

Impact of Blockchain on Financial Technology Innovation in the Banking, Financial Services and Insurance (BFSI) Sector

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Abstract: This research paper aims to highlight the progression of the technological advancements emerging in the BFSI sector across the globe, evaluate them, and find the merits and shortcomings in this sector using literature review assisted by the prior knowledge from the renowned works published in reputed journals. The information was obtained from secondary sources, thereby helping us draw a picture of the existing state of technology in the BFSI sector and its future potential/applicability within the field. We have used advanced search criteria of two levels to comprehensively cover the existing research papers on the topic for evaluation. With the rising need for digital change, banks look up to speed up the existing plans to arrange authoritative changes driven by the new initiatives. Artificial intelligence companies in the upcoming years will thrive. Banks will make all the efforts to utilize their advances to lessen the cost, mechanize all ordinary procedures, and separate administration levels through personal information which was not accessible before.

Keywords: BFSI, Banking, Payments, Blockchain, Fintech, Technology.

1 Introduction

FinTech, with its broad and promising scope and applications, has disrupted the entire banking, finance and insurance industry where they have revolutionized the way business is carried out in these industries and have made the whole system more efficient, transparent and secure [1]. Blockchain in particular, with its cutting-edge applications, has attracted significant attention and investment within the wide scope of the FinTech industry. The wide acceptance and growth of blockchain and its applications can be credited to the two major concerns that arise with the use of the internet for doing business; transaction and trust, and how blockchain not only addresses the issues but also optimizes the process, making it more efficient secure and transparent. Security and privacy issues have always hindered and restricted the use of the internet for doing business. Although a significant amount of research has been done to address these issues, intermediaries were recently appointed to ensure secure transaction completion. Thus, there were limitations to doing business through the internet as confidential and financial information is vulnerable and is prone to data breaches. A few years back, a protocol displayed advanced solutions to these issues and more in the form of blockchain, which was initially introduced as the electronic cash system for transactions through digital currency known as bitcoin. While the economy is yet to gain confidence in cryptocurrency, people were excited to leverage the digital currency blockchain's underlying technology. Financial institutions and companies alike have realized blockchain's advanced capabilities and potential and have accelerated investment into the field.

Blockchain, in simple terms, is the system of transmitting transactions while also encrypting it, through the web using IOT but in the absence of centralized authority so transparency is maintained through independent ledgers.

Although the technology has a scope of being leveraged in various enterprises, it has shown great potential in the financial industry for FinTech applications. Blockchain allows superior business functioning with improved security, durability, and advanced transparency, significantly reducing transaction and operational costs, especially for banks.

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This study is an attempt to understand and expand on the concept of blockchain and its applications across economies. The paper begins with explaining the principles behind the technology and how its advanced applications are being used to simplify and improve the working of the BFSI sector. Moreover, the paper also explains the concept of decentralized public ledgers and the move towards hybrid solutions and their implications. Furthermore, the paper justifies the claim of blockchain being a disruptive technology while also highlighting the potential risks posed by the technology. This paper attempts to understand the applicability of blockchain in defining the future of BFSI and its scope and analyze the scenarios favourable for implementing blockchain technology. Moreover, some of the recent developments in this field has been taken as important basis points to conduct a wholesome analysis of the technology and the reason behind its rapid growth.

The era of technological advancement gives rise to the disruptive FinTech start-ups and solutions that are changing the whole game of how banking, insurance, and other financial institute used to operate traditionally. These Financial Techs are leveraging technological advancement to provide a better way to cater to the ever-changing needs of the customers, both individuals and institutions [1].

This amalgamation of finance and technology has become the largest growing sector globally. In recent years, financial institutions, in response to the growth in the mobile platform and internet accessibility, are shifting their strategies and operation. One such example of change is the payment wallets that distribute the complete payment and money transfer system market in India, making traditional banks redundant and forcing traditional financial institutions to either upgrade or strategically acquire or form a partnership with emerging fintech to stay relevant in the market. The increasing demand pushes the growth of the fintech sector for financial services such as mobile applications, online commerce, SME financing and improved security [2]. Also, with the increasing complexity in the technology in the Fintech market, it gives rise to attractive business and career opportunities. Technology universities and business schools have started to develop courses and programs in this field to cater to the mind power requirement.

1.1 Defining Banking, Financial Services and Insurance (BFSI)

BFSI comprises a set of companies which provide a vast array of financial services or products. Being one of the fastest-growing sectors, it plays a more significant part in a developing country like India. The services provided by the companies in these sectors help improve the standard of living of the people by offering financial services like mutual funds and offering protection to them through services like insurance. The BFSI sector plays a vital role in a country's economy as its contribution to its GDP is a significant portion. But due to events like the subprime crisis of 2008, the sector faced a slowdown, and it took a while for it to be stable again. After this, severe restrictions were put in place to prevent such a crisis from happening again and maintain the global economy's health. This sector has been in existence from time immemorial, with the first institutions part of this sector being the banks. Over the years, the institutions part of the BFSI sector kept increasing, and now the umbrella of BFSI is huge. One such new instrument which has become very popular nowadays is mutual funds. Mutual funds have helped people from all sections of society to grow their wealth and improve their standard of living. Another example of the growth can be seen in terms of the new types of insurance that have entered in the last decade or so.

1.2 Growth of Banking, Financial Services and Insurance Sector

This sector has been in existence from time immemorial, with the first institutions part of this sector being the banks. Over the years, the institutions part of the BFSI sector kept increasing, and now the umbrella of BFSI is huge. One such new instrument which has become very popular nowadays is mutual funds. Mutual funds have helped people from all sections of society to grow their wealth and improve their standard of living. Another example of the growth can be seen in terms of the new types of insurance that have entered in the last decade or so.

The actual benefits from this sector has been experienced by the people only after technology has become an integral part of this sector. Technology has helped grow the sector by inventing new services and products, making the current processes more efficient. In the past, institutions just made use of the personnel to carry out the activities, so there would be a lot of delays and imperfections in the work done. So to overcome this, computers were incorporated into the daily functioning of the institutions. But now, the effects of globalization, the volume of data and the privacy clauses for the data across the world constantly beckon for newer technologies to come into effect like Artificial Intelligence, Cloud Computing, Big Data etc.

Stepanova S.V and Karakchieva V.L quoted in their paper "Changes in Banking Business Models Driven by Technological Innovations". Innovations spur the banks to reinvent their distribution channels, key partners, resources, patterns, and revenue streams. Ignoring the changing business landscape may produce customers' dissatisfaction and backlash or result in innovative risks exposures [3].

Another step is that the companies in this sector have gradually begun outsourcing their work to the top technology firms

of the world so that there is no compromise on the quality of the services offered. BFSI also has become the highest revenue-generating domain for many technology companies across the globe because this domain cannot be the same for a long time. There are constant changes that have to be brought out frequently by the regulatory bodies, So for the banks being the clients of the technology companies, continually push for changes so that they are compliant with the regulatory bodies. Also, the latest technology is incorporated into their functioning.

Through this paper, we would like to bring to light the technological advancements in the BFSI sector and what effects they bore on the sector as a whole. It also brings to light how these advancements have led to the inventions of new products, services and new modes of banking like mobile banking.

The paper gives a broad insight into the evolution of the BFSI sector, and it also helps the analysts understand how much impact the innovations have had. It also helps outline if there are still many issues that have to be tackled in the industry, thereby guiding future research work.

2 Literature Review

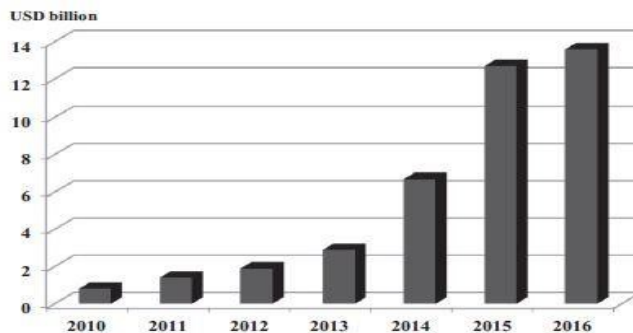
The paper deals with the exploration of fintech and its various changes to the banking industry. Systematic analysis of the fintech innovation nature is brought to the picture. One major assistance of this review revolves around the systematic development of innovative models, which are used to track the progress and pattern of technology development. Fintech (Financial Technology) is seen as one of the financial technologies that would revolutionize the banking industry, receiving global attention. Moving around for decades, banks have invested heavily in the development to improve the efficiency of the financial innovation systems such as electronic fund transfer at the point-of-sale (EFTPOS), Automated Teller Machines, internet banking, Society for Worldwide Interbank Financial Telecommunication (SWIFT), Electronic Data Interchange (EDI), mobile banking, bitcoin wallet, crowdfunding, etc.

Fintechs offer an innovative form of lending and are often in the so-called lending marketplace, which means the potential borrowing can apply for a loan via Peer to Peer lending through the internet. Most fintech companies offer their services without requiring a bank account, payments being transferred through the internet or mobile phone. Stating an example, China is a country where mobile payments and peer to peer lending are already popular and about to gain market rapidly. This shows that mobile payments have already been considered an alternative to cash and other electronic payments. Hence we can state that the widespread of the internet and mobile phones support this development which elaborates the success of fintech companies in China.

This has led to a gradual implementation of blockchain technology in P2P lending platforms, which facilitates safer, transparent, and quick access of funds without dealing with the banks' more complex and costly processes. Block-chain is considered a trusted machine online, and peer-to-peer lending is regarded as an alternative to banks as online platforms have limited information about the borrowers. Blockchain has emerged as an essential part of fintech, primarily as it facilitates transparent and safe access to funds without dealing with the banks' complex processes and settlements. Besides this, blockchain technology improves loan monitoring by tracking the digital use of loan funds toward the stated loan purpose. Hence, assistance in risky loan recovery efforts can be made if a borrower defaults.

Blockchain can be thought of as a distributed database. Here is a conceptual framework including a nine-step sequential scheme from the decision to transfer funds, creating a ledger, notification, approval of funds transfers, creation of blocks, receipt of funds by parties, documentation, and preparation of these documents leading to its final distribution. Implementation of blockchain technology for the transfer payments provides us with a high degree of convenience but with an added cost.

The graph represented below showcases the growth of technology in the BFSI sector. We can see that the importance of technology in banking is seen as substantial for growth in the sector.



Source: KPMG (2017)

Fig.1: Growth of Technology in BFSI.

As the advancement of mobile devices and their usage has increased the uptake of financial technology innovation, financial sectors, as well as start-ups, see fintech as a gateway to increase business opportunities, but mobile applications and other technology platforms must be launched to explore such possibilities. We can see that the most prominent way fintech is disrupting the finance and banking sector is through customer service, where now chat-bots have rapidly become the norm for customer interaction. Online banking is also getting more and more sophisticated daily, where we transfer money with the push of a button. Artificial Intelligence is moving more sophisticatedly than the people who design it. The machine can track the history of an entity and calculate and predict potential fraudulent activities more effectively than a human individual. These are just a few different ways that technology is altering how the finance industry is working.

2.1 Introduction and rise of blockchain

Before blockchain technology entered the financial services sector, digital cash was introduced in a centralized server setting to counter the major issue of double-spending. Up until 2009, despite the significant advances in the cryptographic, this new form of money failed to find stable compatibility between anonymity, centralization and double money prevention. In 2009, Bitcoin was conceptualized, leveraging the blockchain technology, which replaced the centralized server setting with the decentralized mechanism for payment system based on proof of work. In the last decade, blockchain is one such technology which gained a lot of popularity and investment in the FinTech industry since the launch of Bitcoin [4]. The blockchain's popularity is that it addresses two of the riskiest issues of doing business on the World Wide Web, i.e. transaction and trust. The online commerce sector has been plagued by the issue of privacy, security, and trust. Issues such as these leave the financial sector's sensitive information vulnerable and at risk. A significant breakthrough was found in 2009 when a paper published by Satoshi Nakamoto (a pseudonym for an unknown person or group) on an electronic cash system using the digital currency later known as Bitcoin [5]. Although the success of Bitcoin as a legitimate currency in the later stage was hindered due to the scepticism by some, it made stakeholders recognize the importance of disruptive technology such as blockchain and attracted large investments by venture capitalists in the fintech and associated technology sector. However, despite the criticism, transactions through bitcoin have only increased over the years.

Cryptographic techniques can be used to protect both interpersonal or institutional sensitive information, either in communication or stored on a server. The use of this technique, initially in an information security system, is now extended to other spaces. This gives rise to the Crypto-economy, an economic system distinct from the traditional definition of a nation's economy, which is not defined by political structure, geographical boundary, or the legal system. This economic structure uses Cryptographic techniques instead of any trusted third party to constrain behavior [6]. The use of blockchain technology resolves the major problem of double-spending by using public-key cryptography. In this public-key cryptography, each agent is assigned a private key like a password and a public key, cryptographically generated addresses stored in the blockchain, shared among all other agents. A particular transaction takes place when the coin receiver sends their public key to the coin's current owner. The transfer of coins is facilitated through the digital signature of a hash. In the crypto-economy, the transaction simply transfers coins from a different address to address. One of the major applications of blockchain technology can be emphasized through its use by Ripple (by a US-based technology company, Ripple Lab Inc.) for real-time gross settlement, remittance network and currency exchange. This is about harmonizing the different elements of the global financial system of payment protocols. Its application also exists in many other fields under the BFSI sector.

2.2 Blockchain in Finance industries

The intriguing advantage of using blockchain for financial transactions is replacing the third party with the blockchain system, eliminating the risk of information theft and fraud. This blockchain technology system works on a decentralized basis, as not one single entity has the power to create and verify the transactions [7]. Every agent connected to the chain has a record of the blocks containing the transaction information that synchronizes with the server every ten minutes. Every agent system can view the data on the server and verify that transaction whenever any new block is generated in the chain. And once a block is created, a single entity can't alter or delete the information as they have to delete it from every system connected to the platform, which is impossible. This level of transparency eliminates the risk of information alteration and theft.

The use of blockchain technology includes real-time money movement in a financial transaction, replacing the traditional paper money trail. As every agent on the platform verifies every transaction through blockchain mining, it eliminates the need for the risk of double-spending and costly financial audits periodically. Its self-regulatory nature also eliminates the need for an independent regulatory body and its cost. Despite higher safety, the cash-like characteristic of blockchain can cause illicit use due to its complexity, as seen in 2014, Mt. Gox scandal. So, any individual or institution dealing with such complex technology should be cautious.

Even after a decade of a breakthrough in cryptocurrency by bitcoin, which disrupted the global financial market, it is still surrounded by suspicion, reaching its peak in 2014 due to the Mt Gox scandal. However, with people getting more aware of the technology and associated systems, the cloud of suspicion is clearing out. Blockchain technology is being embraced as one of the leading drivers of the twenty-first century for revolutionary change in the financial services sector [8]. This

revolutionary change would bring about the reshaping of the traditional banking and payment system to better cater to the dynamic needs of entities, from individuals to large institutions, by providing an improved version of the financial services available today [9]. One such application can be seen in the trading market, where the risk of fraud and crises is seen, like the crisis of 2008. By leveraging blockchain technology, the global trading and capital market can be improved by enhanced audit ability, integrity and governance of ownership due to increased transparency.

2.2.1 *Blockchain and banking*

Blockchain technology has completely revolutionized the entire banking industry, with several banks already engaging and investing in this technology worldwide. Blockchain allows banks to conduct several of their functions ranging from payments and clearing and settlement to securitization without the presence of a middleman. Moreover, smart contracts enable the banks to automate the otherwise manual and tedious processes, be it compliance or claims to be processed. Not only this, blockchain can assist banks in processing and extending loans and credit and create more transparency and trust in trade finance. The system now in banking and various other financial industries is based on management by a third party, so implementing blockchain technology will significantly reduce the costs and administration and further reduce the scope of data manipulation [10].

2.2.2 *Application of blockchain in the BFSI sector*

This section explores the various applications of blockchain in the BFSI sector.

2.2.2.1 *Stock trading*

Financial industries were one of the first to identify the potential of blockchain technology and implement them in their processes. Although initially being received with mixed reactions, Bitcoin has managed to come around and raise interest with the growing success of blockchain technology which is believed to be the next big revolution in the finance industry [7]. While banks are already exploring various avenues with blockchain, this disruptive technology has set foot in other fields of finance. Blockchain technology can reduce costs and bring much-needed transparency to the operational process. It will not allow the traders and brokers to resort to unfair means to make money, such as "naked short selling". Companies such as Overstock, an online retailer based in the U.S., have started investing in blockchain supported trading platforms. The company launched their blockchain-supported trading platform in 2016, allowing simple, fast, and secure trading of stock online.

Noble Markets, a start-up based in New York, has landed a deal with Nasdaq, one of the largest stock exchanges in the world and provider of exchange and listing information, to provide Nasdaq with advanced core trading technology to assist them in their pursuit of creating a new market for cryptocurrency [11]. Furthermore, they shared their intentions of exploiting blockchain technology to enhance their equity management services provided by their Private market platform ExactEquity through implementing the Open Assets Protocol, which will reinstate integrity and governance and improve audit capabilities to smoothen and simplify the process of transfer of ownership. The company's senior management firmly believes in the potential of blockchain technology, not limited to physical assets but encompassing the entire global capital market. Furthermore, with the increasing attractiveness, it can be observed that exchanges from all across the globe have increased their investment in blockchain, including the Australian Stock Exchange, Toronto Stock Exchange, and London Stock Exchange [12].

2.2.2.2 *Smart contracts and sidechain ledger*

Smart contracts leverage the sidechain functions of blockchain, a separate ledger managed with a specific software code, which is attached or, in technical terms, is "pegged" to the original blockchain ledger to enable sharing of essential information and data from one block to another. Smart contracts that adapt to this function allow the user to determine whether or not a particular operation or transaction should be allowed [13]. They are computerized transactions that automatically process the contract when pre-set criteria are met. This allows the system to benefit from the flexibility allowed by the software and keeps the essential authenticating authority with the main blockchain.

Smart contracts are excessively being used in all different fields of the finance industry, beginning with the crypto ecosystem. This technology allows the system to use multiple networks and prevents the creation of new cryptocurrencies, which is an untested change dreaded by the users [14]. A programme by the name "Elements" built around the same model maintains confidentiality in transactions and prevents the occurrence or possibility of the malleability of transactions. Privacy and confidentiality were one of the reasons behind the suspicion around bitcoins, which is eliminated through a sidechain ledger which ensures that information regarding transactions is visible only to the participants.

Smart contracts have various applications in the banking industry, starting from their primary function, i.e. clearing and settlements. Clearing and settlement require the banks to process the transfer of funds once the terms of the related parties are met [15]. Thus, smart contracts are appropriate for these complex and time-consuming operations by their very nature.

Additionally, they reduce the scope of human error in executing such transactions. It has been observed that established banks like U.S.'s Citigroup and Credit Agricole have adopted this technology in partnership with SETL, London based clearing and settlement platform. Further intelligent contracts also smoothen and improve the whole KYC process (Know Your Customer) for banks, thus enhancing customer experience. Smart contracts allow the banks to secure information about the customers, facilitating many of their operations, cross-border payments being one of them [3].

3 Research Methodologies

The purpose of our paper was to provide a literature review on the technological advancements in the BFSI sector and to review the existing technologies and their penetration and profitability. The adoption of technology by the industry in various countries was also looked into, especially peer-to-peer lending in China and Thailand. These examples were derived from personal knowledge and expertise. We have used secondary research in our paper to chart our progress on the technological advancements in the BFSI sector and use the plethora of reputed databases like EBSCO, Emerald management E-Journal, Web of Science, Frost & Sullivan, Jstor, and Scopus. We have used advanced search criteria of 2 levels in these databases, with words like "BFSI" and "Banking" making up the first broad classification level. The second level of classification uses the following terms to provide comprehensive coverage of literature available on the topic:

- (i) Technology
- (ii) Technological advancements
- (iii) payments
- (iv) Peer to Peer (P2P) lending
- (v) Fintech
- (vi) Financial Technology
- (vii) Reg-tech
- (viii) Regulatory Technology

Based on the peer reviews of research papers and a preliminary read on its relevance to the topic and understanding, the authors have gone through each of our team members individually, read through the documents, and then thoroughly analyzed the research papers. One of the team members also went through editorials in major newspapers like the Hindu, Mint and Economic Times. For the newspapers, a simple browsing method was used to go through newspapers of the last six months to understand the regulatory environment existing in the sector that impacts the growth of technology in the BFSI sector. Bloomberg terminals were used to look at the financials of banking companies and that of listed fintech companies, their valuations and their annual financial statements as important information can be derived from these like prevalent risks in the sector, emerging threats and counter-measures taken by companies to mitigate them and their expectations of the evolution of fintech in the near future.

4 Findings

We can find more cloud-based computing being established and accepted with pleasure by the banking sector. Disruptive advances which are changing the presentation of business - blockchain, big data, internet of things, Artificial Intelligence- will be utilized effectively by applying cloud computing. The artificial intelligence technology will keep progressing with better accounting with real-time charts and reporting from just one click will transform the entire banking industry, and the conventional accounting practices usually applied for one month [16]. Blockchain will further develop, and the financial services institutions that comprehend the technique used to implement blockchain technology to customer-focused business methods will look forward to cost and competition benefits [17]. As much as we use Google wallets or apple pay, we will be able to conduct ATM transactions using just our phones. Security is and has always been a significant issue. However, with the increase in technological advancements, we can find banks increasingly searching for approaches to include new levels of protection for their services, resulting in facial recognition and voiceprints [18]. Authorities understand that working together with new contestants can enable them to get another viewpoint to the industry. Hence, accordingly, we will see a joint effort amongst authorities and investors.

The Gartner research group predicted how the attention and investment would move from bitcoin to the technology behind bitcoin i.e. blockchain. The research study has put blockchain on top of their list as they believe that the scope of blockchain extends beyond the BFSI sector.

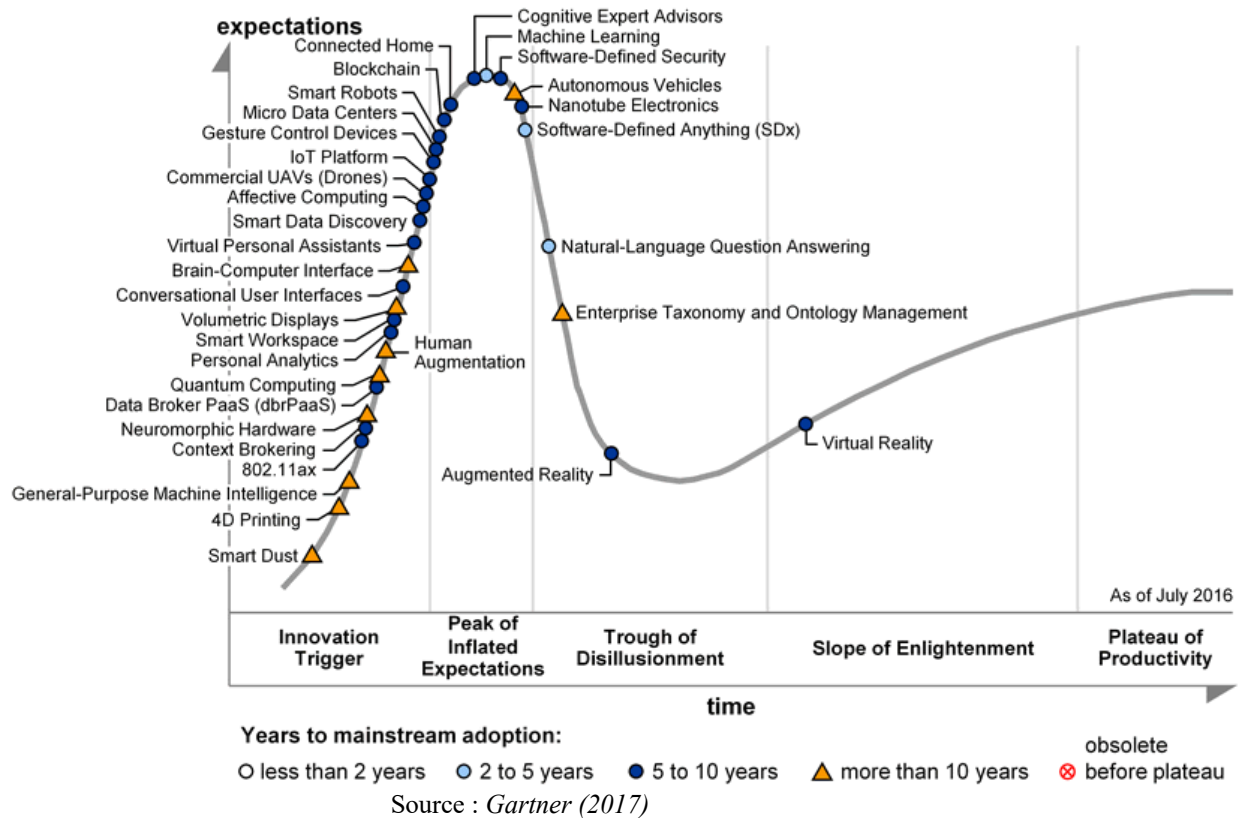


Fig. 2: Movement of investment from bitcoin to technology.

5 Research Limitations

Our paper is done on secondary data. While efforts have been taken to ensure that reputed databases were only considered, we take no responsibility for facts wrongly quoted in our sources. Also, the advanced keyword search was designed by us in consultation with experienced individuals and is not free from personal bias or lack of information in developing it. A three-level keyword search could have given better results. Moreover, the research paper has only looked at recent publications, and older publications have been ignored due to the constant changing nature of technological advancements in the BFSI sector. The research via newspapers suffers from a geographical bias as all the mentioned newspapers are leading Indian journals and hence are not representative of the global regulatory environment. Also, due to lack of information Africa and Latin America have not been covered as the penetration in these areas is relatively low. This by no means implies that they are not important markets in the future. On the contrary, using technology to bridge physical distances can make the banking sector more accessible in these geographies. Due to inadequate research, we have not covered these geographies.

6 Conclusions

Several points are presented in the paper, highlighting how technology has played an essential role in the growth of the BFSI sector, thereby assisting the economies of countries and the world as a whole. It has forced the companies and the governments to provide services to the population at a subsidized rate because the perennial competition forces them to think about their well-being rather than their bottom line [19]. The example of a country like India was taken, which being a developing country use of technology within the BFSI sector has helped developed new forms of banks which allows the people in rural areas to use their mobile phones to carry out bank transactions instead of having to travel long distances as before. They have also played an essential role in improving their standard of living and providing them with access to basic facilities.

This paper gives us a comprehensive view of the emergence of blockchain technology and its effect on adoption in the financial sector across the globe. Over the years, blockchain has gained a lot of admiration because of the value that this technology proposes in terms of transparency, immutability and decentralization. Through the proof-of-concept and pilot

engagements, this value demonstration will help build momentum towards overall enterprise adoption.

In India, more than 50% of the states are involved in blockchain-related activities and initiatives [20], thus driving the public sector blockchain adoption in the country. Additionally, the state governments collaborate with different stakeholders to give an impetus to blockchain adoption in public sector projects. India is lacking much behind other global countries, and this presents a major opportunity for Indian start-ups to emerge and offer industry-specific solutions. Different engagement models such as co-investment and co-innovations are used to develop enterprise solutions for the collaboration of blockchain service providers and blockchain start-ups. Regulators and public sector agencies are working with service providers to achieve advice on industry-wide standards and technical solutions that could be developed for major sectors like BFSI, Food & Safety, Telecommunications, etc. Since India has experience in large-scale solution deployments, the Indian service providers can take the lead in driving the growth of the Blockchain ecosystem in the entire country. Thereby, the policy and regulations will have a significant role in driving the development of the blockchain ecosystem and innovation in India [21]. The regulatory environment requires a highly consultative approach to grow the blockchain start-up ecosystem and high innovation in India.

We hope that this paper provides a broad insight to the researchers on how the technology has helped the Banking, Financial Services and Insurance sector and their evolution over the years.

References

- [1] Sinha, S. (2017). FinTech: The New Frontier. *IEEE Potentials.*, **36(6)**, 6-7, 2017.
- [2] Vijai, C. (2019). Fintech in India-opportunities and challenges. *SAARJ Journal On Banking & Insurance Research.*, **8(1)**, 42, 2019.
- [3] Stepanova, S.V., Karakchieva, V.L. Changes in Banking Business Models Driven by Technological Innovations (2018) 2018 14th International Scientific-Technical Conference on Actual Problems of Electronic Instrument Engineering, APEIE 2018 - Proceedings, art. no. **8545543**, 447-451, 2018.
- [4] Giné, M., & Antón, M. (2018). How Big Data, A.I. and Blockchain Are Changing Finance: The Fintech Revolution. *IESE Insight.*, **(38)**, 15-21, 2018.
- [5] Beck, R. (2018). Beyond Bitcoin: The Rise of Blockchain World. *Computer.*, **51(2)**, 54-58, 2018.
- [6] Duchenko, M., & Pavlenko, T. (2018). THE INFLUENCE OF CRYPTO-CURRENCY ON THE ECONOMY OF THE COUNTRY. *Economy And Society.*, **(19)**, 2018.
- [7] R. Kursh, S., & A. Gold, N. (2016). Adding FinTech and Blockchain to Your Curriculum. *Business Education Innovation Journal.*, **8(2)**, 2016.
- [8] Shubber, K. (2015). The coin rush. *New Scientist.*, **225(3006)**, 35-39, 2015.
- [9] Miraz, M., & Ali, M. (2018). Applications of Blockchain Technology beyond Cryptocurrency. *Annals Of Emerging Technologies In Computing.*, **2(1)**, 1-6, 2018.
- [10] Oh, J. and Shong, I. (2017), "A case study on business model innovations using Blockchain: focusing on financial institutions", *Asia Pacific Journal of Innovation and Entrepreneurship.*, **11(3)**, 335-344, 2017.
- [11] Casey, M. (2015). Nasdaq to Provide Trading Technology for Bitcoin Market place. *The Wall Street Journal.*, **23** March, 2017.
- [12] Yoo, S. (2017), "Blockchain based financial case analysis and its implications", *Asia Pacific Journal of Innovation and Entrepreneurship.*, **11(3)**, 312-321, 2017.
- [13] Maxwell, G. (2015). Bringing New Elements to Bitcoin with Sidechains. SF BitcoinDevsMeetup. Conference Paper. June 8. Retrieved from <https://people.xiph.org/~greg/blockstream.gmaxwell.elements.talk.060815.pdf>
- [14] Davidson, S., De Filippi, P. and Potts, J. (2016), "Economics of Blockchain", available at: ssrn.com/abstract=2744751 or <http://dx.doi.org/10.2139/ssrn.2744751> (accessed 17 March 2017).
- [15] Campanella, F., Della Peruta, M.R., Del Giudice, M. The Effects of Technological Innovation on the Banking Sector (2017) *Journal of the Knowledge Economy.*, **8 (1)**, 356-368, 2017.
- [16] Bhasin, N. K., & Rajesh, A. (2021). Impact of E-Collaboration Between Indian Banks and Fintech Companies for Digital Banking and New Emerging Technologies. *International Journal of e-Collaboration (IJEC).*, **17(1)**, 15-35, 2021.

- [17] Amoroso, D.L. and Hunsinger, D.S. (2009), "Understanding consumers' acceptance of online purchasing", *Journal of Information Technology Management.*, **10(1)**, 15-41, 2009.
 - [18] Kukreja, G., Bahl, D., & Gupta, R. (2021). The Impact of FinTech on Financial Services in India: Past, Present, and Future Trends. In *Innovative Strategies for Implementing FinTech in Banking* (pp. 191-200). IGI Global.
 - [19] Allen, F., Qian, J. and Qian, M. (2005), "Law, finance, and economic growth in China", *Journal of Financial Economics.*, **77(1)**, 57-116, 2005.
 - [20] Misra, S.C., Doneria, K. Application of cloud computing in financial services: an agentoriented modelling approach (2018) *Journal of Modelling in Management.*, **13(4)**, 994-1006, 2018.
 - [21] Dhamija, A., Dhamija, D. Technological advancements in payments: From cash to digital through Unified Payments Interface(UPI) (2017) *Strategic Human Capital Development and Management in Emerging Economies.*, 250-258, 2017.
-