Banking Analysis

Cloud banking or banking in the clouds?

Filip Blazheski

- **Cloud computing is used by most banks, but not commonly for core services, mainly due to risk concerns**
- **Moving core services to the cloud could help banks focus on their primary mission and save money, but it comes with significant challenges**
- **Smaller banks will lead the transition of core services to the cloud as they are positioned to make the largest relative gains**

Cloud computing is computing that uses data stored on an external server, accessed via the Internet. It's defined as ubiquitous, 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] It is an evolutionary result of the improvements in digital networks and computing speed over the last decades. Banks are already widely using cloud computing for non-core and non-critical uses, such as human resources, e-mail, customer analytics, customer relationship management, and development and testing (88% of surveyed EU-based financial institutions were already using cloud based services by June 2015),[2] while a few smaller banks either have transferred or are in the process of transferring entire core services (treasury, payments, retail banking, enterprise data etc.) to the cloud (U.S.-based Independence Bancshares, Tunisia-based Zitouna Bank, U.K.-based My Community Bank, and Australia's ME Bank, for example). This brief looks into the relationship between banks and technology; presents an overview of the cloud model; outlines the model's benefits, costs and risks; discusses risk management strategies; and predicts what the near future holds for cloud computing in banking.

Banks as technology companies?

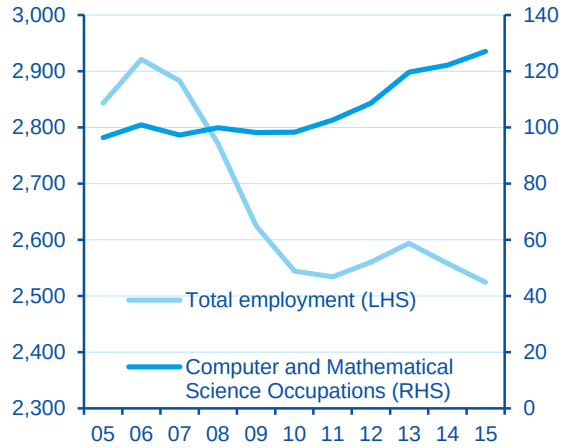
Banking technology was mostly manual until the mid-20th century, when computers were brought in to automate and speed up processes. The first computer in banking was introduced to process checks in 1955. Since the late 1950s, banks have relied heavily on in-house mainframes and server farms for data processing. In the 1980s and 1990s they started using personal computers (PCs) to interact with the mainframes, replacing the older terminal technology. The use of PCs has allowed access to external networks through the web and e-mail, while the explosive growth of the Internet and mobile computing has led to online banking, bringing tremendous flexibility and convenience to customers, while lowering costs. For example, the annual number of noncash payments in the U.S. is more than 122 billion and increases by more than 11 million per day. However, this has also exposed banks' data ever more to security breaches. For example, the value of unauthorized transactions per year is around $6.1bn.

[1] National Institute of Standards and Technology (2011). http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf
[2] ENISA. Secure Use of Cloud Computing in the Finance Sector. https://goo.gl/txcRKd

The greater transparency that online banking and the digital economy provide also lead to greater competition between banks, as well as disruption from new entrants. This leads to ever more products and services, adding to the demands on banks' IT infrastructures. A reflection of all of this is the increasing share of computing-related professionals in total employment in the industry. For example, between 2005 and 2015, the number of employees in credit intermediation with computer and mathematical science occupations increased 32% (from 96K to 127K), while the total employment in credit intermediation contracted 11% (from 2,843K to 2,524K) (Chart 1).

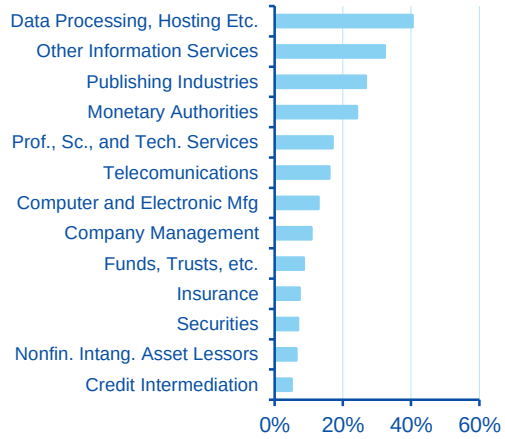
However, the predominant occupations found within credit intermediation and "management of enterprises and companies," which covers bank holding companies, do not include computer scientists and programmers (Chart 2). This influences the corporate cultures of banks, as they are, in part, molded by the requirements of their industry [3]—competitive environment, customer requirements, and societal expectations. If banks are not information technology companies in the traditional sense of the word, despite their high technological intensity, the question of whether they might be losing out by not focusing on core competencies, including having core services on the cloud, becomes very pertinent. As each bank tries to answer this question, it will be weighing control vs. transaction costs related to two alternatives—using in-house data centers and software or cloud computing for core services.

Chart 1
Employment in credit intermediation
Thousands



Source: Bureau of Labor Statistics & BBVA Research

Chart 2
IT-related occupations by industry
% share



Source: Bureau of Labor Statistics & BBVA Research

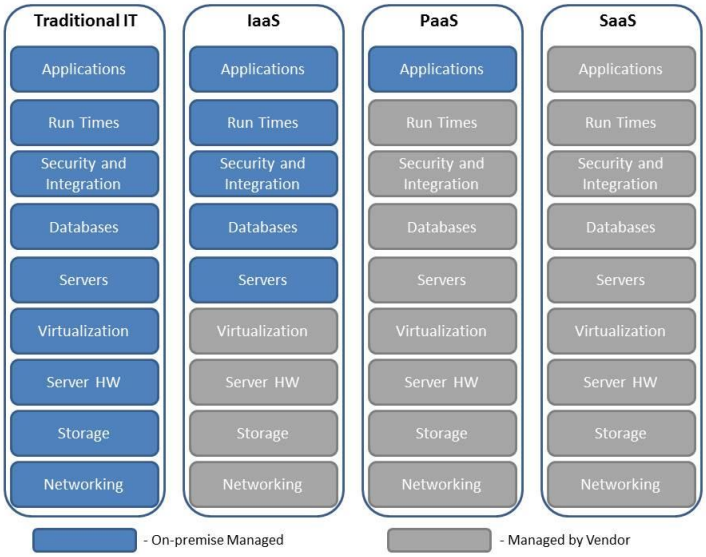
Cloud computing service and deployment models

There are three main cloud computing models: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). SaaS allows use of a provider's applications on a cloud infrastructure. The consumer does not manage or control the underlying cloud infrastructure including the network, servers,

[3] Gordon, G (1991). Industry Determinants of Organizational Culture. Academy of Management Review. http://goo.gl/b0stGV

operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings (Chart 3). PaaS gives users more control as it allows them to deploy onto the cloud their own or acquired applications, as long as they have been created using programming languages, libraries, services, and tools supported by the provider. IaaS allows consumers even more control, as it provides consumer processing, storage, networks, and other fundamental computing resources to deploy and run arbitrary software.[4] According to Cisco, 45% of the installed cloud computing workloads in 2014 used the SaaS model, 42% used IaaS and 13% used PaaS. Cisco forecasts that by 2019, SaaS will account for 59%, IaaS for 28% and PaaS for 11%.[5] Banks are already using SaaS for non-core services in cases when they are able to outsource business processing, such as billing, payroll, or human resources, and are actively exploring moving more critical services to the cloud, but so far, only relatively small banks have transferred the entirety of their core services onto the cloud. When they have done so, they have relied on the PaaS or IaaS models.

Chart 3
Cloud computing models and process and resource management



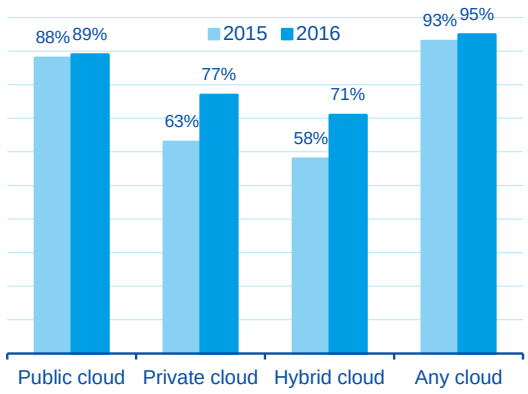
Source: Wenk, D. Porter's Five Forces Analysis of Cloud Computing. http://goo.gl/4azvLP

When moving core services to the cloud, banks have four deployment models: private cloud, community cloud, public cloud or hybrid cloud, which differ by the level of exclusivity offered. Banks generally appreciate the security that private clouds provide, but this comes at the expense of some scalability and cost. Community cloud is a deployment model in which the cloud is used by a community of users with similar needs and concerns, while the public cloud implies use by multiple unrelated users. The banks that have already moved core services to the cloud have used private or hybrid cloud models with one of the big providers (Amazon Web Services, Google and Microsoft being the market share leaders) to keep sensitive data within firewalls, and in that way, fulfill local regulations and client confidentiality requirements. A January 2016 survey of 1,060 technical professionals across a broad cross-section of organizations shows that the use of the cloud is still increasing, but

[4] National Institute of Standards and Technology. (2011). http://dx.doi.org/10.6028/NIST.SP.800-145
[5] Cisco Global Cloud Index, 2014–2019. http://goo.gl/HP1AyY

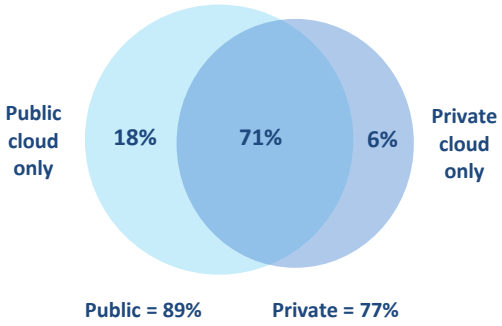
also that the technology is relatively mature as almost all businesses are aware of it and know its benefits (Charts 4 and 5).

Chart 4
Respondents adopting cloud
% of respondents



Source: RightScale 2016 State of the Cloud Report

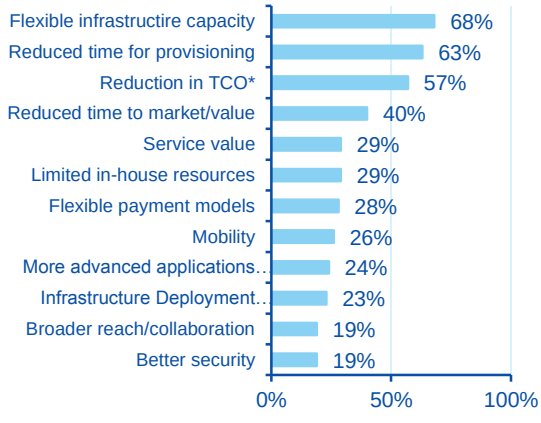
Chart 5
Cloud model in use
% of all respondents



Source: RightScale 2016 State of the Cloud Report

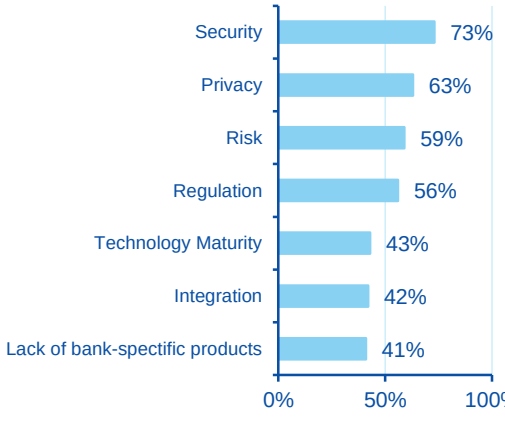
Moving core services onto the cloud is a strategic management decision that comes with benefits, costs and risks. There are multiple ways to group the benefits of cloud computing (Chart 6), but almost all of them stem from the ability of banks to obtain computing power and tools at a lower cost and with improved functionality, while focusing on core competencies. But as is usually the case, these benefits come with numerous costs and potential risks (Chart 7).

Chart 6
Reasons for adopting cloud computing
% of respondents



*TCO – Total cost of ownership
Source: CSA. Cloud Adoptions Practices & Priorities Survey Report

Chart 7
Reasons why U.S. banks are avoiding cloud technology
% of respondents



Source: Forrester, quoted in American Banker (http://goo.gl/AYJFDK)

Potential benefits

First, using the cloud instead of proprietary hardware, and in some cases software, could help lower costs due to the sharing of resources, specialization, benefits from higher scalability and flexibility, and the decreased need to maintain transaction power that is rarely used but required for smooth operation of increasingly complicated banking operations (overprovisioning). A study conducted by Booz Allen Hamilton found that for an average U.S. government agency migrating to the cloud, the NPV would be positive, with a discounted payback period between 2.7 and 3.7 years, depending on the deployment model (Table 1).[6]

Table 1
Life cycle costs and economic summary of traditional IT and cloud computing models

	Status Quo: 1,000 server (non-virtualized) environment	Scenario 1: Public cloud	Scenario 2: Hybrid cloud	Scenario 3: Private cloud
Investment phase costs (3 yr period)	$0.0	$3.0	$6.1	$7.0
Operating and support costs (13yr period)	$77.3	$22.5	$28.9	$31.1
Total life cycle costs	$77.3	$25.5	$35.0	$38.1
Economic metrics				
Net present value	N/A	$41.8	$33.7	$31.1
Benefits/cost ratio	N/A	15.4	6.8	5.7
Discounted payback period (years)	N/A	2.7	3.5	3.7

Source: Adapted from Alford T., Morton G. (2009). The Economics of Cloud Computing. Booz Allen Hamilton http://goo.gl/FmcPHL

Second, the cloud could help banks become more agile when developing new products and services. For example, project teams would have less need to negotiate for resources with internal stakeholders and to obtain sign-offs, again because of the flexibility and scalability of the cloud (infrastructure elasticity), as well as the smaller limitations from legacy technologies. Anecdotal evidence suggests that deploying a server on the cloud takes a day, versus the nine months it would take in a traditional setting because of sign-off requirements by various departments.[7] Cloud computing often comes with more flexible and usage-based billing arrangements, allowing financial institutions to pick and choose services required on a pay-as-you-go basis.[8]

Third, cloud computing can provide greater security compared to traditional platforms. This is especially valid for smaller banks that have limited IT budgets. Banks typically use a patchwork of solutions for their core processes, which due to the need to provide ever more internet and mobile access to clients, as well as flexibility to the banks' workforce, becomes more exposed to cyber threats. Cloud platforms are developed with connectivity in mind and by specialized companies with very little legacy constraints, which makes them potentially more secure. Also, cloud computing could provide a more reliable business continuity solution due to the distributed nature of storage and processing, as well as the ability to move data more quickly. However, there is still no hard

[6] Alford T., Morton G. (2009). The Economics of Cloud Computing. Booz Allen Hamilton http://goo.gl/FmcPHL
[7] Darrow, B. (2016). Pssst, Amazon Cloud Is Not Really New to Banks. Fortune Magazine http://goo.gl/UEVi8l
[8] Capgemini. Cloud Computing in Banking. https://goo.gl/csSp5c

data to support the assumption that cloud computing is more secure, mostly due to the lack of transparency when it comes to reporting vulnerabilities.[9]

Fourth, given the flexibility of the cloud, it could help with data mining and provide richer data analytics insights, especially as data analytics requires increasingly more computing power and moves from batch to real time. As big data becomes more important for gaining and maintaining competitive advantages, the cloud becomes an increasingly attractive option. The advantages of cloud analytics are multiple. Any good SaaS application is developed with big data analytics in mind and usually provides attractive analytics functionalities. For banks that opt for PaaS and IaaS models, using the cloud for analytics can provide better ability to handle large data sets and greater agility. These benefits are arousing strong interest in all kinds of businesses: a survey conducted in 2015 showed that 15% of organizations had already deployed cloud-based analytics solutions, while 39% were planning to actively deploy or analyze them in the following 12 months.[10]

Last but not least, cloud computing could help banks lower their carbon footprint, contribute to a cleaner planet, and achieve corporate responsibility goals due to the higher energy and resource efficiency of the cloud compared to traditional computing.

Costs and potential risks

Transitioning from a traditional to a cloud computing environment entails switching costs that can be very high. For example, a dedicated workforce would need to be established to prepare, manage and execute the switching to the cloud, with the task of possibly replacing applications that are not compatible with the cloud providers' platform with new ones. Other switching costs include the network bandwidth needed for moving the data, any upload or download fees charged by the cloud provider,[11] as well as any potential costs related to moving the data from one cloud provider to another. Booz Allen Hamilton has conducted sensitivity analysis based on multiple models of migration to the cloud, finding that the length of the cloud migration is one of the most influential factors driving economic benefits. The longer the migration schedule, the lower the benefits, which underscores the need to plan, budget and implement the transition in detail and with precision—something that is not always easy to do.

Second, banks, more than any other business, face regulatory challenges due to the sensitive nature of their data. While there are no specific regulations that prohibit banks from using cloud providers for core services in the U.S. at the moment, the regulatory picture is uncertain. In other countries, there are concerns related to the storage location of data, which in some cases has to be within the local jurisdiction. A recent EU report found that "the financial industry is dealing with a lack of clear, formal guidance that is consistent across all National Financial Services Authorities on the specificities of cloud based services."[12] This contributes to banks' reluctance to move core services to the cloud as any regulatory changes going forward could incur unforeseen costs.

[9] CSA. (2013). Cloud Computing Vulnerability Incidents: A Statistical Overview. https://goo.gl/9fdIcR
[10] International Data Group. (2015). The State of Cloud Analytics, Market Pulse Research. https://goo.gl/EEaspC
[11] Violino, B. (2011). The Real Costs of Cloud Computing. Computerworld. http://goo.gl/yXHB1T
[12] ENISA. (2016). Secure Use of Cloud Computing in the Finance Sector Good practices and recommendations. https://goo.gl/txcRKd

Third, banks face increased third party (including security) risk due to relinquishing control over important parts of the corporate infrastructure, which could result in lower security and impacted privacy. Even though in theory, the cloud could be more secure, there are estimates that show otherwise. A recent survey of vulnerabilities in cloud computing revealed that the frequency of vulnerability incidents in the cloud almost quadrupled between 2008 and 2011.[13] This underscores the fact that, as the use of cloud computing grows, the number of attacks and vulnerabilities will grow as well. A Ponemon Institute study[14] found a "cloud multiplier effect," namely that the use of cloud applications instead of traditional IT solutions could result in more damage due to the increased frequency and cost of data breaches. The study found that a breach of data stored in the cloud involving the loss or theft of 100,000 or more customer records could have an average cost of as much as $5.32 million, compared to $2.37 million if the data is stored in-house. Banks are especially concerned about delays in reporting the occurrences of breaches by cloud computing providers, which could magnify their operational and reputational risks.

Fourth, banks that move core services to the cloud face the risk of opportunistic recontracting by providers, as the third party provider gains significant bargaining power, being aware that the user faces switching costs. The EU Agency for Network and Information Security (ENISA), after conducting interviews with multiple financial institutions, identified a lack of negotiating power on behalf of financial institutions when negotiating specific contract clauses with large cloud service providers. This risk will become more apparent as more banks move services to the cloud—a market dominated by a few large players.[15]

Last but not least, there are unknown unknowns. By moving core services to the cloud, banks could end up worse off if the costs outweigh the benefits. Therefore, it is not surprising that banks have been very careful with the potential transition, especially large banks that have already invested significant resources into in-house information technology resources and are considered to be industry technology leaders.

Managing downside risks

Maximizing the benefits, while minimizing the costs and downside risks requires disciplined and comprehensive risk management. The tools that banks could use for this include conducting due diligence when selecting the provider, carefully crafting service level agreements and using severe penalty clauses covering any potential accidents, performing ongoing monitoring and audits, and developing and maintaining contingency plans for terminating relationships, etc. The primary obstacle to effectively using these tools is the size and power of the cloud computing providers. It would be very hard for a small community bank to effectively negotiate with or audit a behemoth like Amazon or Google, and even large banks can find it challenging, as the ENISA study has shown. One risk management strategy that has worked in other industries has been quasi-integration (minority control, strategic alliances), but this is likely not feasible even for the largest banks, again due to the sheer size of cloud computing providers. An alternative for banks would be setting up a community cloud for financial institutions, or at least coming to an agreement on universal requirements for cloud computing providers.

[13] CSA. (2013). Cloud Computing Vulnerability Incidents: A Statistical Overview. https://goo.gl/9fdIcR
[14] Ponemon Institute. (2014). Data Breach: The Cloud Multiplier Effect. http://goo.gl/e50p1f
[15] ENISA. (2015). Secure Use of Cloud Computing in the Finance Sector Good practices and recommendations. https://goo.gl/txcRKd

What does the future hold?

Deciding whether or not to move core services to the cloud is a strategic decision that like all outsourcing decisions involves detailing and comparing control vs. transaction costs and risks. Kotabe and Mol (2009)[16] found a curvilinear effect between outsourcing and performance, meaning that in industries where there are preconditions to outsource, it can contribute positively to performance to a certain degree, after which the marginal effects disappear and then turn negative. In regards to technology, banks are still vertically integrated and could likely benefit from outsourcing more services, but the optimal point is unknown. While banks usually know what the costs and risks are related to traditional environment computing, they do not know with certainty what the transaction costs related to using cloud computing for core services would be.

Technological developments have now made cloud computing readily available and cheaper, but the terms of the transactions in the long run will be heavily influenced by the balance of power between banks and cloud computing providers. As the number of banks will likely be larger than the number of cloud computing providers, in the absence of efficient regulation and competition, banks could end up in a situation where the providers dominate, and thus increase prices or renegotiate contracts to the detriment of banks. Cloud services take a standardized form of raw computing power, so if the transition is planned and managed well, the low asset specificity can keep switching costs low, thus improving banks' bargaining power.

All of this makes it difficult to predict if, when and how banks, especially those considered as technological leaders, will move core services to the cloud, but it is very likely that the trend of small banks transferring core services to the cloud will continue and intensify. The larger banks are likely to transition services onto the cloud step by step, diving deeper into the cloud application in areas such as human resources, customer analytics and customer relationship management, development and testing, and in some cases, payments, all the while continuously assessing trade-offs. Ultimately, the trip to cloud nine will be different for each bank.

[16] Kotabe, M. Mol, M. (2009). Outsourcing and financial performance: A negative curvilinear effect. Journal of Purchasing and Supply Chain Management. http://goo.gl/zKKbS1