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Banking on the Future:

Vision 2020

Banking on the Future: | Vision 2020 | CII-Deloitte

Contents

Message from CII Foreword Vision 2020 Growth through Consolidation – C Regulatory Framework Emerging Competitive and Collabo Growth through Innovation About CII About Deloitte Acknowledgements

	09
	10
Overview of the	
	11
orative Landscape	14
	22
	38
	39
	40

07

Message from **CII**



As India moves ahead with its vision to become an economic behemoth in the next few years, the average level of prosperity among its populace and the degree of equitable distribution of wealth will, to a large extent, be determined by the scale of inclusive growth achieved.

In response to the evolving forces of customer expectations, regulatory requirements, technology, demographics, new competitors and shifting economics, much of the landscape will change significantly. Banks need to choose what posture to adopt against this change – whether to be a shaper of the future, a fast follower, or to manage defensively, putting off change. Staying the same is not an option.

In the field of technology based banking, information technology and electronic funds transfer system have emerged as the twin pillars of modern banking development. Products offered by banks have moved way beyond conventional banking and access to these services have become round the clock. This, indeed, is a revolution in Indian banking industry.

Payments banks will open another alternative channel after internet and mobile banking, and help improve efficiencies and reduce costs involved in catering to customers in the rural and semi-urban areas.

The 'Digital India Campaign' launched in July 2015 by the Government of India, with an aim to ensure that the Government services and subsidy benefits are made available to citizens electronically by improving online infrastructure and by increasing Internet connectivity will pave way for technological reforms in India and make the country digitally empowered.

Another extremely important issue is the infrastructure financing. Banks have been the primary source of funding for the infrastructure sector. As a result, banking sector credit to the infrastructure sector has also increased to around Rs 10 trillion as on March 2016 and accounted for around 15% of the overall banking sector advances. Infrastructure advances have grown at a compound annual growth rate (CAGR) of around 25% in the last 10 years, which is higher than the banking sector advances growth.

India's financial regulators have helped build one of the world's strongest banking and financial systems that has sailed past international crises. They are now injecting more competition by allowing different classes of banks and financial service providers. The Government is also stepping in with the bankruptcy law and the Bank Boards bureau, which will make it easier to do business.

It is in this context, we hope that this report on Banking on the Future: Vision 2020 would help the industry to understand the future evolution of banking and the evolving strategies for reaping maximum benefits from the changing scenario in banking and financial landscape.

T V Narendran Chairman Cll Eastern Region



Foreword by **Deloitte**

Deloitte.

The entry barriers to traditional Banks have been disrupted with new specialized entrants and emerging business models which have blurred the lines between business and technology. The traditional approach to creating value in Banking through growth and efficiency and advantages realized through acquisition, new markets and product offerings will likely be short lived. A Bank's ability to manifest opportunities out of the disruptive environment based on Technology and external partnerships to create customer value will determine its success in the future.

With several new players entering the banking scene, the sector is set to witness unprecedented changes in the times to come. The Financial Inclusion agenda has led to several types of banking models-small banks, payment banks, and on tap license for new banks. The agenda has also taken a step forward to include new non-bank players in the Fintech space who are vying to grab a larger share of the Banking value chain. While, on the one hand, this allows last mile connectivity and lowering of cost to the end customer, it causes huge disruption in the banking environment, possibly leading to a realignment of players in the market as we look ahead to the year 2020.

"Banking on the future : Vision 2020" select key changes that banks need to make in their go-to market approach, starting with shortening their strategy cycles to months instead of years, getting better at reading signals of change in this disruptive environment, and becoming tactically focused on being operationally lean and agile in response to market conditions. This will result in choices being made to adopt or partner with fintech businesses offering digital interactions and to accept that there are alternatives to core legacy IT systems offering greater speed to revenue generation, effective operations and better customer experience. Technology has democratized businesses by creating access across all levels and by creating a level playing field.

This Report provides a broad view of the shape of things to come by focusing on Payment Banks as a model and on Mergers & Acquisitions as a route to consolidation and growth. The report emphasizes the role of Technology and touches upon Cognitive and Artificial Intelligence, Robotics Process Automation, Block chain and Fintech as emerging areas.

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Vision 2020

Introduction

Leading upto 2020, radically transformed Bank models will emerge. A glimpse ahead shows an emphasis on innovative technologies to vastly facilitate banking inclusive banking through new types of Bank models, non-traditional alliances to make banking affordable, Fintech capabilities to make banking customer centric. Banking in the future will be collaborative, exciting and will raise the bar in setting new standards.

Consolidation in the industry is therefore, inevitable. The Deloitte Point of View following on from here, touches upon the growth route of Mergers & Acquisitions, a Banking model in the form of Payment Banks and Innovation in Banking that is technology oriented -Cognitive Technology & Artificial Intelligence, Block chain Technology, Robotics Process Automation, Fintech and of course Cyber Security.



Growth through Consolidation

Overview of the Regulatory Framework

M&A Trends

Introduction

The Union Finance Minister, Shri Arun Jaitley in his Budget Speech for FY 2016-17 emphasized the importance of a strong and well-functioning banking system as a vital cog in the financial sector. Stressed assets in public sector banks have plagued the banking sector since long. It is in this context that growth in the banking sector can be envisaged through consolidation of weaker entities with strong players in the market. The government has already put in action 'Plan For Revamping of Public Sector Banks', INDRADHANUSH, under implementation.

Amalgamation of Private Sector Banks

Amalgamation of banking companies in India is



governed by the Banking Regulation Act, 1949, Reserve Bank of India (Amalgamation of Private Sector Banks) Directions, 2016 ('Master Directions'), in addition to compliance with the provisions of the Companies Act, 1956 / 2013, Foreign Exchange Managament Act, 1999, FDI Policy of Government of India, Competition Act 2012 etc.. Amalgamation of banks is subject to approval by The Reserve Bank of India (RBI) instead of the jurisdictional High Court / National Company Law Tribunal (Tribunal).

In this regard, RBI has recently issued a comprehensive Master Directions vide DBR.PSBD. No. 96/16.13.100/2015-16 dated 21 April 2016 which contain guidelines on amalgamation of two banking



companies or amalgamation of Non-Banking Finance Company (NBFC) with a banking company. The principles underlying these Master Directions are also applicable to public sector banks.

Under the Master Directions, RBI has discretionary powers to approve the voluntary amalgamation of two banking companies, whereas voluntary amalgamation of an NBFC with a banking company is governed by the Companies Act in terms of which, the scheme of amalgamation has to be approved by the Tribunal.

In case of amalgamation of two banks, the decision of amalgamation is required to be approved by two-third majority of the total Board members of transferor and transfree bank. While according its approval, the Board is required to consider several matters inter alia including the impact of the amalgamation on the profitability, adequacy ratio, fairness and propriety of the swap ratio determined by independent valuers, whether due diligence exercise has been undertaken in respect of the amalgamated company etc.

Subsequently, the draft scheme of amalgamation needs to be approved by majority shareholders in number representing two-third majority of the shareholders of transferor and transferee bank, present in person or by proxy at the respective meeting of the shareholders of both banking companies convened for such purposes.

After the scheme is approved by the requisite majority of shareholders, it is required to be submitted to RBI for its sanction.

In the event of the scheme being sanctioned by RBI, dissenting shareholders, if any are entitled to claim

compensation from the banking company, within 3 months from the date of sanction of the Scheme, in accordance with the value of shares to be determined by RBI for such purpose.

In case an NBFC is proposed to be amalgamated with a bank or vice versa, approval of RBI should be obtained after the scheme of amalgamation is approved by Board of bank and NBFC, but before it is submitted to High Court / Tribunal for approval. In such cases, the Board of the NBFC is inter alia required to examine compliance with RBI / SEBI norms and KYC norms.

Further, SEBI Regulations on Prohibition of Insider Trading should be strictly complied with, as the information relating to takeover / merger and transfer of shares of listed banks / NBFCs is price sensitive information.

Report of Standing Committee on Finance on Non-Performing Assets (NPAs)

The Parliamentary Standing Committee on Finance (SCF), submitted its report on NPAs of Financial Institutions in February 2016. SCF observed that despite the Government and RBI taking several steps, NPAs continue to increase. One of the measures to improve the management of NPAs deliberated by the SCF was to merge banks having higher NPAs with other banks. The report makes several recommendations. The notable amongst them are:

- RBI to proactively monitor and follow up with banks and financial institutions on a regular basis till concrete outcomes materialize
- RBI to exercise its regulatory powers vis-a-vis banks to take punitive action in cases of default and to enforce RBI guidelines

- RBI nominees on the Bank's Board not be part of the management of such banks to avoid potential conflict of interest that may arise in discharge of RBI's Regulatory function
- Improve credit appraisal capability of banks especially project appraisal and post sanction monitoring
- Mandatory forensic audit pre sanction of loans for specific class of borrowers to prevent diversion of funds
- Revival of Development Financial Institutions for financing of long term projects including infrastructure projects
- Facilitate recovery of NPAs including restructuring of loans in a manner so as to preserve the economic value of assets
- Making names of willful defaulters' public
- Introduction of timeline of 6 months to settle cases of Corporate Debt Restructuring
- Mandatory change in management in cases involving willful default, or where funds have been diverted and no recovery is possible, and that RBI should consider allowing banks to absorb their written-off assets gradually, in a staggered manner etc.

Budget Announcement by Finance Minister on consolidation of (PSU) banks

The Union Finance Minister in his Budget Speech for FY 2016-17, announced several measures to support consolidation of public sector banks. An allocation of Rs 25,000 crore was made for FY 2016-17 towards recapitalization of public sector banks, which could be increased if required.

The announcement of setting up of the Bank Board Bureau (BBB) was operationalized during 2016-17 and a roadmap for consolidation of Public Sector Banks is being spelt out. In this regard, the process of transformation of IDBI Bank has already begun and the Government will consider the option of reducing its stake in the Bank to below 50%.

For speedier resolution of stressed assets, Debt Recovery Tribunals will be strengthened with focus on improving the existing infrastructure, computerised processing of court cases so as to support reduction in the number of hearings and faster disposal of cases.

The Finance Minister also announced plan to have massive nationwide rollout of ATMs and Micro ATMs in

Post Offices over the next three years to provide better access to financial services especially in rural areas.

Comprehensive Code on Resolution of Financial Firms is proposed to be introduced as a Bill in the Parliament during 2016-17. The Code will provide a specialized resolution mechanism to deal with bankruptcy situations in banks, insurance companies and financial sector entities. Aforesaid Code, together with Insolvency and Bankruptcy Code 2015, will provide a comprehensive contemporary resolution mechanism.

State Bank of India has approved merger of all its subsidiary banks and Bharatiya Mahila Bank with itself subject to regulatory approvals.

Transaction Tax Considerations

- Consolidation of banks could be achieved through merger or share purchase. In case of merger, the operations of the two banking companies are consolidated which is unlike in case of share purchase unless it is followed by amalgamation or a merger.
- In case of merger of banking companies, while any income from the sale of an asset or undertaking is usually subject to taxation, the IT Act exempts "any transfer, in a scheme of amalgamation, of a capital asset by the amalgamating company to the amalgamated company, if the amalgamated company is an Indian company" from the definition of 'transfer', in the determination of assessment of tax on capital gains. In order to avail of this exemption, the scheme must comply with the definition and conditions mentioned of an 'amalgamation' of the IT Act. Additionally, in order for the transfer to be tax neutral for the shareholders of the amalgamating entity, the only consideration that can be received by them is the allotment of shares in the amalgamated entity.
- The recent deal of merger of Kotak Mahindra Bank Limited and ING Vysya Bank Limited was structured as a merger and hence tax neutral under IT Act. Further, when stakeholders of ING Vysya Bank Limited, who received shares of the merged entity pursuant to the Scheme, who want to exit from the merged entity, they can do the following: sell the stake in merged entity on the floor of the stock exchange, by availing the necessary exemptions by paying securities transaction tax, depending upon the period of holding.

Emerging **Competitive** and Collaborative Landscape

Growth via partnerships in a disruptive Technology environment and, even within emerging models such as Payment Banks are the way forward. In this section we look into Payments Banks Partnerships and Fintech Partnerships, and consider the implications of both these partnerships.

Payments Banks Partnerships

Genesis of non-traditional competitors With their mandates to tap the unbanked, promote financial inclusion and digitize cash, Payments Banks (PB) conceptualized by the Reserve Bank of India (RBI) are on their way to revolutionize the banking sector. In India's cash based economy, digital payment instruments will drive growth in non cash payments. PBs will have long term implications on the syntax of large financial institutions as they disintermediate the value chain, by leveraging innovations in "Financial Technology", investing in innovations, and lowering transaction costs. They are capable of adapting easily to changing market trends. Legacy issues such as IT and infrastructure preventing traditional banks to adapt to new age developments are non-existent in the case of PBs. Owing to their agility, they are likely to tap a large segment of the value chain, whose needs were so far not met by traditional Banks.

PBs can provide basic savings, accept deposits up to INR 1 Lakh, offer payment and remittance services, issue ATM cards, do direct transfer of

wages/subsidies, and facilitate low cost online transactions. PBs also have a merchant side business model, where they onboard merchants and facilitate payments. India has ~1000 Mn subscribers with mobile phones and PBs plan to leverage this reach of mobile to bank the unbanked in the last mile. They will lower transaction and acquisition costs, processing time through digitization, use of mobile, and, in parallel drive consumption among consumers, specifically millennials, by impacting their decisions.

The RBI issued most PB licenses to telecom players and mobile wallet operators with a view to bring telecom subscribers into the banking channel. The Government also expects to further its existing campaigns via PBs. For instance from Payment Banks, its expectation is to further the "Pradhan Mantri Jan Dhan Yojana", "Aadhaar Act", and "Digital India".



PB's Challenge

PBs, unlike Small Finance Banks, cannot extend loans, yet they pay interest. Making customers switch over from full service banks to a limited set of offerings is a challenge PBs need to address. As avenues to earn are limited, to be viable, they would have to be technology led and innovative. Solutions need to be structured around moving toward a cashless economy. They will also have to look at asset light business models. PBs will have to position themselves to broadly three kinds of customers: the tech savvy young Indian, who is likely to welcome proactive banking services and a secure payment platform; the lower income financially excluded Indian, who deals in cash and is looking for

Multi Channel presence - Electronic Channels are accounting for a greater share of Bank's transactions



Action through partnerships¹

Partnerships for PBs is perhaps the only option to gain competitive advantage, expand their reach and maximize revenues. For this reason, many applications for the PB license were in Joint Venture format. Applicants could leverage each others' capabilities in technology, branch outreach, mobile networks, ready customer base, merchant distribution services, and ensure capabilities (accounting, regulatory) where they lacked them. Cost containment is another key

basic banking services on mobile; and to the financially included, although digitally, non savvy customer. This implies presence via a digital and branch platform to cater to divergent sets of customers, till the time technology adoption increases significantly. In order to be successful, they will have to innovate and gain significant market share. They will have to look at providing proactive banking services—use of cloud for services such as storage of receipts, data analytics for generating insights, social interactions, tools for budgeting, user experience, and customized offers based on location and transaction history.

consideration making partnerships within sales and distribution pivotal.

Partnerships, although a good strategic consideration, come with their own set of regulatory constraints. For instance, the 3-3-3 rule for bancassurance applies to Payments Banks. This rule limits the set of insurance partners that PBs can tie up with, making a strong case for wisely selecting partners.

Types of partnerships

Since these banks can operate as Business Correspondents (BCs) to large banks, tie-ups with PBs can help partners that want to extend their reach to remote areas and unbanked states, gain scale and also provide market insights to them. Companies developing low cost banking technologies, Fin Tech startups, and companies setting up Branch infrastructure (furniture, fixtures, etc.) can also find value in forming partnerships

with PBs. Innovative partnership models that could also be non-traditional in nature are highly likely. A case in point is a PB-NGO partnership, providing scale to the PB by allowing access to an NGO's vast network. The NGO partnership will also help build awareness about the PB.

Relevant Subset of the Partnership Ecosystem for PBs



Value gained

Select Partnership Areas	Value PBs provide	Value partner provides	Potential players
Insurance	 Last mile connectivity - Allow partners to target the "bottom of the pyramid", as well as geographically remote customer base Creation of customer service point through PB network 	 Provide customers with a comprehensive financial services experience despite the limitation on PB 	General Insurers
			Life Insurers
Loans		Revenue generation via commissions on sales and customer servicing	Universal Banks
Example – Paytm has partnered with 10 Banks that will issue loans ²			• NBFCs
			• MFIs
Other	-		Universal Banks
			MF Houses
DBT Example – Fino has part- nered with Bharat Petro- leum Compay (BPCL) Ltd.	Last mile connectivity to the customer for DBT disbursal	Funds to be transferred to the customer	Government agencies and departments
	Bank accounts and digital traceability till the customer		
and LPG customers who receive subsidies by DBT ³			
Digital Wallets	 Leverage the PB branch and physical network to introduce products and tap into offline merchant acquisition 	 Specialized focus on technology, enabling them to provide innovative, user friendly, scalable and secure products 	• m-Wallet
			Universal Banks
		 Leverage the existing tech. merchant network and expand the user base 	
		Faster boarding and implementation	
Payment Gateway	Untapped customer base	Robust and scalable platform	Payment Gateway
	 Ability to become the platform for Government payments 	 Secured platform for transaction processing 	• m-Wallet
	Ability to acquire offline merchants	Ready merchant acceptance platform	
		 Facilitate overseas funding for Govt. programs 	
Remittance	Last mile cash delivery or account deposits to recipients in villages through branch network	 International branch and channels to the customer through bank or other tie-ups 	Remittance players
			• m-Wallet
			Universal Banks
Cash Management	 Physical branch infrastructure providing assured demand for cash management services Last mile collection, aggregation and distribution from merchant establishments 	 Niche players have a specialized & secure process, experience, network and security in place to take care of cash management across PB branch network 	 Cash Management agencies
			Existing Banks
			 Government agencies
			FMCG companies
			 Other companies involved in high rural cash movement

http://tech.economictimes.indiatimes.com/news/internet/paytm-to-offer-personal-loans-with-10banks/53990617

³ http://www.moneycontrol.com/news/business/bpcl-acquires-21-stakefino-paytech-for-rs-251-crore_7150721.html





Engaging the 2020 customer

"Digital footprint" will be the way forward for all PBs. How well PBs engage in coopetition with Fintech startups playing in emerging technologies will determine how they can differentiate in an increasingly crowded market that will likely see high customer churn.

The success of these Banks will largely depend on the

Fintech Partnerships

The backdrop

Fintech or 'Financial Technology' has become a buzzword in financial circles. Fintech players the world over are challenging the status quo of the financial services industry by bringing in a fresh take on problems faced by customers, as seen through the lens of technology.

The unprecedented growth in the fintech sector in India is a direct result of rapidly changing demographics and consumer behavior, underpinned by the need for convenience. India is fast becoming a digital economy with over a billion mobile phones, 330 million internet users (c.94% on wireless devices), and 240 million smart phones.

An added positive is the regulatory thrust to the adoption of technology in solving long-standing issues of financial inclusion and transparency in financial dealings. Relaxation of KYC norms for smaller ticket transactions, exemption from two-factor authentication for each digital wallet transaction, the Aadhar initiative, NPCI initiatives such as Unified Payments Interface ("UPI") and Bharat Bill Payments System ("BBPS") have all played a role in making fintech more ubiquitous.

The need for widespread fintech adoption

In Payments, for example, the growth in digital alternatives is a result of limitations in the current ecosystem to address the need for seamless customer experience. The current ecosystem is dependent on the existence of physical infrastructure for the acceptance of non-cash payments and the development of such infrastructure has, thus far, lagged the issuance of payment instruments such as credit and debit cards.

customer base they target, adapt to, and the types of

alliances PBs form. Therefore, judicious selection of

partners, e.g., partners with similar brand values, for

these new age Banks.

scaling their businesses is key to ensuring the success of

Digital alternatives to lending have emerged from the need to address multiple pain points for the customer (long-drawn and onerous KYC process, high cost of borrowing, better return for savers in P2P lending, etc.) These lenders also seek to provide credit to a vast section of the population that is underserved by the traditional banks/non-bank finance companies, given that borrowing from banks is contingent on the availability of collateral and credit history.

Alternative lenders seek to fill this gap with innovative use of technology to construct alternative credit scores based on social profiles. Loan marketplaces use algorithms to match borrowers with the most suitable institutional lenders based on their credit profile. P2P lenders, on the other hand, bring individual lenders and borrowers together, creating a new source of funding for the vast unmet credit demand. Given the growing traction of such platforms, the RBI has initiated steps to regulate the P2P lending space, proposing to register such entities as NBFCs.

Why banks need to take note

Fintech players are expected to drastically drive down the cost of financial intermediation, eroding lenders' profit margins. While this wide-spread disruption may seem disconcerting, it also opens up avenues for digital transformation and therefore, new sources of revenue for banks. Banks are being compelled to alter ageold business practices to offer a wider spectrum of services which will allow them to compete effectively with the lean, agile and innovative fintech startups.

Though nascent, partnerships between banks and fintech players are on the rise

In this process of heightened disruption, a clear insight emerges – banks and fintech players are naturally interdependent. Fintech players have built a bouquet of innovative products and services on the strong backbone of the banking and payments infrastructure in the country. Banks, on the other hand, have relied on innovative solutions developed by fintech players to better address the needs of their existing customer base.

For instance, numerous payment players now offer domestic remittance services on the back of the existing IMPS infrastructure. Solutions such as 'Bank in a Box' are attractive to new-age banks as well as incumbent players with limited digital footprints. Mostly based on a SaaS model, these solutions significantly reduce the investment required in setting up end-to-end digital sevice offerings and allow for greater scalability and better customer experience.

Competition is, slowly but surely, giving way to collaboration. Though nascent, partnerships between banks and fintech players are becoming more commonplace, taking the form of commercial partnerships, innovation initiatives or equity investments.

While the private sector banks have taken the lead in exploring partnerships with new-age fintech players, the public sector banks are not far behind.





Chart 2: Illustrative list of bank-fintech partnerships



· Players have to work together keeping in view the regulatory/system limitations

 Joint developments undertaken by banks and fintech companies could have far reaching impact on existing financial products

 Impact on existing, non-tech savvy customers should be borne in mind e.g. digital-only

> TRUST · Trust in banks is built over decades of responsible risk management and regulatory experience

· Banks have to be selective in partnering with the right fintech player

What does the future hold?

Partnerships between banks and fintech companies in India are evolving from mere vendor-customer relationships to that of mentorship and investment by the incumbent banks. This process benefits banks by allowing them early access to innovative technology that they might not have discovered otherwise. Banks could use these platforms to experiment with new business models (e.g. digital-only banks) in an attempt to spread risk and ensure faster rewards. Fintech players, on the other hand, benefit from the vast experience and infrastructure of the bankmentor, resulting in quicker resolution of chinks in the proverbial tech armour.

partner in the relationship, given the different backgrounds and significantly different DNA of the two types of organizations.

within which banks have to operate

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VISION

- Fintech players typically start out with a vision to create innovative solutions for the financial services ecosystem
- Banks have to be cognizant of their role as 'enablers' in the partnership

BUY VS BUILD

- Banks partner with fintech companies, while also creating in-house products of a similar nature
- Banks and fintech companies should align product capabilities with the objective of enhancing customer experience

The debate is no longer about banks versus fintech players. Banks need to strive to make the most of the dynamic changes in the environment not only to stay relevant in the minds of a transient customer pool, but also to create differentiation (e.g. through e-KYC, biometric enabled mini-ATMs for wider coverage, usage of artificial intelligence for better customer response) that could become critical in a competitive market. The entry of new banks only makes this conundrum more complex, leaving both banks and fintech players with no choice but to engage as equal partners in each other's growth.

Growth through Innovation

In this section we focus on what we believe will be key innovations for 2020 and look at how they are likely to impact the Banking sector:

- 1. Artificial Intelligence & Cognitive opportunities
- 2. Blockchain & Distributed Ledger Technology
- 3. Robotic Process Automation
- 4. Cyber Security

Artificial Intelligence & Cognitive opportunities

Introduction

Cognitive analytics is a new approach to information discovery and decision-making. Inspired by the way the human brain processes information, draws conclusions, and codifies instincts and experiences into learning, it is able to bridge the gap between the intent of big data and the reality of practical decision-making. Machine learning systems, artificial intelligence, and natural language processing are now no longer experimental concepts but potential business disrupters that can drive insights to aid real-time decision making.

Components of Artificial Intelligence/ Cognitive technologies

The field of artificial intelligence has produced a number of cognitive technologies. The individual technologies are getting better at performing specific tasks that only humans used to be able to do. We call out some of these cognitive technologies, and it is these that business and public sector leaders may focus their attention on.

- Natural Language processing Ontology Based information extraction and Speech recognition
- Natural Language generation
- Machine Learning Neural networks / Deep learning
- Computer Vision Image recognition

Cognitive computing solutions offer various capabilities, which enable the above technologies to perform tasks as a human brain will do...

Smart banking embracing Artificial Intelligence & Cognitive technologes

Broadly Cognitive opportunities can be classified into 4 categories namely "Engagement", "Automation", "Insights" and "Sensing & Shaping Strategies". Key opportunities for Cognitive in financial services can be illustrated as below:

• Cognitive engagement - Improve customer understanding and activation through personalization, influencing desired actions.

With the dawn of cognitive computing, customers can now get quick, personalized services. Cognitive systems unlock the power of unstructured data (industry reports, financial news) using deep text and/or image/ video understanding. They offer perosonalised engagement between banks and their customers by dealing with each customer and focusing on their requirements.



Companies have explored cognitive engagement solutions—interactive computing systems that use artificial intelligence to collect information, automatically build models of understanding and inference, and communicate in natural ways. Cognitive solutions can automate knowledge creation, empower agents with deeply personalized answers and intelligence, scale a company's knowledge capability, and uncover new revenue streams by learning about customer needs.

Adoption examples: Santander announced that it will provide secure transactions using voice recognition via its banking app, while Royal Bank of Scotland has trialled "Luvo" AI customer service assistance to interact with staff and potentially serve customers in the future. In Sweden, Swedbank's Nina Web assistant achieved an average of 30,000 conversations per month and first-contact resolution of 78% in its first three months. Nina can handle over 350 different customer questions and answers. Several other banks in the UK and internationally have similar systems in place or are trialling them⁴.

· Cognitive automation - Automate repetitive, knowledge & natural language rich, human intensive decision processes.

Automation using artificial intelligence is made possible by the combination of new types of software and recent breakthroughs in computing power. Business benefits are much broader than cost savings and include better use of highly skilled people, faster actions and decisions, better outcomes, etc.

Intelligent automation using OCR and machine learning capabilities can be useful in back/middle office operations performing high volume and rules based work. For example, utilize natural language processing technologies to develop semantic ontology/rules to extract functional information and leverage OCR scan account opening forms, KYC documents such as PAN Card. However back office is not the only area where intelligent automation can play an important role by

helping to reduce risks and costs.

Adoption examples: Fonetic, a provider in voice and text management solutions, partnered with Banco Bilbao Vizcaya Argentaria (BBVA) in rolling out the Fonetic linguistic analysis and trading compliance solution to proactively monitor and prevent trading malpractice at its London and New York headquarters.⁵

Natural language generation vendors like Narrative Science automate investment/earnings reports through a software that can take data and turn it into a narrative. Many financial institutions such as Credit Suisse, USAA, and even publishing houses like Forbes and Associated Press use Narrative Science's Quill platform.6

• Cognitive Insights – Detect key patterns and relationships from billions of data sources in realtime to derive deep and actionable insights.

Personalisation is a major talking point for banks and many are experimenting with innovative ways to match products and services to the consumer. There are also examples of companies embracing new apps in personal financial management (PFM) which help consumers make smarter purchase decisions, manage their finances, and make cost savings while they are out and about spending money.

Adoption examples: UBS used the help of artificial intelligence when delivering personalized advice to the bank's wealthy clients by modeling 85 million Singaporean individual's behavioral patterns. Fine tuned for financial services, the technology allows Sgreem (Seguential Quantum Reduction and Extraction model) to build a profile of an individual showing potential match-ups with different types of wealth management products.

DBS Bank intends to apply Watson to its wealth management business to improve the advice and experience delivered to affluent customers. Watson is a cloud-based technology that can process enormous amounts of information with the ability to understand and learn from each interaction at unprecedented speed. This represents a significant shift in the ability for organisations to quickly analyse, understand, and respond to vast amounts of Big Data. The collaboration with IBM is DBS's latest initiative to harness Big Data to deliver a better customer experience-providing more precise, customised and quality actionable insights that meet its customers' needs. 7

Cognitive "Sensing & Shaping strategies" - Build a deep understanding and knowledge of company, market dynamics, and disruptive trends to shape strategies

Advanced analytics technologies can help banks leverage the abundance of data at their disposal to gain granular, real-time insights into every aspect of banking operations. These technologies empower banks to define their customers, based on their individual values, expectations, and needs, rather than aggregated demographics. Customers trade on information, too much of which is out there. Identifying it, sifting through it, and getting a sense of what a particular news item or expert view means is an enormous task.

Cognitve analytics can drive opportunity and value in almost every banking function, whether it be real time insights on loan, treasury, or investment portfolios. Banks can keep "Discovering" real time insights on their portfolios and accordingly "Shape" their portfolio strategies.

Adoption examples: Goldman Sachs invested in Kensho, a cloud-based software that can find answers to more than 65 million guestion combinations in an instant by scanning more than 90,000 actions such as drug approvals, economic reports, monetary policy changes, and political events and their impact on nearly every financial asset on the planet. Brokerage firms, traders, investors and researchers can track stock prices and news press for their portfolios on real time basis, leading to better decisions based on real time insights. Indian financial institutions are gearing up for Digital era

⁴ http://www.bankingtech.com/474852/clever-banking-with-artificial-intelligence

⁵ https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/operations/lu-intelligent-automation-business-world.pdf

⁶http://www.zdnet.com/article/narrative-science-lands-10-million-in-funding-usaa-as-customer/#!

⁷https://www.dbs.com/newsroom/news_1097_8288934481335335538_MIGRT

⁸ http://www.livemint.com/Industry/VgJeA9DBV3itnXOwUIsuoO/ICICI-Bank-Retaining-its-digital-edge.html ⁹http://www.axisbank.com/download/Axis-Bank-launches-Thought-Factory-an-Innovation-Lab-to-drive-FinTech-innovation.pdf ¹⁰http://forbesindia.com/article/special/hdfc-bank-to-link-up-with-5-fintechs-for-digital-boost/42639/1 ¹¹http://www.business-standard.com/article/markets/kotak-securities-heckyl-launch-real-time-news-mkt-info-apps-115071401172_1.html 12https://www.techinasia.com/dbs-digibank-launch-kasisto-acquisition

Indian banks are running "Accelerators / Hackathons" to partner with Artifical Intelligence / Cognitive technology vendor ecosystem and setting up teams specializing in these emerging technologies.

Earlier this year, ICICI Bank created "Technology and Digital Group" (TDG) that it hopes will help it develop its digital services in commercial, retail and wholesale banking. It is already planning to deploy artificial intelligence chatbots as loan advisors to its customers.8

Axis Bank launches 'Thought Factory', an Innovation Lab to drive FinTech innovation. AXIS Bank is experimenting with emerging technologies such as blockchain, artificial intelligence, mobility, and cloud to bring about disruptions across functions including Credits, Deposits, Wealth Management, Mobile Payments, and Security.9

HDFC Bank has identified five startups whose services it plans to offer to its customers, in its bid to further boost its digital banking operations. One of the AI startups, based in Bengaluru, addresses customers' queries and resolves issues using an artificial intelligence platform, across mobiles and websites, in English.10

Kotak Securities has tied up with data analytics company 'Heckyl Technologies' to provide real-time news, market information, and insights for trading in futures and options. The information will be offered to clients through two analytics applications developed by Heckyl and will be available on the brokerage firm's trading platform¹¹. Singapore's DBS bank has opened a "mobile-only" bank in India called Digibank powered by Kasisto. Kasisto handles the tech behind Digibank, which includes an AI-powered virtual assistant called KAI. KAI can apparently anticipate and answer bankingrelated customer queries in real time.¹²



Blockchain and Distributed Ledger Technology (DLT)

Introduction

If one is involved in the area of Banking Technology, chances are that the word 'Blockchain' no longer sounds alien, but at the same time, possibly triggers more guestions than answers. In May 2016, Deloitte had partnered with EFMA to conduct a survey of global financial services CXOs. In this survey, respondents were asked their views on the impact that Blockchain technology is likely to have on the Financial Services industry. An overwhelming 92%¹³ of respondents believed that Blockchain is going to disrupt their industry over the next five years. The World Economic Forum estimates¹⁴that, by 2017, 80% of all Banks

are going to initiate projects concerning Distributed Ledger Technology (DLT)-the underlying technology supporting a Blockchain. In the past 3 years, Fintech startups working on Blockchain have attracted venture capital funding of over \$1.4 Billion. During the same period, over 2500 patents have been filed and over 90 Central Banks are presently engaged in DLT related discussions worldwide. All these statistics point to the unparalleled excitement triggered by a technology whose first contours were defined less than a decade back, just when the global financial services industry faced one of its toughest challenges in recent memory!

The basics of Blockchain and DLT

The genesis of Blockchain technology and associated distributed ledgers is an anonymous paper¹⁵ that emerged under the pseudonym of Satoshi Nakamoto in 2008. Satoshi had devised a simple yet elegant solution to keep track of the cryptocurrency Bitcoins in circulation. The solution leveraged a 'distributed ledger' architecture under which all users who participated as 'nodes' in the network had a copy of the entire ledger. This implied that all participants had complete visibility of all the transactions at all points in time. Any updates to the contents of the ledger could happen by consensus of participants and any such addition

¹³Partners are defined as those participating in the "business outcome" of PBs

would be in the form of an encrypted new 'block' in an existing 'chain' of all such prior blocks. While Bitcoin as a cryptocurrency has come under the scanner of various regulators, stakeholders soon realized the power of the underlying Blockchain technology enabled by a system of Distributed Ledgers. In essence, the Blockchain architecture proposed by Satoshi could enable a disintermediated and highly tamper-proof ledger using which interested parties could exchange information or even value directly between each other in near real time with no requirement for a trusted third party.



Current System

- Central authorities (bank, Fed, notary, escrow, etc.) transfers actual value between two parties
- Multiple intermediaries and record-keeping are required to facilitate transfer of assets and create trust



Blockchain System -

- Distributed network of computers (nodes) that maintains a shared source of information
- Transaction data is immutable
- · Trust is enabled by cryptographic algorithm

It is this fundamental change in the principle of information/value exchange over the Internet that has made the Blockchain and its associated DLT a very intriguing proposition for all stakeholders in the financial services industry. On one hand, while Fintech players are seeing this as a means to disrupt the role of Banks as intermediaries, Banks on the other hand are trying to take advantage of this technology to strengthen the value propositions offered to their own customers. As a result, we are witnessing all-round excitement as evidenced by the data points in the preceding section!

Converting excitement into value proposition

Various global Banks and Financial Services players have taken a test-and-scale approach to Blockchain and some of the initial success seen by them, albeit in a controlled environment, has led to more players joining the bandwagon. For instance, the R3CEV Blockchain consortium was started by 9 banks in September 2015 to further research and development in Blockchain and DLT. In less than a year, it counts over 50 global financial companies as its members. Members of consortia like R3CEV are developing and testing out use cases across diverse areas like cross border remittances, trading and

securities operations, customer loyalty management, and financial inclusion. In fact, Santander estimates that by 2022, Blockchain based distributed ledger systems can help Banks save \$15-20 billion annually¹⁶.

In line with the excitement in the global markets (please refer to Appendix for select examples), Indian players have also begun to take a serious look at DLT and its implications.

The Reserve Bank of India (RBI) has commented on the potential of Blockchain in its recent financial stability report¹⁷. RBI believes that it can bring about a major transformation in the financial markets. While it has taken cognizance of the multiple use cases offered by Blockchain technology, it has also expressed caution over limited understanding of the implications of this technology.

Institute for Development & Research in Banking Technology (IDRBT) has recently conducted a workshop to explore applicability of Blockchain in the Indian Banking sector. It has also set up a core team tasked with drafting a white paper to dive deep into three use cases

viz. Digital Currency, Identity Management, & KYC and Trade Finance

Individual players like ICICI, Axis Bank and Yes Bank have announced their intent to experiment with Blockchain technology. The former¹⁸ has setup a team to develop use cases that would be relevant given the bank's priorities. Axis Bank is exploring Blockchain use cases in collaboration with startups as a part of its 'Thought Factory' initiative¹⁹. NBFCs like Muthoot Fincorp²⁰ have also evinced interest and given their business dynamics and customer profiles are likely to focus on identity management / KYC applications for a start.

While these are still early days for the technology, these developments help us to uncover a few emerging themes.

- The underlying principles of Blockchain technology are so fundamental that they may be adapted to a diverse set of applications
- Banks across the board have realized that they need to capitalize on this technology in a proactive manner to counter any external threats of disruption from technology players
- Reciprocity is at the core of successful Blockchain implementations. Banks are realizing this and therefore collaborating among themselves and with Fintech startups operating in the area of Blockchain and DLT.

Key considerations for wider adoption

This initial excitement notwithstanding, there are a few key aspects that need to be addressed collectively by the industry for wider adoption of Blockchain Technology. Some of these include:

- Security concerns given recent incidents Financial services institutions have been wary of open or 'permissionless' Blockchains (like the one used as Bitcoin ledger) simply because the loopholes are still less understood. This was exacerbated by the recent incidents like the DAO Attack that further evidenced the vulnerability of Blockchains. As a result, Banks are expected to focus even more on developing closed or 'permissioned' Blockchains.
- Scalability through collaboration While the initial experimentations are encouraging, we are yet to see a scalable model that can produce sustained

¹⁶Fintech 2.0: Rebooting Financial Services http://santanderinnoventures.com/wp-content/uploads/2015/06/The-Fintech-2-0-Paper.pdf

¹⁷RBI Financial Stability Report, December 2015 (Chapter III : Financial Sector Regulation) https://rbi.org.in/Scripts/ PublicationReportDetails.aspx?UrlPage=&ID=832

¹⁸http://www.livemint.com/Industry/VgJeA9DBV3itnXOwUIsuoO/ICICI-Bank-Retaining-its-digital-edge.html

²⁰http://www.cio.in/feature/indian-bfsi-sector-explores-blockchain

business outcomes. This is partly due to the fact that such models necessarily demand participation of wider stakeholders including Banks, Regulators and Governments to come on the same platform to make it a successful exercise. While we have seen effort by Regulators to encourage industry wide participation a more concerted effort is required before adoption may reach new heights. A case in point is Banks reaping full benefits of automated underwriting of mortgages on the Blockchain through smart contracts is contingent on having a robust land record digitization programme.

- Lack of standardization Fragmented experimentation by many on Blockchain has led to a scenario where there is no standard protocol yet. This is a necessity in financial services where standardization is synonymous with 'trust' for the end consumers. While there are competing consortia emerging, many of them like R3CEV are working towards developing a common standard for members. As seen in other such initiatives like 'Faster Payments' etc. this can be a painfully slow process implying further delay in wider adoption.
- Evolving Regulatory and Legal clarity While Regulators have been sceptic about a competing crypto-currency like Bitcoin or Ether, they have been mostly supportive of the underlying Blockchain technology. However, like Banks, most Regulators too are on a learning curve and it will take due time for a clear point of view to emerge. Similarly, there is lack of legal clarity in areas like enforcing of smart contracts in the real world and further work is required I these areas before we see large scale adoption of Blockchain and DLT by the financial services industry in general.



Conclusion

Blockchain today has been compared to what the Internet was in early 1990s. While we have witnessed how the 'Internet of Information' has changed our societies over the past two decades, we are now entering a phase where Blockchain may do the same by ushering in a new paradigm comprising 'Internet

of Trust' and 'Internet of Value'. The financial services industry may be one of the firsts to be impacted by wider adoption of Blockchain and its associated DLT. The extent of this impact is contingent on how nimbly the industry players capitalize on this technology and the nature of support it garners from wider stakeholders.

Appendix: Select international experimentation with Blockchain

Area	Select Example	
Cross Border Payments	In June 2016, Ripple –backed by Santander– announced that it has successfully completed the first cross border fund transfer using Blockchain technology. Ripple estimates that floats today represent 80% of the total cost borne by MNCs given the turnaround time of cross border payments ²¹ . It is attempting to disrupt this by using a Blockchain based protocol called RTXP. It counts global banks like Santander, UBS, and UniCredit as its adopters; Canada based ATB Financial has become the first bank to complete a CAN to EUR blockchain transaction with ReiseBank, a subsidiary of DZ Bank in Germany ²² .	
Process Digitization	NASDAQ has been one of the earliest adopters of Blockchain technology ²³ . In November 2015, it had unveiled 'Linq'–a Blockchain-based service to issue pre-IPO shares of companies. Linq brings in operational efficiency by bringing speed to what had largely been a paper based process. It also has an advanced data visualization functionality that serves to visually underscore how Blockchain technology is used underneath to create unique assets with corresponding terms and conditions through use of the Open Assets protocol. Following NASDAQ's success, other exchanges like Australian Securities Exchange, CME Group, and Deutsche Börse are also experimenting with Blockchain based applications.	
Loyalty Management	Royal Bank of Canada (RBC) is currently experimenting ²⁴ with a Blockchain based customer loyalty application. Using the Ripple based platform, RBC's customers will be able to see their points accrue real time every time they use their credit card giving reward points a feel like 'liquid cash, enabled by Blockchain'. RBC customers would also be able to use the system to redeem loyalty points real time in a frictionless manner with the bank's partners.	
Financial Inclusion	The cloud based software provider Oradian recently tied up with Blockchain platform Stellar to introduce a system of low cost micro-payments in Nigeria. ²⁵ This solution aims to drastically bring down the cost of moving money in rural Nigeria where 74% of the population is unbanked and rely on remittance companies where cost of transfer may be as high as 20%. For this, Stellar has rewritten its codebase to arrive at a more robust version of the 'Stellar Consensus Protocol' that can handle 500 million accounts at a negligible fee of 300,000 transactions per penny!	

²¹https://ripple.com/files/ripple-brochure.pdf

²²http://www.ibtimes.co.uk/seven-banks-kick-off-ripples-blockchain-network-including-santander-ubs-unicredit-90-more-1566894 ²³http://www.coindesk.com/hands-on-with-ling-nasdags-private-markets-blockchain-project/

²⁴http://banknxt.com/56269/rbc-blockchain-based-loyalty/

²⁵http://www.ibtimes.co.uk/leaping-into-future-nigerias-rural-microfinance-community-gets-connected-using-stellar-oradian-1541238

Robotic Process Automation

The spectrum of automation expands from simple rulebased automation to advanced cognitive and artificial intelligence automation. Hence, the task of exploring and understanding automation can often appear more daunting than it is.

Let's take a step back and deconstruct this spectrum of automation in detail. The ability of the tool/solution to automate depends on three factors which are as



What is 'RPA'? is the biggest difference and advantage RPA has over RPA is a technology that mimics the actions of a human traditional automation techniques that relied on backperforming simple rule-based processes. It interacts at end automation requiring massive IT transformation, the application/interface layer of any application and huge investments and complex decision making/ performs the exact steps just like anyone working across approval cycles given its susceptibility to security issues. multiple applications. "RPA is the natural evolution of labor arbitrage, it takes the Robot Out of the Human" It is cost effective, scalable, and easy to implement. This

follows: the type of input it can read, the amount data it can process, and the nature of output it can generate. Typically, as the variability of the input increases, the amount of data to be processed multiplies and the output moves from being deterministic to predictive, i.e., the solution moves from left to right on the spectrum. Robotics Process Automation (often referred to as 'RPA') sits at one end of this spectrum.



Challenges with Adoption:

i) Change in Mind-set:

ii) Historically speaking, whenever a break-through in technology is about to disrupt any industry (such as the effect ATM had on the banking industry when it was introduced), skeptics have expressed concern about one thing consistently — job losses. But, time and again, they have been proved wrong. According to U.S Census Bureau, on average since 1980, occupation with above computer use has grown substantially faster (0.9% per year, 1.61% from 1980 to 2013) than jobs below-median computer use (grown by 0.74% during the same period).

Improved technology reduces the cost of a product/ service, lowers its cost and improves its quality thereby attracting more customers to it. Technology quickens the time to market new innovative products/services, increasing the expectations from firms to deliver more. This increase in demand and expectations typically drives up employment. From an RPA stand point, as companies look to automate mundane, repetitive tasks, the quality of work delivered improves and cost goes down which improves the overall performance of the company. Employees who were performing tasks that are now being replaced by RPA can either improve the work they are currently doing (for example, move up from just creating management reports that are now automated, to analysing these reports and providing business insights) or develop skills to take on new and innovative work.

iii) How to build an RPA Business Case & Operating Model

iv) RPA is certainly not a new concept. It has been around for a while but it's still surprisingly misunderstood. Topics around RPA's business case, its potential benefits and most complex challenges are widely discussed but seldom have conclusive and definitive points of view. Leaders don't embrace RPA as guickly as required and there is some skepticism in the area. The biggest question they have while implementing RPA is "how do you build a business case?" With all the buzz and awareness about RPA in the industry today, there are multiple opinions surrounding its implications. Hence, it is important to break though the hype to clearly understand RPA's potential and limitations in its current avatar. Additionally, an optimal way for companies to evaluate and better grasp RPA's potential and limitations is to implement a PoC/PoV (Proof-of-Concept/Proof-of-Value) in their organization.

Finally, as leaders look to implement RPA in their firms, they should challenge their organizations to leverage RPA to deliver unprecedented business outcomes and be diligent in effectively managing complex change in their organizations. To deliver unprecedented business outcomes and reap the full benefits of implementing RPA, organizations will need to design and implement a HumBot Organization Model that effectively marries the unique and complementary capabilities of both robotic and human workforce.

Scope of RPA:

RPA is best suited for processes that are repetitive and deterministic, have minimum level of ambiguity, and very few exceptions.

Most of these processes have the following

characteristics that make them very conducive for RPA implementation:

- All processes have set defined rules with minimal or no human judgement element.
- The manual effort in these rule-based repetitive steps is high.
- The processes are standardized from input, process steps, and output perspective.
- Most processes have input data that is Electronic (rather than paper).
- Transaction volumes of these process are high enough to justify the automation.

Use Case:

RPA Automation has proven to be industry agnostic thus far. As long as there is manual and repetitive work being done in a company, there is a good potential for automation using RPA. Below are some actual implementation examples of how companies have used RPA:

- 01. Global Investment Banks: RPA has helped clients improve case handling productivity to address the existing case backlog and meet regulatory requirements.
- 02. Insurance & Annuity Insurance Firms: RPA has helped enhance customer experience by reducing inbound calls and "indexing" turnarounds with digital interactions.
- 03. Financial Services: Complex manual processes pose quality issue and RPA has helped reduce such errors and significantly improve quality.
- 04. Leading Professional Services Firm: Erratic and seasonal volume peaks for certain type of work (e.g., input compensation data for employees into Talent Management System) required hiring and training of temporary staff. Automating these processes using RPA not only helped in efficiently and effectively handling these seasonal volume fluctuations at a much reduced cost but also helped improve the transparency and overall quality of the process.
- 05. Global Pharmaceutical Company: RPA implementation significantly improved operational efficiency and helped in overall reduction of operational costs

Summary

RPA allows companies to automate processes that

were difficult to automate using existing technology tools. RPA is easier to implement and has a quicker payback period as compared to traditional IT programs and hence has the potential to help companies reap significant business benefits quickly. Together, with other emerging technologies, (e.g., Blockchain, Internet of Things), RPA and Cognitive Automation have the potential to redraw the competitive landscape of many industries. However, there is no 'one-sizefits-all' solution to RPA; business leaders worldwide will need to try out this evolving technology in their organizations with a diligent and ambitious intent to fundamentally transform their business outcomes and value proposition and thus fortify their competitive positioning in the rapidly transforming global economic environment.





Cyber Security

Moving the cyber security goalpost

Cyber risk, while not at all new, has rocketed up the list of leading issues for banks-for the regulators, for the board, the CEO, the C-Suite, you name it. Nobody wants to be on the wrong side of the headline. One reason this continues to loom large is that the nature of the threat is constantly evolving, and not just from a technology perspective. For example, today a bank may be threatened not just by groups that are looking to steal money, but by actors that may simply want to be disruptive.

Banking industry in India is rapidly evolving facilitated by mobile and internet penetration in the country and

technological innovations disrupting the established processes. In the last couple of years, technologies such as Digital Wallets, EMV Chip-based Cards, and two factor authentication via SMS-based One Time Password (OTP) have become mainstream in India. These innovations were designed to make payment transactions convenient and more secure; but are we really secure?

Digital Wallets

In India, digital wallets are increasingly replacing cash for purchases and payments, especially for mobile phone recharge, DTH service plans recharge, utility bills, transportation services, and even for online money transfers. Almost all major Banks in India have launched their own version of a digital wallet with varying degree of functionalities and are trying to tap into the growing smartphone user market. With increase in usage of smart phones, there have been growing concerns on cyber frauds associated with digital wallets.

Digital wallets in India are primarily mobile based and thus have inherent risk such as the following:

- **Phishing Fraud:** Fraudsters dupe customers through phone calls/SMS/emails to share sensitive information such as PINs/Passwords that may result in embezzlement of virtual money from the wallet.
- Sniffing/ Intrusion/Cyber Attack: Fraudsters hack into the digital wallet platform and manipulate the wallets to gain benefit. Fraudsters intercept traffic between the digital wallet platform and consumers to harvest credentials or to manipulate the transactions.
- Benefits through misconduct: Regular customers discover product or application flaws that can provide benefit to them in specific scenarios and then repeatedly simulate the same scenarios to exploit these limitations.
- Fake KYC: Customers can furnish fake Know Your Customer (KYC) documents to gain access to premium wallets that allow higher transaction value (transfer and cash out). While Reserve Bank of India (RBI) has prescribed strict KYC norms and monitoring, the effectiveness of complying with these norms may be limited.
- Application manipulation by authorized user: Employees having admin/super-user access can perform unauthorized transactions like pseudo virtual money generation on select wallets, virtual money value embezzlement from wallets, and fraudulent reversals.

The digital wallets industry is largely at a nascent stage in India and banks are more focused on building a user base than perhaps looking into fraud control measures. However, it is observed that the mobile platform adoption rates in India are much higher than in other parts of the world. It is therefore likely that this surge in adoption rates may be accompanied by a spate of cyber frauds.

Chip-based Cards

As per guidelines issued by Reserve Bank of India, banks have started issuing EMV chip-based cards, which secure the payment transactions with enhanced functionalities in the following areas:

- Card authentication: Card authentication protects against counterfeit (skimming) card fraud. The card is authenticated during the payment transaction, protecting against counterfeit cards.
- Cardholder verification: Cardholder verification authenticates the cardholder and protects against lost and stolen cards. Cardholder verification ensures that the person attempting to make the transaction is the person to whom the card belongs.
- Transaction authorization: Transaction authorization uses issuer-defined rules to authorize transactions. The transaction is authorized either online and offline using issuer-defined risk parameters set in the card.²⁶

While EMV chip-based cards make it more difficult for criminals to commit credit card fraud by copying a magnetic strip, poor understanding of cyber risks mitigated by EMV chip-based cards leads to following vulnerabilities:

- The EMV chip-based cards issued by banks support both chip and magnetic-strip functions and are thus exposed to the same risks as magnetic strip cards. Magnetic strips on EMV chip-based cards are vulnerable to cloning or tampering.
- The EMV chip-based cards have been successfully exploited and could be prone to
- Pre-play attack: A card inserted into a rogue payment terminal can be charged for a transaction that's done with a fraudulent card at a terminal somewhere else.²⁷
- Any-PIN attack: The attacker initiates a transaction using stolen cards, intercepts the PIN query from POS (point-of-sale) terminals and authenticates it regardless of the PIN entered, thus allowing the attacker to bypass PIN verification in order to authorize fraudulent transactions.
- EMV chip-based cards do not really mitigate cyber risks for online or "card-not-present" transactions.
- EMV chip-based cards do not prevent the theft of card data in transit. As a result, data is still vulnerable

because criminals continue to find entry points into the environment through point of sale systems and other weak links.

- The security concern is not limited to fraudulent credit card use but extends to the critical data collected by the banks or merchants to personalize customer experience.
- Implementing EMV chip-based technology does not automatically satisfy PCI-DSS requirements.

Even though known vulnerabilities in EMV chip-based cards may have been fixed, it is only a matter of time before new vulnerabilities are identified and exploited. EMV chip-based cards merely shift the threat landscape from point of sale to the payment life cycle and the applications merchants run in their online environments.

SMS-based OTP

SMS-based one-time password (OTP) is an extremely popular and one of the most widely used form of twofactor authentication (2FA) in India. SMS-based OTP is used by banks to deliver one time passwords quickly and securely using an out of band delivery channel like simple messaging service (SMS) available on all mobile phones. Most of the banks have implemented SMS-based OTP for critical services such as beneficiary addition, money transfers and have either completely or partially replaced other authentication mechanisms such as grid, profile passwords.

OTPs make it difficult for attackers to gain unauthorized access to restricted resources, like bank accounts or databases with sensitive information. SMS-based OTP is easy to use, manage and distribute, and requires no additional hardware or software to be installed on user's mobile phone. However SMS-based OTP has been declared insecure by National Institute of Standards and Technology (NIST) and is only a stop gap solution at best.

Some of the major cyber risks associated with SMSbased OTP are as follows:

• SMS messages may be intercepted or re-directed. An attacker may be able to divert the SMS containing a

one-time password (OTP) to their own device, which lets the attacker hijack any service, including adding a new beneficiary, transferring money, etc.

- The pre-registered mobile number may not be associated with any mobile network and could actually be a VoIP (or other software-based) service.
 SMS-based OTP is vulnerable to hijacking, if the individual uses a voice-over-internet protocol (VoIP) service, which provides phone call service via a broadband internet connection instead of a traditional network.
- Changing the pre-registered mobile number may not be possible without SMS-based OTP.
- The SMS may be delivered to an incorrect recipient as the mobile phone may be lost/stolen or the number may have been changed by the user.²⁸

Two-factor authentication needs to evolve further and use alternative channels to perform out of band delivery of OTPs. So, while the use of SMS-based OTP is being deprecated, secure mobile device is still a viable alternative to SMS-based OTP.

Conclusion

The very innovation that drive business growth and value also create first order cyber risks. Innovative technologies such as Chip-based cards and SMS-based OTP have helped the banks to implement security controls to mitigate traditional cyber risks. However, as the technology has evolved, attack vectors have also become more sophisticated. Questions are now being raised on technologies that were previously thought as secure.

We are only as secure as our weakest link. Looking at cyber threats in isolation, severely limits our ability to understand the complete impact of cyber risk. There is a need for enhanced cyber risk assessment framework and testing methodology to continuously detect and protect against evolving cyber threats. While being secure is more important than ever, there is a need to also be constantly vigilant and resilient in face of evolving cyber threats.

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