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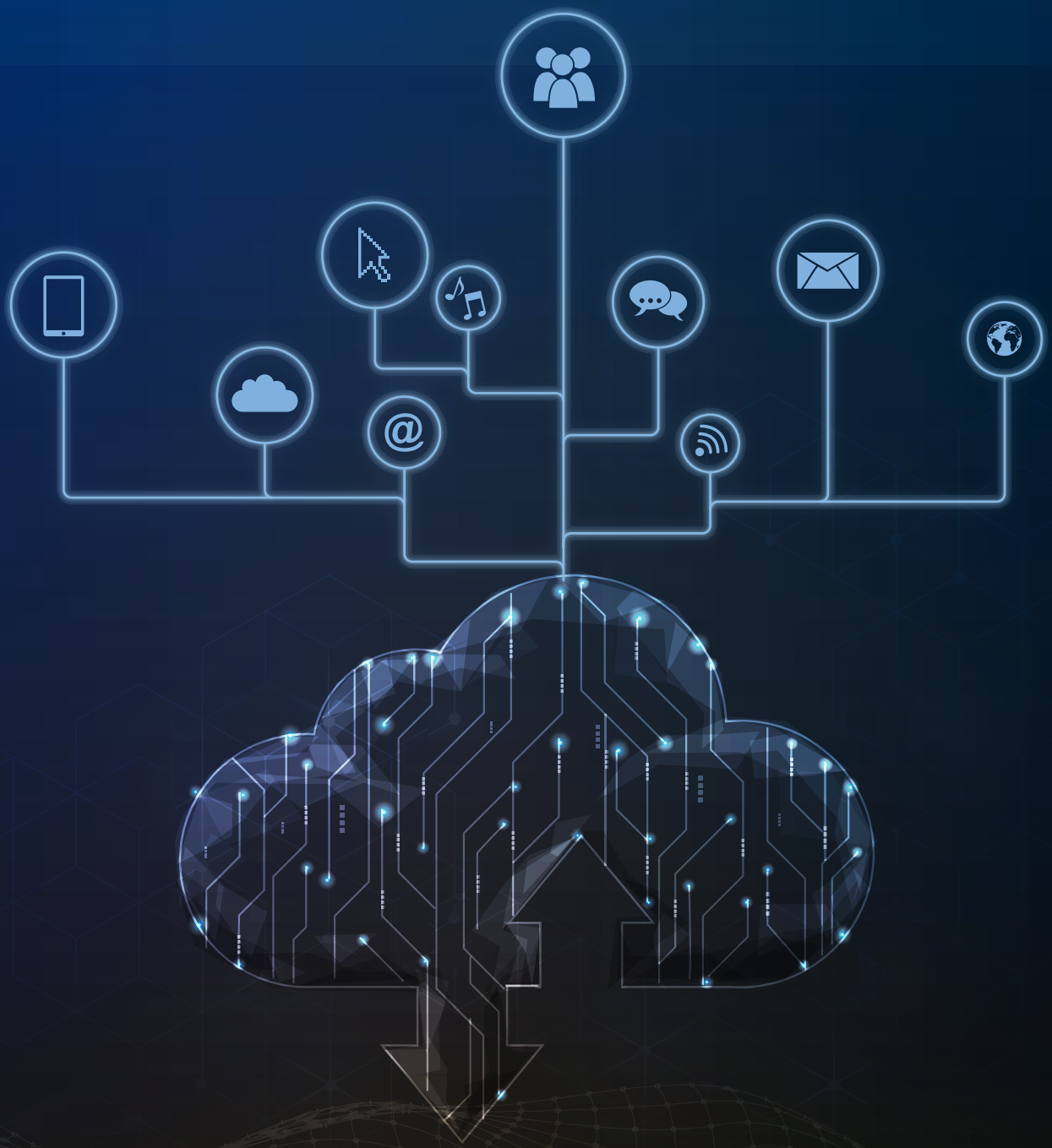
TRANSFORMING BANKING AND FINANCE SECTOR



PRIMER

Driving Cloud Adoption

Transforming Banking and Finance sector

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1 Introduction

New and innovative technological solutions have revolutionised financial services in India, altering the delivery of banking and financial services to consumers. The banking, financial services, and insurance ('BFSI') sectors have experienced rapid growth and technological advancement, necessitating an evolution of industry standards and practices. Currently, the BFSI industry, especially small and cooperative banks, faces challenges in swiftly adapting to transformation cycles, implementing faster Go-To-Market ('GTM') strategies, and competing with fintech entities. These fintech players gain an edge over traditional banks by leveraging emerging technologies. While banks and regulators attempt to address these challenges, it requires an integrated infrastructure and community knowledge-harvesting approach to accelerate the sector's growth. Solutions such as quantum computing, low code, no code, super apps, and cloud computing can potentially transform the banking and financial services sector in the coming days.

One such solution that is not just based upon technological upgradation or hygiene checks but rather has become a critical enabler for businesses is cloud computing. The National Institute of Standards and Technology (NIST) defines cloud computing as: *"a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."* [1]

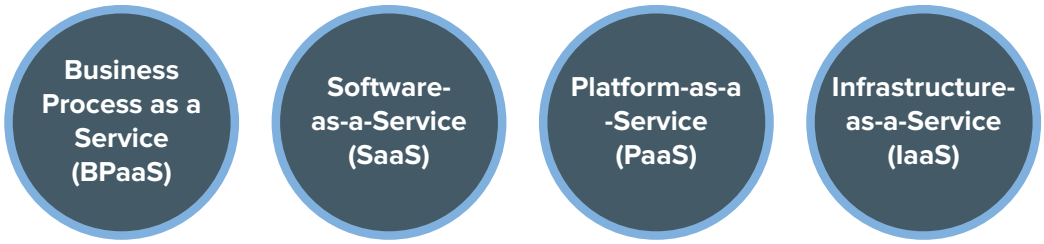
Cloud services bring important innovation, enhance cyber security, increase business operational resilience, and offer cost-saving opportunities. They enable institutions to scale quickly and add flexibility to operations by eliminating the hassles of infrastructure maintenance and other resources. Particularly in financial services, Cloud Service Providers('CSPs') simplify operational resiliency and dynamic scaling for businesses, utilising AI/ML for processing, decision-making, and providing top-notch security.

Cloud computing comprises five essential characteristics[2]:-

[1] Mell, P.M. & Grance, T. (2011) *SP 800-145. The NIST Definition of Cloud Computing.* National Institute of Standards & Technology. Retrieved on 20 December 2023 from https://dl.acm.org/doi/book/10.5555/2206223#:~:text=Cloud%20computing%20is%20a%20model,effort%20or%20service%20provider%20interaction.

[2] Working Group Report on Cloud Computing (2012 October) *Working Group Report on Cloud Computing Option for Small Size Urban Cooperative Banks,* RBI. Retrieved on 20th December 2023 from https://rbidocs.rbi.org.in/rdocs/PublicationReport/Pdfs/RWGFUF031012.pdf

In the financial services sector, cloud service models are most commonly observed in the following formats:-



In this primer, we will explore the necessity of digital transformation and a cloud-first approach for the BFSI industry and outline the migration strategy for the business to adopt the cloud easily.

2 Digital Transformation and Cloud First Approach for the BFSI Sector

Digital transformation integrates digitisation and redefinition of products, people, processes, technology and governance across an organisation. It revolves around four key pillars: IT uplift, digitising operations, digital marketing, and digital business.[3] The first pillar, IT uplift, forms the foundation of the digital transformation journey, where companies upgrade their IT infrastructure, including creating data lakes and migrating to the cloud.[4] Given its crucial role in handling sensitive data, facing constant threats, and ensuring seamless customer journeys, the BFSI sector stands at the forefront of industries that must embrace digital transformation. In this endeavour, aligning storage, scalability, security, and standards requirements becomes critical for BFSI entities.

In the financial sector, where service delivery requires elasticity of resources during peak times, the transition to cloud computing enables scaling services at an affordable cost for India's growing financial services start-ups and established banking players. Cloud computing offers the BFSI industry the added advantage of operating across various applications/platforms and enabling them to formulate contextualised services for clients across India and the globe, with secure storage, interoperability and scalability in a cost-effective manner. Issues related to legacy technologies hinder banks' operational efficiency, impede agility and innovation, and necessitate significant investments to align infrastructure with evolving cybersecurity guidelines from regulators.[5] Cloud technology streamlines operations by offering flexibility, allowing financial institutions to pay only for what they need and automatically scale services to effectively manage peaks and valleys in banking services. In conversations with experts, it was consistently emphasised that financial institutions must conduct friction analysis and understand their use cases, risk appetite, timelines, and desired outcomes when integrating cloud computing into operations from the start. These parameters can be used to assess benefits and improvements to operation more holistically.

The Indian government has long recognised the importance of cloud computing technologies for governance and has actively embraced this technology to rapidly and cost-effectively expand its e-governance initiatives across the country.[6] The 'MeghRaj' initiative, launched by the government in 2013, aimed to host government applications and services on the cloud while encouraging

[3] Furr, N. et al (2022 January 28) The 4 Pillars of Successful Digital Transformations. Harvard Business Review. retrieved February 3, 2024 from https://hbr.org/2022/01/the-4-pillars-of-successful-digital-transformations

[4] Furr, N. et al (2022 January 28) The 4 Pillars of Successful Digital Transformations. Harvard Business Review. retrieved February 3, 2024 from https://hbr.org/2022/01/the-4-pillars-of-successful-digital-transformations.

[5] Ernst & Young. (2022). How cloud powers the future of payments. EY. Retrieved December 24, 2023, from https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/emeia-financial-services/ey-how-cloud-powers-the-future-of-payments.pdf

[6] Banerjee, J., Kumar, A., & Parikh, M. (2015, March). Best Practices for Security in Cloud Adoption by Indian Banks. Data Security Council of India (DSCI). Retrieved December 24, 2023, from https://www.dsci.in/files/content/knowledge-centre/2023/Best%20Practices%20for%20Security%20in%20Cloud%20Adoption%20by%20Indian%20Bank_0.pdf

state governments to integrate and provide e-governance services easily.[7] Another significant initiative is the **Enhanced Access and Service Excellence ('EASE') reforms,** which have incentivised banks to digitalise their services. Pillar I of the EASE 5.0 reforms focused on enhancing digital customer experience, emphasising technology integration, including adopting emerging cloud, account aggregator, open APIs, and data-driven, integrated, and inclusive banking solutions. This drive to adopt emerging technologies has been furthered under the EASE 6.0 reforms, demonstrating the government's commitment to supporting the adoption of technologies like cloud computing in the domestic BFSI sector.[8]

These policy initiatives aim to increase public acceptance of the cloud, eliminating the need to buy, install, and maintain a server while making services more accessible, reliable, and capable of meeting citizens' expectations. Industry bodies such as the Indian Banking Association, PSB Alliance, and others also play a critical role in encouraging BFSIs to evaluate the usage of cloud services seriously and in encouraging small and cooperative banks to adopt the cloud. It is important to understand that the CSP ecosystem is on a learning curve, just like the users, and therefore. At the same time, significant strides have been made, but there is still a long way to go to adapt and evolve the ecosystem.

There is a collective push from the public and private sectors towards greater cloud adoption. This, coupled with the announcement of the IT Outsourcing guidelines issued by the RBI in April 2023, creates adequate impetus for the financial sector to transition to cloud-enabled financial services in a regulated fashion.[9]

2.1. Cloud First Approach for Financial Institutions

While several financial entities, especially new age fintech and larger banks, have either adopted or started to adopt the cloud services to optimise their business, there is a need to inculcate a cloud-first approach that helps smaller banks, especially cooperative and small-size banks, adopt cloud computing to enhance their operations. In India, urban cooperative banks account for 60% of the total banking business and face immense pressure from the new age fintechs.[10] As consumers increasingly demand prompt banking and expedited services, cooperative and small banks struggle to meet these demands. A cloud-first approach could help these banks improve their customer services and operations. As elucidated in the previous section, benefits such as data analytics, interoperability, storage, and cost-effectiveness are crucial for these banks to remain competitive and meet consumer demand. Experts in our consultations reiterated these benefits and highlighted the importance of cloud computing in maintaining

7. Ministry of Electronics and Information Technology (2013 April) Government of India's GI Cloud (Meghraj) Strategic Direction Paper. Retrieved February 26, 2024 from https://www.google.com/url?q=https://www.meity.gov.in/sites/upload_files/dit/files/GI-Cloud%2520Strategic%2520Direction%2520Report%25281%2529.pdf&sa=D&source=docs&ust=1709114532835879&usg=AOvVaw0AQhPJQr7DzJy0WvJZm76E

8. Ministry of Finance (2023 December 27) Ministry of Finance Year Ender 2023: Department of Financial Services. Retrieved February 26, 2024 from https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1990752#:~:text=EASE%20Reforms%20are%20governed%20by,demands%20of%20the%20banking%20landscape.

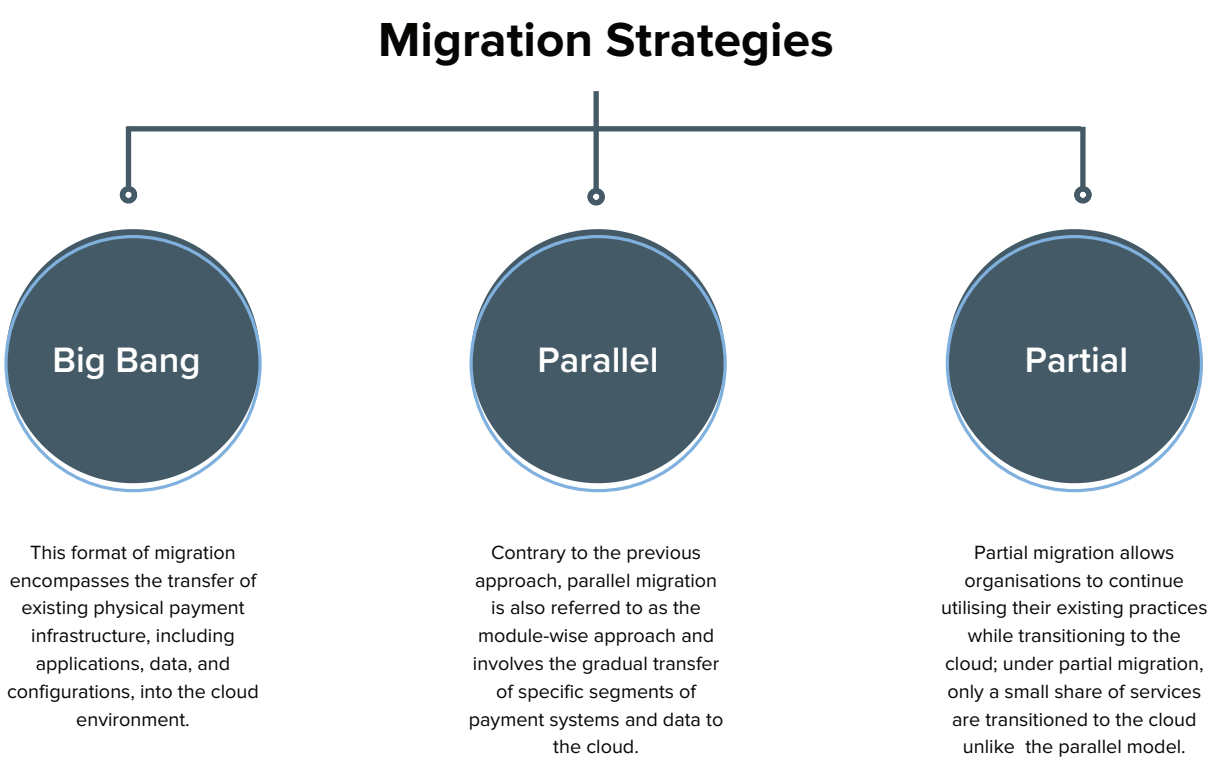
9. Reserve Bank of India (2023 April 10) Master Direction on Outsourcing of Information Technology Services. Retrieved January 28, 2024 from https://rbi.org.in/Scripts/BS_ViewMasDirections.aspx?id=12486

10. Tata Communications (2023 May 15) Why urban cooperative banks are turning to cloud solutions. Retrieved February 3, 2024 from https://www.tatacommunications.com/knowledge-base/cloud-based-banking-solutions/

backups and enabling quicker recovery timelines for financial institutions in emergency situations.

Furthermore, migration to the cloud for financial entities has become easier, with new-age solutions becoming mainstream with increased affordability and accessibility. The role of CSPs, cloud-native solution providers, solution developers, and other migration partners is also critical in helping the entities move to the cloud and ensuring that the migration process is smooth, further easing the migration process. Multiple CSPs already offer such support to the entities and help create a data migration strategy to ensure a smooth transition to the cloud.

Figure 1: Migration Strategies



An assessment of the migration undertaken by Indian entities, as illustrated below through case studies, demonstrates the progress made in making cloud migration simpler and, for certain workloads, the optimal choice. We observe that critical components of the BFSI sector, such as CRM, authentication, and even recommendation engines, can now run smoothly over the cloud using APIs to populate data fields. Thus, as simple and medium complex tasks become easier to migrate, the industry is advancing towards enabling the migration of more complex and dynamic workloads onto the cloud.

FIs are slowly yet steadily moving non-critical workloads onto the cloud. Amongst functional areas, Banks are migrating their digital/mobile banking, data lake and analytics, personalisation, etc., onto the cloud at a higher percentage than non-core workloads. There is a minimal focus on migrating core workloads, open banking, blockchain, etc., to the cloud. Enterprise tasks such as IT, Customer relationship management ('CRM'), marketing and procurement, etc. have been

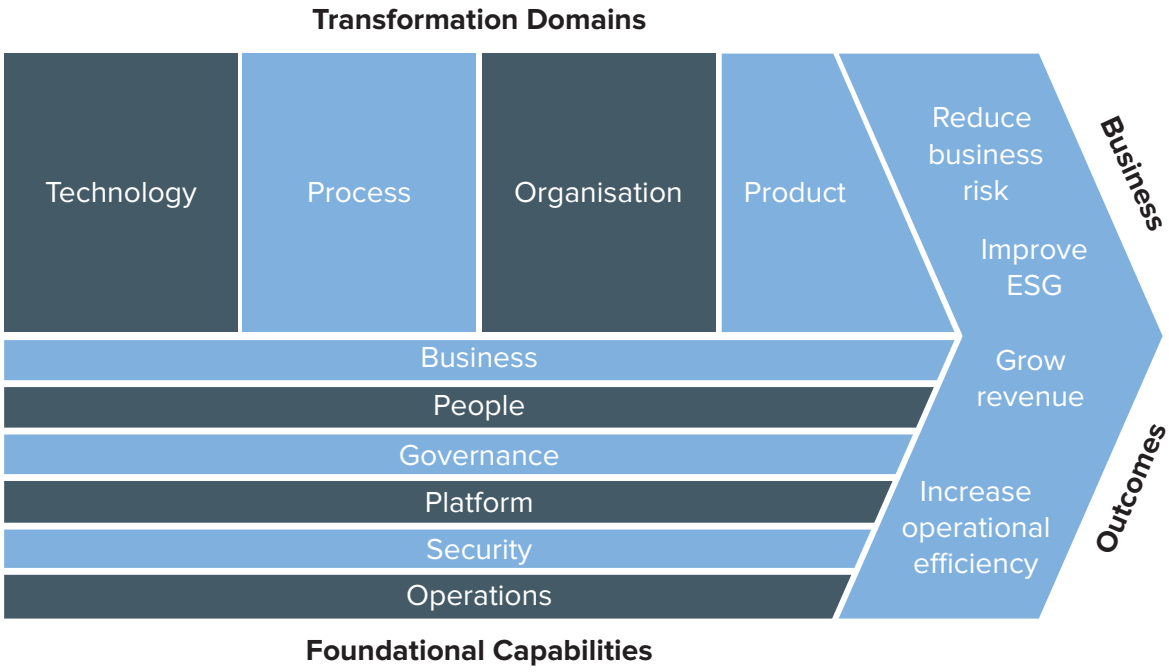
increasingly migrated onto the cloud in recent years. As per reports, while only 20% of all workloads have been migrated onto the cloud, most banks are moving towards migrating more workloads onto the cloud soon.[11]

In observance of these trends, it is prudent for FIs to tweak their migration strategies to prioritise the migration of non-critical workloads as a priority before the impetus for migrating core workloads grows. Operations such as mobile and online banking, enterprise operations such as HR management, collaboration over office applications, etc., can be migrated onto the cloud with little friction at present. A prioritised migration strategy for non-core applications will likely unlock greater efficiency and granular oversight for FIs, paving the way for migrating more critical operations in time.[12]

2.2. Cloud Transformation Value Chain

The following figure illustrates the cloud transformation value chain, showcasing how cloud-powered organisational change (transformation) accelerates business outcomes enabled by a set of foundational capabilities. The transformation domains form a value chain where technological transformation drives process transformation, facilitating organisational transformation, which, in turn, fosters product transformation. Key business outcomes include reduced business risk, improved environmental, social, and governance (ESG) performance, and increased revenue and operational efficiency.

Figure 2: Cloud transformation value chain



[11] Rao,A. Et al. (2022) Banking Cloud Altimeter: Have some banks taken off into the cloud without a flight plan?, Accenture. Retrieved May 22, 2024 from https://www.accenture.com/content/dam/accenture/final/industry/banking/document/Accenture-Banking-Cloud-Altimeter-Volume-6.pdf#zoom=40

[12] Rao,A. Et al. (2022) Banking Cloud Altimeter: Have some banks taken off into the cloud without a flight plan?, Accenture. Retrieved May 22, 2024 from https://www.accenture.com/content/dam/accenture/final/industry/banking/document/Accenture-Banking-Cloud-Altimeter-Volume-6.pdf#zoom=40

- Technological transformation focuses on using the cloud to migrate and modernise legacy infrastructure, applications, and data and analytics platforms. Cloud Value Benchmarking indicates that migrating from on-premises to a CSP results in a 27% reduction in cost per user, a 58% increase in VMs managed per admin, a 57% decrease in downtime, and a 34% decrease in security events.

- Process transformation entails digitising, automating, and optimising business operations. This may include leveraging new data and analytics platforms to generate actionable insights or using machine learning (ML) to improve customer service, employee productivity, decision-making, business forecasting, fraud detection and prevention, industrial operations, etc. Doing so may help improve operational efficiency while lowering operating costs and improving employee and customer experiences. In our consultation with experts, the success story of IDFC Bank's mobile app was highlighted. Experts pointed out that the app, being one of the highest-rated financial apps globally, owes its success to the flexibility provided by cloud computing. The app's design and UI elements were continually monitored and adjusted based on user feedback and usage analytics facilitated by the cloud.

- Organisational transformation involves reimagining the operating model of how business and technology teams orchestrate their efforts to create customer value and meet strategic intent. Organising teams around products and value streams while leveraging agile methods to iterate and evolve rapidly will help banks become more responsive and customer-centric.

- Product transformation focuses on reimagining banks' business models by creating new value propositions (products, services) and revenue models. This may help them reach new customers and enter new market segments. Cloud Value Benchmarking indicates that adopting a CSP leads to a 37% reduction in time to market for new features and applications, a 342% increase in code deployment frequency, and a 38% reduction in the time to deploy new code.

2.3. Shared Responsibility Model in Outsourcing

The Shared Responsibility Model is a global industry norm that delineates roles, responsibilities, and liability between regulated entities (REs) and Cloud Service Providers (CSPs), fostering an expertise-oriented approach to security and compliance.[13] Under this model, entities are responsible for their security in the cloud, controlling and managing the security of their content, applications, systems, and networks. CSPs manage the security of the cloud to protect its infrastructure and services, maintain its operational performance, and meet relevant legal and regulatory requirements. This model enables greater synergies between entities and CSPs, allowing for the integration of new services within existing contracts that may not be possible when contractual agreements

[13] Banerjee, J., Kumar, A., & Parikh, M. (2015, March). Best Practices for Security in Cloud Adoption by Indian Banks. Data Security Council of India (DSCI). Retrieved December 24, 2023, from https://www.dsci.in/files/content/knowledge-centre/2023/Best%20Practices%20for%20Security%20in%20Cloud%20Adoption%20by%20Indian%20Bank_0.pdf

between REs and CSPs are on a service-by-service basis under this model. Experts emphasise the importance of the shared responsibility model as an important tenet of cloud adoption, highlighting the need for clear dichotomisation of responsibilities and liabilities between financial institutions and CSPs under the larger goal of mitigating risk.

In the Indian context, the RBI's master direction on Outsourcing of Information Technology Services acknowledges the shared responsibility model and suggests certain best practices.[14] It clarifies that REs and the CSPs must clearly delineate responsibilities and be held accountable for their respective functions, with Res bearing full responsibility for compliance. While REs can leverage the certification for assurance of the underlying infrastructure of the CSP and utilise tools to ensure compliance with RBI guidelines, however, as controllers of the data, they remain the final decision-makers on the controls they put in place.

2.4. Cloud Deployment Models

Financial institutions often deploy cloud computing solutions in various formats, each with its own set of advantages and disadvantages. The choice of deployment models is typically influenced by the size of the financial institution and its migration strategy. A contextualised migration strategy is key in enabling an FI to optimally use the benefits that cloud computing may enable for their sector.

Data classification is the primary step where participants agree upon data classifications based on the importance of data and its gradational prioritisation for security. Labelling and segregation based on classification enable efficient handling of assets, which is crucial in the BFSI sector. After the process is completed, organisations can manage their data in ways that reflect its value to them instead of treating all data the same way.[15]

Following are some of the other key considerations for the financial service businesses while considering migration to cloud infrastructure:[16]

- **Completeness of portfolio:** Organisations must understand their current and potential workloads in their environment, along with the essential infrastructure requirements for computing and storage. They should efficiently and economically store data on suitable storage tier, incorporating intelligent tiering features that automatically minimise long-term costs for inactive data.

- **Data ingestion:** Tools that facilitate swift and timely movement are crucial for various use cases, including data protection and the Internet of Things (IoT). Similarly, tools providing infrastructure health reports and data utilisation statistics can streamline management tasks, ultimately saving valuable time.

- **Ongoing investment in the portfolio:** When evaluating a service provider, organisations should consider the

[14] Reserve Bank of India (2023 April 10) Master Direction on Outsourcing of Information Technology Services. Retrieved January 28, 2024 from https://rbi.org.in/Scripts/BS_ViewMasDirections.aspx?id=12486

[15] Simorjay, F. (2014) Data classification for cloud readiness. Microsoft. Retrieved February 26, 2024 from https://learn.microsoft.com/en-us/azure/cloud-adoption-framework/govern/policy-compliance/data-classification

[16] Smith A., McCarthy, D.(2021), *Organizations Rely on Cloud Storage to Optimise Cost, Increase Agility, and Drive Innovation*. Retrieved January 25, 2024 from https://d1.awsstatic.com/psc-digital/2021/gc-500/idc-cloud-storage-adoption-whitepaper/IDC-Spotlight-Cloud-Storage-Adoption-Whitepaper-EN-US.pdf

provider's commitment to innovation, responsiveness to customer feedback, and established relationships as pivotal factors in the decision-making process.

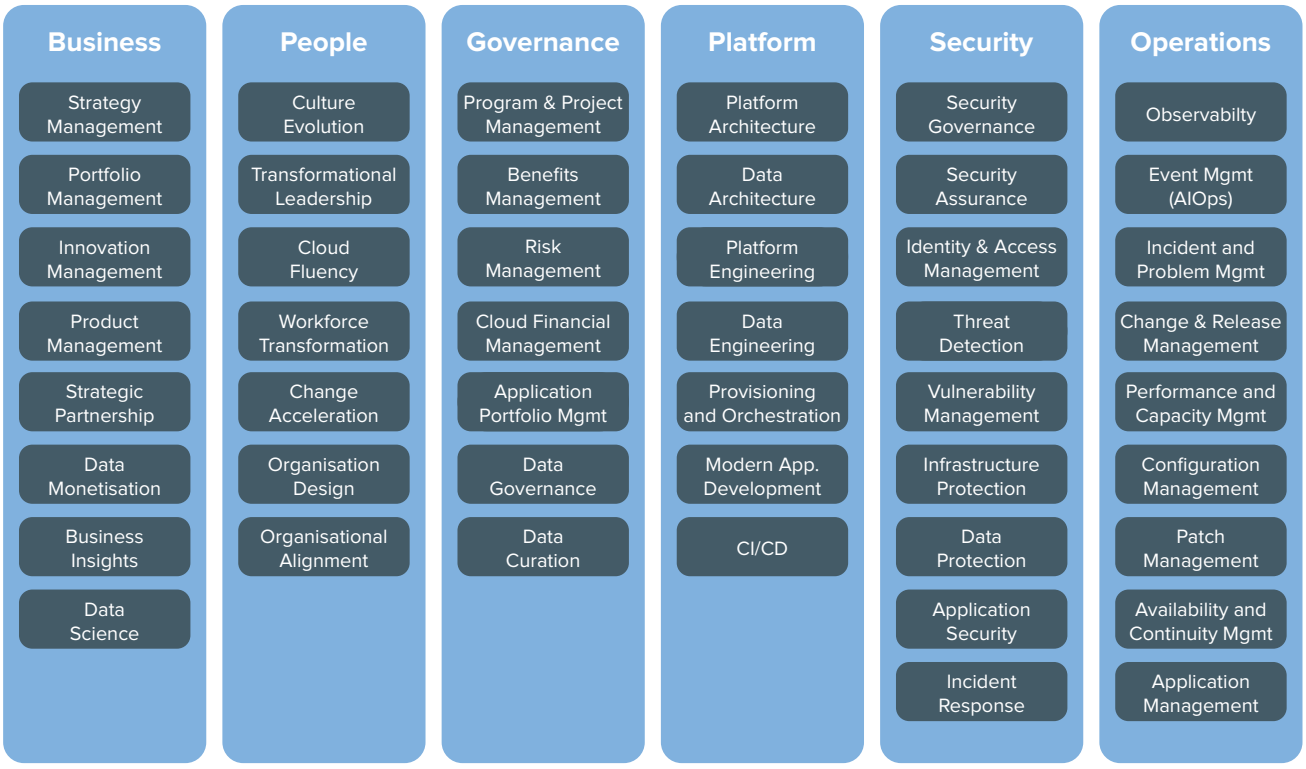
- **Integrated analytics and artificial intelligence (AI):** This involves additional specialised services and tools dedicated to overseeing compliance with personally identifiable information (PII) regulations, data security, and implementing automation for enhanced cost efficiency. These tools and integrated frameworks are increasingly deemed indispensable for businesses striving to remain competitive. Therefore, their availability holds substantial weight in the decision-making process when organisations make procurement decisions related to the cloud.
- **Price predictability:** Effectively measuring and managing costs becomes crucial as businesses transition from a capital expense model to an operational expense model, especially amid the challenges of constrained IT budgets. A consumption-based pricing model, aligning costs with actual activity, serves as a mechanism that empowers businesses to concentrate their budgets on prioritising workloads.

Industry 4.0 entails learning from best practices not only from the same industry but from others as well. Sectors such as retail, telecom, and media, where significant advancements are made in provisioning, orchestrating and renewing IT at periodical intervals, can and should inform practices in the BFSI sector.

3 Foundational Capabilities

Each of the transformation domains mentioned in section B above is enabled by a set of foundational capabilities, as illustrated in the figure below. A capability represents an organisational ability to leverage processes to deploy resources (people, technology, and any other tangible or intangible assets) to achieve a particular outcome. This paper categorises these capabilities into six perspectives: Business, People, Governance, Platform, Security, and Operations. Each perspective comprises a set of capabilities that functionally related stakeholders own or manage the cloud transformation journey.

Figure 3: Foundational capabilities of the stakeholders



- **A business perspective** helps ensure that cloud investments accelerate digital transformation ambitions and business outcomes. Stakeholders typically include the chief executive officer (CEO), chief financial officer (CFO), chief operations officer (COO), chief information officer (CIO), and chief technology officer (CTO).
- **People's perspective** serves as a bridge between technology and business, accelerating the cloud journey to help organisations rapidly evolve to a culture of continuous growth learning, where change becomes business-as-normal, focusing on culture, organisational structure, leadership, and workforce.

Stakeholders include CIO, COO, CTO, cloud director, and cross-functional and enterprise-wide leaders.

- **The governance perspective** orchestrates cloud initiatives while maximising organisational benefits and minimising transformation-related risks. Stakeholders include chief transformation officer, CIO, CTO, CFO, chief data officer (CDO), and chief risk officer (CRO).

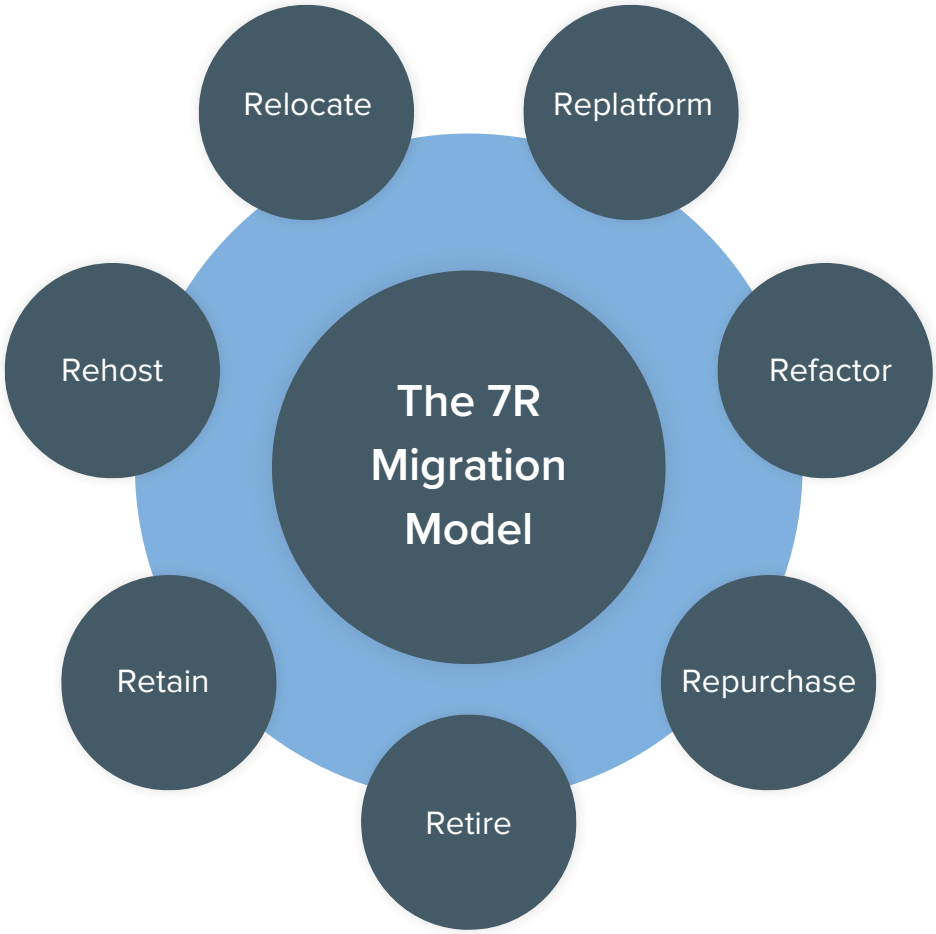
- **The platform perspective** helps you build an enterprise-grade, scalable, hybrid cloud platform, modernise existing workloads, and implement new cloud-native solutions. Stakeholders include the CTO, technology leaders, architects, and engineers.

- **The security perspective** helps you achieve the confidentiality, integrity, and availability of the data and cloud workloads. Stakeholders include the chief information security officer (CISO), chief compliance officer (CCO), internal audit leaders, and security architects and engineers.

- **The operations perspective** ensures that cloud services are delivered at a level that meets the business's needs. Stakeholders include infrastructure and operations leaders, site reliability engineers, and information technology service managers.

4 7Rs of Migration

Figure 4: The 7Rs of Migration



The 7R model, an extension of Gartner's 5R model from 2011, outlines seven migration strategies tailored to cloud adoption. These strategies assist customers in identifying their requirements and transitioning to the cloud accordingly.[17] Following are the 7Rs for cloud migration:

- **Rehost:** Rehosting involves migrating on-premise capabilities to the cloud as is without material changes to the core applications. Since operational and configuration constructs of workloads remain intact, the rehost strategy is also easy to perform and suitable for

[17] Amazon Web Services (n.d.) *Prioritisation and migration strategy.* Retrieved February 16, 2024, from https://docs.aws.amazon.com/prescriptive-guidance/latest/application-portfolio-assessment-guide/prioritization-and-migration-strategy.html#migration-r-type

enterprises lacking in-house cloud-native expertise.

- **Relocate:** Organisations utilising platforms to manage their servers on-premise can relocate to cloud alternatives without altering the underlying code. Relocation minimises downtime and operational disruption, requiring no retraining for staff.

- **Replatform:** With the re-platforming strategy, legacy systems are maintained while workflows are optimised for the cloud environment. This approach modernises workloads and introduces optimisation measures.

- **Refactor:** Refactoring entails redesigning workloads to leverage cloud-native features for enhanced agility, performance, and scalability. It enables applications to embrace advanced functionalities like serverless computing and distributed load balancing.

- **Repurchase:** This method outsources internally managed systems to a third-party cloud service provider. It allows organisations to retire legacy system managers and transition to a consumption-based model, embracing the flexibility of cloud services.

- **Retain:** This approach maintains applications that cannot be retired. Enterprises choose to retain workloads if they rely on another application awaiting migration or lack immediate business justification for cloud migration.

- **Retire:** The retire method shuts down workflows that are no longer needed in the context of cloud migration.

5 Future Readiness of Banking Enterprises through Cloud Services

The transition to the cloud in banks started with pure application-specific computing and has since transitioned to the private cloud and virtual machines as well. The rapid adoption accelerated during the pandemic, with Indian banking and finance institutions leveraging the technology to enhance their services and move towards greater technological resilience. Cloud Computing is the foundation for utilising emerging technologies like artificial intelligence, robotic automation, and cutting-edge network technologies such as 5G and edge computing within the banking sector.[18] A study by IBM in late 2022 highlighted that nearly 80% of banks worldwide were in the early stages of cloud adoption, indicating the nascency of cloud adoption globally.[19]

The banking sector's readiness for cloud computing in India has been under consideration since 2012 when the RBI Working Group Report on Cloud Computing Option for Small Size Urban Cooperative Banks initiated the assessment of the technology's readiness and impact on the Indian banking sector. The report, while acknowledging the benefits of cloud computing, also recommended some caution due to the limitations of target banks at that time.[20] Subsequently, the RBI has encouraged banks to explore cloud services to optimise costs while maintaining security standards. In 2013, the Institute of Development and Research in Banking Technology (IDRBT) released a cloud security framework further supporting this initiative.[21] However, a concrete step was taken last year through RBI's Master Direction on Outsourcing of Information Technology.[22]

The readiness of the financial industry for cloud computing encompasses factors such as infrastructure, ecosystem adoption, security and assurance, talent, and human affinity.[23] An assessment of these aspects allows us to gauge a nation's readiness to transition its technological foundations, especially concerning the financial sector's shift to cloud computing.[24] Most recently, according to Infosys' Global Cloud Ecosystem

[18] ET BFSI Staff (2023 May 3) *Why is the financial services sector in India shifting to cloud?* Economic Times BFSI. Retrieved on December 20, 2023 from https://bfsi.economictimes.indiatimes.com/news/financial-services/why-financial-services-sector-in-india-need-to-transition-to-cloud/99981404

[19] Ramamurthy ,S. Et al. (2022 October 7) *Nearly 80% of Banks Globally Remain in Nascent Stages of Their Hybrid Cloud Adoption.* IBM. Retrieved on December 16, 2023 from https://newsroom.ibm.com/Nearly-80-of-Banks-Globally-Remain-in-Nascent-Stages-of-Their-Hybrid-Cloud-Adoption

[20] Working Group Report on Cloud Computing (2012 October) *Working Group Report on Cloud Computing Option for Small Size Urban Cooperative Banks,* RBI. Retrieved on 20th December 2023 from https://rbidocs.rbi.org.in/rdocs/PublicationReport/Pdfs/RWGFUF031012.pdf

[21] IDRBT Cloud Security Framework Working Group(2013 August) *Cloud Security Framework for Indian Banking Sector,* IDBRT. Retrieved January 28, 2024 from https://www.idrbt.ac.in/wp-content/uploads/2022/07/Cloud-Security-Framework-2013.pdf

[22] Reserve Bank of India (2023 April 10) Master Direction on Outsourcing of Information Technology Services. Retrieved January 28, 2024 from https://rbi.org.in/Scripts/BS_ViewMasDirections.aspx?id=12486

[23] Infosys Cobalt (2022 June) *The Global Cloud Ecosystem Index 2022,* MIT Technology Review. Retrieved February 1, 2024 from https://imagesec.infosys.com/Web/Infosys/%7B9b73064b-6ff7-4299-9ae6-f06979569a73%7D_CloudIndex-Global-June22.pdf?elqTrackId=9db63737f4ab48aabc315bbcb85f8f28&elqaid=2913&elqat=2

[24] Dr. Araral, E. et al. (2017) *A Cloud for Doing Good: A Technology Revolution for All in ASEAN.* Microsoft & NUS. Retrieved on December 21, 2023 from https://news.microsoft.com/uploads/2017/10/A-Cloud-for-Doing-Good-FINAL.pdf

Index 2022, India ranked 51 out of 76 countries in cloud adoption.[25] While the migration has commenced and a cloud-first approach has been embraced, significant progress is still required across industries, with the BFSI sector poised to lead the way.

[25] Infosys Cobalt (2022 June) *The Global Cloud Ecosystem Index 2022*, MIT Technology Review. Retrieved February 1, 2024 from https://imagesec.infosys.com/Web/Infosys/%7B9b73064b-6ff7-4299-9ae6-f06979569a73%7D_CloudIndex-Global-June22.pdf?elqTrackId=9db63737f4ab48aabc315bbcb85f8f28&elqaid=2913&elqat=2

6 Use Cases of Cloud Services for the Banking and Finance Industry

While we have explored the benefits of cloud computing and its relevance for the banking and finance sector, several case studies currently in operation demonstrate its reliability and operational resilience. These case studies underscore the significant strides the BFSI sector has taken in embracing the cloud. Key features of cloud computing, such as storage capabilities, cost reduction, risk management and disaster recovery, enhanced security, data analytics, scalability, and business continuity, are crucial in ensuring smooth day-to-day operations for businesses. Following are some of the case studies/use cases for the BFSI sector, illustrating how cloud adoption has made a significant impact on the operation of these entities:

- **Axis Bank:** Axis Bank has collaborated with CSPs to release cloud-based financial services such as their Buy Now Pay Later ('BNPL') and other ancillary services. The move enabled them to shorten onboarding time to just 8 minutes for certain account types, increasing customer satisfaction and reducing costs.[26]
- **AU Small Finance Bank:** The AU 0101 mobile app enables the bank to provide its services almost entirely online, relying on video banking. This approach increases the reach of its services in rural areas and diminishes operational costs.[27]
- **Piramal Capital & Housing Finance Limited:** Cloud services were relied upon to build an end-to-end loan management system that reduces loan application processing times, enables better linkages with data streams and enables efficient analysis through centralised dashboards.[28]
- **Aditya Birla Capital Limited ('ABCL'):** Cloud adoption helped the firm build a centralised repository to offer transparency to top management. This centralisation aids in the aggregation and analysis of data from multiple streams, streamlining business operations and improving visualisation.[29]
- **RBL Bank:** Cloud solutions enable efficient, seamless, and flexible data processing for the bank. RBL bank was able to process data faster with a lower price-performance ratio and easier maintenance and adoption. Cloud services are also used to process core banking, microfinance, and credit card data by making them available for business users.[30]

[26] Amazon Web Services (2021, June 29) Axis Bank Powers its Digital Banking Transformation with AWS. Retrieved February 1, 2024 from https://press.aboutamazon.in/news-releases/news-release-details/axis-bank-powers-its-digital-banking-transformation-aws

[27] Amazon Web Service (2022). Press Release: AU Small Finance Bank Delights Customers by Offering Video banking Services Seven Days a Week. Amazon Web Service. https://aws.amazon.com/solutions/case-studies/au-small-finance-bank/

[28] Microsoft (2022 June 3) Piramal Capital & Housing Finance leverages Microsoft solutions to cut turnaround times of loans by 30%. Retrieved February 10, 2024 from https://customers.microsoft.com/en-in/story/1510547334290615504-piramal-capital-housing-finance-limited-banking-capital-markets-azure-en-india

[29] Microsoft (2022 September 16) Aditya Birla Capital unlocks the value of its data with the help of Celebal Technologies. Retrieved February 10, 2024 from https://customers.microsoft.com/en-in/story/1549447249861113725-adityabirlacapital-celebaltechnologies-azuredatafactory

[30] Microsoft (2022 May 16) RBL Bank uses Azure to maintain performance through 600% growth in transactions; achieves faster data processing. Retrieved February 10, 2024 from https://customers.microsoft.com/en-in/story/1503314374371736520-rbl-bank-banking-capital-markets-azure-en-india

- **Standard Chartered:** Standard Chartered utilised cloud services to reduce electricity costs significantly, reallocating funds for more efficient allocation in line with the bank's funding priorities.[31]
- **Privat Bank of Ukraine:** The flexibility and stability provided by cloud solutions were evident in the transition undertaken by the Privat Bank of Ukraine. The state-owned bank transitioned within two months, ensuring stability and security for its customers, even as war threatened local infrastructure.[32]

These case studies demonstrate the efficiencies that cloud solutions can enable for financial institutions, reaffirming the benefits of a potential transition towards cloud-enabled financial services at scale domestically and internationally. In our consultation with experts, we also highlighted the critical role of centralised dashboard-based monitoring of services as an enabler for oversight and data-based decision-making for financial institutions, providing real-time insight into the resilience and feasibility of financial services. Another important aspect is the ability of the cloud to offer cloud-native options to financial services providers. Instead of creating new environments for application development, cloud-native enables businesses to create microservices, thereby reducing vendor lock-ins and increasing portability.[33] Due to the flexibility offered by financial service providers, they are equipped to swiftly launch their services and provide an enhanced customer experience, reducing go-to-market ('GTM') times for their products. These benefits were also emphasised during stakeholder consultations with experts, where they highlighted that customers are seeking expedited services coupled with a good experience. The ability to quickly roll out offerings while delivering a seamless customer journey enables financial institutions to cater to the evolving demands of their clientele, underscoring the significance of agility and customer-centricity in the highly competitive financial services landscape.

[31] Amazon Web Services (2019) Standard Chartered Cuts Risk Grid Costs 60% on Amazon EC2 Spot Instances. Retrieved February 1, 2024 from https://aws.amazon.com/solutions/case-studies/standard-chartered-case-study/

[32] Amazon Web Services (2022) PrivatBank Protects Business, Safeguards Customer Access to Banking Services at Time of Unrest by Migrating to AWS. Retrieved February 3, 2024 from https://aws.amazon.com/solutions/case-studies/privatbank-case-study/?did=cr_card&trk=cr_card

[33] Amazon Web Services (2022) PrivatBank Protects Business, Safeguards Customer Access to Banking Services at Time of Unrest by Migrating to AWS. Retrieved February 3, 2024 from https://aws.amazon.com/solutions/case-studies/privatbank-case-study/?did=cr_card&trk=cr_card

7 The Need for Inculcating Cloud Discipline in Financial Services

The digital transformation of the BFSI sector is already underway, with several banks shifting their operations to the cloud. However, some banks and financial institutions remain hesitant to adopt cloud discipline. The slow adoption or reluctance to outsource critical IT infrastructure to third parties may stem from a lack of trust or awareness of the technology itself. Over time, various steps and upgrades have been undertaken to alleviate concerns and build trust in cloud utility. These include deploying encryption technology to keep data safe from unauthorised external access and limiting access by cloud service providers. Implementing multi-factor authentication, incorporating passwords, biometrics, and complex token elements, has significantly enhanced security measures. Additionally, cloud computing infrastructure offers security patching, enabling testing of new products before deployment at a lower cost. Finally, the ability to create a private cloud provides necessary security guarantees.

These entities should adopt the cloud as the next step towards digital transformation in order for them to scale their business, process faster, and provide customer convenience while saving costs. They need to incorporate cloud discipline into their day-to-day operations to become more agile, efficient, and capable of faster processing, ultimately enhancing the consumer experience.

In the overarching push toward digitalising services, cloud computing emerges as a pragmatic tool for enabling digital resilience and future readiness in the BFSI sector. As adoption is already underway, use cases suggest that Indian banks embrace its benefits by implementing the migration strategies mentioned above is best suited for their respective business models. With incubative policies and regulatory backing from the government and regulators, the adoption of cloud services can certainly be further accelerated across the BFSI industry. Challenges, if any, in the migration and subsequent adoption of cloud in the BFSI sector will be addressed over time, and financial services, with encouragement from the RBI, should embrace cloud technologies on a large scale to enhance efficiency and improve customer services.

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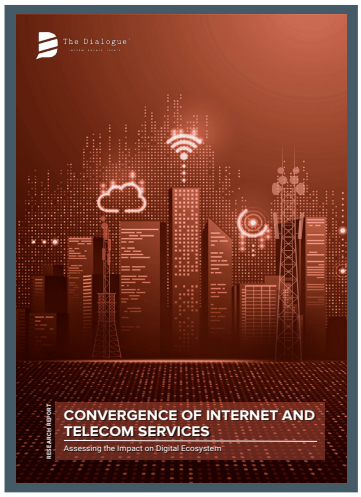

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