

International Journal of Advance Research in Computer Science and Management Studies

Research Article / Survey Paper / Case Study

Available online at: www.ijarcsms.com

Major Factors Influencing the Adoption of Cloud Computing by Startup Companies in INDIA: A Survey based Investigation

Jipson George Thoomkuzhy¹

IT Management Professional in a fortune 500 Company
Bangalore, India

Lokesh V²

IT Management Professional in a fortune 500 Company
Bangalore, India

Abstract: Internet has become an important factor in the life of millions of people around the world and cloud computing is one of the newest services offered over the web. Cloud computing has become a boasting factor for most of the cloud service provider companies. Organizations which are planning to implement cloud services has to consider many factors from a scalability point of view else bad or wrong decisions can badly impact their future business.

Startup companies are currently booming up in India because of the government initiatives like Make in India, Startup India-Standup India. Startup companies start with minimal capital and normally face challenges in adopting latest technologies due to the lack of funds. By adopting cloud technology, the startup organizations in India will be able to obtain latest technology without the need for huge investments. If startups have access to scalable technologies then they could potentially delivery products and services similarly like how the large enterprises could delivery, flattening the competition arena. This paper aims at the adoption of cloud computing and the major factors which influence the adoption of cloud computing by startup companies in India.

In this paper, we present a survey on Adoption of Cloud computing by start-up companies in India, highlighting the key Cloud concepts, the awareness of cloud computing and key factors which influence the startup companies in Adopting Cloud.

A survey was conducted on 150 Indian startups from various industries showed that majority of the startups are aware of cloud computing technologies and they are mainly interested in opting hosting, email, backup and storage services. Majority of startups confirmed that they do not have major financial challenges in adopting the cloud services. The other major reasons for their interest in cloud service is because of the scalability, availability of development platform, sensitivity of data, reduction in CAPEX/OPEX and availability of disaster recovery services. However startups showed concerns on the quality and interoperability of the cloud vendors. Majority of startups confirmed that regulatory compliance is not a major factor for their cloud adoption.

Keywords: *Cloud Computing, SAAS, PAAS, IAAS, OPEX, CAPEX, Start-ups.*

I. INTRODUCTION

Cloud computing [1] is a latest trend in the computing which has the potential of changing the whole perspective of the current computing technologies. Startups and SMEs play an important role in the economy of India by offering large amount of employments opportunities [2]. In order to remain in the market the new startup companies should implement new ideas in a faster manner to enable precedence over its competitors on the global market. A quick response to the customers would help the organizations to sustain in the market by delighting the customers rather than providing just a customer satisfaction. A delay of around six to eight weeks for a new server deployment is an unacceptable factor [3]. New methodologies will help startups companies in India to reduce the time required for implementation along with the cost .An infrastructure built with latest technologies would help startups to be more productive in the competitive market.

In this paper we analyze and discuss about some of the aspects which would play a key role in the adoption of cloud computing by startup companies in India. In the current market there are three cloud delivery models [4, 5, 6] based on a pay per use model. Software as-a-service (SaaS) Platform-as-a-Service (PaaS) and Infrastructure-as-a-Service (IaaS).

Software-as-a-Service (SaaS) is described as a process by which required software applications are provided by the cloud service provider in a rental manner over the Internet by using the cloud infrastructure. This avoids the necessity for installing and maintaining applications on the customers own server. This avoids the customer taking ownership of software maintenances, day to day operations and their support.

Platform-as-a-Service (PaaS) is a virtualized platform which includes servers with operating systems (Linux, Windows, Unix etc) and applications. PaaS also provides development platforms provided as a service over the Internet which helps developers to build and test their applications in a virtualized infrastructure rather than using own hosting platforms.

In Infrastructure-as-a-Service (IaaS) computer infrastructure is delivered as a service. An Infrastructure contains servers, storage devices. This helps to avoid cost for procuring hardware and it creates benefit to startup companies [7, 8] and also relieves them of their future needs and helps to scale their infrastructure based on the future demands.

Startup companies are important for the economic growth of a country [9] but they start with limited capital and it will be tedious for many companies to have latest technologies. This study discuss about the effective usage of cloud computing to mitigate the huge IT investments for Start-up Company. Most of the cloud computing researches has concentrated on two broad areas; business agility and catalysts for more innovation. However difficulties still exist in deciding on the approach of implementing cloud computing services for startup companies [11].

This paper will discuss about the major factors influencing the adoption of cloud computing by the startup companies in India. This paper discuss about the outcome of survey conducted with 150 startup companies in India. This study found that startups are aware of the cloud computing and they are interested in using various services like hosting, email, backup and storage services. The study also confirmed that the startups do not have major financial challenges in adopting the cloud services and the major reasons for their interest in cloud service is because of the scalability, availability of development platform, sensitivity of data, reduction in CAPEX/OPEX and availability of disaster recovery services. This study also showed that the startups have concerns on the quality and interoperability of the cloud vendors and majority of startups confirmed that regulatory compliance is not a major factor for their cloud adoption.

II. BACKGROUND

Cloud computing overview

What is cloud computing?

Cloud computing is a type of IT infrastructure which relies on sharing computing devices rather than having local servers to handle the software/applications. This distributed computing architecture centralizes the computers or servers on a scalable platform to provide on demand resources and services. This on demand platform provides access to a shared pool of configurable devices like servers, networks, storage, software and applications. These devices can be provisioned and released with minimal administrative overhead. Cloud computing providers deliver their services over the internet and they charge their customers with a monthly fee based on their usage [11]

Types of Cloud

Based on the deployment cloud computing is classified as follows [12]:

1. **Public cloud:** Public cloud is a type of computing infrastructure which is hosted by the cloud provider at the vendor's premises. The customer has no visibility and control over where the computing infrastructure is hosted. The computing infrastructure is shared between any organizations.
2. **Private cloud:** Private cloud is a dedicated computing infrastructure which is not shared with any other organizations. Private clouds are considered to be more expensive when compared to private clouds and this is also considered as a more secure infrastructure when compared to public clouds. Private clouds are classified as: On-premise private clouds and externally hosted private clouds. Externally hosted private clouds are cheaper than On-premise private clouds.
3. **Hybrid cloud:** Some of the Organizations may host critical applications or applications which needs more security on a private clouds and applications which needs minimal security are hosted on the public cloud. The usage of both private and public clouds together is called hybrid cloud.
4. **Community cloud** involves sharing of computing infrastructure between same types of organizations. For example all Government organizations within the state of California may share computing infrastructure on the cloud to manage data related to citizens residing in California.

Types of Cloud services

Platform as a Service (PAAS): [13]

PaaS contains a set of software and development tools hosted on the cloud service provider's servers. Platform as a Service (PaaS) is an application development platform delivered as a service to the developers over the Web. This helps in the development and testing of applications without buying the infrastructure.

Software as a Service (SAAS): [13]

In SAAS the cloud service provider provides a set of software applications to its users. These applications can be anything like email, CRM etc. In this the user don't have to do any development or programming, but can use a very flexible, configurable and sometimes customizable software. A SaaS cloud provider normally hosts and manages a given application in their own data center and makes it available to multiple users over the Web.

Infrastructure as a Service (IAAS): [14]

In this the cloud service provider provides virtual servers, storage devices or network devices on an on-demand basis. Customers can pay for the amount of service they use just like how we pay electricity or water bill.

III. CLOUD COMPUTING FROM STARTUP PERSPECTIVE (THE SURVEY)

The survey attempted to explore the major factors influencing the adoption of cloud computing by startup companies in India. The study started by categorizing the major factors which influence the decision making of a startup company. This also mentions about the startups view of cloud computing, various cloud deployment and service models preferred by the startups. This also includes study of the startups planning to use cloud computing for their business, operations or if they do not have plans to adopt cloud computing. This study also reflect the current issues hindering cloud adoption by startups in India.

The methodology used was based on quantitative online survey questionnaire approach. The targeted startups were the companies which started their operations in the last 5 years and with a capital less than 25 Lakhs. Participants varied from IT decision makers to directors of the organization from diverse industry sectors. The major industries (Fig: 1) which we covered in this survey are from HR, Ecommerce, Logistic, Import Export, Software and IT enabled services, Automation, Consulting, Manufacturing, Information Search, Legal, Research & Development, Healthcare, Pharmaceutical, Education sectors

Almost 150 startups were invited for this survey and 23 questionnaires were asked to the startup companies each of the questions were updated with respective information so that the startups can read and acquire the knowledge about the cloud computing. We have received responses from 50 companies. The response rate of this study gave a satisfactory response rate was approximately 35%. Questions were asked to understand the major factors which would influence the adoption of cloud. The survey also analyzed the major reasons, challenges and the benefits for adoption of cloud computing along with the preferred service and deployment models.

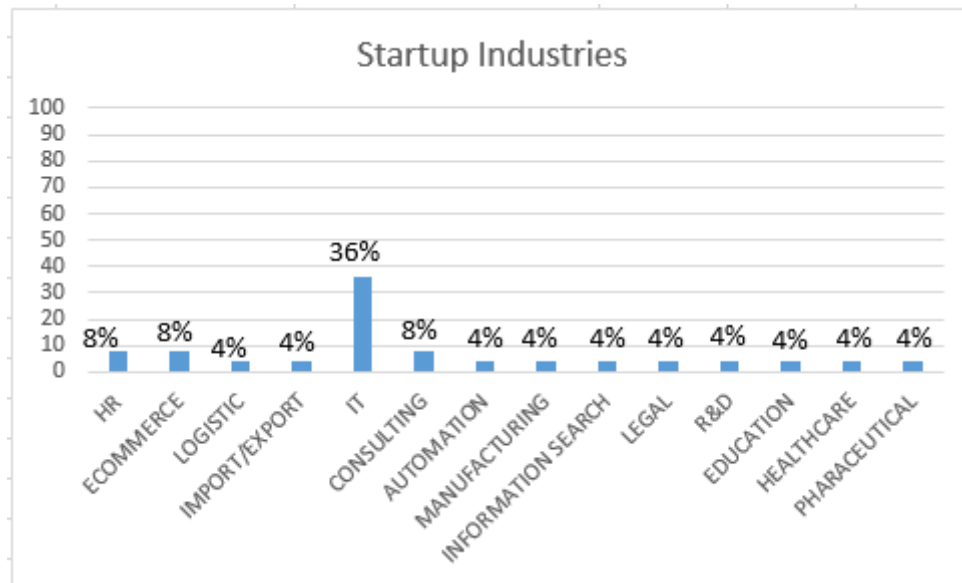


Fig 1: Industries covered in the survey

IV. TOOLS USED FOR SURVEY

A website named e-mailmeform.com was used to create an online survey.

V. RESULTS

This section gives a brief summary about the major factors influencing the adoption of cloud computing in the startup companies

MAJOR FACTORS INFLUENCING THE ADOPTION OF CLOUD COMPUTING IN STARTUP COMPANIES

1. Startups awareness about the IT and cloud computing

The awareness about the IT and cloud computing is found to be a major factor for migration to cloud computing. As per the survey (Fig: 2) 16% of the startups doesn't have any knowledge about the features or benefits of cloud computing and the lack of awareness is preventing them from making a decision about the adoption of cloud services. These companies mainly rely on third parties like web developers or software providers for most of their IT requirements like website hosting, email services, software services etc. The advice from the third party companies plays an important role in their plans for adopting the cloud. The ignorance about cloud computing by third parties also can create a negative impact for startups to adopt cloud computing. We have also identified that companies started in IT sector are aware of the cloud computing and most of them have plans to adopt the cloud services. As per the survey 84% of the companies are interested in adopting the cloud services.

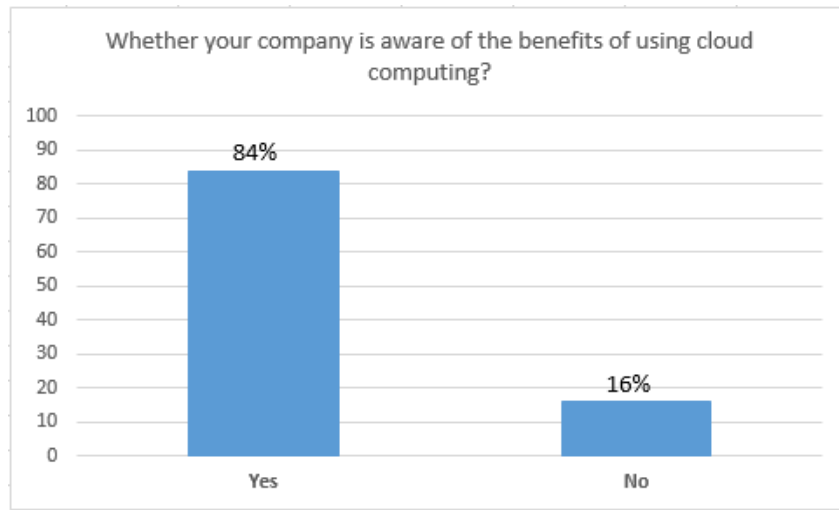


Fig2: Survey results on Cloud Awareness

Findings: The results give us an indication that most of the startups are aware of the cloud computing and this gives a huge business opportunity for Cloud Service Providers to approach the startups for selling their products and services.

2. Type of IT services required for the company operation

The type of IT services required for a startup plays an important role in the decision making process for cloud adoption. As per the survey (Fig: 3) 80% of the companies needs a hosting environment for their business operations and 68 % of the startups mentioned email as an important services for them. Some of the companies prefer to use a shared webhosting or email services for their initial operations. Companies which requires critical business software or applications prefer to go with cloud computing services due to the cheap service offerings of cloud computing. Almost 52% of the startup companies require backup and storage services as part of their day to day operations. As per the survey 16% of the companies are interested in booking services and 24% on calendar services. 36% of the companies mentioned their requirements about other services.

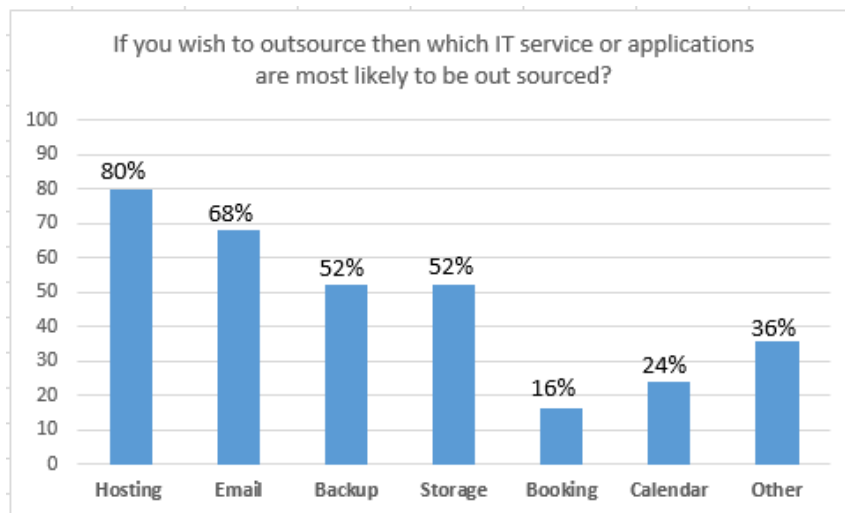


Fig 3: Survey results on cloud service requirements

Note: Some of the startups opted for multiple options, hence the tally is more than 100%.

Findings: The results give us an indication that most of the startups are looking for hosting, email, backup and storage services and this information can help Cloud Service Providers to approach the startups for selling hosting, email and storage services.

3. Budget reserved for the IT infrastructure

Budge plays a very important factor for most of the startups. Most of the companies start with a minimal capital and without the involvement of angel investors. So these companies initially face a huge challenge in acquiring the latest

technologies. Lack of funds is preventing many companies to opt cloud services but some of the companies has a future vision for implementing the cloud services in case if their financial status improves in the future. As per the survey (Fig: 4) 24% of the startups mentioned that the IT budget is challenge for them in adopting cloud services, 52% of the startups mentioned that they do not have any challenges in adopting cloud services due to IT budget limitations. However 20% of the companies were not aware if their IT budget is creating any challenges in cloud adoption.

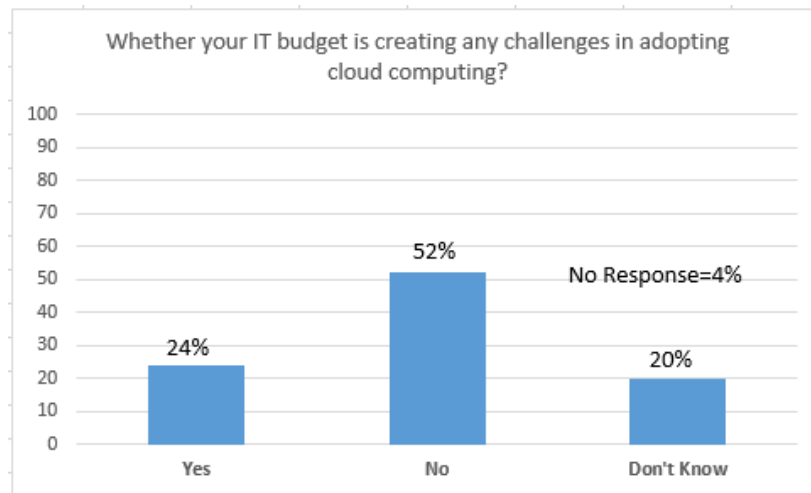


Fig 4: Survey result on IT budget

Findings: The results indicate that the startups are not considering any challenges in adopting the cloud services because the cloud computing itself is considered as the cheapest solution. The gives a good indication to the cloud vendors in approaching the startups for selling their services.

4. Estimated business growth or Scalability of Infrastructure

Projected business growth of a startup plays an important roles for startups to make the necessary decision to move to cloud computing. Some of the startups might be expecting minimal growth in the future and such companies are reluctant to use the cloud services. But some of the companies are expecting a good growth in the future and they plan to use cloud computing to utilize the scalability of cloud computing on an on-demand basis. If business declines then the startups can back off from their cloud services. As per the survey (Fig: 5) 64% of the companies confirmed that scalability is a factor influencing the adoption of cloud computing, however 20% of the companies mentioned that scalability doesn't have any dependency on their cloud adoption. However 16% of the companies mentioned that they are not aware if the scalability is a factor for adoption of cloud computing.

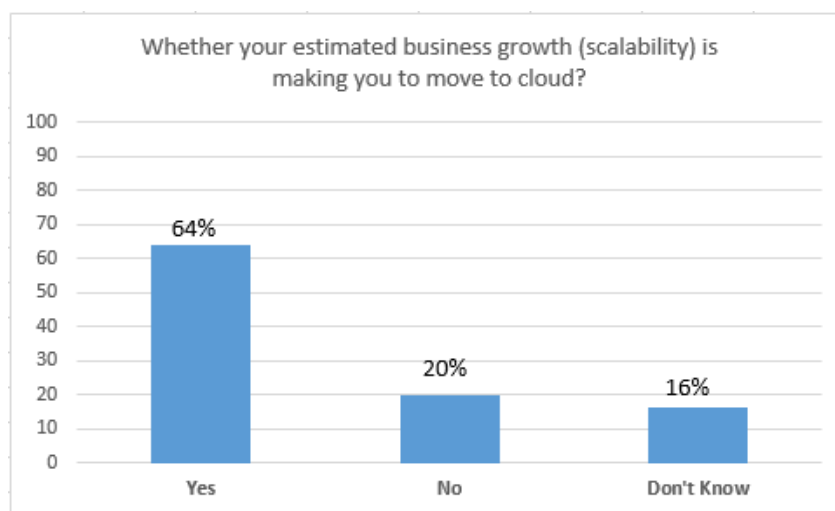


Fig 5: Survey results on the scalability

Findings: The results give us an indication that most of the startups are expecting a good growth in their future and that is the reason they are mainly interested in an infrastructure which scalable based on the growth of the company.

5. Availability of a development platform for testing purpose

The availability of a development infrastructure for testing purpose also makes it viable for startups to opt the cloud services. Some of the startups are product based companies and they need to make sure that their business applications are running as expected. Startups can utilize the PAAS services of the cloud provider for development and testing of applications. As per the survey (Fig: 6) 68% of the startups confirmed that the availability of a development platform is a key factor for their cloud adoption, where as 12% of the startups mentioned that their cloud adoption is not because of the availability of a cloud platform. However 20% of the startups were not aware if the development platform is a driving factor for their cloud adoption.

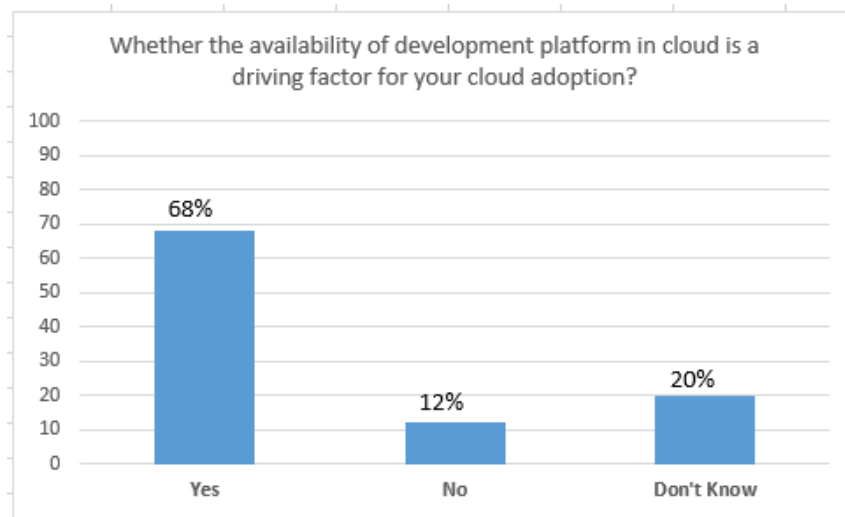


Fig 6: Survey results on the availability of development platform

Findings: The results give us an indication that most of the startups are interested in cloud computing because of the availability of a development infrastructure for building or testing their products or application. This also gives an indication that most of the companies are interested in innovating their business with latest products or technologies. The cloud service providers can approach the startups for selling their PAAS services.

6. Sensitivity of the data used by the startups

The sensitivity of the data also plays an important role in the decision making process. Some of the startups consider their newly developed or patented applications as critical and sensitive and they want them to be handled in a secure manner. The lack of funds in the initial stages to setup an own infrastructure with higher security will be a major concern for startup so they rely on the cloud computing infrastructure for hosting their applications. Private clouds are considered as secure when compared with public clouds so startup can prefer to host their critical applications in a private cloud or even they can opt for community clouds. As per the survey (Fig: 7) 60% of the startups confirmed that the sensitive business application is a key factor for their cloud adoption, where as 24% mentioned that their cloud adoption doesn't have any relation with the criticality of their applications. However 16% of the startups are not sure if their cloud adoption has any relation with the sensitivity of their business applications.

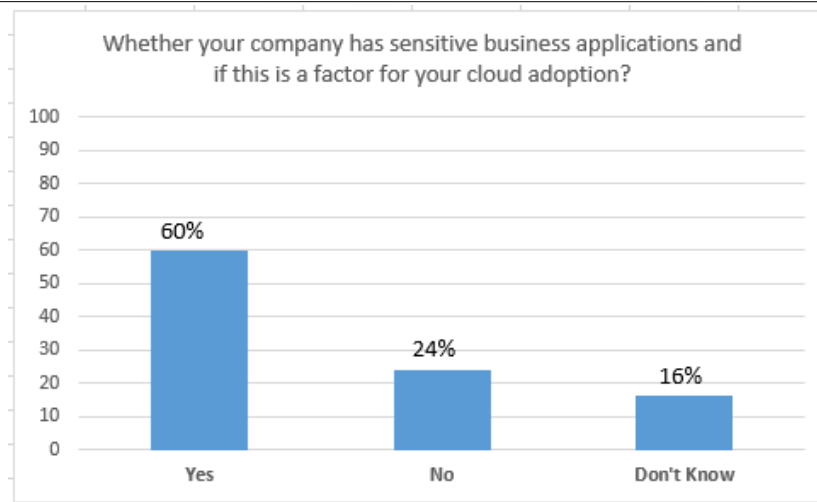


Fig 7: Survey results on sensitive business applications

Findings: The results give us an indication that startups are using sensitive business applications and they expect that the cloud vendor would protect their applications by using the innovative security mechanisms.

7. OPEX and CAPEX

Operational expenditure (OPEX) and capital expenditure (CAPEX) are some of the driving forces for startups to migrate to cloud computing. With minimal capital startup can avoid the huge CAPEX by opting the cloud infrastructure. Startups can also reduce the OPEX by avoiding dedicated support teams for the management of the infrastructure since the whole operational part is managed by the cloud service provider. As per the survey (Fig: 8) 72% of the startups confirmed that OPEX and CAPEX is a factor influencing their decision making in adopting the cloud computing, whereas 8% startups confirmed that OPEX and CAPEX is not a driving factor for their cloud adoption. However 20% of the companies are not sure if the OPEX or CAPEX is a driving factor for their cloud adoption.

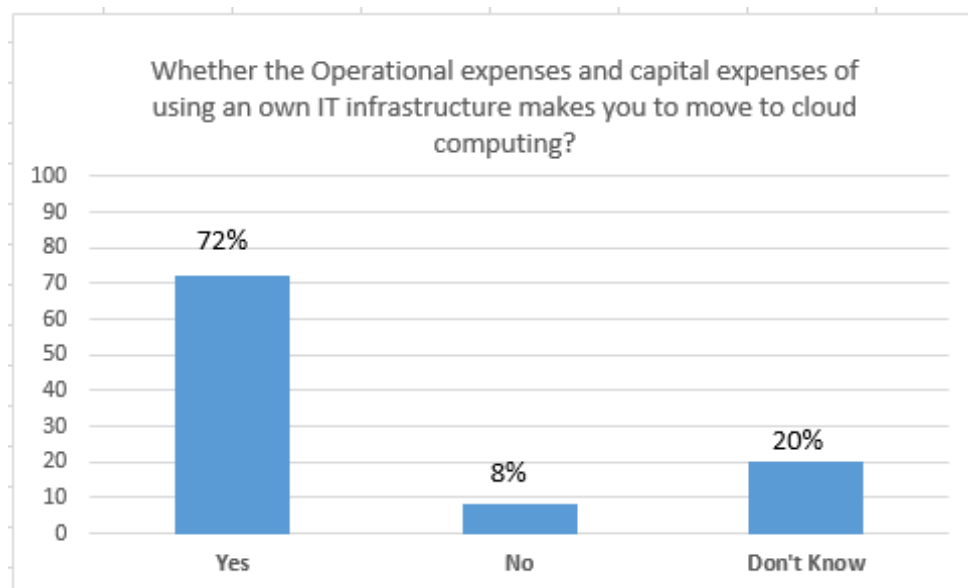


Fig 8: Survey results on OPEX and CAPEX

Findings: The results give us an indication that most of the startups are interested in the cloud computing because of the reduction in CAPEX and OPEX. When startups start their operations with minimal capital they can adopt the best effort cloud technology without any CAPEX or OPEX.

8. Size of the infrastructure or the number of servers

The study was conducted with the expectation that the size of the infrastructure is considered as a factor which makes a decision for opting the cloud services. Some of the startups start with a website and such companies prefer to have a web space for hosting their websites and they generally do not prefer to opt the cloud. But some other startups with a bigger infrastructure opt the cloud services because of the cost factors, scalability and time to implement. This survey (Fig: 9) proved that the size of the IT infrastructure is not a major concern for 36% of the companies however 32% of the companies consider this as a major factor for their cloud adoption. This gives us a confirmation that even startups with small infrastructure also prefer to adopt the cloud services. However 32 % percent of the companies are not sure if the size of their IT infrastructure will be a factor for their cloud adoption.

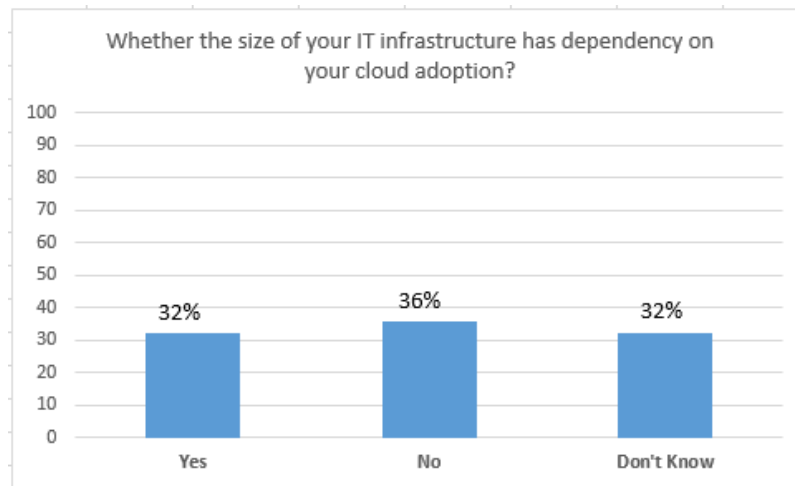


Fig 9: Survey results on size of IT infrastructure

Findings: The results give us an indication that most of the startups are not migrating because of the size of their current or future infrastructure.

9. Disaster Recovery

Disaster recovery is considered as another important factor which influences the decision making for cloud adoption. Some of the startups use a critical application and any downtime for their business application will have a major impact on their business. Such companies expect their applications to be hosted in cloud which provides a better service level agreement as well as business continuity services. As per the survey (Fig: 10) 44% of the companies confirmed that disaster recovery is a factor which influence the adoption of cloud computing. 36% of the companies confirmed that the DR is not a major factor for cloud adoption, where as 20% of the startups are not aware if disaster recovery is a factor for their cloud adoption.

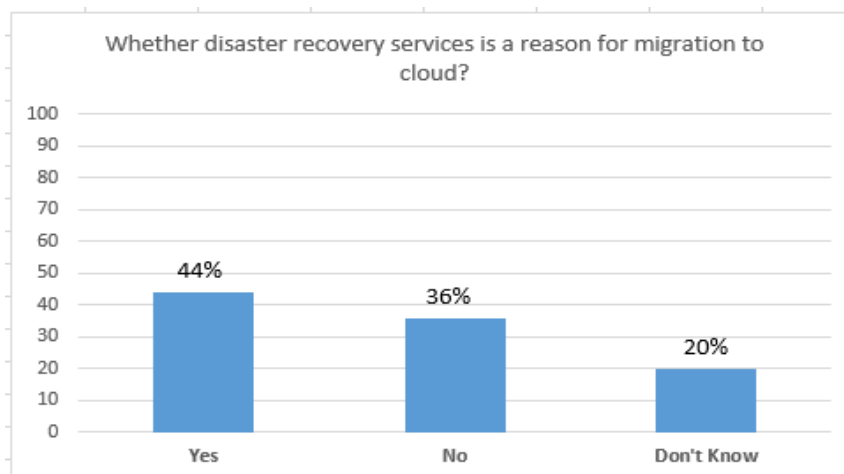


Fig 10: Survey results on disaster recovery

Findings: The results give us an indication that most of the startups are giving importance to the availability of their data. Cloud vendors can approach the startups by highlighting their disaster recovery as a service.

10. Interoperability and Quality of the services provided by cloud vendors

There are numerous cloud service providers in the market and the services offered by them vary in terms of cost, quality and operations. Some the vendors are found to be more reliable in their commitments where are some other cloud service providers have a bad review in terms of the quality of the services offered by them. Some of the startup has concerns about the support model and quality of services provided by the cloud service provider. Certain startups has little fear in opting the cloud services because of the quality of the support offered by them. This can be isolated to an extent by reading the reviews of their customers.

Some of the startups has a concern whether the interoperability between the cloud service providers will be a problem for their future. Cloud service provider migration is considered to be an impacting one and there is interoperability issues between various cloud service providers. The startup have a concern whether they will be able to opt a different cloud service provider in case if they are not satisfied with their current service provider. This plays an important role in the decision making process of cloud adoption. As per the survey (Fig 11) 44% of the companies confirmed that their cloud adoption has a relation with the quality and interoperability of the cloud services. 24% of the startups confirmed that their cloud adoption doesn't have any relation with the cloud adoption. 32 % of the startups are not sure if the quality and interoperability will be a factor for their cloud adoption.

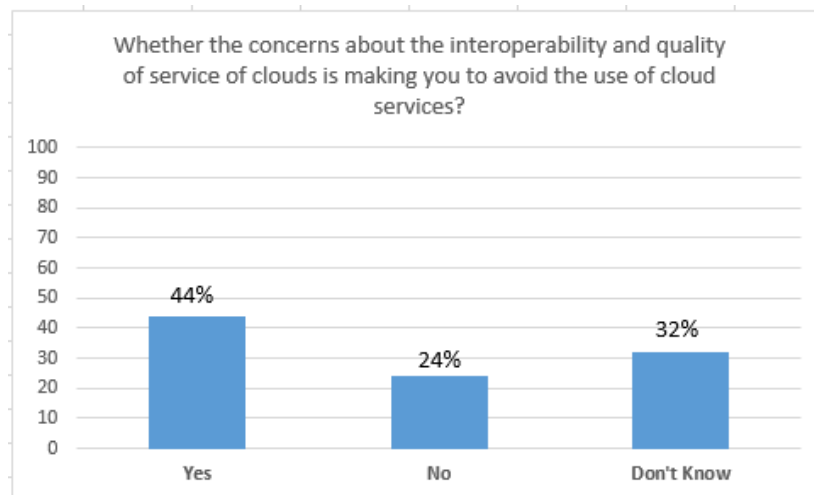


Fig 11: Survey results on Quality and Interoperability

Findings: The results give us an indication that most of the startups are concerned about the quality and interoperability of the cloud services offered by a cloud service provider. This can be a take a way for cloud service providers to highlight the interoperability feature and the quality of the service delivered by each of the cloud service providers.

11. Regulatory Requirements and Compliance

Regulatory requirement is also considered to be a major factor in the decision making of the cloud adopting. Some of the startups which are based on financial or insurance sector have to have an infrastructure which can meet the regulatory requirements set by the government. Most of the cloud service providers offer services or infrastructure based on the regulatory compliance. Regulatory compliance like Sarbanes Oxley and HIPAA are very important in USA. This survey was conducted on Indian startups and as per survey (Fig: 12) 28% of the companies consider regulatory compliance as an important factor for their cloud adoption but 40% of the Indian startups doesn't consider regulatory compliance as a major

factor for their cloud adoption. 32% of the Indian startups are not aware if regulatory compliance is a factor for their cloud adoption.

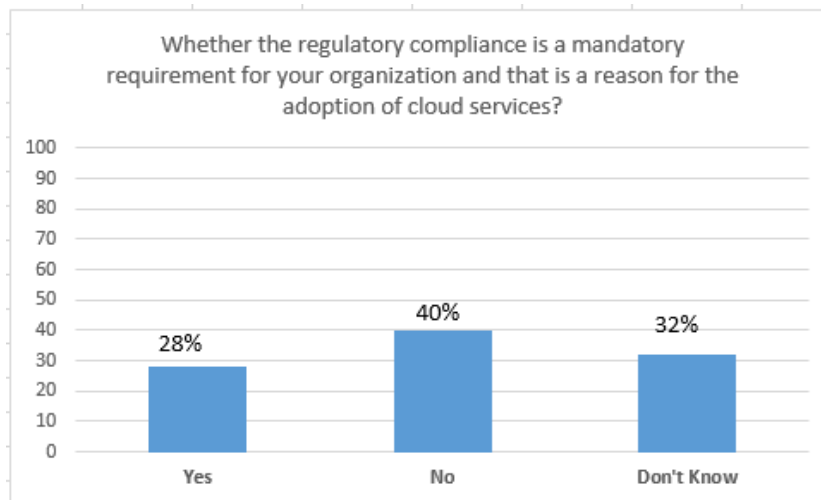


Fig 12: Survey results on Regulatory Compliance

Findings: The results give us an indication that most of the Indian startups are not much concerned about the regulatory compliance and they do not consider this as a factor for their cloud adoption. This could be because of the flexibility of regulatory policies In India.

VI. DISCUSSION

In the current economic situations it is important for any organization to delight its customers with the help of latest technologies more over the sustainability of any organization depends on the way how fast it achieves the latest technologies. Cloud computing is the latest technology in the field of information technology which can create significant impact to the business of many organizations including the startup companies. In order to sustain in the market it is important for startups to decrease the time-to-market. Adopting the cloud technology can provide a real competitive advantage, improve business performance and control the cost of IT resources [15]. As per the survey the most of the IT startups are interested in adopting cloud services because of their sound knowledge about cloud services but startups from other industries do not have enough knowledge and that could be creating a road block in the adoption of cloud computing. Startups are more interested in services like hosting, email, storage and backup services. This is considered as a basic requirement for any organization to nurture in the market. IT budget for the startups is also a major factor for the adoption of cloud services. Most of the startups start as small and there are chances that the company needs to upgrade their infrastructure when the business progresses. The scalability feature of the cloud help the organizations to upgrade the infrastructure on a pay as you go basis.

Most of the startups require development platforms for product development and testing purpose so the availability of PaaS helps startups to develop and test new products or applications. The sensitivity of the data used by the startup organization also plays an important role in the discussion making because of the challenges which they have for setting up an independent security infrastructure. The adoption of cloud services can reduce the operations expense and capital expense to a greater level. A saving of around 25% will create a good impact in the startup companies. Cloud computing uses virtualization techniques and this helps the startups to run multiple servers as a VM instance instead of using multiple dedicated servers in their own infrastructure. Business critical applications used by the startup needs failover in case of any impact to their applications or services. Most of the cloud vendors provides disaster recovery services which helps them to failover the applications and services to a different datacenter in case of a disaster. Interoperability and quality of service also plays a major role in the decision making of many organizations because the interoperability of cloud vendor is considered as a major challenge. Regulatory requirements are important for organizations to comply based on the laws applicable on their service location.

VII. CONCLUSION

The advancement of internet and cloud computing is making a major change in the information technology and makes the utility computing a reality. The current Indian economy is drastically changing with the growth of startup companies and the adoption of cloud computing by startup companies would enable the Indian startups to use the latest technology for effective business. Normally the startup companies start with minimal capital and during the nurture period they face many challenges in acquiring the latest technologies. The major factors which influence the adoption of cloud computing by startup companies are Awareness of cloud computing, Type of services required for the company, IT budget, estimated business growth, availability of development platform, sensitivity of data, operations expense, capital expense, size of infrastructure, disaster recovery, Interoperability, quality of service and regulatory requirements etc. This study gave a confirmation that most of the startups are aware of the cloud computing and this gives a great information to the cloud vendors to approach the startup organizations for various services.

Cloud computing is emerging in to the market and we believe that our paper will provide a better understanding of cloud computing from a startup perspective and we expect that this will help in further research too.

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AUTHOR(S) PROFILE



Jipson George Thoomkuzhy, is an IT management professional with over 11 years' experience in the Industry. He holds a Masters in Science in Computer Networks from Manipal University and an MBA in Entrepreneurship and leadership. He holds several industry certifications like Prince-2, ITIL V3, MCSE, MCDBA, CCNA, CCDA, CCDP, HP AIS, JNCIA, JNCIS, JNCIP, CCIE, CCDE.



Lokesh V, is an IT management professional with over 18 Years' Experience, out of which he's been into Senior Leadership role for the last 10 Year. He is a Bachelor of Engineering in Electronics from University Visveswaraiah College of Engineering and MBA in Systems and Marketing. He also hold several Industry Standard Certifications: PMP, TOGAF, ITIL V3 and Cloud Architect Certifications.