# Public perception of the "Digital Rupee" in India

MSc in Fintech

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## MSc Project Submission Sheet
### School of Computing

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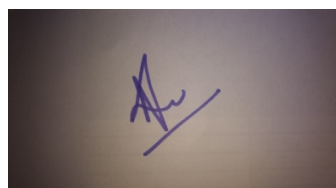**Project Title:** Public perception of the "Digital Rupee" in India

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# Public perception of the "Digital Rupee" in India
## Aditya Kulkarni
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## Abstract

A "Digital Rupee" is a type of "CBDC (Central Banking Digital Currency)" which represents the value of the fiat currency in a digital format. It is a type of payment that exists entirely in electronic forms and is accounted for and transferred utilizing computers. Unlike traditional money, digital currencies have low transaction costs and immediate payments since they can be sent directly between parties. This transactional manner helps in a better and efficient management of currency with respect to conventional payment techniques that include clearinghouses or banks. The research work has focused on examining the public perception of the "Digital Rupee" in India after it was announced by the Government of India in Feb 2022. The research has examined this purpose with respect to CBDC (Central Bank Digital Currency) and has also shed light on the concept of CBDC, blockchain and distributed ledger technology for CBDC. The research has also highlighted the working, characteristics, advantages, and challenges of CBDC. The research has analyzed the public perception by applying sentiment and statistical analysis methodologies on the data collected by a survey and on twitter. The research work has concluded and recommended for future work utilizing the results obtained and can be referenced when the "Digital Rupee" rolls out to compare the perception of public from prior to post implementation.

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# 1. Introduction

## 1.1 Background

Digital currency is a new techno-money development in financial economics. As financial, economic and population growth the digital currency has gradually occupied its existence and development along with support from the internet revolution and soft technology (Armelius, Claussen, & Hendry, 2020). A digital currency has been announced by Finance Minister Nirmala Sitharaman in the annual budget on 1st February for the coming financial year, which will be issued by the "Reserve Bank of India" (RBI). The initiation of a "Central Bank Digital Currency" (CBDC) intends to develop the digital economy and give a choice to virtual money that has proliferated in current period (Kiff et al., 2020). Recently, India has put some regulations and restrictions on cryptocurrencies since it felt it could pose severe concerns to macroeconomic and economic stability and might turn out an ally for fraud, terror financing, and money laundering. The total crypto holdings in India amount to approximately 400 billion Indian rupees (Deutsche Welle, 2022). CBDCs can facilitate the execution of fiscal and financial policy to stimulate financial inclusion in an economy by giving rise to the unbanked into the monetary system. Since they are a centralized currency form, they must maintain the citizens' privacy. CBDCs are in several development stages globally (Worrell et al., 2021). A CBDC is a currency managed by a central bank in a digital medium. In terms of value, it is like a fiat currency, and it can be converted one-for-one with that currency. The only difference is that it is found in electronic form.

# 2. Literature Review

## 2.1 Concept and characteristic of Central Bank Digital Currency

The concept of CBDC is not a new one. (Ducrée, 2022) discussed that cryptocurrency and blockchain technology were introduced more formally by Satoshi Nakamoto, the original Bitcoin founder, in the year 2008. Nevertheless, (BitIRA, 2022) states that other economic organizations and regulatory bodies only started paying attention to the idea of central-bank-issued digital currency in 2015, when the Bank of England first discussed it. (Armelius, Claussen, & Hendry, 2020) stated that CBDC is regulated directly by the central bank of the nation and is supported by government power and national credit. Few technocrats interpret CBDC as a digital aspect of sovereign currency whose financial strategies are constructed by the central bank. Another author, (Kim & Kwon, 2019), stated that a CDBC is essentially another form of paper money administered directly by a central bank, complementing paper money, and competing with cryptocurrencies like Bitcoin. An establishment's monetary strategy or how a central bank regulates the money flow, or the currency rate impacts its deployment. The nation's financial administrator issues electronic tokens that represent the official currency in electronic form.

## 2.2 Blockchain & Distributed Ledger Technology for CBDC

(Lee, Yan, & Wang, 2021). Stated that being the digital form of fiat currency, CBDC may appear like its decentralized counterpart, Bitcoin, but fundamentally there is a technological difference between the two. Though distributed ledger technology (DLT) forms the foundation of Bitcoin but CBDC with its permissioned identity makes it different. (The Times of India, 2022) discussed that the permissionless blockchain facilitates any user to operate the software and perform transactions, while CBDCs permissioned approach works in several ways. While CBDC has only one central database, DLT, for example, contains multiple copies of financial

transaction records. (Allen, et al., 2020) demonstrated that each copy in this ledge is handled and stored by a different financial entity that the Central Bank of the country eventually manages. These entities share DLT in a distributed fashion. The author further claimed that only people with access to the central bank management's blockchain could access or modify financial records.

## 2.3 CBDC Research and Projects

There are several research and development programs for CBDCs in progress. According to (Messieh, 2022), presently, 105 nations, which depict over 95% of the global GDP, are in several stages of CBDC research. Twenty-eight retail CBDC pilots have been conducted, and three live retail CBDCs are being developed in close to 50 nations for this research work. Research conducted by (Kosse & Mattei, 2022) of 81 central banks inferred that 90% are now studying CBDCs, and over half are in the experimental or developmental stage. (Zhang & Huang, 2022) stated that Digia Dollar Project, Project Stella, e-Krone, Project Ubin, e-Peso, Project Sand Dollar, Project Jasper, Project Khokha, e-CNY (Digital Yuan), Project Inthanon, and Project Inanthorn-Lion Rock are some of the current research and projects conducted on CBDC throughout the world. The projects and research have been undertaken to understand the opportunities and challenges prevailing with the associated factors and aspects of CDBC.

## 2.4 Advantages of CBDC

The high currency of India to GDP ratio is one of the significant benefits of CBDCs. According to (Kiff et al., 2020), to the degree more extensive usage of cash can be substituted by CBDCs, the cost of printing, distributing, transporting, and storing currency can be diminished. CBDCs streamline the implementation procedure of government function and monetary policy. They automate the procedure between banks with the help of wholesale CBDCs and organize a direct association between central banks and consumers through retail CBDCs. Moreover, these digital currencies can undervalue the endeavor and procedures for other administration processes, like benefits allotment or taxes collection and calculation. (Auer et al., 2021) discussed that money disbursement through intermediaries starts the third-party threats to the procedure. It is risk-free whether from out of cash deposits. These kinds of events can shock the subtle balance of a financial strategy. A CBDC eradicates third-party threats. Any residual risk that stays in the system outweighs the central bank. (Auer & Böhme, 2020) commented that a retail CBDC operates like fiat currency and protects privacy by bringing transactions affected. In contrast, account-based access to CBDCs functions as a formal bank account and offers privacy protections. Extensive parts of the unbanked people, particularly in emerging and poor nations, face obstacles to financial inclusion due to the costs associated with developing the banking infrastructure. (Barontini & Holden, 2019) stated that CBDCs could develop an explicit connection between the central banks and consumers, excluding costly infrastructure requirements. CBDCs can stave off illegal action as they prevail in a digital layout and do not compel serial numbers for tracking. A public ledger and cryptography prepare it simple for a central bank to monitor money throughout its authority, thus controlling criminal action and illicit transactions through CBDCs.

## 2.5 Disadvantages of CBDC

According to (Buckley et al., 2021), CBDCs do not inevitably deal with centralization issues. A central government, particularly the central bank, is still accountable for and invested with the administration to administer transactions. Thus, it still regulates data and the transaction levers between banks and citizens. (Ozili, 2022) stated that users would have to abandon some

privacy levels as the official is accountable for obtaining and transmitting digital identifications. The provider would serve privy to every transaction performed. The author further stated that this could steer to privacy concerns identical to Internet Service Providers (ISPs) and tech behemoths. For instance, criminals could sever and misuse data, or central banks could prohibit transactions between users or citizens. The regulatory and legal challenges connecting to CBDCs are a major concern. (Pelagidis & Kostika, 2022) stated that investigations in CBDCs are going on, which could be interpreted as a long-term pattern. The portability of these systems implies that a powerful CBDC administered by a foreign nation could turn out to substitute a vulnerable currency of the country. According to (Worrell et al., 2021), when a country's local currency is insufficient, a digital US dollar could replace it, as in Ecuador, which, during high inflation in 2000, replaced its local currency with a digital US dollar.

# 3. Research Methodology

## 3.1 Research approach

The research objective is to study and analyze the public perception of "Digital Rupee" in India. Research would be using two methodologies to conduct this research. The research would be using statistical analysis and sentiment analysis. Statistical analysis will be conducted on the quantitative data collected from the survey. Through this analysis method, the research has examined the age, gender, occupation, region, and relationship with the "Digital Rupee" and analyze principal common factors. The research intends to examine trends or patterns across distinct ages, education, occupation, and genders.

Sentiment analysis would be exposed on the qualitative data collected from the survey and on the qualitative data extracted from the tweets on twitter. Sentimental analysis is crucial to exploring and comprehending people's feelings. It is a natural language processing (NLP) method to infer whether data is positive, neutral, or negative (Solangi et al., 2018). This combined approach of methodology helps the research to explore the research question more comprehensively.

## 3.2 Data collection & analysis

This research has two types of data collection, primary data, and secondary dataset. Primary dataset refers to the information collected via survey and the secondary dataset refers to the information extracted from twitter.

### 3.2.1 Primary Data

The primary data collected from the survey would be cleansed and analyzed using Microsoft Excel. Statistical analysis would be performed on the quantitative data and sentiment analysis will be performed on the qualitative data using Microsoft Excel and Microsoft Azure Machine Learning respectively.

### 3.2.2 Secondary Dataset

The secondary data set will be extracted by contextual mining in python which will recognize subjective data from the texts in tweets. This process will be facilitated by twitter API.

# 4. Design and Solution Development

The objective of this research to get a public perception of the "Digital Rupee" by doing statistical and sentiment analysis on the primary and secondary data. The research will be conducted in a systematic manner to generate a meaningful observation regarding the public perception regarding the "Digital Rupee" (Figure 1).
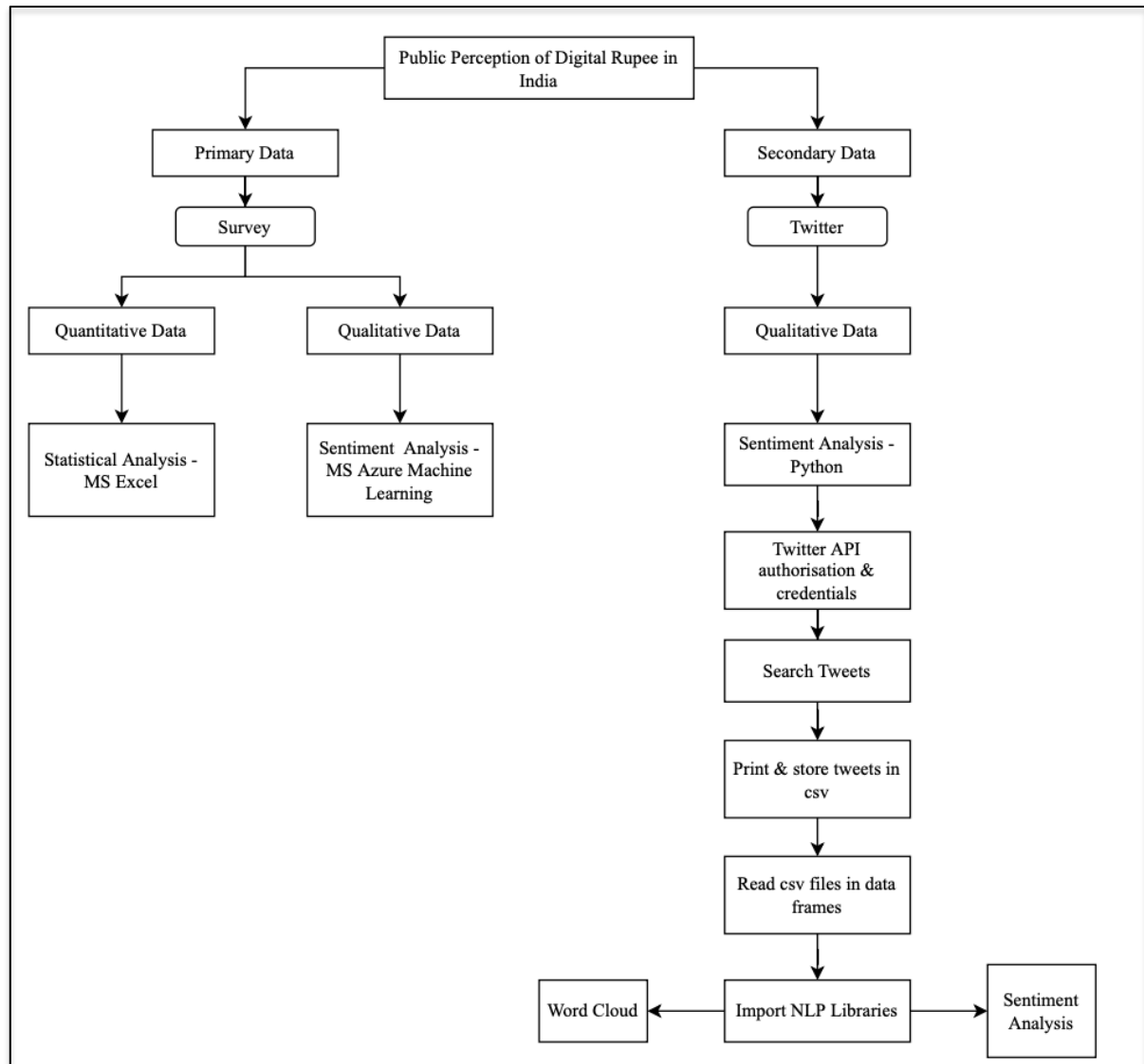


*Figure 1- Research design and solution path [Own source]*

## 4.1 Primary Data

### 4.1.1 Survey Design & Questions

The research will conduct a survey via google forms to get a public perception of the "Digital Rupee". It will be deidentified and will ask the participants to select the answers per their thoughts and understanding. It will comprise of a mixture of questions, including close ended binary questions such as "Yes/No/Maybe", and open ended questions such as "If Yes/No/Maybe, then Why?".

### 4.1.2 Statistical Analysis

The close ended binary questions will be subjected to statistical analysis. The research intends to study the awareness and support of the "Digital Rupee" across Gender, age, occupation, and education qualifications. It will also examine the correlation between the support to the Digital Rupee and participants previous investments in cryptocurrencies. The research will also examine the rating given to the support for Digital Rupee.

### 4.1.3 Sentiment Analysis

The open-ended questions will be subjected to MS Azure Machine Learning and will analyze the sentiments of the responses provided by the participants. The sentiments would be regarding the participants thoughts on why they support the "Digital Rupee" and will it ease domestic and cross border payment system.

## 4.2 Secondary Dataset

### 4.2.1 Sentiment Analysis

To access the data on twitter, the research will create a twitter developer account and create the necessary credentials. These comprises of "Consumer Key, Consumer Secret, Access Key & Access Secret". These will be recalled in the python code to search the tweets. After the authorization is set up the research will search tweets with six different hashtags namely "Digital Rupee", "Digital Money" & "Digital Currency" with and without spaces. The code will extract maximum of hundred tweets and from 01 Feb 2022 when the announcement was made. These tweets will be then saved in csv format and then stored in as a merged data frame for sentiment analysis.

The library used in this research include pandas, tweepy, TextBlob, sys, matplotlib, pyplot, numpy, os, pycountry, re, string, WordCloud, Image, detect, nltk & nltk. sentiment_analyzer. Sentiment analysis will be performed by testing the polarity of words or phrases and determine semantics and similarities. The research will also develop word cloud with the help of TF/IDF vector function on the data collected that can quantify the significance or relevance of string representation, such as phrases or words in a document among a collection of documents (Hasan, Maliha, & Arifuzzaman, 2019).

# 5. Results

## 5.1 Sentiment Analysis

*Table 1 – Result classification (positive, neutral & negative) of sentiment analysis from primary and secondary data. [Own Source]*

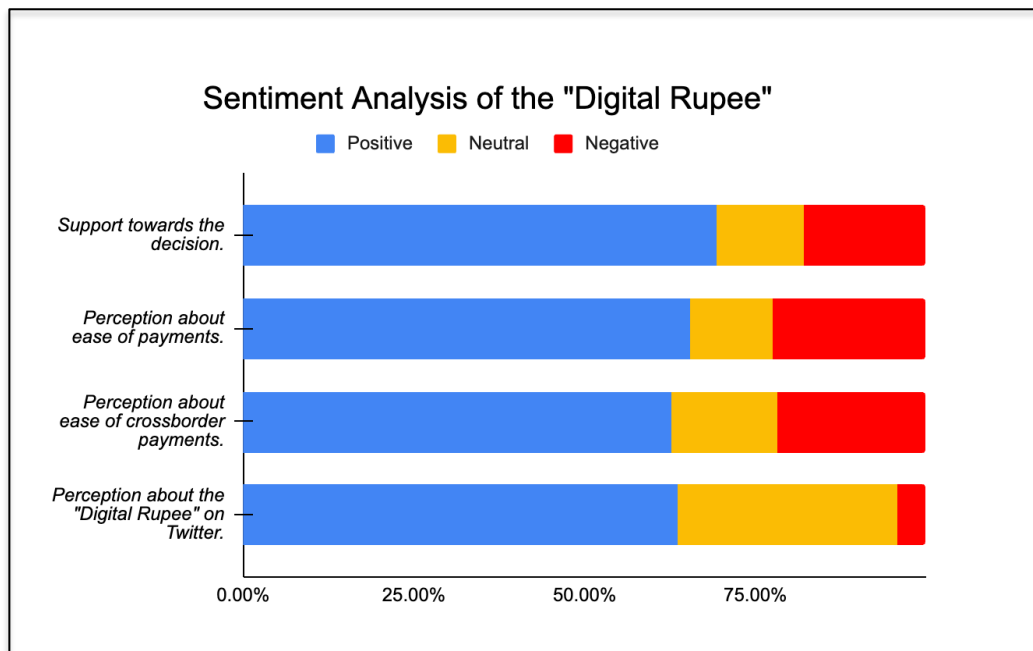| Data Source | | Positive | Neutral | Negative |
|---|---|---|---|---|
| Primary Data (Survey) | Support towards the decision. | 69.31% | 12.87% | 17.82% |
| | Perception about ease of payments. | 65.42% | 12.15% | 22.43% |
| | Perception about ease of cross border payments. | 62.65% | 15.66% | 21.69% |
| Secondary Dataset (Survey) | Perception about the "Digital Rupee" on Twitter. | 63.61% | 32.11% | 4.28% |



*Figure 2 – Sentiment analysis and classification (positive, neutral and negative) of the survey questions from primary data. [Own Source]*

## 5.2 Statistical Observations

*Table 2 – Statistical Observations from the survey (primary data) [Own Source]*

| FACTORS | CATEGORIES | AWARENESS ABOUT THE "DIGITAL RUPEE" | | SUPPORT TO THE DECISION | | |
|---|---|---|---|---|---|---|
| | | **YES** | **NO** | **YES** | **MAYBE** | **NO** |
| AGE GROUP | 18 -35 | 81 | 16 | 51 | 32 | 14 |
| | 35-50 | 43 | 6 | 40 | 8 | 1 |
| | 50-75 | 43 | 9 | 37 | 13 | 2 |
| | 75>0 | 1 | 1 | - | - | 1 |
| GENDER | Female | 9 | 51 | 32 | 21 | 7 |
| | Male | 23 | 117 | 96 | 32 | 12 |
| EDUCATION | 10th | 1 | 1 | 1 | - | 1 |
| | 12th | 9 | 2 | 4 | 5 | 2 |
| | Bachelors | 72 | 13 | 52 | 27 | 6 |
| | Doctorate | 3 | 1 | 4 | - | - |
| | Masters | 83 | 15 | 67 | 21 | 10 |
| OCCUPATION | Accountancy, banking or finance | 17 | 1 | 14 | 1 | 3 |
| | Business, consultancy or management | 17 | 5 | 15 | 5 | 2 |
| | Charity and voluntary work | 4 | 2 | 4 | 2 | - |
| | Computing or IT | 23 | 2 | 18 | 4 | 3 |
| | Creative arts or design | 3 | 3 | 4 | 2 | |
| | Engineering or manufacturing | 8 | 4 | 9 | 3 | - |
| | Healthcare | 6 | 3 | 6 | 1 | 2 |
| | Hospitality or events | 4 | 1 | 2 | 3 | |
| | Law | 2 | - | 1 | - | 1 |
| | Law enforcement and security | 8 | - | 6 | 2 | - |
| | Leisure, sport or tourism | 2 | - | 2 | - | - |
| | Marketing, advertising or PR | 4 | - | 2 | 2 | - |
| | Media or digital | 2 | - | 1 | 1 | - |
| | Property or construction | 4 | - | 3 | 1 | - |
| | Public services or administration | 9 | - | 6 | 2 | 1 |
| | Recruitment or HR | | 1 | - | 1 | - |
| | Retail & Sales | 5 | 1 | 4 | 2 | - |
| | Social care | | 1 | | 1 | - |
| | Student | 14 | 3 | 5 | 11 | 1 |
| | Teacher training or education | 28 | 3 | 23 | 5 | 3 |
| | Transport or logistics | 1 | 1 | 2 | - | - |
| | Unemployed | 7 | 1 | 1 | 4 | 3 |

## 5.3 Support for the "Digital Rupee" vs Previous investment in Cryptocurrencies.
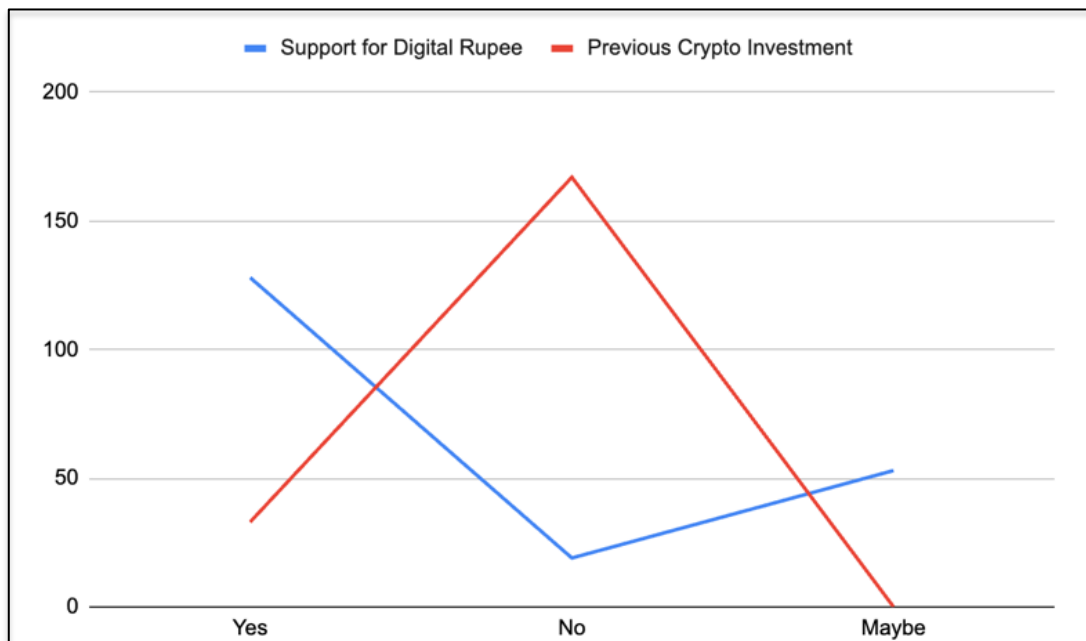


*Figure 3 – Public Perception of the "Digital Rupee" vs previous investment in crypto currencies [Own Source]*
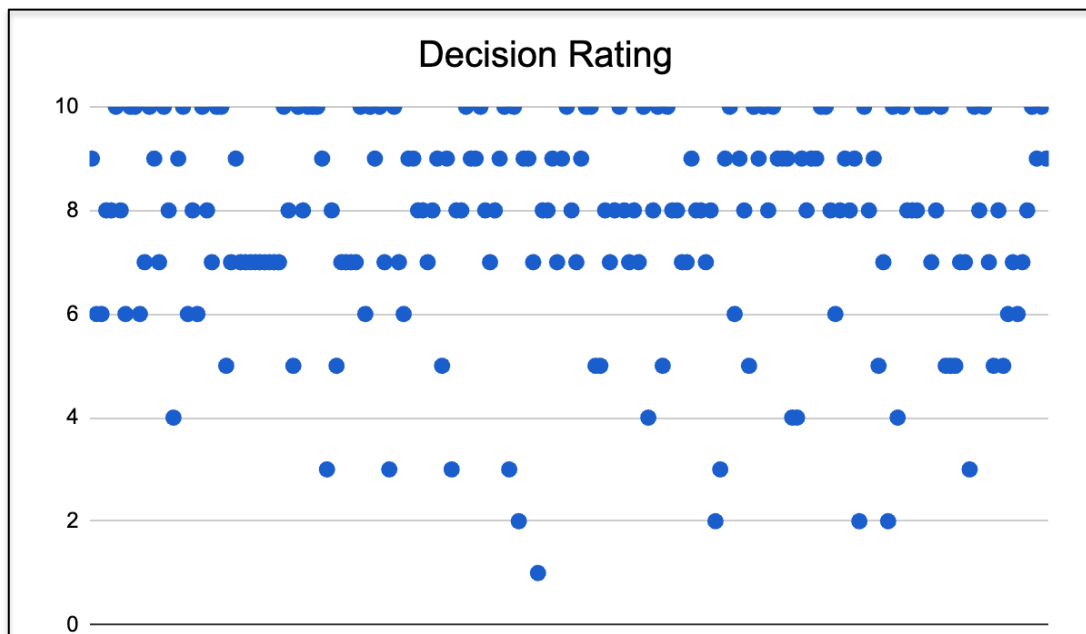
## 5.4 Decision Rating



*Figure 4 – Scatter plot depicting the rating in support of the "Digital Rupee" (0-10) [Own Source]*

## 5.5 Word Cloud for positive Sentiments



*Figure 5 – Word Cloud of positive sentiments on twitter (secondary data) [Own Source]*

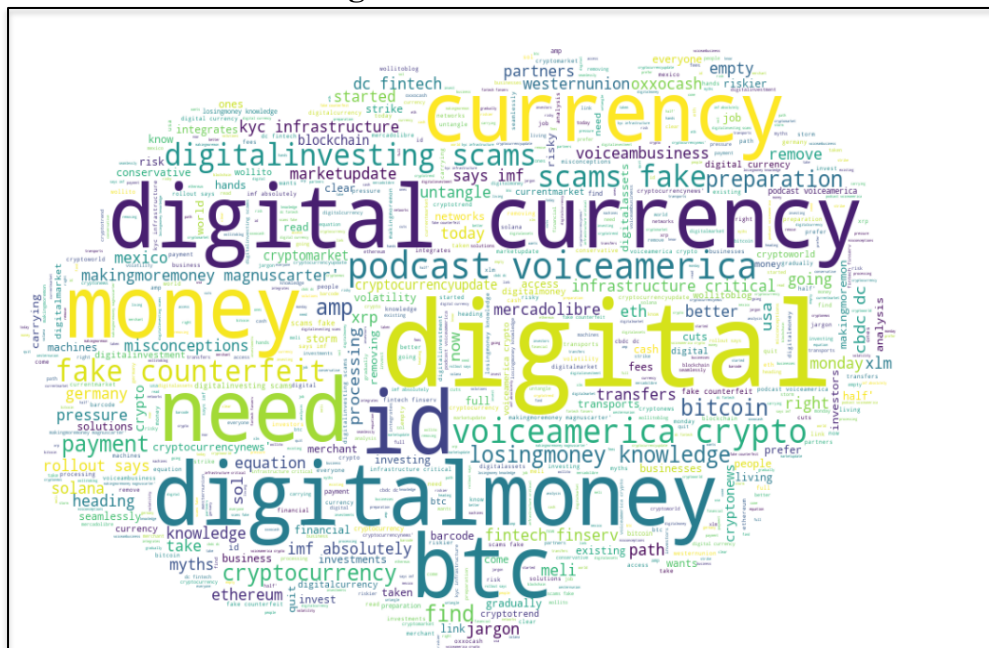## 5.6 Word Cloud for Negative Sentiments



*Figure 6 – Word Cloud of negative sentiments on twitter (secondary data) [Own Source]*

## 6. Evaluations

The research and the results obtained from it give an insight into the public's perception of the "Digital Rupee" in India. A total of 200 responses from the survey and 327 tweets were analyzed. It explores their awareness, support, ratings to the support and likelihood to use the "Digital Rupee". The result reveals that in totality 84.2% participants were informed about the "Digital Rupee" and 15.8% were not aware about it (Table 2).It also depicts 63.9% of total respondents support the decision made by the government to launch "Digital Rupee" and 26.7% are unsure of their support to the decision (Table 2) The remaining 9.4% do not support it and feel it might not bring a change in country's payment system efficiency (Table 2). A 73.3% of participants perceive that "Digital Rupee" will enhance the ease of payments and 60.4% inferred that it might increase the ease of cross border payments (Fig 2). The survey also depicted that 66.8% respondents will use the "Digital Rupee" for domestic transactions and 56.9% will use it for cross border transactions as well (Fig 2). This resonates with the ratings to the decision, 79.2% people have rated the decision between 7-10 which is depicted via a scatter plot (Fig 4).

Moreover, the finer examinations explore different factors of age, gender, education, and occupational group. The statistical analysis shows that both genders are aware of the "Digital Rupee" equally, 85% of female and 83.57% are aware of the decision taken by the government (Table 2). The age group of 18-35 years showed the highest support as well as awareness about the "Digital Rupee" (Table 2). India has youngest workforce in the Asian continent and majority of them believe in the digitization and reforms in the payments. Youngest workforce also reflects more educational numbers and therefore the highest support and awareness about the "Digital Rupee" came from students who are pursuing their masters. (Table 2). The educational institutions play an important role which is reflected in the survey results as highest support and awareness came from the teaching profession and second most from the IT & Computing (Table 2). It is an accurate representation of the Indian society and where a young workforce persists who acquire higher education and enter the world of IT and computer sciences. This young workforce supports new digital reforms in the payments system.

The sentiment analysis from the survey and twitter shows more than 60% positive sentiments towards the support of the decision and perceive that it will increase the ease of domestic and cross border payments (Table 1). The percentage of neutral sentiments range between 12%-32% and the percentage of negative sentiments range between 4%-12% (Table 1). The positive word cloud (Fig 5) depicts "Digital Rupee" for enablement of payments, a better government strategy for payments and regulations hovered by the central banks. The negative word cloud (Fig 6) shows a distrust in cryptocurrency, identification, and security issues along with the difficulty of rolling it out.

The research also shows a breakthrough observation, the respondents who have invested in the cryptocurrencies do not support the decision of rolling out "Digital Rupee" (Fig 3). This shows the current sentiments of the global cryptocurrency dip. People globally invested in the cryptocurrency to gain returns but the current dip in Bitcoin shows the unhappiness in the investors and their skepticism for the "Digital Rupee".

# 7.Conclusions & Future work

The research thoroughly explores the concept and characteristics of CBDC in detail. According to Union Finance Minister (FM) Nirmala Sitharaman, the RBI would develop a CBDC around 2022-23 (Walia & Saggar, 2021).In addition, it has been found that several projects and research have been conducted on digital currency and its different aspect. As per a BIS poll from 2021, 86 percent of central banks examined the chances of CBDCs, 60 percent researched the technology, and 14 percent administered trial programs (Shukla, Misra, & Chaturvedi, 2022).The research has also shed light on benefits and challenges to understand the concept of CBDC and inferred that adopting the 'Digital Rupee" could certainly ease payments and help in the transformation of economic stability, financial inclusion and also facilitate the rupee to influence the Indian diaspora and its trading impact to enhance its function as a reserve currency (Foley et al., 2021). According to their use, CBDCs may reduce the demand for bank deposits, depending on their extent of operation. As transactions in CBDCs lower the risk of settlement, they also diminish the need for transaction liquidity like intra-day liquidity (Priyadarshini & Kar, 2022). Most existing decentralized finance providers or crypto exchange already have an intermediatory (Eichengreen, Gupta, & Marple, 2022) and by getting "Digital Rupee" it could facilitate a new era of monetary services and account portability (Handa, 2020).This programmable money could help the financial inclusion and broadcast innovations in public welfare and also support the budding entrepreneurs. The RBI and the Government of India can further develop a token based use cases which will ease the domestic transactions further. The government could also establish an expiration date for government spending grants and diminish any corruption or leakage by regulating where the grants could be consumed, such as housing or education (Bhat, Nagarkar, & Singh, 2021).' At the same time it is stressed that the sovereign backing of CBDC might cause individuals to relinquish balances from banks, causing bank operations whenever they anticipate the bank's health to be unstable (Ayeswarya & Varghese, 2021).

India has the youngest workforce in Asia, combined with cheap internet access people in India want to get their things done more fast and efficiently. This emerging technology might help people make payments more easier and convenient. "Digital Rupee" which is form of "Digital Currency" is a new endeavour, a lot of people do not know why it is developed, its benefits and the challenges it poses. This is a significant innovation in the sphere of financial technology, it can be major stroke by the government especially after the success of UPI (United Payments Interface in India). It intends to overcome the cash issues and make payments cheaper and faster. The research observes that a lot of people support the "Digital Rupee" but some of them are still not aware of the "Digital Rupee" and sceptical about the features of the "Digital Rupee". The research also suggests a drawback in terms of number of participants as India is has vast population but this research will be an useful insight when the "Digital Rupee" rolls out. People of India were sceptical of UPI (United Payments Interface) when it was rolled out but it turned out be a phenomenal success, from small villages to urban towns, from farmers to consultancies everyone is using UPI for payments. This research shows the initial perception of the "Digital Rupee" and can be referenced later in arguments of the ever changing payments technology and government decisions towards financial inclusion.

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