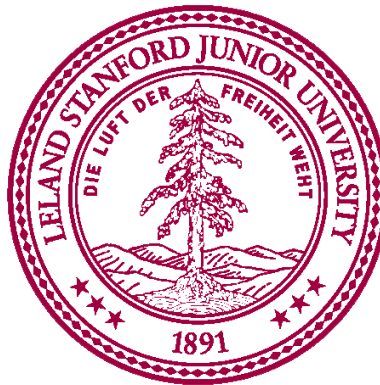# Leading Trends in Information Technology MS&E-238

PhD Daniel Barreto

ASCENDING TO THE CLOUD: THE BUSINESS MODEL OF CLOUD COMPUTING IN 2014

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1.0 Introduction

The final purpose of the research we illustrate in this paper is to describe all the different features of the cloud computing business in 2014. Since this technology is developing and growing fast, our aim is to clearly define its actual aspects and potentialities for the future. Cloud computing has not only introduced a new kind of IT technology in the market, but has also revolutionized the existent businesses operating in several different sectors. Changings regard the business model, the way of organizing employees' work, the estimation of costs and profits and numerous other key factors for corporations. Our overview of the cloud computing market passes though statistics, academic publications, newspapers' articles and experts' opinions. In this way, we made our research complete and detailed.

The paper is divided into three main sections.
First of all, we examine the actual situation of the market. This part of our paper includes descriptions of cloud services providers' strategies, the competition among them, and customers' requirements and concerns about cloud services. We focus on specific needs of corporations and public organizations currently using cloud services or planning to do so in the next few months. Moreover, we report statistics about the expected future trends of this market, in order to understand how profitable this business is and the volume of the demand from customers.
Secondly, we discuss the transformations caused by cloud computing within companies. In particular, we focus our SWOT analysis on the financial services industry. Then we examine the major changes in companies' business models and cloud services impacts on them. This section ends with the analysis of the modifications brought by cloud computing in the staff organization of companies' IT departments.
Thirdly, we report and discuss opinions of the experts about past, present and future of cloud computing. Our analysis begins with the discussion upon the origin of the name and the illustration of the first concepts of the cloud, moving towards the current situation and future expectations through the perspective of distinguished experts.

In order to analyze these aspects of cloud computing, we utilized a broad variety of resources. For the first section, we compared the most updated statistic web sources and verified accuracy and consistency of data. We mainly used academic publications for the second part of our work. Moreover, in the same paragraph, we included results of analytical models applied to the specific sector of financial services. Finally, we could personally get opinions and thoughts from one of the experts we cite in the last section. In addition to this, we searched for different perspectives among distinguished personalities from newspapers such as Forbes and The Wall Street Journal.

2.0 Cloud Computing: Current Players

2.1 Supplier - Analysis of the Supply Side of the Cloud Computing Market.

In this section we will examine the different kinds of cloud services offered by vendors and the competition among the main providers in the market. Finally, we will provide two examples of partnerships between some of the companies currently providing cloud services.

Cloud computing services are divided into three classes (Voorsluys, 2014), according to the abstraction level of the capability provided and the service model of providers. These three classes are: (1) Infrastructure as a Service (IaaS), (2) Platform as a Service (PaaS), and (3) Software as a Service (SaaS).IaaS providers offer virtualized resources by managing VMs with a software stack that can be customized by the users. PaaS providers offer an environment on which developers create and deploy applications without any concern about the number of processors or how much memory they are using. SaaS providers offer several services that can be accessed by end users through Web portals; this means that traditional desktop applications such as word documents can be accessed as a service in the Web.

Considering the deployment model, there are three types of cloud: private, public or hybrid. The alternative to this technology is the traditional dedicated infrastructure. According to Microsoft, today most of the companies run dedicated servers (48%) but this percentage is expected to decrease in the next two years with an increase of hosted private cloud users (Microsoft, 2014).
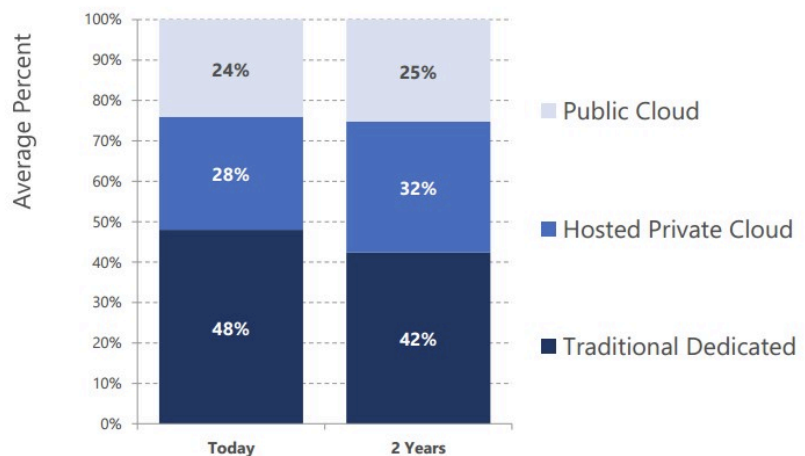
The cloud computing industry is composed of 30 large public companies collectively representing more than $100 billion in market capitalization and $12.5 billion in estimated 2013 revenue and IDC predicts a 25% growth in 2014 (Bort, 2013) (Zeitler, 2014). The market is extremely large, but also crowed, which means that companies are highly competitive and not always profitable. Forbes has analyzed Amazon's latest quarterly results. In July, the company reported a loss more than twice the analysts' expectations ($126 million) and, as a consequence, shares fell by 11% (Cohan, 2014). Moreover, expenses resulted up more than sales. Considering other important providers, there's significant rivalry between Microsoft's Azure and Google's Web Services. Major vendors have to compete also with new entrants coming into the market, such as Verizon
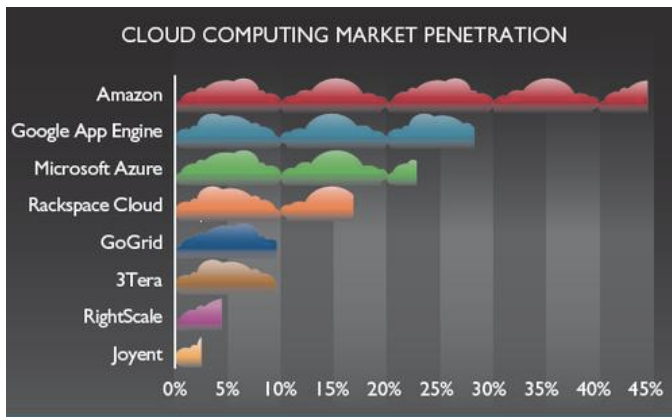
Communications, Cisco Systems, IBM and VMware. According to Forbes, both Amazon and Google's Compute Engine have cut prices down in order to beat competitors, although risks of security and continuity of the service might occur. In 2003, Amazon controlled 37% of the Iaas market, much more than the other providers: Microsoft (11%), Google (10%) and Rackspace (4%). Nowadays, even if Amazon remains the leader, the situation has significantly changed, since Microsoft has been catching up fast and has reached almost 30% of the market (Brannan, 2011).

Gartner analyzed the most important Iaas providers and classified them into the "Magic Quadrant". On the y-axis there's the ability of execute, whereas on the x-axis the completeness of vision. Amazon results far ahead from all its competitors: it has an advanced vision of the future of the market and performs well in executing services. According to Gartner, even though AWS, as an early mover, has several years of competitive advantage, it is expected to face significant competition both from Microsoft in the traditional business market and from Google in the cloud-native market. Moreover, according to the report, Microsoft's Azure cloud service is already creating significant rivalry, despite the fact that it only launched the IaaS component of its business into general availability a little over a year ago. According to Gartner, companies in the "Visionaries" quadrant are going to lose market share unless they change their business strategy and approach to the market. Other corporations such as VMware, HP and Rackspace fall in the bottom quadrant ("Niche Players") (ZDNet, 2014).

The high level of competition in the Cloud Computing market has forced companies to make partnerships. As an example, in 2013, Oracle has announced the project of working closely together both with Microsoft and Salesforce.com (Oracle, 2013) (Economist, 2013).

Oracle and Microsoft have always contended the software marketing share: since 1990s the two companies have tried to beat each other, both on PCs and databases, and they still

compete in several areas. Nevertheless, the partnership on delivering Cloud Computing services seemed to be the only solution to the unexpected growth of the cloud business and the success of other providers such as IBM and Amazon. Oracle will ensure that various bits of its software run well on Azure, Microsoft's cloud platform. In return Microsoft will promote Oracle's database software and other products to Azure customers.

About the partnership with Salesforce.com, in the future Oracle will provide the technology on which Salesforce's platform and applications will run, and Oracle will integrate Salesforce's cloud-based applications with its own ones for finance and human-resources management. In this way, Salesforce.com becomes a secure customer for Oracle and Salelforce.com can address Oracle customers.

2.2 Customers and End Users: Requirements, Benefits and Concerns for Companies and Organizations

This paragraph analyzes features and requirements of cloud services' customers. It focuses on companies and then on public organizations, explaining benefits and issues of cloud adoption for each of these two segments.

Cloud computing has become an essential resource for companies. In order to measure cloud's direct value to the business at large, several aspects have to be considered: cost versus returns, impact on agility, customer satisfaction, business transformation and workforce satisfaction. A study by IBM gives evidence that the enterprises which took the lead in cloud benefited from better decisions and that they were 136% more likely to use cloud to reinvent customer relationships. Moreover, cloud leaders were 79% more likely to rely on cloud to locate and leverage expertise anywhere in the ecosystem (McKendrick, 2014).

According to IDC, the top 5 industries to benefit from the Cloud are: 1) IT operations, 2) Financial and Accounting, 3) Program Management, 4) Customer support, 5) Operations. There are specific benefits for each of these segments – and we will especially focus on the financial services industry in the second part (Cisco, 2014). However, in general, cloud services provide faster access to newest functionality, improve resource utilization, enable business units to control IT solutions more directly and build revenue-generation services faster.

A study from Enterprise Management Associates (EMA) (McKendrick, What Cloud Computing Customers Want: Clarity, Simplicity, Support, 2014) reports that cloud customers are primarily interested in:
1. Transparent pricing: potential customers perceive confusion among the several different assortments of pricing models offered by cloud providers. As a consequence, businesses are not able to make the clear budget previsions on all the costs related to cloud computing. A clear pricing structure, with detailed forecast of expenses will help companies with their financial plans, avoiding saving too large or too little part of their budgets for the development of cloud technologies.
2. Ease of management: the cloud as a user-friendly platform.

3. Support: once customers decide to move to the cloud, they have to consider not only the best deployment model or provider, but also the support system that best fits
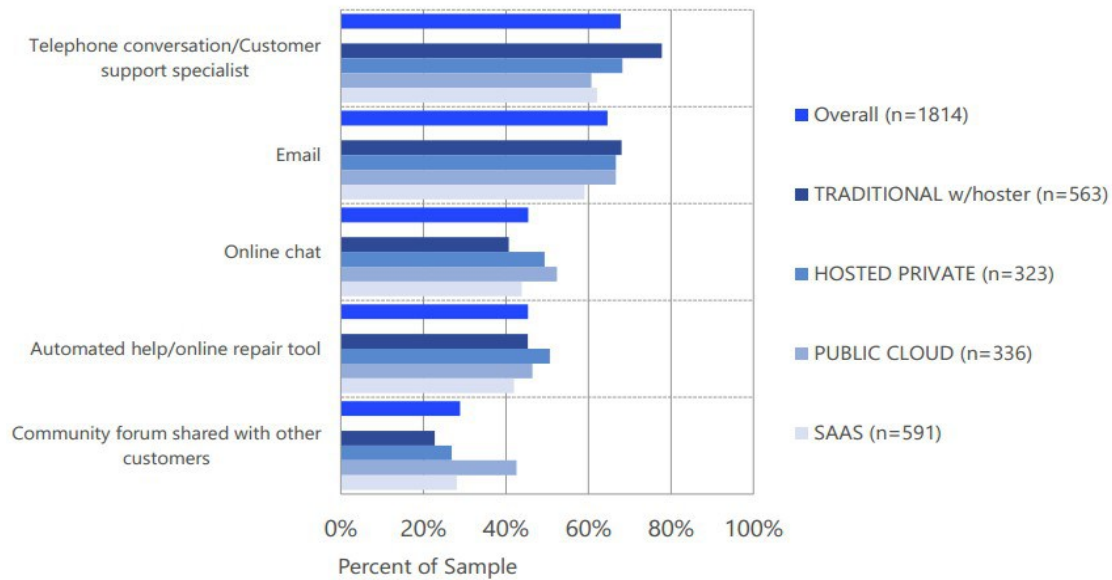
their needs and experience with cloud technologies. Users are also interested on the quality and the medium used to provide assistance (ticketing system, email, phone). According to a survey by Microsoft, telephone conversations with customer support specialists are the most valuable form of communication (just over 60%) across all support channels (Microsoft, 2014).

4. Services: users have to choose among several different services offered in the market. The decision is mainly driven by the analysis of the areas of strengths and limitations of the user/company.

The cloud technology has an extremely important role even in public organizations. The state of California has recently developed its own cloud infrastructure called "CalCloud". The project was initiated in December 2013 with the aim of increasing efficiency and reducing costs in the supply of services by the State of California (Ramos, 2014). According to Carlos Ramos, CIO of the State of California, the development of this technology is included in a number of initiatives that will reduce costs, improve efficiency and simplify government's procedures (Techwire, 2013).

The state of Texas decided to move to the Microsoft's cloud in 2010. In an interview for Oracle Openworld 2013, Todd Kimbriel, director of e-government for the Texas Department of Information Resources, explains the key features of this new technology (Oracle, Oracle Voice with the State of Texas, 2013). First of all, the State has deployed its own datacenter and databases. Differently from the private business clouds, its customers are federal agencies such as the Health and Human Services. Therefore, regulation and security requirements are extremely strict and the Government has to be careful of the technology support in delivering this service. Benefits of the cloud technology include cost savings on a daily basis due to the fact that federal agencies are sharing the infrastructure. According to Todd Kimbriel, the best way to create a shared cloud infrastructure is doing it with the customers, not to the customers, in order to understand their needs and concerns.

Studies on the European market of cloud computing show that the top three customers' major concerns about cloud computing are security and data protection, trustworthiness and data location (Cattaneo, 2012). In particular, customers are afraid of unauthorized people and Government agencies accessing and looking after their data and cyber-attacks. In addition, lack of standardization and support are other major concerns that do not allow customers to clearly understand the level of security of the chosen provider (Angeles, 2013). Furthermore, studies show that customers have different concerns according to their experience in using cloud computing: full users' issues regard data location and portability and the improvement of security and accountability of the provider they are already using. Those who are thinking or planning to move to the cloud, share some concerns with the full users and, in addition to this, require more evidence of benefits.

A survey by Microsoft reports customer's opinion after using cloud services. 87% of the respondents globally would recommend cloud computing to a peer or colleague and 13% would not. The following chart shows the most important reasons that customers provided for both the positive and the negative answers.
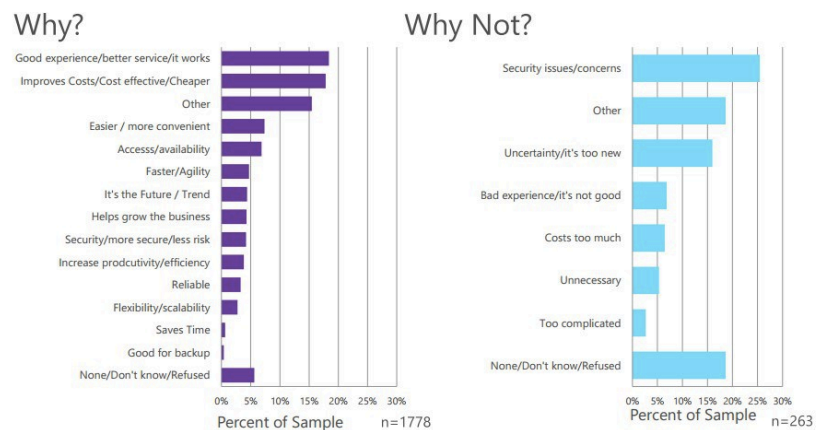
Most of the happy customers point out the efficiency of the cloud system and the cost savings. Other reasons to recommend cloud computing involve availability of data, agility of the service and scalability. On the contrary, the first reason why customers would not recommend cloud technology is data security (more than 25%). Just a little part of them has had a bad experience or thinks it is unnecessary.

In conclusion, data and statistics confirm that the introduction of cloud computing both in businesses and organizations has brought several advantages in terms of cost savings, efficiency and productivity. Still, some concerns remain among security and reliability of the service. Most of those who tried the service has benefited from its advantages and kept using the cloud technology. People who are not currently using cloud services are composed of "unhappy" customers and skeptical late adopters.

2.3 Demand: Current status, trends and predictions for the future

In this last section of the second part of our paper, we will analyze the demand side of the cloud computing market. In particular, we will focus on its trend to grow and on the differences between customers' segments in demanding cloud services.

The cloud computing services market is currently valued $79.60 billion for the year 2011. It is estimated to grow at a CAGR (Compound Annual Growth Rate) of 23.21% and reach market size of $ 148.9 billion by year 2014 (Research, 2014).

Moreover, a research by IDC (Cisco, 2014) shows the following results:

- The cloud software market will surpass $75 billion by 2017 growing at a CAGR of 22% in the forecast period.
- The percentage of organizations currently using or planning to implement cloud computing depends on the size and on the age of the organization itself:

Large Organizations (>1000 employees)	Medium organizations (100-1000 employees)	Small organizations (<100 employees)
67.8%	69.7%	34.0%

| Mature Organizations (25+ years)	Medium Organizations (5-25 years)	Young Organizations (5 years)
55.8%	70.0%	50.8%

- Analyzing data about the number of organizations planning to optimize Cloud strategies in 24 months, it is clear that older companies focus on driving business innovation by improving IT operational efficiency in order to surpass younger organizations.
- Current organizations using the Cloud expect to spend 53.7% of their IT budget in the Cloud in 24 months.

According to a survey by Accenture, the top three technologies that have the most potential for company ROI (Return on Investment) are: Big Data, Cloud Computing and Mobility. Moreover, 88% C-suite and VP-level respondents to the survey believe that companies who do not embrace digitally based strategies will lose their competitive position in the market (Accenture, 2014).

Forecast by HIS Technology (2014) states that Cloud-related tech spending by businesses is going to triple from 2011 ($78.2B) to 2017 (IHS, 2014). In 2014, global business spending for infrastructure and services related to the cloud will reach an estimated $174.2B, up 20% from the amount spent in 2013. According to Jagadish Rebello, Ph.D., senior director and principal analyst for the cloud and big data at HIS, spending on the cloud will be dedicated toward building an efficient framework able to connect every consumer and enterprise using cloud services.
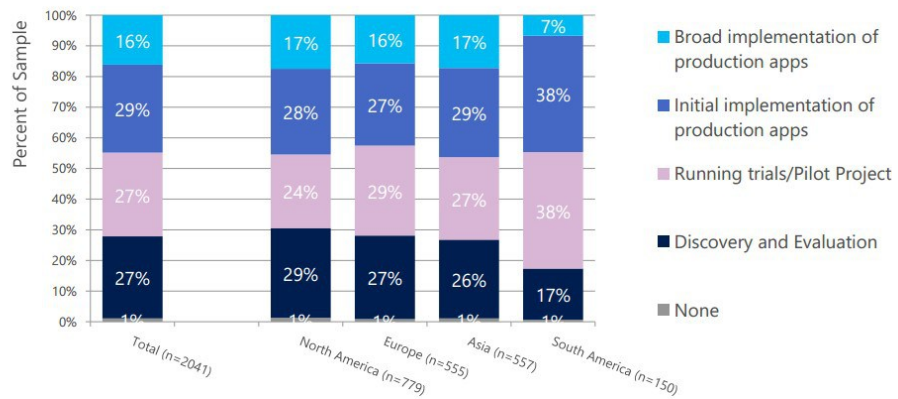

Cloud IT Spending Soars
Global spending forecast by enterprises on cloud architecture

Source: IHS
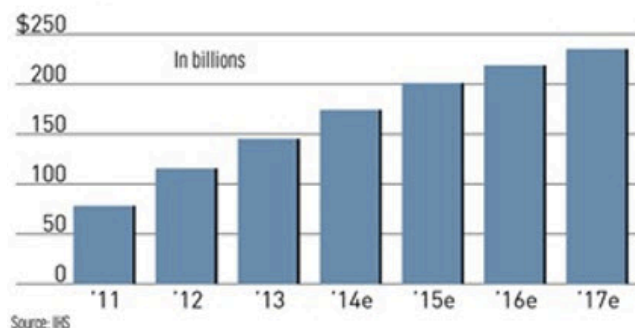
Moreover, research by Microsoft shows the following data:

- 45% of the global enterprises are currently using cloud computing services. Looking at the stages of adoption, North America has both

the greatest percentage of enterprises reporting broad implementation (with Asia) and in the discovery/evaluation phase (Microsoft, 2014).
- Saas is one of the most common IT services currently purchased today. The fastest growing category is Paas, which will grow another 26% in two years (Microsoft, 2014).

In conclusion, cloud computing market is currently large and its size will increase significantly in the next few years. Private users, companies and organizations are demanding these kinds of services at a constantly rising rate, in order to benefit from its numerous advantages in terms of efficiency. Furthermore, statistics give evidence of the profit rises given by cloud adoption. The amount of money

spent by corporation in creating and implementing cloud services will increase in the next few years, which means a rise of the demand of cloud technologies.
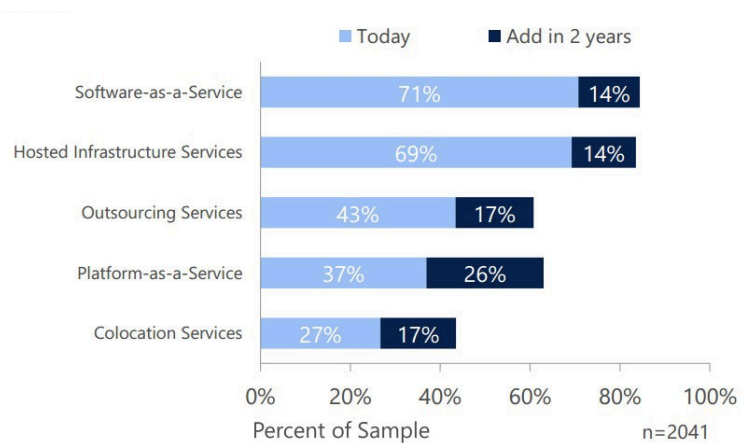
3.0 The Economic Model of Cloud Services

Cloud computing is slowly shifting the IT world into a new paradigm revolutionizing the business model of companies. This part is dedicated to the analysis of the transformations that will happen within the general industry environment as well as within the corporations themselves.

3.1 A New Major Shift in the IT Industry

To best illustrate the impact of cloud computing on the corporate environment we decided to focus on the specific industry of financial services as the second industry to benefit the most of cloud computing services (see paragraph 2.2). Indeed, according to Celent, a consultancy, banks were expected to spend no less than $180 billion in IT in 2013. For the moment cloud-based services represent a tiny portion of this amount but it remains that the potential growth is huge. Some estimates spending by financial services firms on the cloud will total $26 billion in 2015 (Economist, Silver linings, 2013). Then we need to see in further details what cloud computing is expected to bring to the financial services industry.

Exhibit 1 presents the SWOT analysis of cloud services in the financial services industry.

CTOs and IT management of this particular industry realize that this infrastructure will enhance the value of their business offerings by divesting themselves of the problems of managing. In that way, resources can then be deployed onto strategic and value-adding initiatives. This is one example of the strategic impact that cloud services may have in this sector. We will evoke in particular the transformations of the IT department resulting from a move to the cloud in the last section of this part.

Strengths:
Cloud computing can count on several good arguments to attract financial institutions. Among them cloud services will fill up the need of these organizations that require to run mission-critical applications at enterprise class levels of availability, security and availability while retaining a flexible architecture with capacity of expansion. One example of this flexibility is the possibility for banks to use temporarily more servers than needed when realizing a specific task involving huge levels of calculations. Thanks to the cloud, banks can undertake these tasks such as credit risk management computations or "what-if" scenario analyses with simplicity and for a minor cost. For instance, Bankinter, a tech-savvy Spanish bank, runs its complex credit-risk simulations on Amazon's cloud platform. Calculations that previously took more than 20 hours to complete on the bank's own systems are now done in 20 minutes. Similarly, the pay-as-you-go structure allows to go smoothly through seasonal peaks and exceptional website affluences. Some big players are also renting resources in the cloud when they need safe test environments in which they can mirror their own computer systems and then make changes or updates without the risk of crashing the entire bank.

Another notable illustration of that flexibility is the cost structure of cloud computing that is not considered as capital expenditure anymore. It is a unique opportunity for corporations to move from a capital-intensive approach to a more flexible business model that lowers operational costs. The consequences are twofold. First the company can focus investment on core-business related

activities. Secondly, managers now have more flexibility in the decision process as investment decisions require going through an extensive procurement process. On the contrary, this new cost structure allows him to move forward under its own budgeted operating expenses. We will detail the implications of cloud services on the cost structure in the next section.

On the other hand, cloud services can drastically shorten deployment time by creating for instance virtual desktops. Indeed according to the IT provider Savvi, it takes approximately 6 weeks for banks to set up an internally configured desktop when hiring new employees procured and deployed because of security issues. Thanks to a service provided by Savvi, desktop can now be configured and operational within an hour.

Similarly, in the past, developing a suitable software infrastructure internally could take up to nine months. By externalizing this task to the expertise of cloud providers, institutions can save a lot of time especially in the development and testing phases of implementation.

Weaknesses:
As highlighted earlier in the second part of this paper, one of the major drawback of cloud services applied to financial institutions is about security and privacy issues and this should not be underestimated especially because of the role of financial institutions in the economy (as the main financing support of the economy) and because of the current economic context that caused mistrust in the banking system after the financial crisis. Another related problem with cloud platforms is that most of the time, the corresponding data centers are located in a totally different place thousands of miles away which make them unsafe. Consequently, we can expect in the future a spread of data centers at the local level especially if corporations need to make it safer.

Furthermore, another concern is about regulation and compliance. Indeed, banks must abide by the laws and banking regulations of the country they are operating in. For instance, many financial regulators require that financial and personal data for banking customers stay in their home country. Others also require that data not be intermixed with other data, such as on shared servers and databases. As a consequence financial institutions must have a clear understanding of where the data resides in the cloud.

Threats:
From the first weakness cited can be derived a worst case scenario for financial institutions. Indeed, any confidentiality or privacy issue such as a security breach could result in a wave of mistrust in the organization and consequently damage its image. The financial institution could then be exposed to significant financial losses.
Besides, the cost benefits implied by cloud computing might represent a threat for the big players of that industry as they will lower the cost to entry for newcomers. Indeed, the latter can rent modern IT infrastructure at monthly fees of less than $10,000 instead of having to invest millions of dollars upfront to build their own secure data centers. This cut in launching costs should be a major revolution in various industries as it will probably reset the ratio of power between the different players.

Opportunities:
As said earlier, cloud computing represents a bunch of opportunities for financial institutions especially given the software and IT dependence of this particular industry. As such cloud services should be an important catalyst in the transformation and improvement of the banking services that are currently happening. Indeed, the banking system is facing a turning point and it

is hard to predict exactly what the bank of the future will look like. Still, it will be one where customer service (and personalized service) will be of great importance. People are asking for more interaction and simplicity. Yet, in many countries and in many financial institutions, creating an account still requires long fastidious steps and sometimes a lot of papers. For instance, when opening an account in the French bank called *La Caisse d'Epargne* customers need to provide the following proofs: copy of passport, proof of revenues under 6 months, proof of address under three months and the three last external bank statements. Cloud services could be really helpful to deal with that type of fastidious administrative process if banks are able to secure them. People could actually use the cloud to transfer those proofs to their bank advisor without having to pass by the agency. This would bring more convenience for the customers especially as banks opening hours are usually hard to match. Cloud services should also make the communication between the branches easier by sharing type documents, spreadsheets on a virtual cloud accessible to all employees.

3.2 Transforming the Business Model of Corporations

3.2.1 How to adapt the business model

Now that we have seen the impact of cloud services over industries through the example of the financial services industry, we will narrow our scope to companies and see how cloud services are expected to transform business models within newly-established corporations and how to efficiently adapt to this move.

At this point, we need to consider two different types of companies: start-ups and small companies on one side and medium to large-sized companies on the other side. Indeed the impact will not be the same on these two different structures.

Undoubtedly, the smaller firms without legacy computer system to constrain them have the advantage to be more flexible. As a consequence moving entirely to the cloud will require less time and fewer steps. For instance, by using standard software and existing data centers, a recently-created financial institution named Renaissance Credit's drastically cut its start-up costs. It pays a fee on the number of clients it has and can keep scaling up as it grows. Moreover, it was able to start operations only a couple of months after signing the contracts with its suppliers.

The effect of starting directly on the cloud is then radical. We now better understand why cloud platforms offer new entrants better ways to rival quickly and at a minor cost with existing players.
In these small structures, IT is entirely outsourced meaning that the IT department is nonexistent or reduced to a couple of geek guys whose job is to "take computers out their boxes and plug them in" as Mr Akintemi - founder of Renaissance Credit - says.

If large banks have not totally turned themselves to the cloud, they will probably be forced to do it soon. The main reason is a growing pressure to cut spending that will outnumber the current concerns about regulations, privacy and security. Whenever the timing of this big change, it is clear that the task is rather complex for bigger businesses and many decisions have to be taken into account in order to make a successful and smooth turn to the cloud. Here are a few guidelines that company should follow when moving progressively to the cloud (Economist, Silver linings, 2013).

First, companies have to choose the right cloud services model to match business needs. Exhibit 2 shows the distribution in terms of spending of the three most popular cloud services for the year 2012. Whether the company chooses standard business processes (BPaaS), business software and related data (SaaS), a complete platform (PaaS) - for application, interface or database development and storage - or an outsourced infrastructure (IaaS), actually depends on which degree of control the company really wants to maintain over its IT operations. SaaS offers the ultimate level of abstraction and is very popular for non-core competencies activities such as human resources or financial and accounting applications. The consumer only needs to focus on administering users to the system. This service offers the fastest access to market but least control over applications and accesses as well. On the contrary, the IaaS guaranties an absolute control over activities. Big companies and especially financial institutions that run a lot of software and IT services may very likely need several cloud services to match their different utilizations.

Secondly, corporations should focus on carefully choosing a suitable deployment model between private, public and hybrid. There the choice is probably more obvious and depends on the level of security the company actually needs.

Third, companies should select an operating model for the required mix of resources and assets. In other terms, it must decide the level of IT staff outsourcing to run operations. Should the company go for staff augmentation for more flexibility and control, outsourcing vendors to delegate responsibilities or virtual captives as an alternative of a complete outsourcing approach?

Fourth, corporations have to deal with the practical implementation: activities to be moved to the cloud, timing, ROI objectives. To start, companies should probably move non-core business applications such as IT development, Human Resources, Customer Relationship to the cloud as shown in exhibit 3 in the case of financial institutions. The core functions such as retail banking, corporate banking and investment banking are somewhat too strategic to be considered primarily especially while privacy and security issues remain unsolved as said before. On the contrary, support functions are a good start to test and experiment the cloud services and models we talked about earlier (Report, Cloud computing in Banking, Capgemini, 2011).

3.2.2 Economic Impact of Cloud Computing

We will use some of the arguments used above to convert them into economic considerations and impacts on the business.

First, cloud computing thanks to the flexibility of the service allows companies to shift part of the risk to the cloud provider. Indeed, a traditional service company offering a website with variable demand needed to higher up the exploitation of its servers to the highest peak of the day in order to satisfy its customers during these peaks. Consequently, during the rest of the day, the company is overprovisioning by offering more servers than necessary. Cloud computing totally removes that time constraint by introducing per server-hour utilization and therefore offering elasticity. The company does not own the servers anymore and has to pay a fee on a server*hour basis to the provider. However, by doing the math and comparing both alternatives it is easy to understand how companies can benefit from the cloud from a financial point of view. Not only because it lowers down the company's capital expenditures and very likely its debt level but also because it saves the installation and maintenance costs.

To make it clearer, let's use an analogy of a toys producer facing the Christmas peak. Let's suppose Toys "R" Us owns all the plants in which it produces its toys. These plants utilization rate would be very high around Christmas (around 1) and very low during the rest of the year. Yet the company still needs to be able to satisfy its consumer's needs for Christmas as the season represents around 70% of its annual revenues. The solution is then to outsource the production process to suppliers so that Toys "R" Us only pays for the quantities it actually needs in the same way as the service company will pay an hourly fee to meet the exceptional demand.

With this service, the elasticity is total meaning that there is no waste in capacity as it would inexorably happen to any traditional business even if the peak load is correctly anticipated (since the adjustment of capacity could not be perfect). The shaded area in the graph in exhibit 4 shows these actual losses.

Cloud computing will also have an impact on the cost structure as explained before but not only. It will help to increase economies of scope by being an important tool in reinforcing the current trend within big corporations. More and more current companies try to create synergies between their support functions in order to save operations costs and make economies of scope. In this environment mastering the cutting edge IT tools like cloud computing and big data analytics constitute real levers to improve data processing and thus outperform competition.

To conclude, cloud services appear as a great solution for companies to cut costs. However, as Matt Ellis CEO of Cloudability's claims, cloud analytics offer more than that: it is a way for the user to see where costs are happening and where it could be best spent. The new cost structure introduced by cloud computing actually helps to trace spending and CIOs now have to reinvent their role (Asay, 2014).
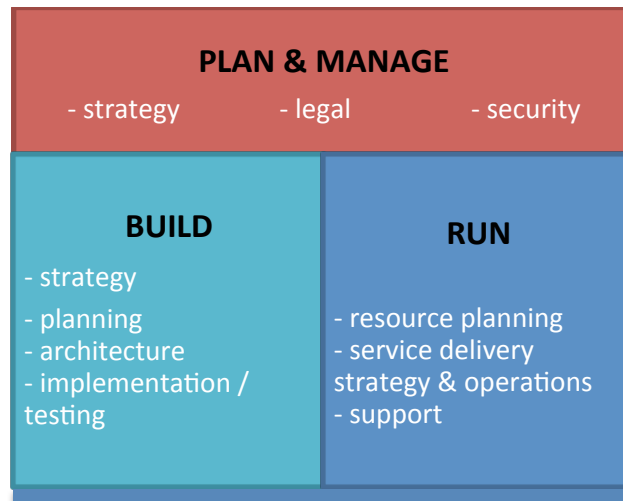
3.3 Impact on the IT department of Corporations

Our focus will now be solely on big corporations in which the role of the IT department truly makes sense.

At first sight, as mentioned before, cloud computing sounds like an externalization of the IT department of companies. Indeed, after all, cloud computing is just about using a service provided from somewhere else by someone else. In other terms, something that does not physically belong to the company. In this context it seems legitimate to ask what the possible needs for an IT department will now be.

However, in spite of this quick judgment, cloud computing does not mean the end of IT departments. It is more about a mutation of it. A mutation that will change the role and responsibilities of IT within the organization and raise new challenges. Thus, in this section, we want to highlight the main transformations that IT departments may face in the near future. Let's first start by looking at the current role of IT within organizations and compare it with its expected role in the future.

Traditional organization of the IT department

New organization of the IT department
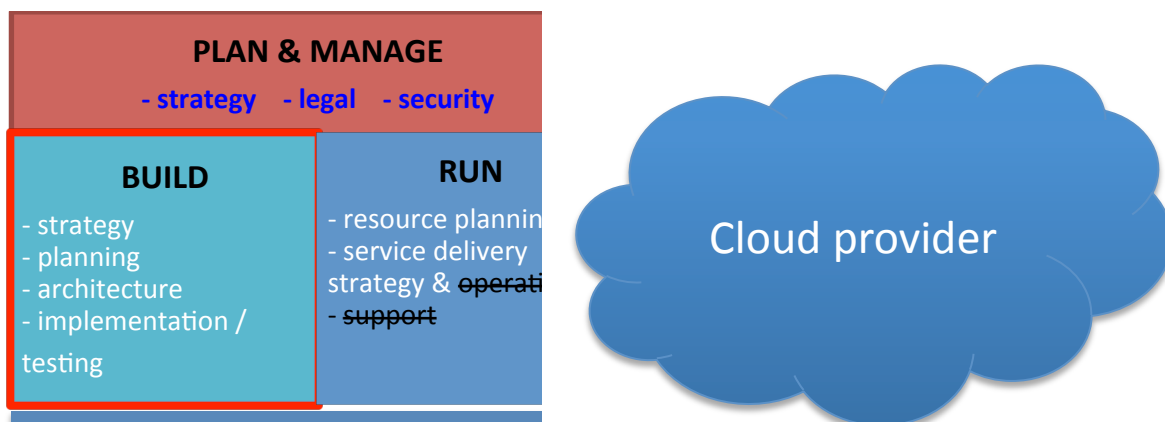
Not surprisingly, the move to the cloud has a greater impact on the operational layers of the IT department as the delivery of the component comes from the cloud provider. Just like industrial companies outsource their production to lower costs, a similar trend is likely to happen within the IT department. Therefore the traditional IT department usually divided into three layers within the corporation - manage, build and run - will suffer some rearrangements that could drastically lower its size. Indeed, the 'building' area in charge with the development of services and solutions is likely to disappear entirely as it focuses only on operational tasks such as building the system architecture that are to be now executed by the cloud provider. The planning, implementation and testing steps which usually require a lot of time and effort will also be provided by external actors. The 'Running' area that traditionally deals with the service delivery and technical support will suffer changes as well. Most of the maintenance and support tasks will naturally be executed by the external building team of the software or IT service. Assistance will then be provided online or by phone directly by these experts. Other tasks like resource planning or service delivery strategy will not disappear but see their scope reduced.

On the other hand, if some areas will suffer from the move to the cloud, others, more strategic and tactical, will undoubtedly see their scope and responsibilities grow. Indeed, by externalizing its operations the IT department will get closer to the business itself and will serve its interests better. It will now be able to better align the IT objectives with the corporation strategy. As a consequence, the role of the head of the IT department will be reinforced. Especially, areas like business strategy, administration, security and customer relationship.

For instance, the new role of the customer relationship's component will require to focus on the interaction between the companies' cloud providers and the IT users. There needs to be an understanding between the high-level business requirements of the company user communities and a matching of these to enabling IT capabilities. In other words, building a strategic map synthesizing those requirements is a key element in defining the relation between the company and its providers to make sure both parties are on the same page and thus avoid any mismatch. Another area that should grow is the Business Risk and Compliance that traditionally sets the rules and guidelines for the security and privacy of data.

Finally, the Business Administration area of the department will see its importance grow especially when it comes to manage the relationships between the enterprise and the cloud provider. Indeed this area will act as an intermediate to establish contracts, pricing, coordinate the services and allocate the cloud budget (The future of IT department. Smart Cloud. IBM. 2012).

In conclusion, many tasks will move from the enterprise to the cloud provider and we've seen a few examples of how the responsibilities of the surviving IT roles will change in this new environment. These new roles and responsibilities will ensure that the IT department has a much greater involvement in the strategic and financial planning process of corporations.

Cloud computing will certainly introduce a big shift in industries as well as in small and big corporations. It will especially have a big role in mutating the financial services industry. Moreover, it will deeply impact companies' business and economic models in many ways. Undoubtedly, the potential of cloud is huge but surprisingly it faces some difficulty to impose itself. That is why we decided to get a closer look at what the experts think of the cloud and its future.

4) Opinion of Experts through Cloud Computing's history

4.1 Past

Cloud computing's present is brilliant, and undoubtedly will have a better and brighter future. However, many years ago it was just a concept behind an idea and there was no name behind such amazing creation. The revolutionary cloud that we know today started as an idea more than 50 years ago since it was first envisioned by a Canadian electrical engineer. In 1966, Douglas F Parkhill became the first person to envision the idea in his book "The Challenge of the Computer Utility" (Cohen, 2014). He anticipated that the computer industry would someday be similar to a public utility such as natural gas, electricity, water and telephone companies. His predictions were not that unrealistic. Parkhill stated in his book the idea of "many remotely located users connected via communication links to a central computing facility" (Carr, 2013). That was the time when such innovative idea was conceived.

Despite the fact that such idea was envisioned in the 1960s, cloud computing needed to wait for a couple of decades before it could emerge into the technology industry. This occurred mainly because there were missing some pieces of the puzzle: internet and virtualization. In 1980, the evolution and rapid adoption of internet allowed the first hosted application services like ISPs and ASPs to appear. Such application services could be offered as a service over the internet, while at the same time allowing it to be managed by a third party. Moreover, the emergence of virtualization in the mid-1990s made computing resources more flexible (Cohen, 2014). At that time, virtual representations of computing resources were completing the missing part of the puzzle. According to Reuven Cohen, cloud computing expert in Forbes Magazine, it was virtualization the evolutionary missing link, the one that gave computational resources new manageability and efficiency (Cohen, Intel Technology Journal 2012, 2012). Virtualization became then the final piece that would enable cloud computing to migrate from just an idea in the 1960s into a reality today.

On the other hand, there exists a debate regarding the origins of the term "cloud computing". Several cloud computing experts state that there is not exact date of when the word "cloud" was first used. Some say that it was first used since the 1960´s, when experts started drawing cloud symbols of diagrams and flow charts to refer to such service. Moreover, there is a record from a Technology Review article that the oldest use of cloud computing as a term comes from 1996. It all happened when internet and start-up company executives at Compaq offices in Houston were describing a universe being transformed by the internet in which "cloud computing enabled applications" would someday become available on the web (Fogarty, 2012). However, the first public use of the term cloud computing happened in August of 2006. It was at a search engine conference in San Jose, California when Google´s CEO Eric Schmidt defined one approach to data storage as "cloud computing" (Koba, 2013). Later on that month, Amazon released its Elastic

Compute Cloud System. Indeed, the debate of who first used cloud computing as a term will remain open forever. However, all experts agree that it was in the 1960s when the concept was first envisioned by Douglas Parkhill.

4.2 Present

As of 2014, cloud computing is becoming the foundation of success for every company willing to transform digital information into a powerful and profitable tool. This tool is helping businesses to do an infinite number of things that couldn´t be done before: detect new business trends, prevent diseases, combat crime, forecast more accurately weather conditions, etc... (Cohen, The Past, The Present, and The Future of Cloud Computing , 2014) Digital information is now becoming a trigger that unlocks new sources of economic value. This is due to the fact that companies understand the importance of having valuable information that was impossible to get before. As a result of this, the ease of availability of digital information through cloud computing is making businesses and organizations work better, faster, and more effective than ever.

Moreover, John Donovan, Senior Executive VP of AT&T affirms that there is a need to shift and adapt previous business cloud models (Stanford, 2014). New business cloud models must include innovative and new cloud computing solutions in order to keep up with the competitive world in which we live today. The best way to make this happen is to build proper cloud architecture according to the needs of each business (Later on, this architecture will be explained in more detail). As an example, AT&T is moving into a transition that he calls "mobile first, mobile only". AT&T was a communications company and now they are becoming more a services company, where cloud solutions are one of the divisions with the biggest growth potential. Currently, Mr. Donovan says that AT&T is attacking the could services market from three different angles: putting all new applications in the cloud, extending VPN services into the cloud, and enabling cloud services that enterprise customers use from Amazon and other providers (Buckley, 2014). Because of this, Mr. Donovan believes that AT&T is probably the most aggressive cloud company nowadays. Some experts say that being too aggressive might not be the best approach to take the most out of cloud computing services. However, AT&T has proven to be one of most innovative services company in the world in recent years.

Furthermore, Reuven Cohen says that large scale computing has been democratized for the first time. What in the past was only available to the biggest companies in the world is now accessible to everyone. Having a fully integrated use of the IT services for small and medium sized firms is not a utopia anymore. Also, accessibility to data is becoming as important as the data itself. This is due to the fact that unimaginable amounts of data are being created every day. Hence, it is essential now to access and give such data a meaning that can give value to businesses (Cohen, The Past, The Present, and The Future of Cloud Computing , 2014).

In addition, cloud computing is becoming more and more popular for non-tech companies. Firms that in the last few years were reluctant to start taking advantage of cloud solutions are now moving to get the most out of this service. But the question is, what has convinced

them to migrate to cloud solutions? What has made cloud services more attractive? Most experts agree that the trends happening today are responsible for it. According to Sven Denecken, Vice President of SAP´s Cloud Solutions and Head of Co-Innovation, there are several trends that are changing the way people think of cloud computing in 2014:

A) Cloud Enables Agility and Business Innovation

Businesses have changed, and so their needs. Companies today need to be digital in order to succeed in the market. As the world is changing every second, small, medium and large firms need to think of cloud as a business. This is due to the fact that cloud services are recognized for their ability to boost business agility. Also, they can quickly be adapted and applied to new business solutions without the need of using a significant amount of their resources. Current cloud solutions can ease companies to face and confront new challenges and develop new strategies to reach their business goals (Denecken, 2013).

B) Cloud as a Wrapper

The world in which we live today is driven by customer experiences. Its value has surpassed the one of products and services in most of the markets. Businesses are focused on delivering a better customer experience to the end user. Also, companies have realized that customer experiences are becoming more and more important in the decision making process while buying a product/service. This is where the cloud enters. Cloud services are allowing new consumer engagement and are bringing new innovation to businesses. Companies are realizing that cloud services can offer a whole new level of consumption in IT. Hence, cloud solutions are becoming an agile wrapper of different systems that can deliver a better and more effective customer experience (Denecken, 2013).

C) Cloud as an Innovation Platform

As it has seen lately, some of the current leading trends in IT are mobile, social, and Big Data. The market of such trends is expected to keep on growing exponentially in the next years. Thus, cloud services and solutions are now becoming the platform provider for the aforementioned trends. Cloud services are easing and speeding-up the way companies respond to new innovations in IT, such as the internet of things and wearable technologies. In addition to this, the market of Services as a Platform (SaaP) is becoming more and more popular nowadays. At the end, companies are using cloud solutions as a platform because it is delivering ideal results for them (Denecken, 2013).

D) Easier to Understand Big Data through the Cloud

For the last 2 years, Big Data has become a popular term over the high-tech industry. Companies are willing to know more about what Big Data can offer and how they can take the most out of it. Currently, all the amounts of data collected by companies need to be properly analyzed to make it useful. Ventures need important and relevant data rather than just tremendous amounts of non-organized information. People now refer to this trend as Smart Data because it gives much more information to make decisions than traditional data. And all this is happening through cloud computing. Cloud computing is making the collection, analysis and dissemination of results much easier (Denecken, 2013).

At the end, transforming conventional data into Smart Data through cloud computing is a trend that will keep happening for the next years. This is due to the fact that it is giving companies the missing information they need to make decisions easier, faster, and better.

E) Cloud Solutions helping Predict Business Scenarios

Today users have at their disposal statistics and analytics in real time. But they are no longer enough, since a need to predict what will happen next is emerging. Information has reached the point where it needs to be predictive in order to calculate risks and business scenarios more accurately. Cloud solutions are providing the pillars to create such agility and innovation. Thanks to this, people are relying more on cloud computing, as they now see the potential it has to support and calculate predictive data (Denecken, 2013).

F) PaaS needed to success in Cloud Solutions

As they have now arrived to the mainstream market, cloud solutions are appearing everywhere. Many experts agree that one of the keys to take the most out of the cloud is to know how to build the architecture of the cloud according to each organization´s or company´s needs. Several companies have had trouble because they don´t build a cloud accordingly. That is why nowadays the key to succeed in cloud solutions is to have a clear path converging the cloud services into one platform. Also, it is not only important to drive innovation to the IT environment, but to provide integration to the existing landscape. Thus, cloud brokerage is becoming more and more important today. After all, IT departments in companies need to decide and get the correct cloud structure and capacity early on. This is due to the fact that they need to decide how to administrate different cloud environments with a consistent management framework, tools, and user experience (Denecken, 2013).

G) Hybrid Cloud: The Perfect Mix

There is an eternal discussion of private vs public cloud services. However, users know today that they need the benefits of both types of clouds to remain competitive. They are also aware that they can´t move everything to the public cloud, but can´t afford to miss the advantages of using it. Hence, users are starting to have a mix between both services. The use of public and private cloud services in the same business is becoming more popular nowadays. Users have detected that to get the most out of the cloud; they must have a balance between both types of cloud (Denecken, 2013).

4.3 Future

For some experts, the future of cloud computing will depend entirely on how well companies adapt to the current trends. Nonetheless, cloud computing has a market that has evolved from a reduced number of suppliers, to a bigger marketplace. Also, as cloud computing moves ahead through the Technology Adoption Life Cycle, the barriers of adoption are constantly decreasing, and people now understand the economic value that cloud solutions can deliver to their businesses. Indeed, cloud computing will change our lives in the future, but how much? According to award winning expert on technology and writer of The Wall Street Journal, Joe Mullich, the cloud will change and mold how people do business in the future in different ways:

A) Small Businesses will go Global in Days.

Without the need of having a physical and local data center, companies will have in the future the chance to scale, and to target new geographic areas easier than ever. This will be possible by accessing infrastructure as a service, and will shorten the differences between a small and a large company. Thanks to this, small and medium-sized ventures will leverage the cloud and will be able to enter markets that were impossible to reach in the past. Thanks to cloud computing, processes that in the past took a couple of months to complete will take a few days (Mullich, 2014).

B) Decrease of Laptop Security Breaches

Thanks to cloud computing, laptops will stop storing data, as they will become an instrument by which people access to it. Cloud services will also reduce security concerns by storing safely the data on the internet. This means that information that is currently stored in laptops will be more protected, as it will be encrypted and kept safe in the internet. Hence, laptop theft will decrease substantially and businesses will stop worrying about their secrets being stolen or taken from laptops of their employees. In the end, the information of companies will be kept in a safer place (Mullich, 2014).

C) Developing Countries Will Grow Faster

Emerging countries that don´t have a thick and robust infrastructure IT yet will be able to adapt faster and better to cloud services. This is due to the fact that they will need less time and resources to adapt to cloud computing. Hence, they will take advantage of new opportunities faster, as it won´t take them much time to integrate new technologies. For instance, some countries have a higher number of cell phones than landlines. Mobiles devices will open new markets as the cloud tends to remove all the barriers (Mullich, 2014).

5.0 Conclusion

In this paper, we saw that cloud computing was not just a passing trend but will very likely become the next IT revolution to come. As statistics show, its potential is enormous and unrealized yet. For now, the cloud computing industry is just organizing itself on the supply side to best meet the needs of the users. Some big players have emerged, Amazon ahead of them but the concentration is very low. The market is large and crowded and it is hard to speculate about what it will look like in the future. The main reason for this is that the cloud services industry in itself is paradoxical. Indeed on one side, cloud platforms create a united world without barriers, probably as powerful as the internet, in which any multinational can share its files and documents with any of its employee around the world. However, on the other side, cloud providers are pushed to act locally to avoid security and data protection issues. In other terms, if a cloud provider wants to become an international provider it has to set up or acquire data centers and servers all around the world. This requires a lot of agility and so far AWS is certainly the most popular since it offers the biggest presence worldwide. The future of the market depends on this localization. In fact, the companies that have not moved to the cloud yet are waiting for these concerns to be erased from the agenda.

When the time has come for a brighter sky and more secure clouds, the market of cloud computing will probably soar at an even higher rate than expected. Indeed companies are already convinced of the benefit of cloud computing. And so do we. By looking at economic considerations, we have seen how cloud services could revolutionize corporations especially in terms of flexibility, efficiency and cost structure. The financial services industry is probably the best example to illustrate the current situation. Part of the industry is facing a big dilemma. Dare to move to the cloud and improve my processes despite the security concerns or just wait for the service to improve and let the competition go ahead… That is why, we advised corporations (especially large-size companies) to go patiently and carefully step by step - until reaching the top - by starting moving the non-core activities to the cloud.
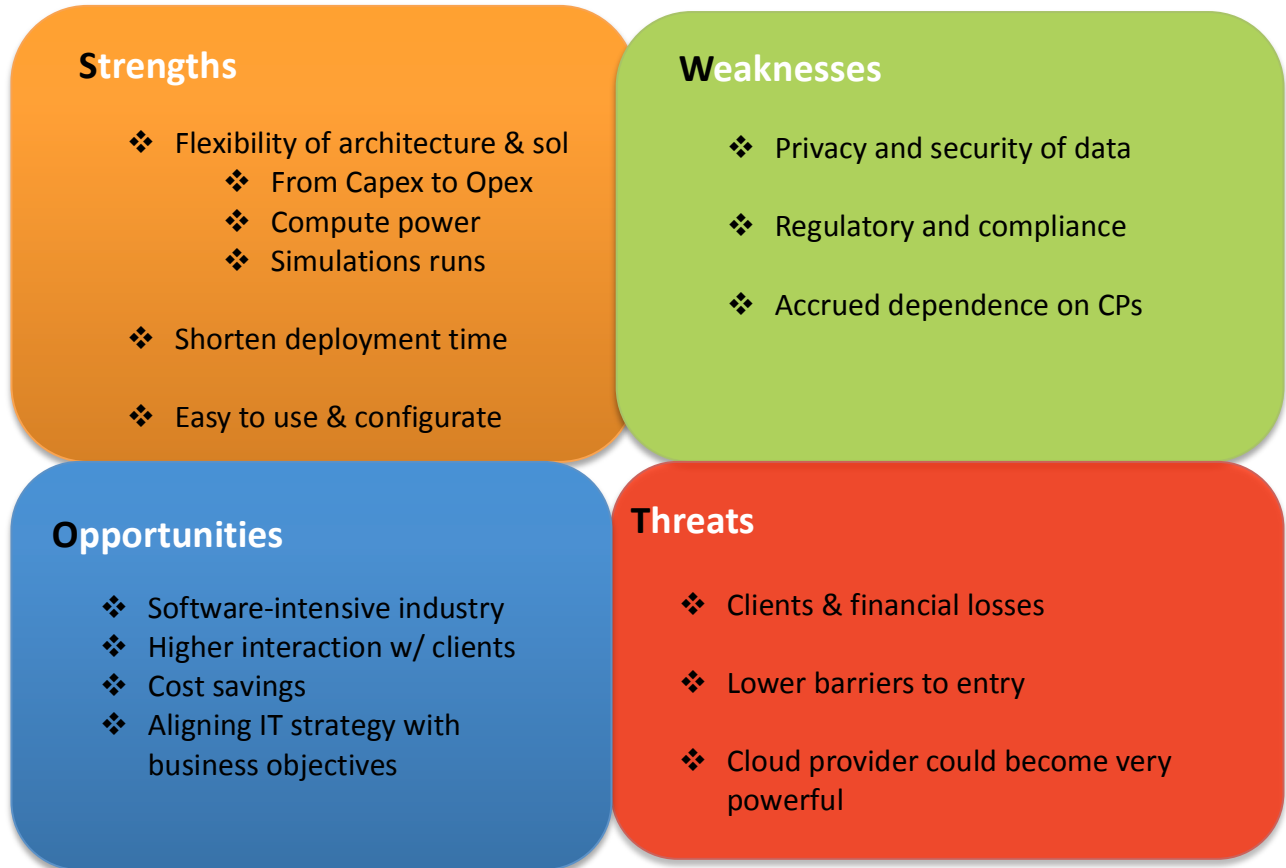
Cloud computer will likely become in the near future an unmissable trend just like computers and internet are nowadays. Companies will not be able to grow without it. Especially because, as we seen in the fourth part of this paper, cloud computing is closely linked to other new coming trends like Big Data and Virtualization.

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7.0 Appendix

Exhibit 1 – SWOT Analysis of cloud services applied to the financial services industry.

Strengths

- ❖ Flexibility of architecture & sol
  - ❖ From Capex to Opex
  - ❖ Compute power
  - ❖ Simulations runs
- ❖ Shorten deployment time
- ❖ Easy to use & configurate

Weaknesses

- ❖ Privacy and security of data
- ❖ Regulatory and compliance
- ❖ Accrued dependence on CPs

Opportunities

- ❖ Software-intensive industry
- ❖ Higher interaction w/ clients
- ❖ Cost savings
- ❖ Aligning IT strategy with business objectives

Threats

- ❖ Clients & financial losses
- ❖ Lower barriers to entry
- ❖ Cloud provider could become very powerful

Source: Cloud Solutions for the Financial Services Industry. Savvis. Use case.

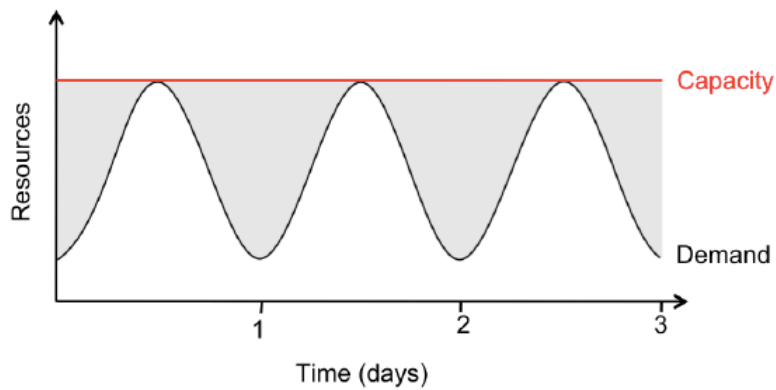Exhibit 2 – Worldwide IT cloud services spending by area, 2012.
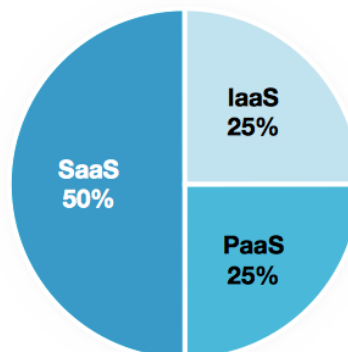
Source: Global Spending on Cloud Computing: an evolutionary road map for Financial Services. Tower Group.

Exhibit 3 – Which Areas are Best Suited for the Cloud? Example of the financial services industry.
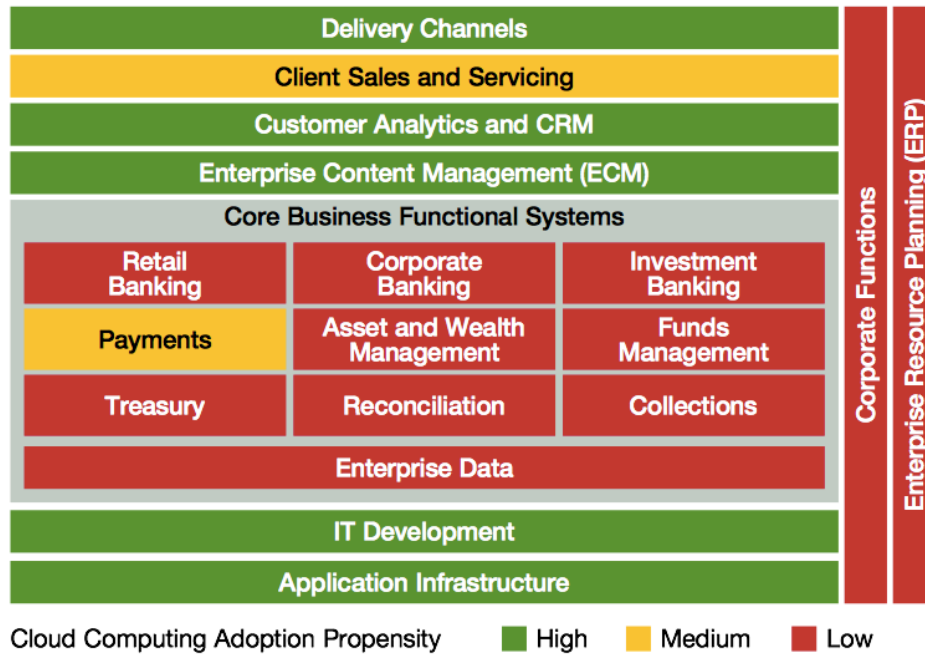
Source: Capgemini Analysis 2010

Exhibit 4 – Provisioning for peak load

Source: Above the cloud: A Berkeley view of Cloud Computing. Universityof Berkeley. 2009.