Cloud computing industry analysis

Business, Industries

Report - 2012 Cloud Computing Industry Analysis Submitted ByRomi Narang (197) Suryadeep Gumber(212) Rajesh Anuragi (196) Smith Rakesh (194) Neha Chavan(221) Neha Agrawal (224) Chandrika Gailot(229) 1/10/2012 Contents 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. Cloud

1. Cloud Computing

Cloud computing refers to the provision of computing resources like computing power, applications, computing infrastructure and business

processes in manner that is scalable as per requirement and can be shared in order to gain economies of scale. These provisions are delivered as a service over the internet (or any other electronic network) and the service can be accessed by the end users via a computing device. The data and application related information relevant to the end users business/personal needs is stored on remote servers.

The term ' cloud' is used for the abstraction of the complex network infrastructure that is used for providing the service. [1] Figure 1. Logical Diagram for Cloud Computing: [2] Office building analogy for cloud[4] A more effective way to explain the concept of cloud computing is to compare it with an office building. An office building can accommodate multiple companies belonging to different types of industries. Although some companies can go for privately managed maintenance/servicing of their own office, it will be extremely economical and cost effective for all companies to go for shared services that are used by all.

These will mostly comprise of some essential and fundamental utility services. Likewise, Cloud computing enables sharing of the computing resources, management of which by a single company could be taxing and uneconomical. The flexibility, immediate availability and cost effectiveness of the maintenance, hardware and platform development offered by cloud computing can be compared with the electricity coming out of every wall of an office building, the underlying technical aspects being abstracted from the user. Figure 2: Cloud computing compared to shared office space[4]

Players in the Cloud computing world: [1] Vendors: Provide applications and enablingtechnology, infrastructure, hardware, and integration. Partners:

Collaborate with the vendors and provide support services to customers. Business Leaders: Either use or evaluate various types of cloud computing offerings. Types of Cloud computing services:[3] Private Cloud: The cloud is owned by a particular customer with the required infrastructure and technology residing either on-site or off-site. This type of service is costly but provides better security.

Public Cloud: The cloud is owned by a large organization or company specializing in cloud computing services. The cloud can be rented for use to anyone willing to pay for it. It is the cheapest type of cloud computing service but because of its public nature it is deemed to be less secure. Hybrid Cloud: It consists of multiple private and public clouds. 2. WHAT ARE THE NECESSITIES OF CLOUD COMPUTING? 1. Information Technology penetrated in day to day life very fast With the starting of Internet era, most of the people and majority companies in the world became dependent on the services you could get to with a click of the mouse.

The best example may be the free email (Gmail/Yahoo mail), the chat technology (Yahoo Messenger), Social Networkingwebsites (YouTube, Facebook, Twitter). One can't imagine life without them. That's where the cloud was born. You need cloud data centers to run that stuff. 2. Cheaper source of Technology One may look for quality or ease of access but in the end the main thing that's at the top of everybody's mind is the economy. Cloud data centers are fundamentally different because they are built for very large user numbers and for a particular focus. Traditional data centers cannot compete on cost.

In fact it's no competition on the cost front. 3. Go Green In the scenario whereenvironmentis one of the biggest concerns, cloud computing seems as a perfect option as there is no paper etc required. The data is saved over internet as digital signals. Nowadays digitization of everything is becoming a trend among all top multinational companies. 4. The never ending and always expanding data The data is ever increasing and it probably always will. It seems to grow at about 60% a year and it doesn't pause for breath. It won't stop, even if you cry at it.

But like old email, you never access most of the data and at the same time you also don't want to delete it. So saving it all in the cloud makes sense clearly. 5. Unlimited Access This is almost impossible to stop users accessing anything they want on the Internet. One may be able to blacklist some web sites (adult sites etc) but one can't want to prevent users from finding useful capabilities on the Internet. And those are cloud apps by any definition. There's a wealth of it and it's a boon to us. 6. No need for continuous software development Cloud computing is the best way of software development.

There was always two types of software development; the mission critical stuff that gives us business traction, and the rest. We need not to worry for it. It's the competition that drives the software development and thus making it cost effective. 7. Emergence of cloud computing as an ecosystem The cloud computing has created an environment and hence various companies and developers create applications that support this environment, just likeGooglewhich is no more a website but an ecosystem.

[4] 3. What are the needs of PaaS, IaaS, SaaS (Cloud Families)? PaaS: What is it? [5]

The way of renting hardware, operating systems, storage and network capacity over the Internet is called PaaS(Platform as a Service). It allows the customer to rent virtualized servers and associated services for running existing applications or developing and testing new ones. Features:[8] 1. All the services needed in the process of making an application like developing, testing, deploying, hosting and maintaining applications is integrated into the same platform. 2. It is very user friendly as different user interfaces can be easily created using various web tools available in PaaS. . Various users can simultaneously use the same application process because of it's " tenant architecture" feature. 4. It is used for billing and subscription management. 5. Integration can be done via common standards with web services and databases. 6. It has built in feature to handle load balancing and failover. Revenue: Figure 3[9] Players: Amazon, IBM, Microsoft, Rightscale, Wipro, Adobe, Oracle, Vmware, TCS, Sales Force, Google, VirtuStream, NetMagic. Which industry can use it and why? [11] Telecommunications industry can use PaaS.

With the advent of 3G and popularity of Mobile VAS, PaaS products like Flypp that enable telcos with faster go-to market applications and reduce risk and operational overheads are predicted to see increased adoption. SaaS: What it is? [5] The model in which applications are hosted by a vendor or service provider and made available to customers over a network, typically the Internet is known as SaaS (Software as a Service) Features[8] 1. 2. 3. 4. It is used in commercial applications for accessing web It has a central hub for

software management It uses the star network model for oftware delivery It has a feature called " application programming interface" which is used to link different softwares 5. Time to time upgradation of software and recovery of system patches is not required to be monitored by the SaaS users. Revenue Figure 4[9] Players: IBM, Microsoft, Synage, Wipro, Oracle, Vmware, TCS, Salesforce, Google, VirtuStream, NetMagic. Which industry can use it and why? [11] Healthcare industry can use SaaS. With medical tourism flourishing, India is slowly becoming a haven for healthcare services.

Healthcare industry is also advancing its IT platforms to touch the global standards. This industry's key worry of system consolidation can be addressed by SaaS solutions. Iaas: What it is? [7] A model in which an organization outsources the equipment used to support operations, including storage, hardware, servers and networking components is called IaaS (Infrastructure as a Service). The service provider owns the equipment and is responsible for housing, running and maintaining it. The client has no obligations and he only pays on a per-use basis. Features:[8] 1.

Dynamic scaling can be done 2. It allows access to multiple users on single hardware 3. It is based on the model of utility pricing and hence has a variable cost 4. Resources are distributed as a service. Revenue Figure 5[10] Players: Amazon, Go Grid, Wolf Frameowrks, Microsoft, Rightscale, Wipro, Oracle, Vmware, TCS, Google, IBM, Net Magic, Reliance Data Centre. Which industry can use it and why? [11] Government and public sector can use IaaS. With current e-governance initiatives driving on a PPP model, immense investments are being made on the IT infrastructure front.

For projects like Aadhaar, the UIDAI is contemplating on the adoption of a cost-effective cloud based model that can provide effective and scalable processing of large databases. 4. Pricing Models Elastic pricing or Pay-as-you-Use model Elastic pricing model is a model that incurs less wastage and lower costs as under this system customers are charged based as per their usage and consumption of a service. As the users are keenly aware of the cost of doing business and consuming a resource (since it's coming from their pockets) therefore the awareness of cost and selective usage is quite prominent.

When to use it? 1. When there is Unpredictability of resources . 2. When there is limitation of budget. Fixed or Subscription based pricing The simplest pricing option where the customer organization is billed on a fixed monthly basis is known as fixed pricing. The consumer is billed the same amount every month without consideration for actual usage. When to use it? 1. When requirements are well defined. 2. When more control over the budget is required. 3. When it is required to use the cloud for a longer periods. Spot pricing for cloud It is a new concept in cloud computing, where market forces will decide the pot pricing model i. e. , when the demand of computing and storage resources is higher than the price of services will be higher and vice-versa. Cloud chargeback Customers are charged on the basis of usage. Benefits of this model are: 1. 2. 3. 4. Resource utilization can become more visible. Forecasting, budgeting and capacity planning can be facilitated. It encourages the use of new emerging technologies. It facilitates justification and allocation of cost to their stakeholders and business units. Adoption of

cloud computing models in India Findings on the basis of survey done by E&Y recently: 1. 2. 3. 4.

Annual contract based modelling is mostly opted by large enterprises. Resource based usage model is adopted by SMB segment in majority. Potential customers are not satisfied with single pricing model. Pricing structures offered by vendors should be easy to understand, transparent and cost efficient. Figure 6 [61] 5. PESTLE Analysis Figure 7 Political Regulations Even with Internet's rise to the Horizon, it took many years for policy makers to set up common norms and procedures regarding the internet's usage. With the current popularity of cloud computing policy makers are more proactive in addressing technological changes.

Regulations are still at a very nascent stage for Cloud computing: There are various government policies involved in that need to be incorporated by vendors to successfully implement cloud. There are various issues like security, privacy, location and ownership of data, that hinder the growth of cloud computing. Some vendors like Amazon Web Services have addressed certain issues by deploying local infrastructure in main markets (US and EU). [12] Government projects Cloud computing has the potential to provide good level government service deliveries to the people despite the government agencies suffering from resource constraints.

US government has an estimate to spend almost USD 20 billion on cloud computing related products. Figure 8[13] The federal government has a complete cloud related strategy that can be described below. ? Develop a decision framework that can be used to migrate services to cloud ? Find the services that can be migrated to Cloud and their time frames ? Calculate the

resources required to move the services to cloud. Figure 9[13] Economic Various multinational companies have reduced their IT spending in lieu of the economic slowdown that has hit the economy hard. JP Morgan recently cut their IT spending. 14] Cloud computing helps cut costs in following ways ? By lowering opportunity cost of running technology. When it comes to technology only 20% of the time and effort goes into running technology which is where all the value lies. By using Cloud computing the 80-20 can be reversed as time required to manage the OS and hardware gets considerably reduced. ? Capital expenditure shifts to operating expenditure. Figure 10[15] ? Renewed focus on core activities With the movement from traditional operation to cloud, A company gets a lot of time focus on its core activities. Recently, Netflix moved on to the Amazon Cloud service (AWS EC2).

Social Figure 11[18] Internet has been the most disruptive social phenomenon of the past couple of decades and has found its use in both professional and personal activities. The number of internet users is close to 2. 23 billion[18] and growing. Figure 12[12] Internet users Since cloud being an internet based technology its adoption has a greater probability. The future generation will no doubt be connected through the internet for both personal and professional lives. Social mediahas grown from strength to strength and now even companies are focused towards the use of social networking to find opportunities for their growth.

Technical Technology has taken great strides over the last 2 decades and IT infrastructure and service sharing has become a great source of growth for some companies. With high speed of internet, low connectivity issues, higher security standards and modularization of environments, it has become easier

to implement cloud. Figure 13[12] IBM IT Transformation Roadmap The IBM IT transformation road map suggests how the IT has transformed over the years and it is headed straight towards the adoption of cloud computing on a major level. LEGAL There is currently no legal framework designed for the adoption on cloud computing.

There are local regulations on free flow of information between countries. Figure 14[16] There are a few questions that are raised by the law structure when cloud is being implemented. 1. Who is the controller? 2. Which law is applicable 3. Transfer outside the country? The future of legal policies appear uncertain and they can easily keep a lid on growth of cloud computing Environmental IT contributes 2% of the world's CO2 emissions in the world which is the same as the Airline industry[12]. Other than CO2 emission IT produces 2 million tones of electric waste as well.

Cloud Computing is one of the ways to reduce the environmental impact of IT industry. Most of the electric waste would become obsolete with the evolution of cloud computing. Figure 15[17] Total PESTLE Impact Diagram Figure 16[12] 6. Technological Infrastructure required for Cloud Computing Following Infrastructure is needed for Cloud computing: 1) 2) 3) 4) Computing Infrastructure Network Infrastructure Storage Infrastructure Linking Infrastructure a. Linking to Network b. Linking to Storage Depending upon the service required (IaaS or PaaS or SaaS), these infrastructure elements can be owned by the client or the Cloud service provider.

As per the CIO. com article are as follows: [1] , there are seven important aspects of any cloud infrastructure, these 1) Heterogeneous System Support Other than leveraging the latest software and hardware systems, the cloud

infrastructure should also be compatible with the legacy and traditional systems of the organization and should also support the existing infrastructure. 2) Service Management In order to make the cloud offering successful, the cloud service should be able to provide proper resource (e. g. CPU cycle or storage etc) guarantees, transparent metering rules of the service and proper billing cycles.

Also, the service should be able to be managed and deployed easily and quickly. 3) Dynamic Workload and Resource Management For providing truly on demand and virtualized services, it is important for any cloud infrastructure to manage the resources and workload as per the required service level agreement to the consumer. And hence in case of peak load, prioritize resources in order to be highly efficient and performance driven. 4) Reliability, Availability and Security Reliability, Availability and Security are important aspects of any service, whether it is provided through cloud or through the traditional model.

Hence any cloud infrastructure should provide a smooth transition to the cloud service without compromising on any of these aspects of the system. 5) Integration with Data Management tools It is possible that cloud computing management solutions do not fully take the place of the traditional systems and data centers. Hence the cloud infrastructure should be able to integrate with these out of the box systems and data centers to provide a hassle free service to the clients. 6) Visibility and Reporting An important feature of the cloud service is the ' pay as per-use' facility.

Hence to fully achieve this objective, the cloud infrastructure should support detailed levels of visibility and reporting regarding the usage, service level

agreements, compliances, system and network performances, billing schedules etc. 7) Administrator, Developer and End User Interface Most Cloud infrastructures provide user interfaces and portals to hide the cloud service complexities from the end user and in a way also provide the ability to manage these cloud services in a simple yet comprehensive way. [19] 7. Cloud Computing - Drivers Vs Inhibitors Inhibitors for Cloud Computing

A report published by IBM [20] (IBM Academy of Technology, ThoughtLeadershipWhite Paper, October 2010) based on the survey conducted on 110 Cloud implementation Projects, revealed that the major concerns for implementing Cloud were issues involving security, lack of perceived value proposition by the customers, lack of standardization and lack of funding for implementation. Some of the other factors include- complexity concerns, lack of skills, concerns about reliability and availability of cloud, technical immaturity etc. Figure 17 Source: IBM Academy of Technology, Thought Leadership White Paper, October 2010 [20]

Security [20] Security is one of the major concerns specially in public cloud implementations. Most customers are worried about the privacy and integrity of their data. The concerns may increase even more if the cloud is shared among other customers, who may be your competitors. Hence according to the IBM survey most companies are interested in implementing the private cloud (instead of going for the public Cloud). Standardization [20] As Cloud Computing is an emerging technology, the processes and implementations are not yet standardized.

Each of the Cloud implementers provides their own solutions. There are no industry wide standards yet developed for Cloud computing. Hence this lack

of hardware requirements, software, operating system and processes act as an inhibitor for implementing cloud. Value Proposition [20] Implementation of Cloud is much easier if value which it provides in terms of meeting the business requirements and cost benefits can be explained to the customer. Hence lack of tools and models that assist the customers to calculate the return on investment and value proposition pose a deterrent in cloud implementation.

Complexity and Integration [20] Most customers today run a host of applications including numerous legacy tools. Customers are looking integrated solution for all their applications from the cloud providers. Hence the doubts over integrating all solutions and also reducing complexity are one of the concerns of the customers in implementing cloud. According to Keane White paper [21] on " Cloud Computing – Clear thinking about its risks, benefits and success factors" impediments to cloud Adoption are as follows: 1) 2) 3) 4) 5) Security Privacy / Compliance Immaturity of vendors / Offerings Risk Mitigation Legacy Applications

Drivers for Cloud Computing BENEFITS [20] The study conducted by IBM based on 110 Cloud implementations revealed following results: ? ? ? Around 80% of clients acknowledge benefits in sharing of IT resources through highly virtualized infrastructure by implementing cloud. Around 60% achieved ease-of-use through self service with rapid delivery. Taking about public clouds specifically ? ? ? Ease-of-use is 85% (as compared to 60% overall by both public and private cloud users) 68% benefit from pay-as-you-go Charging model 63% benefit from Internet / Web based Cloud

Figure 18 Source: IBM Academy of Technology, Thought Leadership White Paper, October 2010 [20] According to Keane White paper [21] on " Cloud Computing – Clear thinking about its risks, benefits and success factors" benefits of Cloud solution are as follows: 1) 2) 3) 4) 5) 6) Cost Capability / Scalability More Green Organization Agility Collaboration Focus According Deloitte report on " Cloud Computing – Forecasting Change – Market overview and Perspective" [22] Figure 19 Source: Deloitte Report on Cloud Computing – Forecasting Change – Market overview and Perspective [22]

Deloitte's perspective on perceived and real impact of cloud Inhibitors [22] Figure 20 Source: Deloitte Report on Cloud Computing – Forecasting Change – Market overview and Perspective [22] 8. Global cloud computing market size& Future growth According to the report called " Sizing the Cloud" of independent research firm Forrester Research the global cloud computing market would fetch the $241 billion by 2020[1] as compared to $40. 7 billion in 2010. It could be possible cause of rapidly growing of cloud computing services.

Figure 21 According to this report, Software-as-a-service(SaaS) would have a significant share in the total revenue. This segment would offer more opportunity growth than any other segments. The SaaS would have the leading position in the Cloud Computing market by holding the $92. 8 billion by 2016[23]. According to IDC by 2015[24] nearly 24% of the software purchaseswould be service enabled software. SaaS delivery will have the share of around 13. 1% of worldwide software revenue and 14. 4% for applications. Global Corporate Mobile SaaS Market will be at $1. billion in 2011 and will grow to $3. 7 billion by 2016 with Compound annual growth

rate of 25. 8% according to latest Strategy Analytics Wireless Enterprise Strategies. It will be possible by integration of business application on smartphones, tablets and other wireless devices[25]. Deloitte has estimated that cloud based usage will replace 2. 34% of IT spending in 2014 and further it will rise to 14. 49% in 2020[26]. Figure 22[26] Cisco's Global Cloud Index forecasted that the transition of workloads from traditional data centres to cloud data centres will exceed in 2014.

This year would be the crucial year when workloads through cloud data centres (51%) would be higher than the traditional data centres (49%) for the first time. If this trend would be continued then cloud workloads would be dominating to the traditional work load by 2015. The Compound annual growth rate expected to be at 22% during 2010-15[27]. Fig 23[27] According to Gartner, Insurance industry would have a higher rate of cloud adoption (34%) compared to their enterprise counterparts (27%) in the Small & Medium Business (SMB) category. Fig 24[28] Complete analysis of Cloud Computing in Asia [8]

Fig 25[30] Indian Market In terms of market size, Indian market holds only $990 million compared to global market $ 109 billion7. It is predicted that India would be having market of $3-4 billion by 20157according to Zinnov Management Consulting. On the other hand Nasscom and Deloitte consulting estimated that Indian market would be worth of $16 billion by 20207. It is also estimated that India would have a huge potential growth in future cause of millions of Small & Medium Business who are not able to afford to invest in the expensive business software solutions.

Vishnu Bhatt, head of cloud services at Infosys says that, " About 60 per cent of enterprise workloads will be on the cloud in five years, from the current nonexistent levels". Four different types of market opportunity are there in the India. Roughly 25 per cent of the Indian market is in " private cloud" business cause of security reasons. Other three opportunities lies in the " public cloud" as Saas, PaaS, & in Iaas. Independent software vendors (ISVs) like" Infosys, Wipro etc. " are the middle players who serve to small clients from the big players like Microsoft and Salesforce.

The entire cost is borne by the end users, on an average the ISVs make around 20-30 per cent of the total revenue. Around 3000 ISVs are there in India and nearly 1000 of them have tied up with the Microsoft and Salesforce. So we can say Indian cloud market mostly depend on the ISVs[29]. 9. CLOUD COMPUTING AFFECTING FIRM BOUNDARY Start-ups Cloud computing reduces initial investments of the start-ups by reducing capital investment in a data center. In cloud computing the infrastructure for data storage is provided by the cloud providers which help start-ups in reducing their investment.

Cloud computing does not eliminate the development cost but helps start-up companies to focus on their core competency without hiring people with expertise. Cloud computing also helps different software companies (start-ups) to expand their offering by partnerships with big firms (exa-IBM). [32, 33] Due to this lowered capital cost the companies were able to prove their products on less initial capital. . In 2011, 1339 companies received a total of US $5. 8bn in first-time financing (an increase of 7% in capital raised and an inc of 19. % in deal numbers, compared with the same period in 2010). The

data shows that Venture capitals are taking interest in investing on these small amounts since the risk is low. This helps the entrepreneurs in cracking more deals as supported by data. [34] SMB's Cloud computing will help SME's in modeling their business. Since it is cost effective, now companies are targeting these small and medium size businesses. These firms were not able to implement ERP due to high cost and lack of IT infrastructure. Now due to cost cut of the infrastructure they can use cloud for their business. iON will enhance India's global competitiveness by giving 35 million Indian SMBs access to world-class, simple-to-use and scalable technology tools. SMBs can use the power of iON to build their business advantage and compete on the global stage," said N Chandrasekaran, chief executive officer and managing director, TCS, and chief architect, iON, in a statement. [35] The table below shows the share of small & medium businesses in different countries. In India Tata Consultancy Service is targeting $1 billion revenue from these small and medium businesses firm [36] over five years.

Figure 26[37] A survey taken from Zoomerang (in April 2011) for small and medium businesses has shown that 77% of the small and medium businesses are not using cloud computing for their businesses and 52% of them will use cost effective IT management and maintenance sources. Figure 27 [39] A report published by Microsoft has shown that there is high potential for cloud adoption in SMBs. As per the report the number of companies with between 11 and 25 employees will potentially double till next wave.

In 101 – 250 employee segment 33% companies will adopt cloud in the next wave. [38] Figure 28[38] Cost effectiveness of cloud computing will help

startups and SMB's in adopting it , which in turn will help them in making their process efficient and as the result " SMBs will be able to challenge big businesses". [40] Venture Capital Investment The diagram below shows the growth of public cloud and its comparison with the overall IT. The public cloud services are growing strongly with a rate of 18%, which is a positive sign for the companies providing cloud services. 42] This growth is also attracting the Venture Capitalist. Currently, not much of the investment is done on this sector and there is a strong chance of investment. [43] Figure 29[42] Venture capital is also affected by government regulations. A report published by Josh Learner shows the impact of copyright policy changes on Venture capital investment in cloud computing companies. The data provided in the table in Appendix A has shown the investment of venture [41] capital quarter wise for cloud service firms in U. S. A. Figure 30[41]

The figure below shows the ratio of investment in cloud computing companies to investment in all IT companies. A drastic change can be seen in the graph after the copyright policy changes. [10] Figure 31[41] A survey taken in 2012 by Deloitte regarding global trends in venture capital shows the confidence level of investors of different countries in different industries. The first graph shows the confidence level of venture capital investment sector wise and the second graph shows the confidence level of respondent's country in cloud computing. 44] Figure 32[44] Figure 33[44] According to the article of NASSCOM Deloitte " Deconstructing the cloud - The new growth frontier for Indian IT – BPO sector" cloud computing will affect by making (below points are directly taken from the article) [40] Lines blur between consumer and enterprise IT – Initially innovation was driven by enterprises

but now trends have been changed and innovations are driven by customer segment also e. g. blogging, social networking and cloud is fast helping merge this divide between consumer and enterprise. IT drives arket-facing differentiation for businesses - Cloud will be a net positive impact on existing service lines while opening up new " product" opportunities Cloud have a net positive impact on existing service line revenues, though traditional IS outsourcing and testing service providers will have to re-invent existing models Uptake will vary across industries because of different drivers and barriers Cloud will alter the industry landscape - commoditization of IT through cloud computing will reduce entry barrier bringing some new breed competitors.

Partnerships and alliances will be key to succeed in the Cloud ecosystem [40] 10. Web 2. 0 and Cloud Computing Web 2. 0 and Cloud computing have changed the way we develop, deploy and use computer applications. The World Wide Web had seen a transition from traditional publishing model to the new collaborative information creation model. [45] Web 2. 0 uses network as a platform for sharing information, creating content, & making a virtual community, in contrast to the websites where users can simply read the text (passive viewing of content). Web 2. includes some of the most widely known and used applications blogs, social networking sites, YouTube, wikis, Twitter, web applications etc. [46] Figure 34: Web 1. 0 & web 2. 0 Structure [47] Cloud computing services in nature are Web applications which deliver desirable computing services on demand. It is thus a natural technical evolution that the Cloud computing acquires the Web 2. 0 technique. [50] Cloud computing defines the way the applications are

deployed. It offers infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS).

As per the requirement of resources, the processing power and memory gets allocated in an elastic manner. [45] The cloud is often misinterpreted as a combination of clusters and grids. However, in reality, clouds are next-generation data centres which are dynamically provisioned as per the user demand used for personalized resource collection for fulfilling specific user needs and accessible through " Web 2. 0" technologies. [51] Web 2. 0 and Implications on cloud computing Web 2. 0 contributes to the front end of the business, cloud computing contributes to the back end of the business.

Combining both, web 2. 0 & cloud computing, both front end as well as some of the back end of the business can be outsourced. The work can be performed from anywhere, teams may not be at the same location thus collaborating the information using, web 2. 0 tools, cloud, mobile technologies. This is the concept of virtualized organizations. [53] Statistical Support David Osimo shows how web 2. 0 applications have grown masively. He uses the data from Technorati, Wikipedia, Myspace, Youtube and Nielsen-Netratings for analysis.

His findings can be seen in Figure 2.. [10] Figure 35: Growth of Web 2. 0 applications [54] Cloud computing is addressing two different market needs [50] 1. Large scale web applications (' web 2. 0 markets') – scale-out cloud E. g. Google Traditional data centre computing (' enterprise market') - server clouds E. g. Microsoft 2. Figure 36: Evolution of World Wide Web [48] Cloud computing is integral to web 2. 0. It brings all sorts of user data along with

operating system online and enables content sharing platform making the use of storage devices unnecessary.

Web 2. 0 provides the collaborative functionality that helps in sharing documents and making changes on a real time basis regardless of their locations. This along with cloud computing allows for online storage of data avoiding the use of hardware, data centres as well as software replaced by online web applications like Google documents. There can be two kinds of customers for cloud [49] Those that need to scale up (achieve higher scale) at low costs 2. Those that want to eliminate data centre model and choose pay-as-you-go model 1.

Many technologies like grid computing, peer to peer computing contribute directly to cloud. Thus, web 2. 0 provides users the capabilities of easy sharing and accessibility of data with anyone, from anywhere. Applications like Google doc, face book are managed by cloud storing huge amount of user data at one place and making it readily available to everyone anytime. These applications are one type of services, software as a service. Users have their own hardware at place, and use their own platform to run these cloud applications. The software resources like application servers, database servers, IDE etc. re not required. Other kind of services include application as a service where users have their own hardware at place and rent platforms from cloud to develop customized software. Finally infrastructure as a service means the complete virtualization of business with storage at cloud. Hardware and computing also need not be performed at the site but takes place in cloud. Resources like storage, computing power are not required. [52] With the advent of web 2. 0, cloud computing got a boost as people

could create and access any amount of information without having to worry about its storage.

Google is the best example. It provides many services and applications like, Google doc, spreadsheet, YouTube all of which are cloud based and help sharing information on a real time basis. The real time sharing of knowledge is what is made possible though combination of the two. Cloud is incorporated in the next version of web 2. 0 retaining the features of web 2. 0 and adding new ' elasticity' to the whole application or business deployment. 11. Porter's 5 Forces Analysis Threat of new entrants ? ? ? ? Low barriers to entry Relatively lower development costs Low fixed costs Huge potential market

Bargaining power of suppliers: ? ? High for few big players. Can depend on the type of service provided. Bargaining power of buyers: Existing competitive landscape ? ? Intense rivalry. Presence of big, small & niche players. ? ? Dependent on the size of the buyers. SMEs' power can increase with standardization of offerings. Threat of substitutes: ? Mild threat from open source computing Figure 38 1. Existing competitive landscape: The Cloud computing market comprises of both small and big players causing intense rivalry.

But there is a large variety in the type of products and services required by customers and so there is room for big, small and niche players. There are the big players providing end-to-end services like IBM, Amazon, Microsoft etc, pure players like Salesforce and niche players like Dell-BOOMI (specializes in Cloud Integration), Rackspace (leader in managed hosting services) and small players like Zenith. [55][56] 2. Suppliers' bargaining

power: Since there is a huge potential for demand from SMEs and few big players like Google, Amazon and IBM, the bargaining power of suppliers is quite high.

Bargaining power could vary according to the type of service provided. E. g. In case of an IaaS service, switching cost for customers might not be very high since the offering is largely undifferentiated, but same cannot be said for a SaaS offering. Also there are is no clear rule of law for regulation of the data stored on the cloud. Data stored on the cloud could be subject to less stringent action by the regulatory authority than that stored on a personal computer. This could make the switching costs for the customers quite high. [57][58] 3.

Buyer's bargaining power: Bargaining power of buyers can be said to be dependent on the size of the buyer's business. In case of SMEs, the bargaining power can be said to be low since many of the suppliers in the cloud computing market are large corporations. Whereas the buyer's bargaining power can substantially dominate the supplier if the buyer itself is a large organization. The bargaining power of SMEs can increase if with the standardization of the services which will be facilitated with establishing proper regulatory compliances. [57] 4. Threat of new entrants:

With the huge potential market among the SMEs, it is expected that many new entrants from the SME segment itself will enter the Cloud computing market with low cost offerings. This expectation lies on the fact of low fixed costs, relatively lower costs of developing a product and low barriers to entry. [57][59][60] 5. Threat of substitutes: Open source computing can be considered as a substitute for Cloud computing services. But it can be

expected that the SMEs will prefer Cloud computing over open source due to higher switching costs in case of open source and lower costs of cloud computing services. [57]

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