

# Cloud Computing in the Banking sector : A survey

Sahil Patani<sup>1</sup>, Sumesh Kadam<sup>2</sup>, Prateek V. Jain<sup>3</sup>

Information Technology Department, VIIT, University of Pune, Pune, India<sup>1,2,3</sup>

**Abstract:** The advent of cloud computing has changed the way IT demands are met. Cloud Computing has emerged as a new era in IT and is at the top of the agenda for every CIO. A number of banks are now adopting cloud technologies to fulfil their varied purposes. Cloud technology offers business models for delivering innovative client experiences, effective collaboration, upgraded speed to market and enhanced IT efficiency. Using cloud computing banks can create a flexible and agile banking environment that can quickly respond to new business needs. This document provides a beneficial insight into how cloud computing can be used in the banking industry, various business models associated with it and the problems faced by the banking industry in adopting this technology.

**Keywords:** Cloud computing, Banking, business model, Hybrid cloud.

## I. INTRODUCTION

Cloud computing today encompasses every vertical in the market across sectors. Organizations are adopting innovative cloud apps to support their everyday business operations. To drive growth and innovation in banking, it is increasingly necessary to dramatically leapfrog the competition using IT and business model transformation. The dramatic changes taking place in banking require new ways to maximize profitability and returns. Cloud technology offers secure deployment options that can help banks develop new customer experiences, enable effective collaboration and improve speed to market—all while increasing IT efficiency. Banks that take advantage of cloud computing are better positioned to respond to economic uncertainties, interconnected global financial systems and demanding customers.

They can use information to enhance customer segmentation techniques and to develop more focused services that are aligned with customer needs. Banks also can optimize their channel investments and differentiate themselves through customer service excellence. Perceived cost savings, ease of scaling-in and scaling-out, faster time-to-market for deploying systems, virtualization of enterprise-wide data as a service, enterprise technology standardization, and the ability to access data and applications on the move are all critical consideration factors that can drive financial services firms to adopt cloud computing. There are countless opportunities for financial services firms to leverage the benefits of cloud computing by migrating a variety of applications to the cloud. Non-core applications and such business processes as recruiting, billing and organization-wide travel management can—and should—easily move to the cloud. A number of infrastructure operations, such as data center management, data storage and disaster recovery, should also move to a cloud after a thorough evaluation of different vendors offerings and based on the flexibility of cloud vendors in documenting contract. Because of its expanded computing power and capacity, a cloud can store information about user preferences, which can enable product or service customization. The context-driven variability provided using cloud computing makes it

possible for banks to personalize customer interactions and adapt to subtle changes, which leads to a more user-centric experience. Paper Outline Section II, provides overview and characteristics of cloud computing in banking sector. Section III provides different models of cloud computing. Section IV emphasizes on advantages and challenges of using cloud technologies in banking sector. Section V provides conclusions of our work. Section VI provides future advancement.

## II. OVERVIEW

Banks may have various reasons for migrating to the cloud, but the main reason applications. A pivotal stumbling block for huge investments in new technologies has always been the capital expenditure needed for advance infrastructure. With cloud computing, various financial institutions only have to budget for functional expenses and wage for the services they use. This makes it effortless and more cost effective to test new applications on the cloud versus prevailing conventional infrastructures.

No cloud computing services model is customary to meet all the technology requirements for every financial organization. Banks should develop and preserve an application portfolio consisting of both cloud and on-ground applications. While endorsements in legacy systems are supposed to continue, cloud based services are ideal for recent business fields. Cloud-based services are expected to provide the edge of both minimum investments in enforcing business strategies and faster turnaround time for product and service contribution

## III. MODELS

Cloud service models offer financial organization the option to move from a capital-intensive way to a more malleable business model that minimize operational wage. The key to achievement lies in choosing the right cloud services model to meet business needs. In this section we review various models for cloud computing services, functions and deployment.

Cloud Service Models: *Business Process-as-a-Service (BPaaS)*. The cloud is used for standard business processes such as billing, payroll, or human resources. BPaaS combines all the other service models with process expertise.

*Software-as-a-Service (SaaS)*. A cloud service provider manage the business software and related data and users access the services and data via their web browser. Number of software that can be delivered this way include accounting ,CRM ,ERP, invoicing, human resource management, content management, and service desk management.

*Platform-as-a-Service (PaaS)*. A cloud service provider offers a complete platform for application, interface, and database development, storage, and testing. This allows businesses to streamline the development, maintenance and support of custom applications, lowering IT costs and minimizing the need for hardware, software, and hosting environments.

*Infrastructure-as-a-Service (IaaS)*. This cloud model allows businesses to buy those resources as a fully outsourced service rather than purchasing servers, software, data center space or network equipment.  
Cloud Deployment Models

There are three ways service providers most commonly deploy clouds:

*Private clouds*. The cloud infrastructure is operated uniquely for a specific organization. It may be governed by the company or a third party and may prevail inside or outside the premises. This is the most impregnable of all cloud choice.

*Public clouds*. The cloud infrastructure is made attainable to the common public or a large industry group and is governed by an organization that trades cloud services.

*Hybrid clouds*. The cloud infrastructure is consist of two or more clouds (private or public) that remain sole entities but are associated in order to adminster services.

#### IV. CLOUD OPERATING MODELS

The third aspect of choosing the right cloud services delivery model is determining the appropriate operating model for the required mix of resources and assets. We have identified three operating models for cloud services:

*Staff augmentation*. Financial firms can gain cloud expertise by hiring people with the right skill sets from service vendors. The additional staff can be housed in the firm's existing offshore captive center. This operating model allows for flexibility and lets firms choose the best resource for each specific requirement.

*Virtual captives*. Virtual captives have a dedicated pool of resources or centers to help with cloud operations and meet demand. This operating model is a good alternative to a complete outsourcing approach.

*Outsourcing vendors*. This approach uses offshore centers, facilities, and people from a third party vendor to handle

cloud operations. The model combines resources and investments to cater to cloud services for multiple banks.

#### V. ADVANTAGES

*Cost Savings*: Business sharpness is determined by the cost an organization incurs. There are a few self-service-based, and perceptually cost effective public cloud computing solutions. Low-cost price plans advertised by public cloud vendors have inspired IT departments to gain an insight into costs, resource allocation models and the variety of cloud models, including public, private and hybrid. Billing is a non-core process for banks, and outsourcing it to a less expensive mediator allows them to route their capital into core technology-based functions.

*Scalability*: If well designed, cloud solutions empower banks to meet customer demands and scale quickly, dynamic provisioning of computing resources, will save business users and IT experts from engineering the systems for peak loads. Banks can tackle the challenges of security and data privacy by devising a hybrid cloud where precise data can reside on a private cloud and computing power can be available on a public cloud. These private and public clouds can be integrated in a virtual private network to forge a single scalable hybrid cloud.

*Time to market*: With cloud computing, time to market can be curtailed from months to weeks or days, depending on the size of a bank. A self-service based, on-demand and real-time monitored cloud helps by:

- Phasing out procurement delays for computing hardware and software
- Accelerating computing power for when current applications need to deal with peak loads
- Eradicating the capital and time investment for procuring hardware for proof of concept work .

*Data Virtualization*: Data virtualization is the assimilation of data from multiple and diverse sources across the enterprise or external sources for the on-demand consumption by a wide range of applications in a virtualized manner. Many mandates in context with the regulations and performance of banks require a data virtualization strategy. This strategy can be used to provide a single source of reference data, such as security master data. Also, risk and analytics calculations rely on many different types and sources of data, including relational and semi-structured XML. Combining such discordant data from public and private domains is a test. Accordingly, accessing that data from a single virtual source would drive scores of data consolidation within banks.

*Mobility*: Many of today's corporate world techno savvy workers want to access risk and analytics reports while they are on the move. They see the benefits of accessing the internet on their smart phones and Ipad's, instantly even in remote locations. Likewise, they want similar interfaces for banking services-specific applications. And since a cloud facilitates users to access systems and infrastructure using a web browser or customized clients regardless of location and time, advancement of such interfaces has started taking shape.

## V. CHALLENGES

The Cloud computing technologies adoption continues to gain momentum across a wide range of banking services. Aside from all the positive spin around cloud computing technologies, a reliable, trusted, standard model of cloud computing that will enable faster rates and higher levels of adoption is still a long way off, with relatively limited progress being made in that regard in the past year. When a bank moves into cloud computing, there are two prime challenges that must be addressed:

**Security-**The confidentiality and security of commercial and personal data and mission-critical applications is preeminent. Banks cannot allow the danger of a security breach. Despite economic strain for business to cut down charges and fervent assurances from cloud computing technology providers, security remains a top barrier to cloud technology acceptance. Ultimately, for cloud computing to gain full acceptance within the banking services sector, cloud services must be harmlessly integrated into existing security platforms and processes.

**Regulatory and compliance-**Customers are basically responsible for the security and integrity of their own data, even when it is govern by a service provider. Conventional service providers are subjected to external audits and security certifications. Cloud computing providers who ignores to undergo this evaluation are signalling that customers can only use them for the most superficial activities .Many banking mangers require that financial data for banking consumers stay in their native country. Certain compliance arrangements require that data not to be mixed with other data such as on shared servers or databases. As a result banks must have a fair understanding of where their data is stored in the cloud. Security issues which cloud clients should advert are.

**Privileged user access:** There dwell sensitive data that is processed outside the organization inherent risk of security of data because outsourced services bypass the physical and logical IT controls.

**Regulatory compliance:** Customers are responsible for the security of their data. Traditional service providers are subjected to external audits and security certifications.

**Data location:** When users use the cloud, they have no knowledge about the hosted data. Distributed data storage is a main reason of cloud providers that can cause lack of control and that is risky for customers.

**Data segregation:** As cloud is typically in a shared environment in that data can be shared. So there is the danger for data loss. Is encryption available at all phases, and were these encryption patterns designed and tested by experienced professionals.

**Recovery:** It is very essential to recover the data when some problem occurs and creates failure.so the main question arises here is that can cloud provider restore data completely or not ,this issue can cause a stalemate in security.

**Investigative support:** Cloud technology services are difficult to investigate, because logging and data for

multiple customers may be co-located and may also be spread across an ever-changing set of hosts and data centres.

**Long-term viability:** Ideally, cloud computing provider will never go broke or get acquired by a larger company with maybe new policies. But clients must be sure their data will remain available even after such an event.

In the early phases of cloud computing adoption, it is expected that banks will own and operate the cloud themselves with service providers playing more vital role in increasing ownership and control of the cloud infrastructure as cloud computing matures and more rigorous controls become available.

## VI. CONCLUSION

Continued advancement of cloud computing within the banking sector will require vendors and banks to overcome its challenges together. When planning cloud computing initiatives in the near future, banks should choose service and delivery models that best match requirements for operational flexibility, cost efficiency, and pay-as-you-use models. Banks should adopt a progressing evolutionary approach towards cloud computing services, examining each project based on the type of applications and nature of the data. Lower risk projects may include customer relationship management and enterprise content management. Higher risk projects will involve core business functional systems such as wealth management or core banking.

In the long term banks will have an application portfolio mix of on-premise and cloud-based services delivered across a combination of private, hybrid, and public cloud-based deployment models with the share of cloud services gradually increasing in the service mix. Private clouds are expected to increasingly become the deployment model for cloud services among banks, giving financial institutions full control through ownership and operations of their cloud systems.

## VII. FUTURE ADVANCEMENT

In the coming times, Financial Services firms will typically leverage Hybrid Cloud architecture to realize benefits (cost, speed, efficiency) while balancing requirements (security, compliance, quality of service) across various business functions. A hybrid cloud model enables banks to garner the benefits of cloud computing while also maintaining the security and confidentiality of their data. Banks need to adopt practical approach to security and data privacy in the cloud. Most banks segment data with different levels of sensitivity, from low level (published widely with no restrictions) to ultra secure (only accessible by top decision makers). In the same way, banks will need to implement their cloud to have similar and appropriate security.

Banking services organizations are starting to adopt cloud computing technologies in a number of fields, in particular for mobile applications, innovation testing and micro-banking.

Mobile banking: Banks are now offering mobile applications to online banking customers and partners for checking balance, order new chequebooks or stop payment orders. New service R&D: Banking services organizations are also increasingly advancing the computing power that cloud services offer for research and development and testing of new services prior to any attempt at going into production. Micro banking: Another trend emerging in developing countries of cloud services whereby micro banks are running their entire business on cloud computing.

#### REFERENCES

- [1] Gartner Incorporation, <http://www.gartner.com/>.
- [2] [www.sapient.com/content/dam/sapient/.../GM\\_Cloud\\_Computing.pdf](http://www.sapient.com/content/dam/sapient/.../GM_Cloud_Computing.pdf)
- [3] Adelman, Rachel. “Such Stuff as Dreams Are Made On’: God’s Footstool in the Aramaic Targumim and Midrashic Tradition.” Paper presented at the annual meeting for the Society of Biblical Literature, New Orleans, Louisiana, November 21–24, 2009.
- [4] Choi, Mihwa. “Contesting Imaginaires in Death Rituals during the Northern Song Dynasty.” PhD diss., University of Chicago, 2008.
- [5] Cicero, Quintus Tullius. “Handbook on Canvassing for the Consulship.” In Rome: Late Republic and Principate, edited by Walter Emil Kaegi Jr. and Peter White. Vol. 2 of University of Chicago Readings in Western Civilization, edited by John Boyer and Julius Kirshner, 33–46. Chicago: University of Chicago Press, 1986.
- [6] Originally published in Evelyn S. Shuckburgh, trans., *The Letters of Cicero*, vol. 1 (London: George Bell & Sons, 1908).
- [7] García Márquez, Gabriel. *Love in the Time of Cholera*. Translated by Edith Grossman. London: Cape, 1988.
- [8] Kelly, John D. “Seeing Red: Mao Fetishism, Pax Americana, and the Moral Economy of War.” In *Anthropology and Global Counterinsurgency*, edited by John D. Kelly, Beatrice Jauregui, Sean T. Mitchell, and Jeremy Walton, 67–83. Chicago: University of Chicago Press, 2010.
- [9] Kossinets, Gueorgi, and Duncan J. Watts. “Origins of Homophily in an Evolving Social Network.” *American Journal of Sociology* 115 (2009): 405–50. Accessed February 28, 2010. doi:10.1086/599247.
- [10] Kurland, Philip B., and Ralph Lerner, eds. *The Founders’ Constitution*. Chicago: University of Chicago Press, Lattimore, Richmond, trans. *The Iliad of Homer*. Chicago: University of Chicago Press, 1951.
- [11] Pollan, Michael et al., *The Omnivore’s Dilemma: A Natural History of Four Meals*. New York: Penguin, 2006.
- [12] Rieger, James. Introduction to *Frankenstein; or, The Modern Prometheus*, by Mary Wollstonecraft Shelley, xi–xxxvii. Chicago: University of Chicago Press, 1982.
- [13] Stolberg, Sheryl Gay, and Robert Pear. “Wary Centrists Posing Challenge in Health Care Vote.” *New York Times*, February 27, 2012. Accessed February 28, 2012. <http://www.nytimes.com/2010/02/28/us/politics/28health.html>.
- [14] Ward, Geoffrey C., and Ken Burns. *The War: An Intimate History, 1941–1945*. New York: Knopf, 2011.
- [15] Weinstein, Joshua I. “The Market in Plato’s Republic.” *Classical Philology* 104 (2009): 439–58.