

Technological Innovations in the banking sector in India: an Analysis

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Abstract— The goal of the paper is to identify ten important innovative solutions in the banking sector and analyze them in the context of assumptions of the paradigm of relationships and features of product orientation with related to technology. Banking is a rapidly changing industry. The biggest paradigm shift that has occurred is the digitalization of banks which aim at providing customers with a broad scope of benefits. Technology-based innovations will be the key determinant in offering diversified and customized banking services to their varied customer portfolios, at a reduced cost. Even if it is convergent with the assumptions of the paradigm of relationships, it should be indicated that some banking products are based on advanced solutions that may surpass real market demands. We examine the development of technology in the banking sector.

Index Terms—Technology, Innovations, Banking Sector, India

I. INTRODUCTION

With the rise of technology, banking customers are living in a connected world with their experience from other industries influencing their expectations from their financial services provider. This has led to an evolving customer-bank relationship necessitating banks to be more customer-centric by embedding themselves in customers' lives to meet rising customer experience expectations. However, banks have been facing challenges in meeting customer expectations, as they are troubled with legacy challenges both in terms of technology and culture.

While technology has been acting as an enabler for banks to make the right moves, it has also led to the growth of non-traditional firms like financial technology firms (henceforth referred as FinTechs). FinTech firms leverage technology to provide simple, easy-to-use, convenient, and cost-effective products and services to customers. However, FinTechs lack scale, access to a larger customer base, and expertise in handling regulations, all of which leading to a realization that there is significant scope for banks and FinTechs to collaborate and operate together—driving innovations and providing better products/services to customers. As the rise of FinTechs has had a significant impact on the industry on both technology and the business front, there is a growing trend of banks focusing on innovation by leveraging new technologies such as block-chain, biometrics, and robotic process automation. This document aims to understand and analyze the trends in the banking industry that

are expected to drive the dynamics of the banking ecosystem in the near future[1].

II. ANALYSIS

A. FinTech Firms are Being Considered as Partners Rather than Competitors

Banks are troubled by their inheritance frameworks and are centered around following controls as opposed to addressing advancing requirements and desires of clients. FinTech firms have entered the business with inventive items and benefits and are focusing on the most gainful business portions. Attributable to their inventive, helpful, and less expensive offerings, FinTech firms have begun procuring clients from conventional banks, and additionally unbanked clients and customary banks because of the absence of positive condition for advancement are thinking that its difficult to rival them. Section of FinTech firms in the managing an accounting industry has constrained banks to search for new offerings by making the best condition for development with the assistance of FinTechs, considering them as an accomplice as opposed to a contender. This association can give a sandbox sort of approach for experimentation, with the flexibility to test new thoughts, [1]as FinTechs are situated outside the bank condition free from infrastructural and social imperatives. Many driving banks are running startup projects to hatch FinTech organizations or store them through their funding arm, notwithstanding putting resources into quickening agents and advancement labs. BNP Paribas has propelled their own interior quickening agents/hatcheries/tech centers Lux Future Lab in Luxembourg and TEB startup House, and cooperated with other environmental partners, for example, Partech Shaker and NUMA Startup training camp FinTech New York has banded together with Deutsche Bank, Route 66 Ventures, and Wilmer Hale, additionally growing the support in its FinTech Accelerator program Motif Investing is collaborating with J.P. Morgan where introductory open offerings drove by J.P. Morgan will be accessible straightforwardly to retail clients on Motif's cutting-edge online business stage. From 2013– 2016, worldwide interests in FinTech were at \$62 billion, with ventures topping to \$24.6 billion out of 2015. Biometric confirmation strategies utilize novel natural or behavioural attributes to check a client's character. [3]Given the uniqueness of biometrics, it can give included security and diminish hazards

superior to customary security frameworks Bank of America is utilizing a unique mark scanner on their cell phones for their clients to sign in to the versatile managing an account app. Barclays offers finger vein innovation to its corporate clients for approving exchanges. One of the principal purposes of keeping down banks from full usage of biometric validation into all gadgets is the general cost of the innovation and execution; nonetheless, multiplication of cell phones with such arrangements may quicken the procedure of implementation as the weight from clients expands

B. APIs to Monetize the Digital Assets and Data

Customary banks need to manage expanded rivalry from FinTechs and rising client desires, which is achieved by comfort and accessibility of propelling advances. With expanding digitization and connectivity between networks, it is critical for banks to develop a biological community of advancement around client information. Banks are searching for new income streams and approaches to open the estimation of computerized resources and client data. Application Program Interface (API) is an innovation convention that enables different programming segments to impart—if actualized in banks it would enable them to bundle their business resources and information, making them available both inside and outside an organization.[3]API innovation empowers saves money with the adaptability they have to give the sort of item customization and experience that clients expect through outsider applications in this developing advanced age. Banks are relied upon to open up their APIs, empowering engineers to assemble creative applications that can be facilitated on a bank's application store. Incorporation of outsider applications through [3]APIs will enable banks to address their shortcomings in a specific territory. Activities, for example, Open Bank Project will engage banks to improve their computerized offerings utilizing a biological community of outsider applications. White-mark arrangements are relied upon to be created by unmistakable managing account players, which can be utilized by others by paying a charge. The likelihood of white-name arrangements and an extensive variety of administrations are required to offer ascent to the API economy. Many banks are likewise putting resources into the advancement of utilization programming interfaces. An API is an arrangement of innovation rules and instruments that empowers programming designers to construct associations between two frameworks, taking into account speedier exchanges and encouraging information access and investigation. For the treasury end client, and in fact, for banks, APIs speak to an essential change in devices, for example, instalment centre points and treasury workstations. APIs are progressively turning into a basic piece of banks' corporate offerings since they understand a few difficulties in addressing singular organizations' needs around bank network. APIs likewise can possibly quicken exchanges, in the nick of time for real-time instalments. Banks may offer APIs straightforwardly, for example, the instalment APIs of Citi Bank. The more esteem banks can give, the stickier the relationship. The more esteem included keeping money administrations turn into, the more

apprehensive treasurers will be to pull the attachment on that relationship. On the other hand, banks may push toward an open engineering and open up their innovation determinations to outside designers. In February, Standard Chartered Plc opened up an engineer center for corporate applications, to energize outsider budgetary innovation organizations to create APIs. Different banks, including JPMorgan Chase, are investigating comparable capacities. Fintechs are working with banks to enable customers to streamline their money administration and different abilities. TreasuryXpress, for instance, utilizes APIs to give treasury administration arrangements. "The advantage we find in APIs is in the speed of the network and in this way the speed of the informing," said Thomas Leitch, VP of business improvement at TreasuryXpress. "Having these sorts of advancements enables clients to be substantially more agile with instalments and to realize what to do to upgrade the money they have." From the perspective of banks and innovation suppliers, APIs can limit issues of tweaking frameworks for each different corporate customer.

C. Platform to many FinTech Firms

FinTech players are increasing present expectations higher for the conventional banks, situating themselves as straightforward and basic other option to the customary banks. In spite of the fact that FinTechs don't give the full scope of items and administrations, banks remain to miss out business in particular territories. Banking as a Platform (BaaP) is a term that implies customary banks will go about as a center money related stage and will be straightforwardly connected to numerous FinTech ventures. Banks have a significant client base, put stock in, steadiness, access to a lot of capital, and demonstrated involvement in taking care of direction prerequisites, alongside an approach to use readiness and convey the capacity to improve with innovation aptitude from FinTechs to give a more extensive combination of arrangements and turn into a center point of circulation. The stage will give clients a one-stop shop, from which they will have the capacity to get to conventional banks for their center offerings, alongside new arrangements that are offered by FinTech firms.

D. Cybersecurity Systems with the Increase in Cyber Threats:

Expanded appropriation of web and portable applications in the keeping money industry has made the business inclined to cutting-edge digital assaults. The programmers have turned out to be more expert and master in breaking obstructions built up by means of customary security measures.[4]The Systemic Risk Barometer Survey of April 2016 noted digital hazard as the best danger in monetary organizations by 25% of respondents, while 56% positioned digital hazard in their best five threats. Being the gatekeeper of national riches, governments have a unique concentrate on protecting banks against security ruptures. As banks leave working in storehouses and attempt to coordinate a various managing an account biological community, they should deliver security

worries to ensure clients' cash and data. The worldwide cybersecurity advertise is relied upon to develop from \$122.4 billion out of 2016 to \$202.3 billion at a CAGR of 10.6% by 2021. The money related administrations industry is set to witness the most noteworthy development of 11.6% CAGR amid the figure time frame.[4]

E. Cloud Services

Customarily banks have kept close control of their IT, supporting huge in-house groups and building their own particular server farms. This is set to change as banks are taking a gander at the chances to diminish the volume of server farms and spare expenses by executing open cloud-based infrastructures. The managing an account industry has more often than not shied far from open cloud usage because of shared framework and its apparent security and administrative risks.[1]Major worldwide banks are expanding their cloud ventures, numerous enormous banks are presently concentrating on open cloud deployments. The open cloud gives banks' dexterity and adaptability to convey an IT foundation without putting resources into their own physical framework, which helps in lessening of expenses. A mix of figuring energy of the cloud and Big Data empowers banks to give better bits of knowledge and make better decisions. Cost of processing in the cloud has been on a decrease, making the cloud an alluring cost-sparing choice for banks. [5]Public cloud is putting forth various decisions in engagement models, for example, Software as a Service, Platform as a Service, Infrastructure as a Service,[2] and Data as a Service, which banks can select according to their necessities. Utilization of an open cloud is little in huge banks, however, explore says they could go from zero use to as much as 30% inside three years. Despite the fact that an open cloud is most suited for keeping money regions, for example, client relationship administration, IT improvement, application framework, and examination, it might progressively discover acknowledgement for other saving money works too.

F. Augmented Reality to Provide Enhanced Customer Experience

To keep clients faithful and keep utilizing their administration, banks are attempting to adjust inventive courses for giving straightforward, helpful managing an account answers for their clients. Clients these days have exclusive requirements, requesting a specific nature of administration, making it harder for banks to keep an aggressive edge. Banks are concentrating on adjusting new advances and finding inventive methods for conveying answers for giving better client experience. AR is the ongoing utilization of data and other virtual upgrades, incorporated with true objects. [6]The capacity to consolidate computerized and physical substances will change client encounters, coordinating saving money flawlessly into regular associations. Visually engaging uses of AR can improve client encounter by giving area based offers,

ATM locators, conversing with a relationship chief, do a property hunt, or make instalments. While utilization of AR in managing an account capacities are relied upon to increment after some time, a few banks have just propelled different applications Commonwealth Bank of Australia has built up an application that when pointed at a property can give its posting subtle elements and other data that can be utilized to settle on property choices. An AR application was propelled by Standard Chartered China that gives area based administrations like rebate coupons Westpac propelled an AR application, which causes its clients to check card adjusts, make installments, and locate the nearest bank or ATM branches – Citibank dealers have been trying Microsoft HoloLens as a virtual workstation to supplement the bank's current gadgets and work processes.

G. Distributed Ledger Technology

Albeit critical advances have been made in innovation, banks today are as yet keeping up customary records to record exchanges inside their biological systems. Regardless of endeavours to decrease intricacy, the mid-and back-office capacities stay moderate and wasteful—with electronic exchanges that can occur in a matter of moments as yet taking days to settle and accommodate. [7] The systems are costly and powerless because of the procedures that support resource possession and resource transfer. Distributed record innovation works on a shared premise permitting appropriated record administrators to take out supervision, IT framework, and their related costs. Banks are receiving block chain innovation significantly quicker than anticipated: – 15% of best worldwide banks are relied upon to take off business block chain items by 2017, and 65% of banks are required to have block chain extends underway throughout the following three years. Banks investigating disseminated record innovation utilize cases are following an approach that joins inside trials with association in consortia, which incorporate their kindred banks, other money-related organizations, and innovation suppliers: – Ripple is a startup assembling a bitcoin-like installment stage went for banks' cross-fringe exchanges and tending to the procedure, which is right now expensive¹⁸ – R3 (R3CEV LLC), in association with Microsoft, drives a consortium of 45 budgetary organizations in innovative work of block chain use in the monetary framework taking a shot at the exchange settling process. The Hyper ledger venture is an open source cooperative exertion comprising of 80 individuals made to drive block chain advancement.

H. Cognitive Banking to Provide an Edge over Competitors

As an ever-increasing number of clients advance toward computerized channels, the measure of information produced from their association with banks is expanding exponentially in volume and in addition in many-sided quality while investigation is as of now being connected by most put money on this Big Data, maximum capacity is yet to be acknowledged as frameworks can't comprehend and process fluctuated sorts of

non-pre-characterized datasets. Banks are in the need of innovation that can help adapt to these information difficulties to keep pace with contenders and satisfy client desires. AI and psychological advances are being connected in the keeping money industry predominantly toward client relationship administration, character validation, hostile to illegal tax avoidance, consistence, chance control, and other operational aspects. AI has begun assuming a noteworthy part in client benefit exercises: – Customer benefit through chat bots or voice colleagues has just been received by a few banks including Santander UK, Atom Bank, Swed bank, and Digi bank, in this manner empowering them to deliver client demands to a more prominent degree – Even for physical channels, for example, branches, banks are testing by embracing humanoid robots that can welcome clients as well as have discussions with them – It isn't just client self-benefit channels where AI is discovering selection, banks, for example, RBS has propelled AI to empower its staff to answer client inquiries all the more productively. Unlike pervasive examination being utilized by banks, AI makes them learn abilities, making it conceivable to process fluctuated sorts of information, subsequently empowering banks to offer pertinent and customized arrangements and administrations to their clients. Setting up AI and intellectual frameworks can likewise help in satisfying consistence and against misrepresentation necessities, possibly sparing banks from enormous punishments emerging due to rebelliousness or security ruptures. Banks searching for better operational proficiency are additionally taking a gander at AI as a potential arrangement due to its ability of shrewdly overseeing robotized forms, which limits errors. Owing to its significance, AI is as of now getting a huge mindshare of managing account administrators, as 52% trust AI to be one of the developing advancements affecting the saving money industry.[2]

I. Robotic Process Automation

The managing an account industry is confronting extensive dangers, inside and remotely, prompting weight on both the best and base lines. As banks confront the risk of disturbance, there has been an expanding center around changing their inward frameworks to remain at pace with outer difficulties, be that as it may, the many-sided quality associated with inheritance change is compelling banks to investigate imaginative approaches to drive interior efficiencies. RPA is a product based way to deal with organizing exercises among existing applications by using existing business principles and logic. When executed in banks, RPA can decrease manual procedures, robotize rules-based high-volume exchanges and handle redundant procedures flawlessly with higher proficiency and exactness levels. RPA gives huge esteem add to different ranges of the client lifecycle, particularly credit preparing, installments, operations, and accumulations.

J. Biometric Authentication Tools

Banks are seeing a change in perspective in the way their purchasers associate and execute with them in this hyper-associated world with the expansion in digitalization of procedures and assorted advanced channels. This expanded digitization and network has prepared for some passage focuses in the framework, which have made banks more defenceless against attacks. Biometric validation techniques utilize special organic or behavioural attributes to check a client's personality. Given the uniqueness of biometrics, it can give included security and lessen chances superior to anything ordinary security frameworks: Bank of America is utilizing a finger impression scanner on their cell phones for their clients to sign in to the portable managing an account app. [7] Barclays offers finger vein innovation to its corporate clients for approving exchanges. One of the primary purposes of keeping down banks from the full usage of biometric verification into all gadgets is the general cost of the innovation and execution; be that as it may, expansion of cell phones with such arrangements may quicken the procedure of implementation as the weight from client's increments. Union Bank of Philippines is one of the significant banks of Philippines positioning seventh as far as resources. Usually known as Union Bank, it has made different channels accessible for encouraging access to data and performing exchanges. Giving wide assortment of monetary administrations, Union Bank is an all-inclusive bank. The bank has run with an IdentityX stage for versatile biometric validation. The identityx stage is created by Daon, a main biometric programming arrangement supplier, and is set to give an extra layer of security for Union Bank's portable channel by biometric confirmation and gadget cryptography. Banks far and wide are progressively picking biometrics to confirm clients getting to their administrations. This pattern isn't constrained to banks; different financials outfits are additionally taking up biometric confirmation to distinguish clients and defend assets. Expanding instances of money related extortion, wholesale fraud, and dangers from the internet have made banks to rebuild their character practices and biometrics in keeping money and monetary administrations offers the arrangement. Most managing account clients are educated these days and expect a grinding less access to saving money benefits yet watchword based character arrangement comes up short stay aware of desires, be that as it may, with biometrics in saving money, things is by all accounts evolving now.[7] Having stored cash and assets of individuals, banks and monetary establishments are dependably on hit-rundown of fraudsters and digital crooks. Since banks and money related organizations have an awesome significance in the monetary security of a nation, they are one of the much managed establishments. Administrative consistence additionally influences how banks recognize their clients. Customarily banks have been utilizing paper-based personality records or government provided picture ID cards to recognize and verify their clients. Be that as it may, this technique for recognizable proof has been always fashioned by fraudsters as it is anything but difficult to print archives and cards as amazing printing is effectively accessible to everybody. With biometrics, be that as

it may, it winds up noticeably close difficult to utilize another person's character.

III. CONCLUSION

In the current scenario, people go with innovation and technology to get their work done much smarter and faster. Frugal Innovations that are sustainable and accessible will be able to generate more revenue and increase firm value while significantly reducing the resource requirements, cost and thereby enrich the environment [8]. FinTech is one such path-breaking frugal area which will address the issues in access and use of financial services without geographic constraints [9]. So the trends listed will bring up a satisfied customers in terms of banking and the trends include FinTech Firms Are Being Considered as Partners Rather than Competitors-Banks are collaborating or partnering with FinTech firms to build an environment that nurtures innovation and meets the ever-evolving expectations of customers, APIs to Monetize their Digital Assets and Data-Open APIs enable banks to integrate their products and services with third-party applications to provide customers a variety of products or services through the banking ecosystem and can also be monetized, in many cases, Banking Business Model where Banks will be Acting as a Platform to many FinTech Firms-Banks as a Platform (BaaP) is a complete shift in the banking business model, directly linking with FinTechs for their innovative solutions, enabling them to provide a one-stop shop for customers, Cybersecurity Systems with the Increase in Cyber Threats-Increasing digitization and connectivity has triggered an increase in incidents of data breaches, compelling banks to strengthen their security systems, Cloud Services, as It Provides Flexibility and Agility-Banks are now increasingly moving toward public cloud-based banking infrastructures, as perceived security and regulatory risks recede, Augmented Reality to Provide Enhanced Customer Experience-Banks are investing in augmented reality (AR), as it will enable them to deliver seamless solutions to customers and also provide an opportunity for banks to stand out from the crowd, Distributed Ledger Technology-Banks are exploring distributed ledger technology applications by either collaborating, partnering with startups, or by creating

incubators and innovation labs, Cognitive Banking to Provide an Edge over Competitors-Artificial Intelligence (AI) and cognitive technology enable banks to speed up its digitization initiatives and provide targeted, customized products and services, Robotic Process Automation-Robotic process automation (RPA) is a highly efficient way to help banks reduce IT spending without compromising service provisioning, Biometric Authentication Tools to Combat Identity Theft and Fraud-Biometric authentication will help banks to combat identity theft, make transactions more secure, and enhance the customer experience.

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