4, FS6 = 4, FS7 = 4, the median of this observation is 4. The same goes with the other 3 independent variables (financial inclusion, payment, and security and privacy), the same step has been performed.

4.8.1 Pearson Correlation Coefficient

In 4.8.1, Pearson correlation coefficient has been conducted in order to estimate the relationship between 2 variables are linearly related. By looking at the result, we are also able to determine whether there is any multicollinearity occurred if two independent variables are highly correlated which one another. Multicollinearity problem happened when there might be two variables contain same information which make our estimate of a predictor on the response variable less precise and less reliable (Rekha, 2019). Hence, if the independent variable has correlation of more than 0.7,

we might suspect there is multicollinearity problem in our model. According to Statisticstechs (2018), the rules of thumb of correlation coefficient was shown below as Table 4.8.1.

Table 4.8.1

Rule of Thumb of correlation coefficient

r	Strength of relationship
< 0.2	Negligible Relationship
0.2 - 0.4	Low relationship
0.4 - 0.7	Moderate relationship
0.7 - 0.9	High relationship
> 0.9	Very high relationship

Table 4.8.1.1 below shows the Pearson Correlation Coefficient test for each of the variables and also the rules of thumb of the correlation coefficient. Based on the results, we can observe that the correlation range falls between 0.222 and 0.302 which the 4 independent variables (financial stability, financial inclusion, payment, and security and privacy) have a low relationship with the dependent variable (Willingness of people to use CBDC).

The highest correlation between x and y is the payment which has a 0.302 correlation with the independent variable. Followed by financial inclusion has a value of 0.298 and financial stability has a value of 0.245. The least correlation coefficient between x and y is security and privacy which shows 0.222 based on the result. Also, correlation coefficient between independent variables is less than 0.7 indicated there might not be multicollinearity problem happened in our model.

From the view of the significance of the relationship, there is a significant relationship between all the independent variables and dependent variables which is lesser than the 0.01 level of significance. Hence, in the research, we are able to reject the null hypothesis and conclude there is a significant relationship between each of the independent variables with the dependent variables.

Table 4.8.1.1

The results of the Pearson Correlation Coefficient test

Variable		Willingness	Financial stability	Financial Inclusion	Payment	Security and Privacy
Willingness	Pearson Correlation	1	0.250**	0.298**	0.302**	0.222**
	Sig. (2-tailed)		< 0.001	< 0.001	<0.001	< 0.001
	N	383	383	383	383	383

Financial stability	Pearson Correlation	0.250**	1	0.476**	0.509**	0.493**
	Sig. (2-tailed)	< 0.001		< 0.001	< 0.001	< 0.001
	N	383	383	383	383	383
Financial Inclusion	Pearson Correlation	0.298**	0.476**	1	0.607**	0.527**
	Sig. (2-tailed)	< 0.001	< 0.001		< 0.001	< 0.001
	N	383	383	383	383	383
Payment	Pearson Correlation	0.302**	0.509**	0.607**	1	0.584**
	Sig. (2-tailed)	< 0.001	< 0.001	< 0.001		< 0.001
	N	383	383	383	383	383
Security and privacy	Pearson Correlation	0.222**	0.493**	0.527**	0.584**	1
	Sig. (2-tailed)	< 0.001	< 0.001	< 0.001	< 0.001	
	N	383	383	383	383	383

Noted: ** Correlation is significant at the 0.01 level (2-tailed)

4.8.2 Multiple Linear Regression Analysis

In this section, we will perform a multiple linear regression analysis to investigate how the dependent variable depends on independent variables which means how the willingness of people to use CBDC depends on the potential impact of the implementation of CBDC such as financial stability, financial inclusion, payment, and security and privacy. Hence, we will be able to achieve our objectives of study which is

i. To find out the market expectation of different stakeholders whether they are willing to use CBDC.

Also, we will run 3 models of multiple regression analysis which differentiate the result of overall responses (383 observations), financial institution employees' responses (32 observations), and responses excluding financial institution employees (351 observations). The purpose is to achieve our objective which is

ii. To identify the gap of perspective between professionals like financial institution employees and non-professional respondents such as university students, academics, non-financial institution employees, and retirees.

In this section, we will show 3 different multiple regression models by using SPSS software to calculate. The equation will be

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \mu$$

Where Y denotes willingness of people to use CBDC, X_1 is financial stability (FS), X_2 is financial inclusion (FI), X_3 is payment (P) and X_4 is security and privacy.

It is expected that people are willing to use CBDC if CBDC is designed to make more people financial included, to facilitate payment, and provide more safety measure.

4.8.2.1 Multiple Regression Model Results

Below is the equation of these 3 multiple regression models.

i. Model 1: Included all respondents (383 observations)

$$Y = -0.516 + 0.095\,X_1 + 0.156\,X_2 + 0.159\,X_3 + 0.001\,X_4 + \mu$$

(0.146) *** (0.038) (0.040)** (0.051)** (0.045)

ii. Model 2 = Include respondents who is a financial institution employee (32 observations)

$$Y = -1.030 - 0.110\,X_1 + 0.363\,X_2 + 0.368\,X_3 - 0.043\,X_4 + \mu$$

(0.435)** (0.164) (0.150) (0.164) (0.155)

iii. Model 3 = Included all respondents but excluded respondents who is a financial institution employee (351 observations)

$$Y = -0.473 + 0.067\,X_1 + 0.087\,X_2 + 0.107\,X_3 + 0.007\,X_4 + \mu$$

(0.155)*** (0.039)* (0.042)** (0.054)** (0.047)

Below Table 4.8.2 reveals the summary table of comparison between 3 models where we have the independent variables of financial stability, financial inclusion, payment and security and privacy. For model 1, Financial Stability (FS) has a coefficient of positive but insignificant at 1%, 5%, and 10%. It shows a result that a positive result in financial stability, people are more willing to use CBDC. This is what we expected but it has no relationship with dependent variable. Financial inclusion (FI) has positive coefficient of 0.156 and significant at 5%. This indicated that when people are more financial included, people are more willing to use CBDC. Hence, there is a relationship between financial inclusion and willingness of people to use CBDC.

In terms of payment, it has positive coefficient of 0.159 and significant at 5% level which means people are more willing to use CBDC if CBDC is designed to be facilitate the payment. Also, security and privacy have positive coefficient but no relationship at whether 1%, 5% and 10% alpha level which indicated H_0 cannot be reject.

From the perspective of Model 2, it is about to determine the perspective of professional in terms of their willingness to use CBDC. In Table 31, we can notice there is negative coefficient of financial stability and security and privacy which have a value of -0.429 and -0.177 respectively. For this model, there is no independent variables significant at 1%, 5%, and 10%. Hence, we can conclude there is no relationship between independent variables and dependent variable.

Next, Model 3 is the model that excluded only financial institution employees from the data. Hence, it has 352 observations where the regression show four positive coefficients and they are significant at 5% or 10% expect security and privacy. FS is significant at 10% and has a coefficient of 0.106. Financial inclusion (FI) and Payment (P) is significant at 5% where we able to reject H_0 and conclude there is a relationship between these variables with the dependent variables. However, security and privacy have a p-value of 0.875 where it is not significant at all.

Table 4.8.2

Summary table of comparison between 3 models

Variable	Model 1	Model 2	Model 3
C	-0.516 ***	-1.030 **	-0.473 ***
	(0.146)	(0.435)	(0.155)
Financial Stability	0.095	-0.110	0.106 *
	(0.038)	(0.164)	(0.039)
Financial Inclusion	0.156 **	0.363	0.138 **
	(0.040)	(0.150)	(0.042)
Payment	0.159 **	0.368	0.140 **
	(0.051)	(0.164)	(0.054)
Security and Privacy	0.001	-0.043	0.010
	(0.045)	(0.155)	(0.047)
R^2	0.118	0.340	0.106
F-statistic	1.9429E-9 ***	0.021**	7.1374E-8 ***

Note: * P-value (< 10%), ** P-value (< 5%), *** P-value (< 1%)

Model 1 = Included all respondents (383 observations)

Model 2 = Include respondents who is a financial institution employee (32 observations)

Model 3 = Included all respondents but excluded respondents who is a financial institution employee (351 observations)

4.8.2.2 Measure of Goodness Fit

R-square or known as goodness of fit is an important indicator to show how well the dependent variable can be explained by independent variables. Hence, by looking at the summary output in Table 4.8.2, Model 1 has a R-squared of 0.118 which indicated that 11.8% of the total variation of willingness of people to use CBDC is explained by independent variables such as FS, FI, P, and SP whereas 88.2% is explained by other independent variables which are not included in the model. Same goes with the Model 2 where the R-squared is 34% which means 34% of variables fits the model well. Also, Model 3 only has 10.6% of R-squared which is lowest compared to other 2 models.

4.8.2.3 F-test Hypothesis Testing

F-test hypothesis testing has been conducted to estimate the overall significancy of the model. For F test, it assumed that at least one slope of coefficient is not equal to zero. Below are the hypotheses:

H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$

H_1: At least one $\beta_i \neq 0$, where i = 1, 2, 3, 4

Based on Table 4.8.2 above, both three models are significant where Model 1 and Model 3 is significant at 1%, 5%, and 10%. Model 2 has a value of 0.021 which significant at 1% and 5%. We are able to reject the null hypothesis and conclude there is a relationship between all of the independent variables with the dependent variables.

4.9 Conclusion

In short, this chapter present the overall findings and analysis of the data collected from respondents via the survey distributed. All of the data has been summarized and analysed using the SPSS software to examine the validity of the variables assessed in the study and the significant relationship between the independent and dependent variables. Also, by using descriptive statistics, we are able to see clearly the overall demographic profile of the data collected and the central tendency measurements of construct also being assessed.

CHAPTER 5 DISCUSSION AND CONCLUSION

5.0 Introduction

In this chapter, we will discuss the summary of our findings and some statistical analysis. Also, we will try to reach out to some recommendations for further research, challenges, limitation of this study, and implications based on our discussion and findings.

5.1 Summary of Statistic Analysis

Section 5.1 will summarize the summary of statistical analysis which is descriptive analysis and inferential analysis such as Pearson correlation coefficient and multiple regression analysis that implemented in Chapter 4 analysis and interpretation of results.

5.1.1 Summary of descriptive analysis

In our survey, we have collected 383 responses who are our targeted stakeholders. Under demographic profile, we have 50.7% of male and 49.2% female who all comes from different of age group. The 18 to 25 years old age group is the majority which comprises 58% followed by 26 to 35 years old which contributed 27.4%. The remaining 14.6% of the respondents belong to the 36 to 45 years old group, 46 to 55 years old group, and 56 years and above age group.

From the perspective of education, approximately half of the respondents have attained a bachelor's degree level. 14.9% of respondents graduated with a diploma, 13.6% graduated from SPM, while a small percentage of respondents attained a master's degree and Ph.D. which comprises 6.3% and 0.8% respectively.

Followed by occupation, a university student has a greater percentage which is 53.5%. 27.4% of respondents come from non-financial institution employees, 8.4% belong to financial institution employees and 7.6% come from academics whereas the rest of the remaining is from other occupations. For monthly income level, there is 33.4% of respondents have income below RM1,000 due to a greater percentage of university students. 25.8% of respondents have a monthly income between RM1,001 to RM3,000. The income range between RM3,001 to RM5,000 has 24.3% whereas 12.3% of respondents have an income of RM5,001 to RM8,000.

Followed by the living area, 59% of respondents live in the city area, 33.2% live in the town area whereas 7.8% live in the rural area. In terms of owning a smartphone, 98.7% own it while 1.3% of respondents do not have it. In addition, 60.8% of respondents still preferred to use cash in their daily transactions, followed by 56.7% of people who used E-wallets and 51.7% of people who used debit cards. Some respondents also preferred to use mobile banking apps and credit cards which comprised 41.5% and 27.4% respectively.

Also, approximately half of the respondents do not know and heard of CBDC. 26.6% somewhat heard it but not yet followed the news, 19.6% of respondents have occasional attention to CBDC, whereas a small percentage

of respondents have some regular attention and in-depth research. Furthermore, 69.2% of respondents do not have any investment experience in digital currency although, there is a large percentage of respondents know different kinds of digital currency. Interestingly, a huge percentage of respondents (50.9%) think that digital currency has greater potential for development, 33.9% of respondents feel general development prospects whereas 15.1% believed it has poor prospects for development.

5.1.2 Summary of Inferential Analysis

In Chapter 4, we did two inferential analysis which is Pearson correlation coefficient and multiple regression analysis. All of the result and interpretation will be summarized in the following Section 5.1.2.1 and 5.1.2.2 respectively.

5.1.2.1 Pearson Correlation Coefficient

By using the SPSS software to calculate the Pearson correlation coefficient, all 4 independent variables (financial stability, financial inclusion, payment, and security and privacy) have a positive relationship with the dependent variable (willingness of people to use CBDC). First and foremost, the relationship between financial stability with the willingness of people to use CBDC is 0.250, followed by financial inclusion is 0.298. Payment has a correlation of 0.302 whereas security and privacy have a 0.222 Pearson correlation coefficient.

5.1.2.2 Multiple Regression Analysis

We have performed three models of the multiple regression analysis where Model 1 discusses overall respondents, Model 2 included financial institution employees, and Model 3 excluded financial institution employees.

For the first model. all of the independent variables have a positive coefficient where the highest coefficient value belonged to payment which is 0.159 whereas the lowest coefficient value is security and privacy which is 0.001. In addition, there are two variables (financial inclusion and payment) has a significant relationship with dependent variables as it has a p-value of less than 0.05. Financial stability and security and privacy are not significant at an alpha value of 0.05. In terms of R-square, 11.8% of the variation of the independent variables can affect the dependent variable.

In terms of Model 2, R-square is approximately 34% and the overall F-statistic is significant at 5% and 10%. By looking at the coefficient, financial stability and security and privacy has a negative coefficient which it has a value of - 0.110 and - 0.043, respectively. The other two independent variables (financial inclusion and security and privacy) have a positive coefficient. However, T-statistic for four independent variables is not significant at 1%, 5%, and 10%.

By excluding financial institution employees from the observation, we have an R-square of 10.6% and the F-statistic is significant at 1%, 5%, and 10%. Overall coefficients are similar to Model 1 where we have positive coefficients for all the variables and T-statistic for financial inclusion and payment is significant at 5%. The difference is that the T-statistic of financial stability for Model 3 is significant at 10% where it has a value of 0.087.

5.2 Discussion of significant findings

Based on our study, there is a relationship between a dependent (willingness of people to use CBDC) and independent variables (financial stability, financial inclusion, payment, security and privacy).

Based on the summary table of the ANOVA test which is Table 4.8.2 shown before, we clearly understand the importance of the P value for financial stability and security, and when we assume that the alpha value (error percentage) is 5% or 0.05, we get the result that privacy is not important. The p-value of financial stability is 0.112 and the p-value of security and privacy is 0.990, both of which are greater than 5%. This means that there is not enough evidence to conclude there is a significant relationship at 5% significance level.

In addition, according to the Table 5.2, we can know that the P-value of financial inclusion and payment are 0.015 and 0.020, respectively, and these two independent variables are obviously less than 5%. So we can conclude from here that financial inclusion and payment are significantly related to people's willingness to use CBDC because it is significant at the level of 5%.

Finally, the P value between all independent variables (financial stability, financial inclusion, payment, security, and privacy) and dependent variables (people's willingness to use CBDC) is 0.000, which is less than our assumed alpha value of 5%. Therefore, we can conclude that the overall model is important when there is a relationship between dependent variables and independent variables.

Table 5.2

Summary table of significance findings for 383 observations

Relationships Findings	Alpha < 0.05	Conclusion
There is no relationship between the willingness of people to use CBDC and financial stability.	0.112 > 0.05	Insignificant
There is a relationship between the willingness of people to use CBDC and financial inclusion.	0.015 < 0.05	Significant
There is a relationship between the willingness of people to use CBDC and payment.	0.020 < 0.05	Significant
There is no relationship between the willingness of people to use CBDC and security and privacy.	0.990 > 0.05	Insignificant
There is a relationship between a dependent (willingness of people to use CBDC) and independent variables (financial stability, financial inclusion, payment, and security and privacy).	0.000 < 0.05	Significant

5.3 Implication of the study

The CBDC is also known as the digital form of a country's fiat currency which is also claimed by the central bank. This CBDC is not issuing on printing money but issues on the electronic coin or accounts where all the accounts are full faith and credited by the governments. The major difference between cryptocurrencies and the CBDC is that cryptocurrencies are private money whereas the CBDC is a

government-backed form of money that is safer and trustier to buy. Moreover, the cryptocurrencies use the permissionless open network while the CBDC uses a private permissioned open network to operate.

From the result of the survey, Malaysia's citizens are not that familiar with the concept of the CBDC and the difference between CBDC and cryptocurrencies. Also, the majority of them do not know what CBDC all is about. But glad to know that Malaysian citizens are eagerly wanting to know how the CBDC works and will give a try on using the digital currencies that are carried out by the government. So, if the government wants to implement these CBDC systems in Malaysia, much work has to be done to make sure the citizens of Malaysia know these systems and the concept before so that people are willing to trust them. Moreover, much education and advertisement need to be done to give the users of the CBDC payment systems more confidence and security in the system provided by the government.

For the current conditions in Malaysia nowadays, the technical problems and financial problems are not yet mature enough to implement this CBDC payments system in a short period. The country which implemented the CBDC systems and digital currencies depends on its economic situation. Bahamas, Nigeria, China, Sweden, and other 16 countries currently use the CBDC payment system because of some motivation which is to provide an easy and safest way to access money for the unbanked and underbanked population to introduce competition in the domestic payments market which provide people cheaper and better options access to money. These CBDC payment systems also provide cheaper and better access to money thus increasing the efficiency in payment and lowering the transaction costs. Malaysia as a developing country needs to focus more on its domestic products and after the economy is more stable then can enter the CBDC digital currencies for more efficiency of users in Malaysia.

The CBDC that have the innovation and competitions also supporting future payment systems that people required since the digital payments are rapidly changing in response to an increasing integration into evolving digital services. These changes will make the future day more depend on novel of use cases and payments requirement for today. So the Malaysia's government may need to consider the current and possible future demands in their CBDC design thus knowing which the technology will be harnessed such as programmable money and encouraging innovation and competition among intermediaries to evolve with these digital economies.

From the other view of perspective, we are able to find that a professional person who is working in a financial institution has the opinion that the issue of CBDC by the central bank has a negative impact on them. Whether it will affect the profitability of banks or reduce the ability of lending loans and bank disintermediation may occur. Based on the result, we able to notice there is negative coefficient for financial stability and security and privacy which proved there is a negative relationship. They might do not have confidence on the prospect of the CBDC launched by central bank.

5.4 Limitations of the study

Throughout the study of this survey, there is a significant relationship between the potential impact of the implementation of CBDC and the Malaysian economy. While conducting this research, there are a few limitations occurred in this research.

The first limitation of this research topic is the study has a big sampling size. This big sampling size is based on the citizens in Malaysia covered with the university student, academic, non-financial institution employees, financial institution employees, retirees, university fresh graduates, mechanics, and form 6 students.

Because the coverage of this sampling size is too big for us when doing the research in Kampar, we only get limited respondents which are different from the categories of university students and university fresh graduates. Most of the financial employees and non-financial institution employees are from our relatives and cousins who are working in the related field; thus the majority are university students. There is also limited time consuming for getting more of the respondent to get a better result.

Furthermore, since the research is very new and not so popular in Malaysia, many of the citizens do not understand the problem of this study while some of them just know little knowledge about the CBDC and heard of it only. This caused the result of the survey to have many neutral responses, and this also showed that the citizens in Malaysia have less awareness about the potential impact of the implementation of CBDC in Malaysia.

5.5 Recommendations of the study

There are some recommendations and solutions to solve the limitation of research to make this research more precise and more accurate.

5.5.1 Limitation of the sample size

Since the research topic's potential impact of the implementation of CBDC in Malaysia's economy involves many different levels of people conducting research, the data collection may be too big, and the difficulties of collecting all the data precisely. Hence, the suggestion for future research may be to conduct the survey form in the smaller circle such as conducting this survey in Kampar, Perak citizens first, then after collecting all the data from

Kampar's citizens can move forward to the next country as well. Hopefully, this suggestion can be considered for future research.

5.5.2 Lack of popularity

In Malaysia, the CBDC can be considered as a new term because majority did not know what the CBDC is and what CBDC does. Most of the people are confused a security and privacy bout CBDC and cryptocurrency and they might know about cryptocurrency more than CBDC. These problems happened when we were conducting the survey form and many respondents required explanations about what CBDC is and got confused about CBDC and cryptocurrency. Therefore, the government should create more awareness of the CBDC since Malaysia has the intention to launch this CBDC in the future. Social media such as YouTube, Facebook, television, broadcasting and radio stations can be the tools to create awareness of people in Malaysia to let them know about the function of CBDC. If the public knows about the CBDC, they will have their own opinion about this implementation, and this will also be helpful for future research.

5.6 Conclusion

From the result, we can conclude that there are four independent variables which are financial stability, financial inclusion, payment, and security and privacy have a low relationship with the dependent variable which is the willingness of people to use CBDC. But from the view from the significance of the relationship, the independent variables and dependent variables have the significant relationship which all of them less than 0.01 level of significance thus we can reject all the null hypotheses.

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