A Beginner's Handbook for Digital Finance

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CHAPTER 1

OVERVIEW: FINTECH, REGTECH, AND SUPTECH

Chapter Goal

- To introduce the following concepts: Fintech, RegTech, and Suptech.

Introduction

Technology has positively transformed finance, resulting in innovative game-changers that deliver financial services more efficiently and quickly across borders and domestically. Numerous financial products have emerged as a result of transformative technological innovation. For example, digitalizing financial transactions has significantly reduced domestic demand for fiat money in physical forms in several countries. Governments issue fiat money through central banks that are not backed by the value of any commodity. Even in developing countries, fewer people hold or use bank notes or coins, preferring to pay for transactions electronically. Digital or electronic forms of money offer lower transaction fees and faster turnaround times for all transactions and parties, regardless of whether they are peer-to-peer (P2P), peer-to-business (P2B), or business-to-business (B2B). In the future, the use of physical forms of cash for financial transactions is expected to cease across the globe. Hence, electronically transmitted assets and currencies are increasingly important.

Technological innovations transforming finance are sometimes complex; many are delivered through Web 2 solutions. These include faster domestic Automated Clearing House (ACH) low-value payments, global 'Real-time Gross Settlement' (RTGS) transfers for high-value payments, and efficient instant cross-border payments through the SWIFT[1] GPI

[1] https://www.swift.com/our-solutions/swift-gpi/instant-cross-border-payments#

payment solution. Although artificial intelligence (AI) and Web 3 solutions utilizing distributed ledger technology continue to deliver numerous game changers in finance, basic technology solutions that do not even use the World Wide Web have also successfully brought about quick and efficient payment facilities for individuals and businesses in many emerging markets. For instance, mobile money through MPESA provided cashless payments through mobile phones that were not even smartphones more than a decade ago using a PIN and text messaging.

Digital finance, therefore, encompasses an extensive range of technologies, from non-web-based solutions to AI-driven Web 3 mobile applications. These technologies are used across all aspects of finance, such as accounting and auditing, supervisory and regulatory services, as well as innovative customer interaction solutions delivered by Fintech, RegTech, or Suptech companies, established banks, and various start-ups that offer one or more financial, supervisory, or regulatory and compliance service.

Pre-WWW, Web1, Web2, and Web3

- **Pre-WWW** refers to enabling technology that existed **before** the World Wide Web and continued to be used in many emerging markets until recently.
- **Web1** refers to the first generation read-only web, the 'World Wide Web,' based on i) Hyper Text Markup Language – HTML, ii) Hyper Text Transfer Protocol– HTTP, and iii) Unified Resource Locators – URLs. These protocols continue to deliver static web pages today.
- **Web2** refers to the ‘participative web’ delivering dynamic, user-friendly interactive content. Social media tools such as Facebook and LinkedIn fall within this category, as do interactive websites facilitating polls, forum discussions, and webinars. RTGS payment systems utilize Web 2 technologies, as does SWIFT for cross-border solutions, to enable automatic settlement.
- **Web3** technologies facilitate data ownership and decentralization of transactions through blockchain, also referred to as distributed ledger technology (DLT). There is a heightened focus on data privacy and the security of online transactions. Public or private blockchains are used as an infrastructural layer for Web 3 services involving tokens representing crypto assets and cryptocurrencies.

Importance of Cybersecurity

The internet, which facilitates digital financial transactions, is connected through standard protocols and rules of operation involving many intermediate systems and applications that ensure the data is delivered to its intended destination. As data (which could be either unstructured or structured) and information (which is generally structured and contextualized) travel across the globe through the internet, they are vulnerable at many points, including the originating computer, the local area network, or the vast area network. Therefore, securing digital financial transactions is a challenging task and a significant issue to be dealt with in digital finance.

Regulators are concerned that the organizations' private information and network systems could be inadvertently vulnerable to hackers. To ensure the required level of protection, organizations need effective cyber security policies that prevent unauthorized users from accessing private networks and the unauthorized disclosure of personal information. Even if an organization is not connected to the internet, it will still want to establish internal security policies to control user access to network parts and protect sensitive or private information. However, the rapid development of the internet, with the emergence of various types of users, including anonymous users, has resulted in vulnerabilities and security lapses that have caused significant harm. For instance, crypto-jacking, phishing (fake emails that seek to extract information and personal details by tricking victims into installing malicious software), distributed denial of service (DDOS) attacks against websites, ransomware that hijacks files or other confidential information, identity theft, fraudulent messages sent via social media or messaging apps, or voice calls that aim to defraud and steal by convincing victims to reveal passwords or other confidential details related to bank accounts.

Digital Finance and Technology in 2024

Multiple processes and systems have changed the traditional system of providing financial services to customers. Payments and financial services are now delivered via mobile and internet banking systems. Recent advances in software applications, such as India’s Unified Payments Interface (UPI), which facilitates mobile applications such as Phone-pe and Paytm, have created competition in the market, meeting the needs of a varied customer base through innovative solutions.

The full range of banking services, including retail, private, commercial, and investment banking, have been transformed through innovative digital solutions. Financial services such as insurance, accounting, auditing, and related regulatory compliance mechanisms are now delivered digitally.

The nature of money itself has been redefined as consumers increasingly prefer to use fiat money in digital or electronic formats as it is easily accessible through a mobile phone or computer. In developed economies, most fiat money in circulation is electronic. In addition to traditional fiat money being available digitally, various new forms of digital currency have been created by private companies over the past decade and, more recently, by governments through central banks.

Cryptocurrencies (Private Digital Currency)

Digital currency produced by private companies is often referred to as virtual currency or cryptocurrency. Cryptocurrencies are digital representations of value used as an alternative to fiat money and are not issued by a central bank, credit institution, or e-money institution. Cryptocurrencies can be decentralized and are encrypted, transferred between peers, confirmed through mining (in the case of Bitcoin) or staking (in the case of Ethereum), and recorded on a public ledger. Cryptocurrencies can be classified into i) public permissionless, ii) public permissioned, iii) private permissionless, and iv) private permissioned. Further detailed discussion about this will be provided in Chapter 2.

Private cryptocurrency companies issue digital currencies to consumers or businesses who store these in accounts, which are called wallets. They are accessed, stored, bought, sold, and traded electronically. As with digital fiat money, cryptocurrencies offer low transaction fees and quick settlement times. As with all financial instruments, the value of cryptocurrencies is determined by supply and demand. It is important to note that while global financial organizations such as the World Bank have classified cryptocurrencies as a subset of digital currencies, not **all** digital currencies are cryptocurrencies. Digital currencies issued by central banks are called central bank digital currencies (CBDC). The World Bank has defined cryptocurrencies and CBDCs as digital representations of the value of money as opposed to e-money, which refers to digital payments in fiat currency.

Besides digital currencies, numerous other forms of tokenized digital assets are created using the same distributed ledger infrastructure built for cryptocurrencies. You will learn more about these assets in later chapters.

Dangers of membership in a decentralized system

Michael Sockin and Wei Xiong (2020)[2] have put forward the view that cryptocurrency owners are, in fact, members of online trading platforms. As utility tokens can only be issued to members through the platform, only members can exchange goods and services. Hence, the price of the token is based on the demand for membership in relation to the supply of utility tokens. Sockin and Wei Xiong (2020) caution that while "user optimism [can] mitigate the market fragility by increasing user participation, speculator sentiment exacerbates it by crowding users out."

Central Bank Digital Currencies

Central Bank Digital Currencies (CBDC) are created and circulated by governments through their central banks for digital payment purposes utilizing a similar underlying technology to that used for cryptocurrencies. CBDCs are linkable and traceable by stakeholders and are stored on a distributed ledger.

Table 1.1 reveals the status of CBDC acceptance and development across the globe.

Table 1.1: Status of CBDCs

Status of CBDC	No. of countries
Launched	11
Pilot stage	21
Development stage	33
Research stage	46
Inactive Digital Currency	16
Canceled Digital Currency	2

Source: https://www.atlanticcouncil.org/cbdctracker/ (retrieved on 4 Jan 2024)

[2] Sockin, Michael and Xiong, Wei, A Model of Cryptocurrencies (March 2020). NBER Working Paper No. w26816, Available at SSRN: https://ssrn.com/abstract=3550965.

The Bank for International Settlements (2023)[3] states that "to successfully implement a CBDC, central banks must consider the objectives and use case for a CBDC (i.e., its core factors), engage with a wide range of internal and external stakeholders, and include several considerations of difference factors relating to a CBDC project. Each jurisdiction will have its objectives to introduce the CBDC, which may differ from those of other jurisdictions. For example, promoting financial inclusion is an objective cited by more than 50% of emerging market economies (EMEs)".

Digital Assets: A Comparison:

The following table compares and contrasts various digital assets and their features:

[3] Bank for International Settlements 2023. Central Bank digital currency (CBDC) information security and operational risks to central banks. Consultative Group on Risk Management.

Table 1.1: Digital Assets: A Comparison

TERM	**DIGITAL ASSETS**	**TOKENS**			**COINS**		
DESCRIPTION	Private companies or central banks produce digital value representations **as an alternative to fiat money or real-world assets**.	Tokens are associated with a particular distributed ledger and have limited scope and value.			'Coins' have features of traditional fiat currency. They are divisible and exchangeable. Other assets do not back coins.		
TYPE	Some digital assets are tokens, and others are coins. Some tokens are fungible, and others are not. All coins are fungible.	Fungible tokens (FT) & Non-Fungible Token	Security token	Utility token	Cryptocurrencies/Private Digital Currencies	Stablecoins	Central Bank Digital Currencies

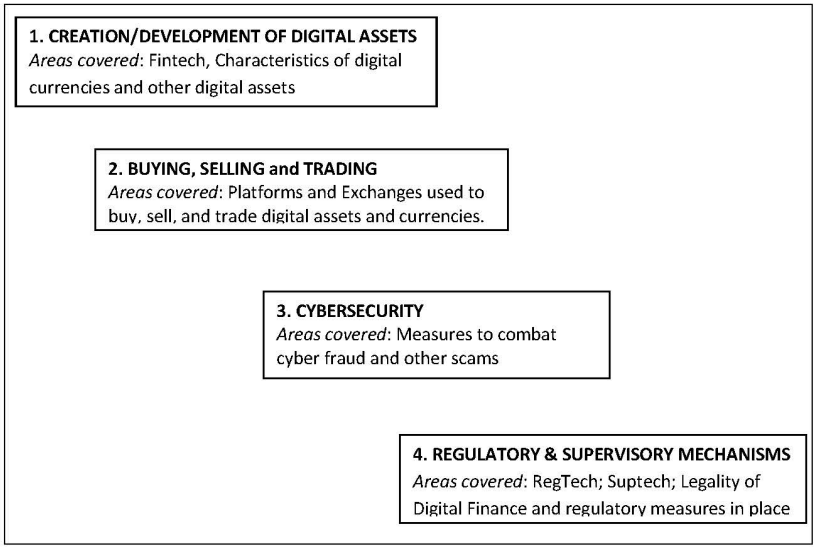
Features	**Some assets are centralized, and others are decentralized**	**Centrally issued**	**Centrally issued**	**Centrally issued**	**Decentralized**	**Decentralized**	**Centrally issued**
	Transferable	FT- Can be copied NFT-No substitute	Within regulations	Transferable	Transferable	Transferable	Transferable

Source: Regulating the Crypto Ecosystem-The case of unbacked crypto assets-Note/2022/007

Four Key Areas

The following diagram highlights four critical areas related to digital assets that will be discussed in this book:

Figure 1.1: Four Key Areas



Source: Author

Step 1: Creation of Digital Assets: Digital Assets, such as cryptocurrencies and tokenized digital assets, are created and issued by private companies. Some central banks have also launched government-backed central bank digital currencies, and others are still in the exploratory stage.

Step 2: Buying and Selling Digital Assets: Digital assets are bought and sold on platforms and exchanges. Investors may also buy or sell cryptocurrencies via online platforms or trade without owning cryptocurrency through "Contracts For Difference (CFDs)." Investors who purchase CFDs will not utilize wallets to store cryptocurrencies. CFDs can be used to open positions in the short and long term.

Step 3: Cyber Security to Combat Fraud and Scams: Fraud affects individuals, corporations, and governments, as well as the growth of the financial services sector and the development of a country's finances. Public financial markets exist primarily to fund businesses by investing

and trading equities and funds. Regulators ensure economic stability in financial markets and protect consumers and businesses from fraudsters, criminals, and others who seek to disrupt the sector. Many types of cybercrimes are combatted through cyber security. Crypto-jacking is a form of cybercrime that has increased tremendously in the past year. You will learn more about efforts to combat various types of financial crime in Chapter 6.

Step 5: Regulatory Mechanisms: Cryptocurrencies are now regulated in most jurisdictions through existing financial legislation or bespoke regulatory mechanisms such as the Markets in Crypto Assets (MiCA) Regulation in Europe. Cryptocurrencies can be bought with fiat money to purchase some virtual and authentic goods and services.

Fintech

‘Fintech’ is a combination of the words 'finance' and 'technology' and essentially refers to financial services offering innovative technology solutions. Arguably, the majority of financial transactions are carried out digitally today. The term ‘Fintech’ is, therefore, used to describe companies offering these innovative financial services that were previously the domain of established banks. Many fintech services have challenged financial norms and addressed fundamental issues such as non-systemic risk, which caused the Global Financial Crisis of 2007-08. Fintech, therefore, reduces the primary source of risk in the financial sector inherent in the control previously held by large Globally Systemically Important Banks (G-SIB) and other Systemically Important Financial Institutions (SIFI).

Examples of fintech applications available online or from mobile apps include digital payments and e-money, international remittances, personal and business loans, peer-to-peer lending, crowdfunding, and robo-advice. All activities related to developing, purchasing, and trading cryptocurrencies such as Bitcoin or Ether can be classed as fintech services. In later chapters, you will learn about other altcoins forked from Bitcoin or Ethereum, such as Litecoin and Dogecoin. ‘On and off-ramp' solutions that facilitate the transfer from fiat to numerous cryptocurrencies like Litecoin, Ethereum, Zcash, Dash, XRP, and Monero will also be explored in later chapters.

Examples of Fintech Payment Solutions

Apple Pay, Google Pay, and Alipay are all mobile payment applications. In addition, Alipay also acts as a 'shadow banking' system as it offers higher interest rates than traditional banks.

Robo-advisors

Robo-advisors, or digital investment managers, are an excellent tool for retail investors who fall below the required threshold set by private banks and wealth managers who provide investment and wealth management advice to wealthy individuals and corporate entities. Some robo-advisors make use of AI and other emerging technologies. AI is the simulation of human intelligence processes by specially designed software. This book will not discuss many different forms of AI in detail.

Robo-advisors

There are various investment advising agencies for portfolio management. They offer multiple services for early retirement, buying a home, planning for children's education, paying for a wedding expenditure, etc.

Examples of robo-advisors

Moneyfarm, Wealthify, Wealthfront, SoFi, and Acorns are examples of robo-advisors.

URL:
Moneyfarm: https://www.moneyfarm.com/uk/
Wealthify: https://www.wealthify.com/
Wealthfront: http://tinyurl.com/4dyevkcj
SOFI: http://tinyurl.com/wzxzt2k8
Acorns: http://tinyurl.com/ms6xvfbe

Crowdfunding

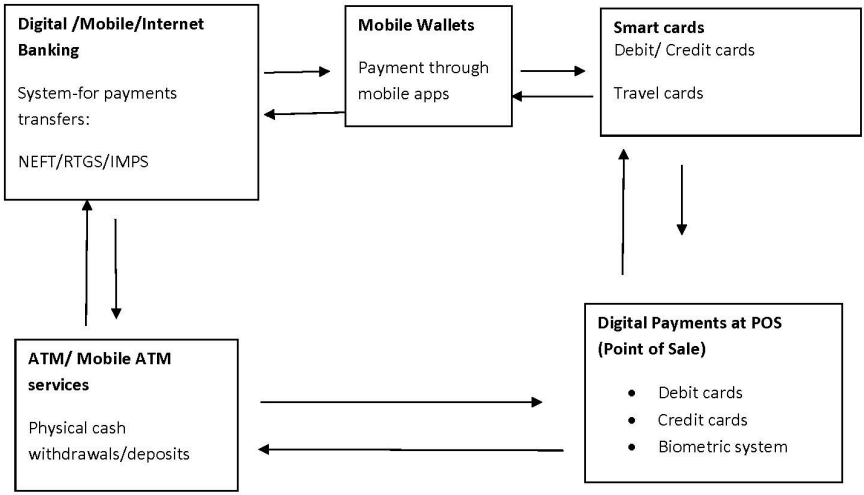
Crowdfunding involves many investors coming together to raise debt or equity capital primarily to fund new and innovative projects through a web-based platform. Many crowdfunding platforms accommodate retail investors, who invest small amounts of money, and institutional investors. Crowdfunding platforms help business owners seek funding from several investors. Crowdfunded projects often attract investors with goals and values similar to business owners.

Web2 Fintech Ecosystem

Fig. 1.2 depicts the functioning of the Web2 Fintech Ecosystem. This system helps customers use digital banking technology and quickly transfer funds through the online payment system.

Hence, customers can deposit, withdraw, and make payments through smart cards and mobile wallets. In addition, banks provide physical cash withdrawals and deposit facilities through ATMs and Mobile ATMs.

Figure 1.2. Web2 Fintech Ecosystem



Source: Author

RegTech

RegTech combines the terms “regulation“ and “technology” and describes using Web2 and Web3 solutions to assist fintech companies and established banks in the regulatory compliance process. Data analytics tools, artificial intelligence, and machine learning assist firms and regulators by automating numerous mundane regulatory compliance tasks with meticulous scrutiny, resulting in high levels of consistency and accuracy. RegTech services will continue to be developed to help organizations meet changing requirements as the regulatory environment continues to evolve in various jurisdictions.

Regulators from most jurisdictions around the world actively promote collaborative RegTech activities. The Innovation Hubs set up by the Bank for International Settlements (BIS) to proactively develop RegTech and Suptech activities throughout the world have resulted in numerous innovative projects. The BIS is owned by 63 central banks, representing countries around the world that account for about 95% of world GDP. Through the Basel Committee on Banking Supervision (BCBS), the BIS helps foster cooperation amongst central banks, ensuring monetary and financial stability for the entire world by acting as a global standard setter for prudential regulation. Its 45 members comprise central banks and bank supervisors from 28 jurisdictions.

The following are examples of Regtech projects that BIS Innovation Hubs from around the world are involved in:

1. Project Leap– This project aims to equip national banks and the worldwide monetary framework with the tools to move toward quantum-safe encryption. Because quantum computing is a vital tool for data encryption and transfer, this project helps to help in cybersecurity. To achieve this goal, a public key algorithm will be implemented along with several quantum-resistant algorithms in a hybrid cyphering mode to maintain the privacy of messages sent. Hence, the post-quantum cryptographic conventions between two national banks were executed to prepare central banks for a transition towards quantum-resistant encryption.
2. Project Symbiosis – This project examines the benefits and challenges of using AI and distributed ledger technology in supply chains. It focuses on the emission disclosures of small and medium size companies.
3. Project Promissa – This project focuses on digitalizing promissory notes as 'tokens' based on the 'proof of concept.' Promissory notes issued by the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA) that various nations have pledged will be turned into digitalized tokens.
4. Project Hertha – This project will identify current and emerging financial crime typologies, RTGS, and digital asset networks. It is intended to explore all networks to trace out financial crime partners.
5. Project Dunbar– This is used to create a multi-Central Bank Digital Currency (mCBDC) Platform.

Application of RegTech

As illustrated by the projects developed by the BIS, RegTech prevents financial crimes and fraudulent activities and promotes economic stability by facilitating prudential reporting and credit risk mitigation by increasing the accuracy of creditworthiness assessments.

In India, the Public Credit Registry System, initiated by the Reserve Bank of India, is linked to all cash flows from borrower transactions. Then, banks can sanction loans on a cash-flow basis instead of asset-backed loans.

Regulatory Mechanisms and Initiatives

Central banks use RegTech for regulatory data management, reporting, tax compliance, and risk analytics. It is also used to identify cybercrime and data privacy. Thus, various jurisdictions have developed regulatory mechanisms to protect consumers and ensure effective market competition in the financial industry.

At the same time, RegTech incentive schemes have been set up to encourage compliance with regulatory mechanisms. For example, RegTech companies are eligible for a 150% super deduction per the government of the island of Jersey.

The following are some examples of regulatory mechanisms that impact digital finance.

USA – SEC

Within the Federal government, most of the focus has been at the administrative and agency level; the regulatory authorities working are i) The Securities and Exchange Commission (SEC), ii) The Commodities and Futures Trading Commission, iii) The Federal Trade Commission, iv) The Department of the Treasury, v) The Internal Revenue Service, vi) The Financial Crimes Enforcement Network, vii) The Financial Stability Oversight Council, and viii) The Office of the Comptroller of the Currency, Federal Bank.

Regulatory Acts in the USA

- Bank Secrecy Act
- Anti-Money Laundering Act
- Electronic Fund Transfer Act

Status of Digital Assets across the Globe

In the United States, House Financial Services Committee member Maxine Waters met with CEOs of several major cryptocurrency companies to discuss digital assets and the future of finance in July 2023[4]. This committee passed a bill relating to cryptocurrency and its interpretation and regulatory mechanism.

UK Financial Conduct Authority

Regulations in the UK that address crimes that have increased as a result of the growth in digital finance include: i) The Money Laundering, Terrorist Financing and Transfer of Funds (Information on the Payer) Regulations 2017, ii) The Financial Services and Markets Bill, 2022, and iii) Prudential Regulation Authority-Existing or Planned exposure to crypto assets, 2022. A detailed analysis is provided in Chapter 11.

India

In India, the Reserve Bank of India (RBI) and the Securities Exchange Board of India (SEBI) are regulating cryptocurrency. The Government of India also suggested possible regulation of crypto trading platforms under the Foreign Exchange Management Act (FEMA) as crypto assets are available for trading in a foreign jurisdiction as well and consumers abroad can remit funds to India using such currency.

China

China officially granted legal status to Bitcoin (it is considered to be a virtual commodity asset) jointly issued in December 2013 by i) Ministry of Industry and Information Technology, ii) China Banking Regulatory Commission (CBRC), iii) China Securities Regulatory Commission (CSRC), and iv) China Insurance Regulatory Commission (CIRC).

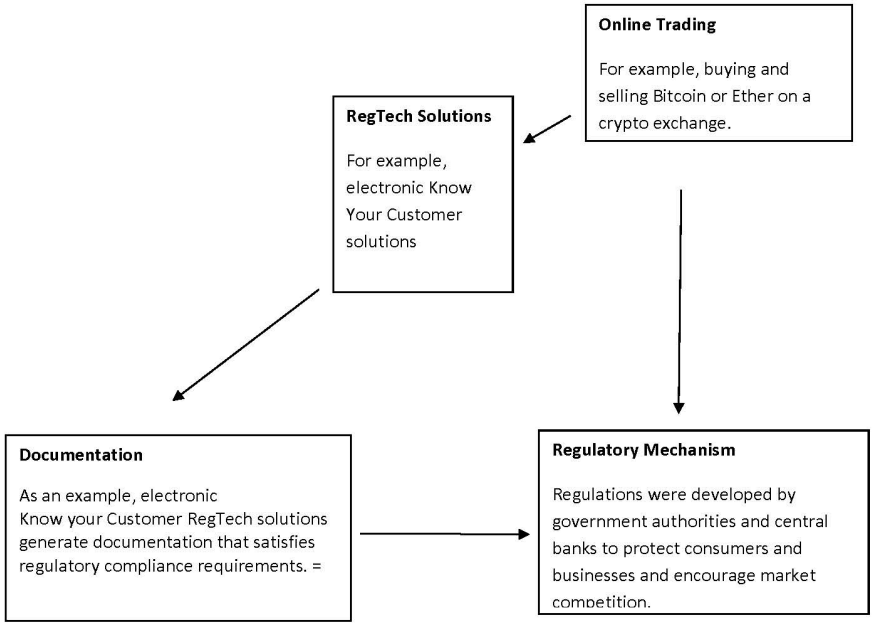
[4] https://www.reuters.com/technology/us-congressional-committee-set-weigh-crypto-bills-2023-07-26/.

Singapore

The Monetary Authority of Singapore (MAS)[5] proposed a new regulatory technology (RegTech) grant scheme on 30th April, 2021. This is to prepare for the adoption and integration of technology solutions. The activities are KYC, monitoring transactions, detecting suspicious activities, regulatory reporting, risk management, and case management.

Figure 1.3 depicts the framework of RegTech – online trading platforms, regulatory mechanisms, and documentation.

Figure 1.3. An Overview of RegTech



Source: Author.

[5] https://www.mas.gov.sg/development/fintech/technologies---regtech.

E-KYC Platforms[6]

Several E-KYC platforms have the following features: fraud detection, biometrics, real-time monitoring, background screening, compliance management, identity verification, etc. Some popular websites are – IDnow, GetID, Fully-Verified, SignDesk, ComplyCube, etc.

- **RegTech Tools –** The following tools utilize AI
  - IBM Open pages: Used for Operational Risk Management and Governance
  - Ayasdi – Machine Learning tool used for Data analysis
  - QRM- Quality Risk Management
  - RSA Archer GRC- Governance, Risk, and Compliance software
  - AQ Metrics: Helps in regulatory reporting and monitoring
  - Blackline: This helps in finance, accounting, and reporting.

Suptech

Suptech is derived from the words 'supervision and technology' and refers to the use of technology for regulatory, supervisory, and oversight purposes[1]. As with Fintech and RegTech solutions, various technologies such as artificial intelligence, cognitive analytics, and data analytics tools drive Suptech. Supervisory Agencies established by the governments of respective countries will adopt suitable supervisory technology for data collection, authentication, compliance, and risk management.

European Central Bank (ECB) developed Suptech tools to simplify and streamline the tasks of banking supervisors. Examples include Athena, which is used for bank documents and supervisory assessment with the help of the 'Natural Language Processing Technique' -Heimdall, which is supported by process automation and data analytics. The information management system is a vital tool used by supervisors to ensure the transparency and efficiency of data.

Data Analytics

A data analytics tool is a software application that collects information from various complex data types and sets and then processes these to provide meaningful results. Thus, data analytics is part of report

[6] For further information: https://www.capterra.com/kyc-software/ and also see: https://sdk.finance/how-to-choose-a-kyc-provider-part-2/.

processing and requires data validation and cloud computing techniques. For example, Azure Synapse Analytics is used for data warehousing and analytics.[7]

AI

Many forms of AI are used in data analysis, cognitive analytics, problem-solving, etc., and simplify the working of supervisors in the financial services industry. For example, AI tools can be used to monitor and forecast risk. AI with machine learning tools is applied to automating financial transactions. This also helps in customer support with the help of chatbots. It also helps detect fraud and provide financial advice. For example: JP Morgan –Client Contact Intelligence- to read legal contract documents.

Summary

This chapter focuses on the evolution of changing technologies in business, particularly digital finance, and describes the use of technology in the financial services sector. It includes many products, applications, processes, and business models that change the shape of banking and financial services. This chapter also explains the relationship between budgeting, technology management, and technology management. “Fintech” is derived from “Finance and Technology,” “RegTech” is derived from “Regulation and Technology,” and “Suptech” is a combination of “Tracking and Technology.” All entrepreneurs need to know about digital assets and digital currencies. It is important to remember that, like fiat money, private digital currencies have no intrinsic value and are not backed by a commodity or precious metal. However, unlike fiat money, central banks do not issue all cryptocurrencies; therefore, they are not legal tender. Banks back only CBDCs and ensure the interests of the public.

Review Questions

1. What are the four critical areas in game-changing technologies? Explain with a suitable diagram.

2. What are the components of a Web 2 digital finance ecosystem?

3. How is 'Suptech' used in digital financial technology?

[7] https://fintechlatvia.eu/news/big-data-and-suptech-development/

Test your knowledge

1. Digital currency issued by central banks is called:
i) ABDC, ii) CBDC, iii). DBDC iv) EBDC

2. The Markets in Crypto Assets (MiCA) Regulation is issued by:
i) India ii) America iii) UK iv) Europe

3. China officially granted legal status to Bitcoin in the year:
i) 2010, ii) 2013, iii) 2020, iv) 2000

4. The Financial Stability Oversight Council was established in:
i) India ii) USA iii) UK iv) Europe

5. Trading without owning cryptocurrency is called:
i) CFD ii) CBDC iii). DBDC iv) EBDC

Answers

1. (ii), 2. (iv), 3. (ii), 4. (ii), 5. (i)

List of References

[1] Sockin, Michael and Xiong, Wei, A Model of Cryptocurrencies (March 2020). NBER Working Paper No. w26816, Available at SSRN: https://ssrn.com/abstract=3550965.
[2] BIS, BIS Innovation Hub work on Suptech and Regtech.

Further Reading:

City of London Corporation Pwc Fintech Series: India-UK RegTech landscape, 2019- source: https://www.cityoflondon.gov.uk/assets/Business/pwc-india-uk-regtech-series.pdf.
https://www.bankingsupervision.europa.eu/banking/html/index.en.html.

CHAPTER 2

MONEY AND CURRENCY

Chapter Goal

- To explain private digital currencies, known as cryptocurrencies, central bank digital currencies, and other digital assets.

Introduction

All financial transactions between two parties are carried out through a medium of exchange – money or currency. The technology used by banks and fintech has facilitated the circulation and accessibility of electronic or digital forms of fiat money and digital currencies, thus reducing the demand for physical forms of fiat (banknotes and coins). Therefore, ownership, usage, and circulation of physical fiat currency gradually decrease and could eventually cease worldwide.

As discussed in Chapter 1, various new forms of digital currency have been created by private companies over the past decade and, more recently, by governments through central banks. Digital currency produced by private companies is often called virtual currency or cryptocurrency. It is important to note that while global financial organizations such as the World Bank have classified cryptocurrencies as a subset of digital currencies, not **all** digital currencies are cryptocurrencies. Digital currencies issued by central banks are called central bank digital currencies (CBDC).

Despite all the advantages of digital finance and digital currency, running a business online makes it vulnerable to cyber-attacks. Many firms may venture into e-commerce without employing cybersecurity experts who are well-versed in the latest cyber threats, security measures, and fintech regulations. Companies that carry out financial transactions on Web2 or Web3 applications are also vulnerable to data breaches and must manage data protection risks. To resolve the issues, a strong network security solution is required to easily and automatically manage access to the corporate intranet used by internal staff and the external websites and

mobile applications used by customers. Network security solutions should also address user authentication needs by encryption throughout the process. Since the customer must provide confidential information, such as credit card numbers and other personal details, cyber security professionals' primary focus must be protecting customers' personal data.

Implications of disintermediation

Through detailed research and analysis, several pundits have found that the disintermediation that could result from the widespread adoption of private digital currencies (cryptocurrencies) could have profound implications for financial regulators and policymakers. Some academics have discovered a correlation between citizens' choice of CBDCs and increased bank loans (Cirelli, 2023; Martino, 2023). Martino notes, "Although the debate between private and public money is not new as it has shaped both legal and economic debates for decades, private cryptocurrency may radically challenge state sovereignty due to its borderless nature."

Distinction between Fiat Money and Digital Currencies

Fiat money/currency

As you learned in Chapter 1, precious metals with intrinsic value were used as a medium of exchange and store of value. Fiat money, or currency with no inherent value and not backed by any other asset, has replaced precious metals and other commodities as a medium of exchange. It is issued by each country's central bank and deemed to be legal tender. Every country issues fiat currency with a unique denomination and name.

Features of Money/ Currency

The acronym CUP-DISH represents some essential features of money:

- C- Cognizable
- U- Uniformity
- P- Portability
- D- Divisibility
- I- Interchangeability
- S- Stability
- H- Holdable

Virtual Currencies, Private Digital Currencies, and Cryptocurrencies

Although fiat money is widely circulated electronically or digitally, this book only refers to private cryptocurrencies and CBDCs as digital currencies. As there is much confusion over the terms 'digital currency,' 'virtual currency,' and 'cryptocurrency,' we have included the following definitions that are accepted by the International Monetary Fund (IMF) and Committee on Payments and Market Infrastructures (CPMI) which was set up by the Bank for International Settlements (BIS). According to the IMF, digital or virtual currencies include simple IOUs ('Informal certificates of debt') similar to air miles offered by airlines, digital currencies backed by assets such as gold, and cryptocurrencies[3]. The CPMI refers to cryptocurrencies as digital currencies or digital currency schemes. Table 2.2 and Table 2.3 outline the differences between traditional money/currency and digital money/currency.

Table 2.2: Traditional Fiat Currency vs. Digital Currency

<table>
<tr><td colspan="2">Traditional Fiat Currency</td><td colspan="2">Digital Currency</td></tr>
<tr><td>Intrinsic value</td><td>No Intrinsic Value</td><td colspan="2" rowspan="2">No Intrinsic Value</td></tr>
<tr><td>Precious Metals
Ex: Gold, Silver, Copper</td><td>Fiat Money/ Physical currency[8]</td></tr>
<tr><td colspan="2" rowspan="2"></td><td>Private Currency</td><td>Public currency</td></tr>
<tr><td colspan="2">Regulatory authority and Intermediary
Central Bank to Commercial Banks</td><td>Intermediary Through Escrow Service[9]</td><td>Central Bank Digital Currencies (CBDC)</td></tr>
<tr><td colspan="2">Electronic Exchange through –Net Banking- ATM – Credit card/ Debit card/ Mobile Banking</td><td>Exchange through Digital Wallet for 'Peer-to-Peer' transactions</td><td>Regulated by Central Banks</td></tr>
</table>

Source: Prepared by author

[8] Sveriges Riksbank, Sweden- was the first central bank to issue currency notes in 1668.

[9] Escrow Service is a third-party intermediary through digital form for peer-to-peer transactions.

Table 2.3: Characteristics of Fiat Currency and Digital Currency

Characteristics	Fiat currency	Digital currency
1. Legal tender/ recognized	YES	NO, except CBDCs
2. Intrinsic value	NO	NO
3. Divisible and portable	YES	YES
4. Exchange value-stability	Depends on foreign exchange	Depends on virtual transactions-highly volatile
5. Tangibility	Tangible and intangible transactions through banks	Intangible- not a legal tender currency

Source: Prepared by author

Private Digital Currencies (Cryptocurrencies)

Origin of bitcoin -Satoshi Nakamoto

In 2008, a white paper revealed that the Bitcoin network was launched by an anonymous computer programmer under the pseudonym "Satoshi Nakamoto." It is a peer-to-peer electronic payment system that uses a bitcoin cryptocurrency to transfer value over the distributed ledger or blockchain and store value like any other precious metal, e.g., gold and silver. Each bitcoin is 100 million satoshis (the minor bitcoin), and individual bitcoins are divided into eight decimal places.

DLT- Distributed Ledger Technology

DLT is helpful for online financial transactions among corporate entities operating from various locations. DLT is based on four pillars viz., i) distributed ledger network (peer-to-peer), ii) hash function, iii) consensus algorithm, and iv) smart contracts.

The year 2140: Threshold limit of Bitcoin Generation

To ensure that the total supply of Bitcoins is at most 21 million, the number of generated rewards per block is divided by two every four years. Hence, Bitcoin generation will reach its threshold limit and cease by 2140.

Source: https://brill.com/edcollbook-oa/title/62244

Key Characteristics of Cryptocurrencies

Cryptocurrencies are encrypted and transferred between peers through a public ledger via 'mining' (in the case of Bitcoin) and staking (in the case of Ethereum) and are digital representations of value that a central bank, credit institution, or e-money institution does not issue. Cryptography identifies and verifies transactions when transferring cryptocurrencies using distributed ledgers or blockchains. They allow peer-to-peer transactions using a decentralized system, so there is no need for a central authority. Although blockchain, the distributed ledger that Bitcoin was built on, was decentralized, public, and permissionless, there are several other distributed ledgers today that cryptocurrencies are built on that are either centralized, private and permissioned, public and permissioned, or private and permissionless.

Cryptocurrencies offer users more flexibility than coins built for specific games or virtual domains, which are prohibited-exchanging coins outside the specific virtual domain. Cryptocurrency can also be used as an alternative to fiat money in certain circumstances. However, they are not considered by governments to be legal tender. Cryptocurrency can also be exchanged for fiat currency, which can then be used to pay for goods or services.

Purpose of Cryptocurrencies

Cryptocurrencies were conceived to serve two primary purposes: (i) the digital exchanges of money between individuals (peers) and (ii) payment in monetary terms that is transferred from the buyer to the seller. Digital currencies generally claim to facilitate both peer-to-peer (P2P) and consumer-to-business (C2B) transactions with lower transaction fees and faster turnaround times. The value of cryptocurrencies derives from the expectation that others will be willing to exchange them for goods, services, and fiat money. Electronic fiat money can now be cleared and settled in real-time through instant payment mechanisms in most countries, e.g., UPI, Faster Payments, etc.

Cryptocurrency Transactions

The bitcoin pizza

Laszlo Haynecz reportedly made the first ever commercial exchange utilizing bitcoin on May 22nd, 2010, paying 10,000 bitcoins for two pizzas. Digital currencies (cryptocurrencies) may have lower costs and quicker