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# The Future Innovation of Fintech in the Metaverse Banking: Review

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## Article History

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*NFT.*

## Abstract

*The term "Fintech in the Metaverse Banking" refers to the control of financial transactions in virtual settings. Through Metaverse individual can carry out their financial and business operations entirely from the comfort of living room, travelling instantly to any bank worldwide virtually. Digital twins make it feasible to provide a digital replica of the bank's actual assets, processes, and systems, and they can be crucial in a bank's Fintech transformation. This can assist banks in automating their processes and enhancing the user experience. As a result, banks may be capable of improving the effectiveness of their physical branches and automate their internal operations. Making these intangibles tangible is a difficulty for Fintech businesses. Smart transactions, autonomous payments, cross-border payments, interoperability, and profitability expansion should be the main areas of focus in the financial, insurance, and utility businesses. Digital twins can be used by banks to effectively handle any possible difficulties by tracking and forecasting the performance of assets like lending activities and Mobile payments. This may contribute to increasing these assets' availability and dependability, decreasing downtime, and raising satisfaction and loyalty.*

*In this study, 454 papers from the Database of Web of Science, Scopus and dimensions are retrieved between 2003 and 2023 in order to well know the emergence and progressions of Fintech in the Metaverse banking sector. The software programmes were used, are VosViewer for network visualisation and Biblioshiny, R software. This article aims to address a number of concerns about the development of the Fintech in Metaverse Banking.*

## 1. Introduction:

The Metaverse is a networked virtual environment that is equivalent to the internet but made up of three-dimensional virtual areas rather than web pages (Vivek, Saumya, and Pradhan) . Social networking websites and other online programmes that let users make their own digital avatars and engage in real-time communication with one another. It is getting harder for governments all over the world to oversee or control what happens in the Metaverse as more individuals utilise these platforms. Several experts feel that this could eventually result in big changes to our political and economic systems and raise important issues regarding how we define online individual rights and privacy. The physical bank branches are decreasing gradually as advancements in new technologies and financial institutions

going towards Metaverse and may contact with customers in the virtual Reality (Aharon, Demir, and Siev) and offering basic banking services, it makes the financial institutions may intelligent in these virtual platforms. Fintech companies and banks are working together to provide a solution for the management of digital assets. Fintech has a tendency towards intangibles, the use cases for digital twins are often developed from a technological and financial perspective and for a specific industry or vertical.

The concept of banks providing services to their clients in the Metaverse has recently been discussed widely in the banking industry, (Zainurin et al.) giving rise to the phrase Fintech in Metaverse. All facets of life are changing as a result of the rapidly developing financial technologies. Among other technologies used in the banking industry, digital twins and Metaverse are important because they enable customers to make interactive financial payments. In the banking industry, the Metaverse (Turdialiev and M) Enables consumers to make virtual payments and experience branch features virtually. Financial institutions and Fintech firms are collaborating together to erase physical obstacles and make Fintech more, engaging, more interactive and immersive through Virtual Reality Metaverse artificial intelligence.

Business, customers can greatly benefit from technology transformation by being able to save costs, and automate company operations and comprehend consumer behaviour and enhance productivity. Financial Technologies in Metaverse will be able to change by compelling billions of people and businesses around the world to move their transactions to digital platforms, businesses may compete on a larger scale and access global markets by conducting business in Virtual Reality.

Given the importance of Financial Technology in the Metaverse and interactions with clients and Bankers, financial technical services are essential to their transformation. Fintech is changing (Alkhwaldi et al.) the financial sector itself. Mobile phones have been transformed by technology into financial tools, and new marketplaces, for banking sectors. Banks are spending money on new technology creation, integration, and acquisition, whereas Fintech companies use digital platforms for financial service provision and trying to advance in Metaverse to create new world to customers to experience virtual Reality in Payments, asset management.

## 2. Review of Literature:

Banks with a physical location and a domestic banking licence are referred to as traditional banks. Physical presence; regional offices in every nation where they operate; ATMs with their own brands; a sizable workforce Dedicated account managers; in-person or one-on-one customer service. On the other side the future of online banking is virtual reality. With the help of Metaverse, it would be possible to conduct financial transactions in this virtual space, resulting in an exceptional customer experience. Virtual reality is being examined by banks because technology has the potential to transform how people finance. In order to better analyse complex data, better engage clients via mobile devices or Computers, and even better train staff, banks will increasingly employ immersive technologies like virtual reality (VR).

The Metaverse offers digital experience, virtual avatars, and immersive experiences as alternatives to the idea of virtual worlds. Several banks around the world are lining up their services for an extraordinary customer experience by hopping on the Metaverse wave after finding success in digital banking. Financial institutions do not want to be left behind this time since creating new goods for the Metaverse is suddenly interesting in a way that only occasionally occurs in any business. In the Metaverse, analytics will be crucial. Analytics are necessary for Fintech companies and banks to understand how clients are utilising virtual reality financial services. To help companions improve their performance, it can be as easy as finding skill gaps and providing focused follow-up coaching and personalised advice. Consumer interactions are the clearest example of how the ”Metaverse” may influence banking. Providing customers in virtual worlds may be the logical next step in the digital customer experience, as was previously indicated. The US-based CBM Bank has been developing a fully immersive virtual world experience for its clients; Metaverse technologies will be reachable via smart watches and augmented reality headsets.

Web 3.0 employs smart contracts in combination with big data, decentralised ledger technology

(DLT), machine learning (ML), and other technologies to create a more open and connected world while upholding user ownership rights (Haddad and Hornuf). Web 3.0 will speed up the completion of all digital financial transactions, including payments, money transfers, loan sanctioning, lending, and investment. Hence, Fintech businesses may automate traditional processes and provide an enhanced experience for consumers. Web 3.0 is more concerned with using the internet to carry out daily tasks. It expands the possibilities for sending and spending money online, including selling services, NFTs, and anything else (Katterbauer, Syed, and Cleenewerck) . It surely means increased commercial and investment prospects for the Fintech industry

The Metaverse and NFTs have the power to transform corporate practises and professions. The key distinction is that while the Metaverse has not yet gone global, NFTs (Sonmezer and Çelik) have already revolutionised a number of industries, from video gaming to music and art. NFTs will drive these new virtual economies, which the Metaverse will use to change how we work, live, and interact with one another.They are a special kind of irreplaceable crypto asset with particular qualities, therefore they cannot be modified or swapped. Non-fungible tokens (NFT) can't be manipulated, divided, or forged (Vivek, Saumya, and Pradhan) . These special characteristics enable an NFT to function for image, video, or physical thing by utilising a special code to represent the item, much like a certificate of authenticity.

JP Morgan - In Decentraland, they have inaugurated an Onyx lounge. They enable the production, storage, and exchange of financial assets as well as cross-border payments in the Metaverse. For its 50,000 workers, Bank of America has created a VR training programme that simulates actual client situations. Financial cybercrime in the Metaverse has grown in importance for governments, businesses, and people to address, necessitating new legislative and compliance frameworks as well as innovative cyber security techniques to stop these crimes (Smaili and De Rancourt-Raymond) . Significant amounts of cybercrime (Hua and Huang) have been committed in the Metaverse, although few cases have resulted in prosecution due to the lack of legislation and virtual nature of these crimes via connecting the financial services, Islamic finance may create a significant opportunity for the Metaverse.

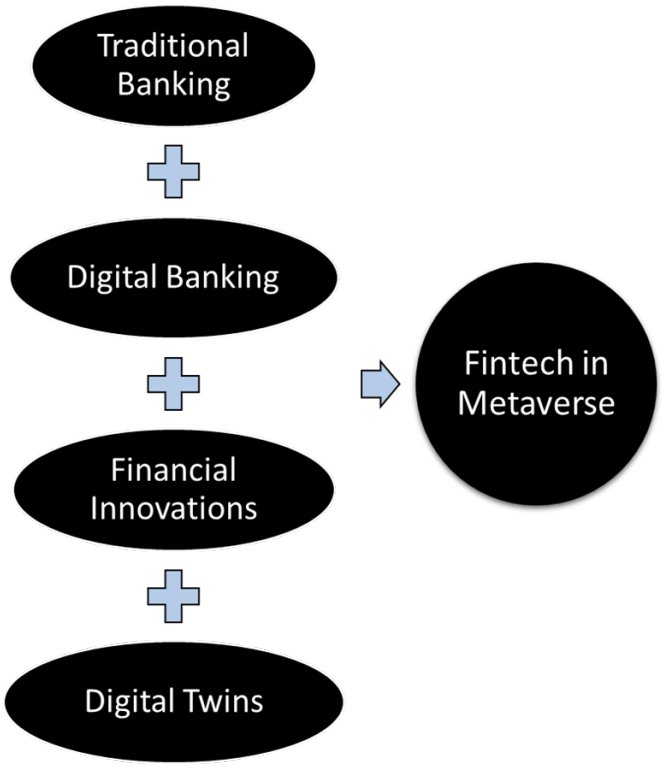


**FIGURE 1. Elements of Fintech in the Metaverse Banking (Source: Author compilation, 2023).**

## 3. Data Collection and Methodology:

To better understand the emergence and developments of Fintech (C and L) Metaverse in the Banking industry, 454 publications from the Web of Science, Scopus Dimensions database published between 2003 and 2023 were collected for this study. The total articles screened are 3173 and filtered via languages subject categories and finally said number of articles analysed for the study. The soft programmes that were employed were Biblioshiny, an R-based web application that required the authors to complete open-source codes for citation metrics, and VosViewer for network visualisation. (Cheng et al.) Many issues with the concept of Fintech in the Metaverse are addressed in this article.

## 4. Based on the search string the objectives of the study include-

**RQ1**: What is the current publication trend in the field of Fintech in Metaverse?

**TABLE 1. Search String (Source: author)**

| Keyword Search String (Web of Science) | |
|---|---|
| Fintech related keywords | "Fintech" Or "financial technologies" Or "Financial technology" Or "mobile technology "Or "online Banking" OR "digital payments" |
| Metaverse related keywords | "Metaverse" Or "Virtual Reality" OR "Artificial Intelligence" Or "Augmented Reality" Or "web 3.0" Or "Non-fungible token" Or "NFT" Or "Mixed reality" Or "MR " |
| Search date of String | $2^{nd}$ February, 2023 |
| Years | 2008 to 2023 |
| Subjects Included | Business, Business Finance, Economics, Management |
| Language Included | English |

**RQ2:** Who are the multiple countries Publications (MCP) and Single country Publication (SCP) in Fintech and Metaverse?

**RO3:** which countries are collaborated with India in this field?

**RQ4:** Which are the most influential journals in this field?

**RQ5:** Which are the most cited countries in this field?

**RQ6:** Which are the author's Co-Occurrence of keywords in the documents in this field?

### *4.1. Current publication trend in the field of Fintech and Metaverse:*

The Annual Scientific production for the search string from the year 2005 to 2023 the trend is flat during first fifteen years and upsurge from early 2020's and the fig 2 clearly indicates that research related to Fintech in the Metaverse Banking is an emerging technology and need future research to gain more insights.

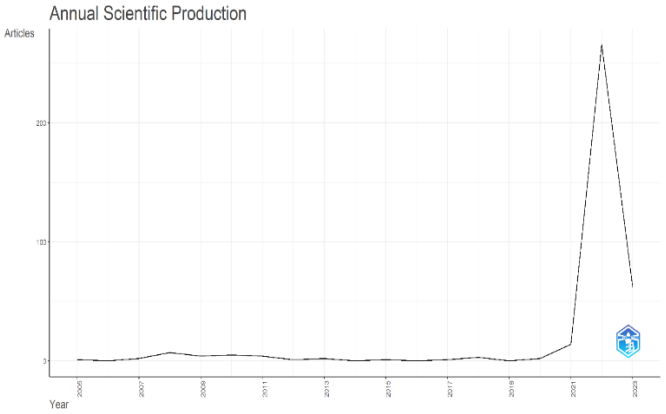


**FIGURE 2. Annual Scientific Contribution (2005:2023)**

### *4.2. MCP and SCP Publications:*

The top ten countries in positions of SCP and MCP are the Korea, USA, United Kingdom, Italy, Germany, Spain, India, Australia, Canada and Turkey.

### *4.3. India collaboration:*

India is collaborated mostly with the countries like Spain and South Africa in the field of Metaverse and contributed its part but at less intensity as it is novel emerging technology and future scope of research when there is change in government policies and regulations. Covid-19 significantly accelerated the digital transformation process and increased consumer adoption. Several ground-breaking client solutions, particularly in the banking and financial services sector, were made possible by Web3.0, the expansion of the FinTech ecosystem, and numerous government of India initiatives including Digital India, Jan Dhan -Aadhar -Mobile (JAM) and the less cash economy. India is a great representation of how to achieve digital economy.

The country has greatly benefited from the strong mobile and internet connectivity in terms of network expansion. Since the widespread adoption of internet services a decade ago, the country's Fintech (Financial Technology) industry has expanded quickly. With an acceptance rate of 87% compared to 64% internationally, India has the fastest growth in the fintech industry. Yet, 190 million Indians remain unbanked despite growing internet usage and rapid growth. There is a demand for safe, technologically advanced banking services everywhere. Start-ups in the fintech industry provide

**TABLE 2. Simple Country Publications (SCP), Multiple Country Publications (MCP)**

| Country | Articles | SCP | MCP | Freq | MCP_Ratio |
|---|---|---|---|---|---|
| KOREA | 92 | 79 | 13 | 0.184 | 0.14130435 |
| USA | 53 | 41 | 12 | 0.106 | 0.22641509 |
| UNITED KINGDOM | 26 | 17 | 9 | 0.052 | 0.34615385 |
| ITALY | 19 | 15 | 4 | 0.038 | 0.21052632 |
| GERMANY | 13 | 4 | 9 | 0.026 | 0.69230769 |
| SPAIN | 13 | 6 | 7 | 0.026 | 0.53846154 |
| INDIA | 10 | 5 | 5 | 0.02 | 0.5 |
| AUSTRALIA | 9 | 7 | 2 | 0.018 | 0.22222222 |
| CANADA | 9 | 8 | 1 | 0.018 | 0.11111111 |
| TURKEY | 7 | 6 | 1 | 0.014 | 0.14285714 |
| FRANCE | 6 | 4 | 2 | 0.012 | 0.33333333 |
| SINGAPORE | 6 | 1 | 5 | 0.012 | 0.83333333 |
| INDONESIA | 5 | 4 | 1 | 0.01 | 0.2 |
| NORWAY | 4 | 1 | 3 | 0.008 | 0.75 |
| SOUTH AFRICA | 4 | 2 | 2 | 0.008 | 0.5 |
| FINLAND | 3 | 2 | 1 | 0.006 | 0.33333333 |
| MALAYSIA | 3 | 0 | 3 | 0.006 | 1 |
| NETHERLANDS | 3 | 2 | 1 | 0.006 | 0.33333333 |
| NEW ZEALAND | 3 | 3 | 0 | 0.006 | 0 |
| SWITZERLAND | 3 | 3 | 0 | 0.006 | 0 |
| THAILAND | 3 | 2 | 1 | 0.006 | 0.33333333 |
| U ARAB EMIRATES | 3 | 1 | 2 | 0.006 | 0.66666667 |
| AUSTRIA | 2 | 0 | 2 | 0.004 | 1 |
| BRAZIL | 2 | 1 | 1 | 0.004 | 0.5 |
| DENMARK | 2 | 0 | 2 | 0.004 | 1 |
| ESTONIA | 2 | 1 | 1 | 0.004 | 0.5 |
| GREECE | 2 | 1 | 1 | 0.004 | 0.5 |
| IRAN | 2 | 1 | 1 | 0.004 | 0.5 |
| IRELAND | 2 | 0 | 2 | 0.004 | 1 |
| ISRAEL | 2 | 0 | 2 | 0.004 | 1 |
| PAKISTAN | 2 | 2 | 0 | 0.004 | 0 |
| POLAND | 2 | 2 | 0 | 0.004 | 0 |
| SERBIA | 2 | 2 | 0 | 0.004 | 0 |
| SWEDEN | 2 | 1 | 1 | 0.004 | 0.5 |
| BELGIUM | 1 | 0 | 1 | 0.002 | 1 |
| CZECH REPUBLIC | 1 | 0 | 1 | 0.002 | 1 |

convenience, flexibility, openness, and accessibility. The 'digital leap' will have a significant social impact in the aforementioned areas, and India's per capita yearly income is expected to increase from $1,700 to $4,135 by 2027 (FE Bureau 2023)

### *4.4. Most influential journals in this field:*

Sustainability is the top most contributing journal in this field. Sustainability is an open access, international, cross-disciplinary publication that examines human sustainability in terms of the environment, culture, economy, and society. It is published online by MDPI every two months and offers

**TABLE 3. India collaboration with other countries**

| Domestic Country | Foreign Country | Documents |
|---|---|---|
| INDIA | Collaboration | |
| | ANGOLA | 1 |
| | AUSTRALIA | 2 |
| | BRAZIL | 1 |
| | CANADA | 1 |
| | CYPRUS | 1 |
| | DENMARK | 1 |
| | FRANCE | 2 |
| | GERMANY | 3 |
| | GREECE | 2 |
| | IRELAND | 1 |
| | JORDAN | 1 |
| | MALAYSIA | 1 |
| | MEXICO | 3 |
| | MOROCCO | 1 |
| | NETHERLANDS | 1 |
| | NORWAY | 3 |
| | PAKISTAN | 1 |
| | QATAR | 2 |
| | SAUDI ARABIA | 1 |
| | SINGAPORE | 2 |
| | SOUTH AFRICA | 4 |
| | SPAIN | 4 |

a sophisticated arena for research on sustainability and sustainable development. Applied Sciences-Basel, IEEE Access follows next to it and more than 50 papers published in these three journals related to this field.

### *4.5. Most cited countries in the field of Metaverse*

Austria has the highest average article citations in this field while USA has the top total citation score. In the United States of America, a recent research found that 43% of banking consumers felt comfortable using virtual reality for routine banking tasks, such as checking accounts or conducting transactions. (Prabs Parthasarathy-Business Head, Central and Eastern Europe – Profinch Solutions, 2022).

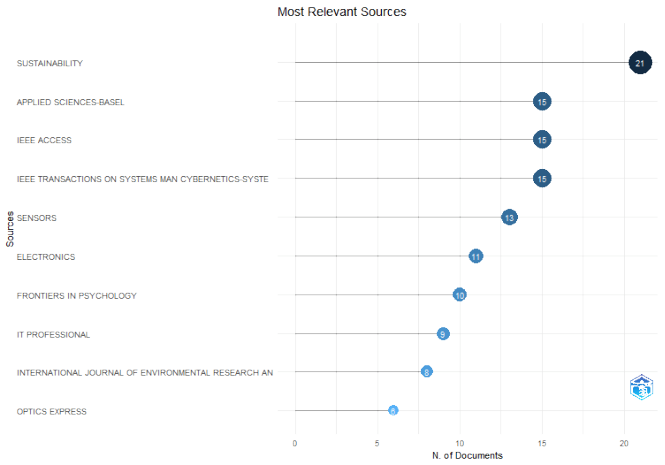


**FIGURE 3. Most Relevant Documents (Source: author)**

**TABLE 4. Total Citation (TC) Score**

| Country | TC | Average Article Citations |
|---|---|---|
| USA | 485 | 9.2 |
| KOREA | 322 | 4.6 |
| UNITED KINGDOM | 270 | 10.8 |
| CHINA | 204 | 1.7 |
| ITALY | 53 | 2.9 |
| SPAIN | 42 | 3.2 |
| FINLAND | 41 | 13.7 |
| FRANCE | 36 | 6 |
| GERMANY | 34 | 2.8 |
| AUSTRALIA | 32 | 3.6 |
| AUSTRIA | 31 | 15.5 |
| SWEDEN | 30 | 15 |
| NETHERLANDS | 20 | 6.7 |
| ISRAEL | 19 | 9.5 |
| NORWAY | 19 | 4.8 |
| SINGAPORE | 19 | 3.2 |
| SERBIA | 18 | 9 |
| U ARAB EMIRATES | 17 | 5.7 |
| INDIA | 12 | 1.2 |
| BRAZIL | 10 | 5 |
| CANADA | 10 | 1.1 |

### *4.6. Authors keywords used and countries involved in this field*

The authors' mostly used keywords in the document are Metaverse, Crypto currency, Virtual Reality. The view can be clearly visualized by using co-occurrence keyword among others of various coun-

tries by the software Vosviewer with the help of Density and cluster view.

Cluster density visualization of the keywords

The space between any couple of keywords, x and y, depicts their resemblance Z xy, and let say n the number of keywords to be plotted and highly similar to one another should be placed close together, whereas those that are less intensive to one another should be placed apart . The mean distance between two keywords of VOS software mapping technique should be one is set in order to prevent small maps in which all objects are located in the same place and thus it represented by the following equation.

$$V(D_1 \_\_\_\_\_ D_n) = \sum_{\varkappa<y} Z_{xy} \ \| \ Dx - Dy \ \|^2$$

The point $Dx = (\mathbb{d}_{x_1}, \mathbb{d}_{x_2})$ denotes the x and the software minimizes the constraint by this mathematical representation as follows

$$\frac{2}{n\,(n-1)} \sum_{x<y} ||Dx - Dy|| = 1$$

The SMACOF algorithm is used in this VOS viewer software and each iteration with randomness will increase the probability of getting optimal solution for clear visualization of co-occurrence network.

When these all items allotted to clusters then only it is visible (Van Eck and Waltman 2007b) and precisely the visualization of Density can be implemented.

Suppose $\bar{p}$ is the distance then the equation is

$$\bar{p} = \frac{2}{n\,(n-1)} \sum_{x<y} ||Dx - Dy||$$

The item density $I\,(D)$ can be defined at the point D = $(D_1, D_2)$

$$I\,(D) = \sum_{x=1}^{n} w_x K(|\,(D - Dx|\,|/(\bar{p}h)\,)$$

VOS viewer uses a Gaussian kernel function denoted as

$$K\,(t) = exp\,(-t^2)$$

The number of nearby things and their weights affect how many items are present at a given point on a map. The item density increases as the number of close keywords increases and as the spaces among these keywords and the points of interest decrease (Scott 1992).In this view, each cluster's density at D on a map is calculated individually. The density of a D and cluster (C), say IC(D) is defined as

$$I_C\,(D) = \sum_{x=1}^{n} Q_c\,(x)\, w_x K(|\,(D - Dx|\,|/(\bar{p}h)\,)$$

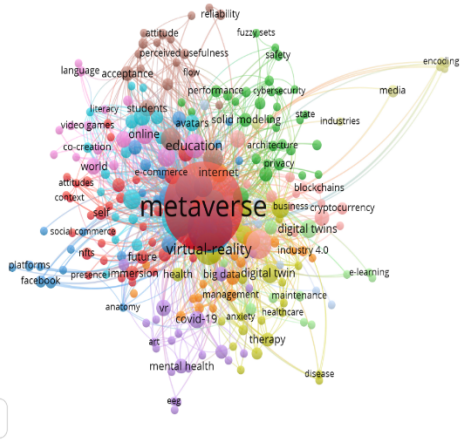


**FIGURE 4. Co-Occurrence Network keywords (Source: author)**

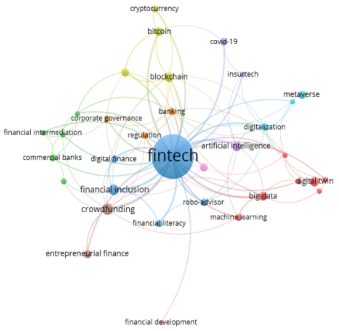


**FIGURE 5. Co-Occurrence Network keyword Plus (Source: author)**

## 5. Findings and Conclusion:

The review study indicate that Fintech in the Metaverse Banking is emerging technology. The Fintech companies offer a better customer experience than traditional banking, with Innovative services Digital Twin technologies, Virtual Reality and high handiness in the Metaverse. The Study related to Fintech in Metaverse published from 2003 to 2023 indicates that the many of the Fintech companies are

very new and the research shows very few papers contributed in this special filed and the research should be taken again to know more about this filed and about authors contribution in the coming years. Researchers could further build on the framework by incorporating all the tools required and supportive technologies to carry out Fintech in Metaverse successfully. The findings could also be used to identify specific differences between traditional banking and Fintech in Metaverse banking. The bank managers might use this information to decide how much they should invest in these various branches of banking. Fintech could have a variety of uses in the Metaverse, especially starting in 2023. New rules that encourage innovation, more adoption from sectors outside of financial services, and increased bank-financial technology company collaboration are all part of the predicted future of Fintech in Metaverse from 2023 to 2030. They include streamlining compliance processes, reducing fraud, and facilitating international payments. The creation of digital assets that represent fiat money or other assets like bonds and commodities is also possible with Metaverse. These digital assets are tradable on the decentralised exchange provided by Metaverse, which provides a high level of security and openness and a number of advantages would result for both customers and institutions, revolutionising the way banks work.

### *5.1. Future Research:*

Researchers could further study on the different frame works of financial technology connected to Payments , Lending, Asset Management, Social Trading including all the required and supporting Financial technologies to carryout Fintech operations in the Metaverse Virtual space Banking**.**

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