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Open Source Technologies and Cloud Computing Advantages and Challenges

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Abstract: Cloud computing is a technique where depend on your specific requirements, your complete IT infrastructure resides over some third party cloud service provider. Despite of lots of challenges, threats and risks, it's still a great option to adopt and cut your IT infrastructure cost almost by more than 50% after doing a thorough due diligence and feasibility checks. One of the major drawbacks with respect to same is, it's a complete proprietary solution where you have to adopt complete solution which is own by some cloud service provider [1]. All infra, Softwares, security, tools etc. own and managed by them and you have to use by taking proper subscriptions. You may need some more functionality & modifications but you don't have any choice for that. This drawback inspired lots of organizations and open source communities to look and develop some alternate open source solutions which can be easily integrated with cloud based solutions from management, development and implementation perspectives [1] [2]. Where you have flexibility to develop and enhance according to your specific requirements. My article will focus on the relation between cloud computing and open source technologies, as well as the different open source cloud vendor solutions, misconceptions, Do & Don't and existing challenges.

Keywords: Cloud Computing, Open Source, Cloud Computing Due Diligence.

I. INTRODUCTION

Open source technologies are developed by large no of open source communities where you have flexibility to download complete code of the solution, develop and customize it according to the requirement freely, and most importantly you don't have to pay any license fee for that. You don't have such options and flexibilities with traditionally proprietary solutions. You have to purchase the compiled version of software by paying license cost, in parallel you have to buy the hardware's, networking, security etc. related solutions to setup and build your complete data center for IT infrastructure requirements, and then you have to pay regular yearly licensing, maintenance and support cost. It's very costly solution [4]. Other major drawback is, it's not open for you to develop and customized further according to you current or future requirements. If any such customizations or development needed then you have to go back to OEM (Original Equipment Manufacturer) for same and have to pay good amount for same. On the other side, open source solution address all the issues. It's freely available to download with complete source code; you can develop and customized it according to your requirements with only your development team efforts. You still have to purchase hardware's for deployment of same but still you software ownership will be significantly very low. Its play a great role when comes to cloud computing, here you even don't have any visibility or control over the services or software's you are using. You just stick with cloud service provider solutions and just used the applications exposed to you. Here open source communities are playing great role since they are developing solutions which you can easily integrate with cloud computing solutions as well as customize them according to your requirement and since it's an open source so you don't have pay any licensing fees for same as well. Apart from that, to get more confidence on open source technologies and avoid the development and customization efforts, many organizations has taken over the open source solutions and providing you the complete support of same. It means you still don't have to pay anything for licensing, but just have to pay for support and customization efforts which you wanted to bypass. All those software's defines under commercial

open source. Please refer below figure to get complete understanding on different between open source, commercial open source and traditional software's [5].

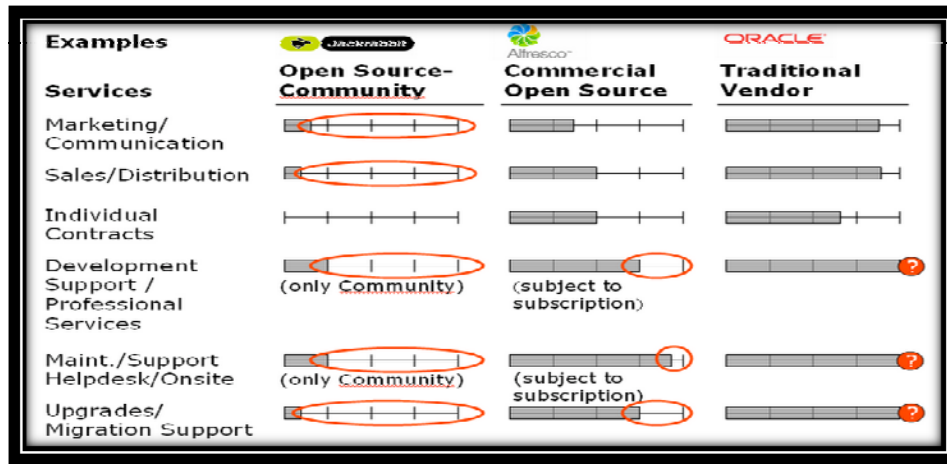


Fig 1 – Comparison between Open Source, Commercial open source and traditional software's

It's clear from the Fig 1 that enterprise (traditional) vendors are still close in all areas however with open source and commercial open source solutions, you have complete flexibilities to customize and work according to your need at each and every stage with less cost.

II. SELECTION CRITERIA FOR OPEN SOURCE AND TRADITIONAL SOFTWARE'S

Despite of all benefits, open forum and knowledge, there is still some confusion and misconceptions exist in mind of everyone before adoption of any open sources software or technology especially if it's come to cloud computing where security is still a big concern till today. No doubt, it's not an easy decision to adopt an open source stack or not, but it's not hard if you know the selection process and do the complete due diligence before taking any decision. first of all you have to identify all of the technologies you would like to implement, and then you have explore all alternate options from the market whether it's open sources or proprietary software [6]. Look for the peoples in your organization as well as outside whoever using those software's, discuss and take reviews, do some exercise on net and read reviews and feedbacks fin open forums. Below are few generic points you have to consider and compare with each and every alternate option.

You can divide your selection checklist in two parts

- Cost related Factors
- Qualitative Factors

Please see below for sub options of both checklist parts

Cost related Factors	Qualitative Factors
Software Costs [Licensing]	Performance
Hardware Costs [Purchase, Licenses]	Scalability
Manpower Cost (IT & Non IT Resources)	Availability & Reliability
Implementation Cost	Maintainability
Operational & Maintenance Cost	Security
Annual Technical Cost (Patches, Upgrades, BugFixes etc.)	Flexibility of Customization
Annual Maintenance Cost	Interoperability
Other Costs (Training, Documentation etc.)	Product Support Life

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Fig 2 – Cost and Quantitative factors

III. CLOUD INFRASTRUCTURE AND MANAGEMENT

No doubt cloud computing has established a dramatic impact in the field of Information Technology, and open source cloud computing communities have also been moving toward the same impact. According to one of the IDC market analysis, cloud computing business was grown almost more than 25% in between 2013 to 2014 and almost over \$100 billion [7]. Specifically in the area of cloud computing, open source community are now started equally participating in the race due to two major factors.

- Most of the open source software's for all enterprises and small business applications are now available as a SaaS by most of the cloud service providers.
- Most of the open source communities have started focusing and development of IMS (Infrastructure Management Softwares) which makes possible to design and setup almost all cloud delivery models, public, private and hybrid.

As of today, availability of Open Source Softwares is almost in every cloud solutions

- Open Source Hypervisors
- Open Source Cloud Appliances
- Open Source Compute Clouds (IaaS)
- Open Source Cloud Storage Software
- Open Source Platform as a Service (PaaS)
- Open Source Software Defined Networking Tools
- Open Source NoSQL Databases
- Open Source Provisioning Tools
- Open Source Configuration Management Tools

Please refer below some of the great open source cloud computing software's to understand the growth and innovation of OSS in the field of IT and Cloud Computing.

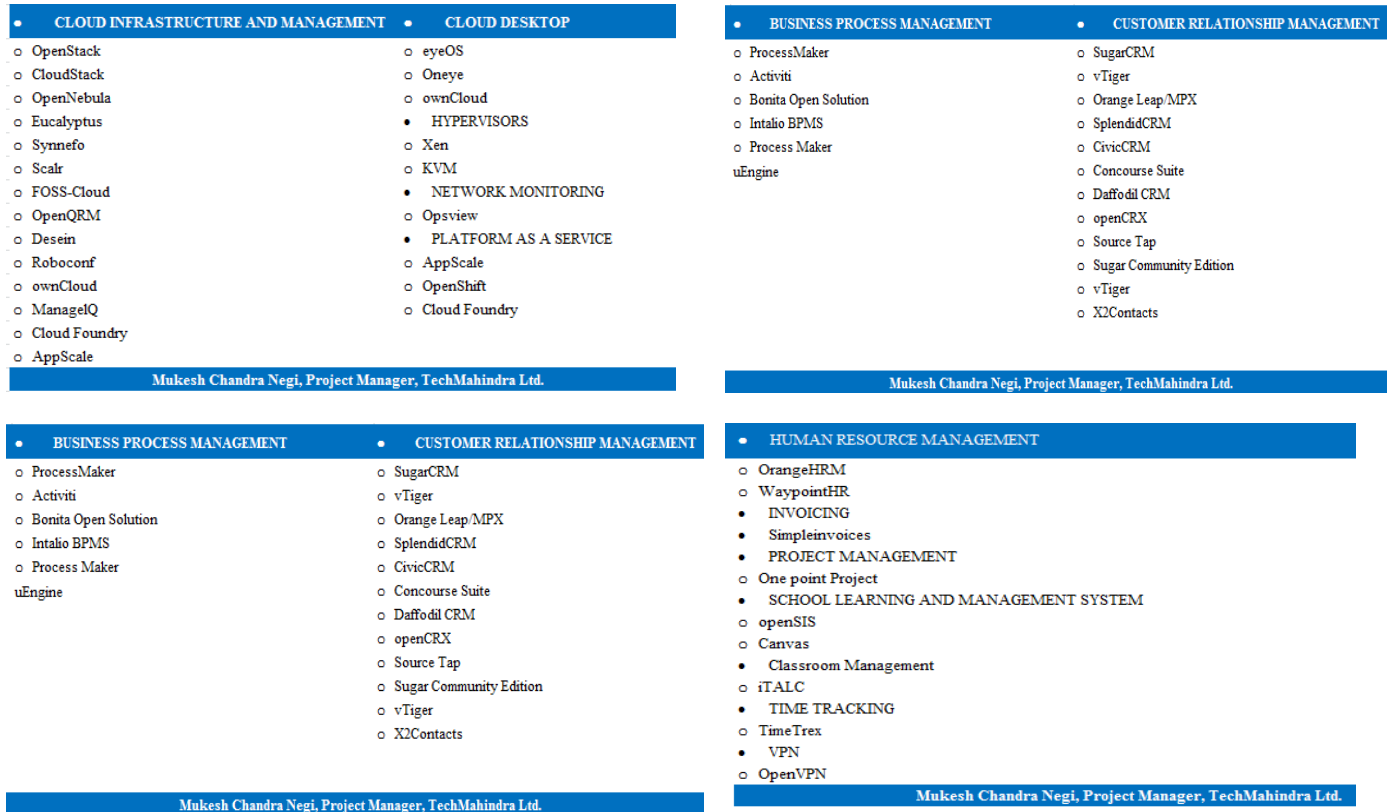


Fig 3 – Different open source technologies and Softwares

IV. RECENT SURVEYS ON COMPUTING AND OPEN SOURCE BUSINESS GROWTH

According to a survey conducted by computer world forecast 2015 [4], most of the IT managements said that their most of the projects and clients are demanding and working on to implement the cloud computing solution.

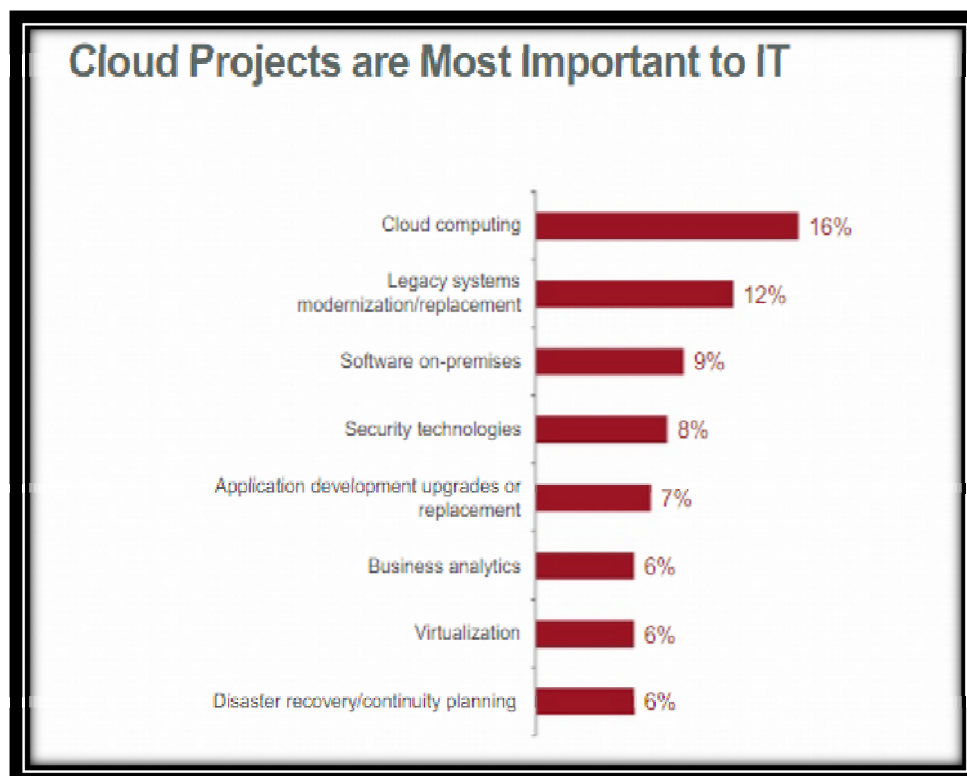


Fig 4 – Computer World Forecast 2015

Below are the areas where actual IT management and business is focusing.

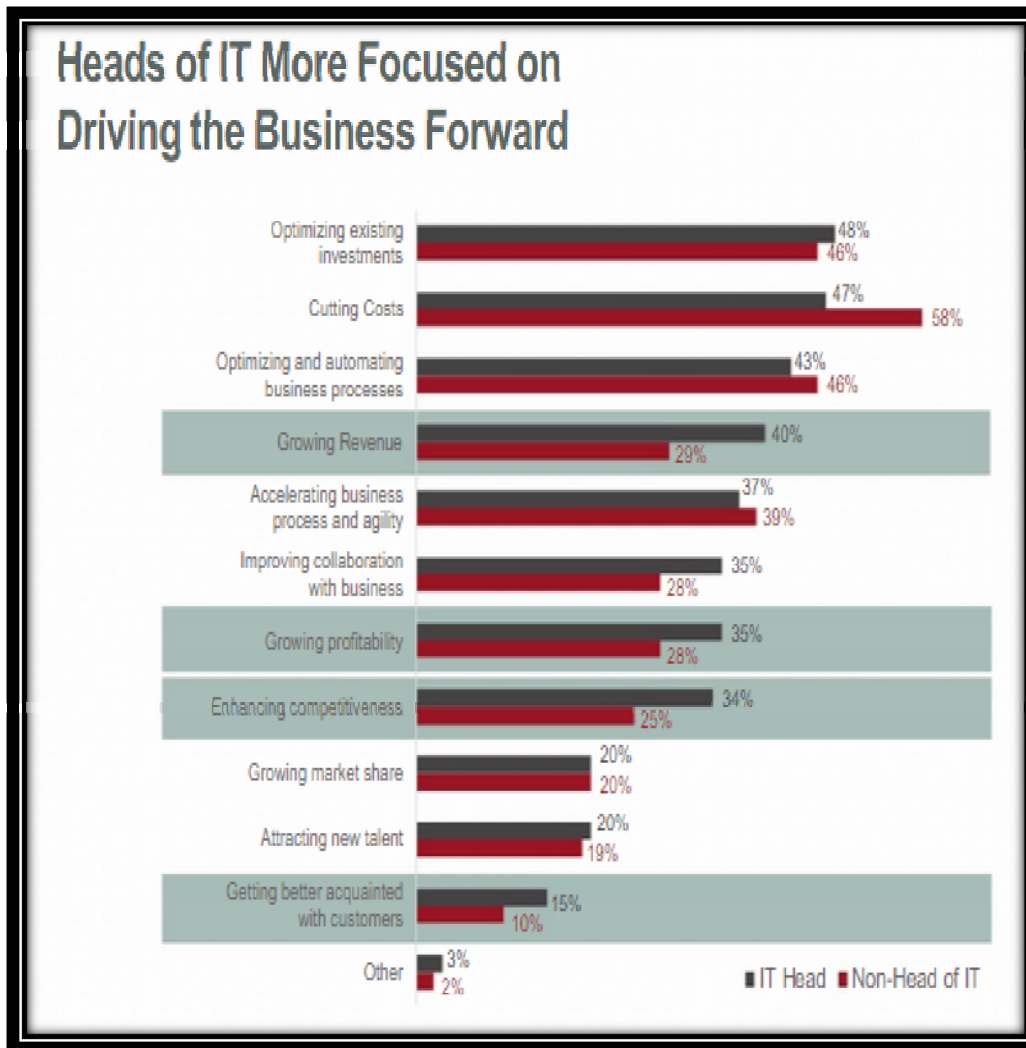


Fig 5 – Top IT and non IT business focus areas

And according to forecast by IDC [5], the business of Cloud Computing will going to cross over \$127 billion by year 2018.

Worldwide Public IT Cloud Services Spending by Segment (in \$ billions)

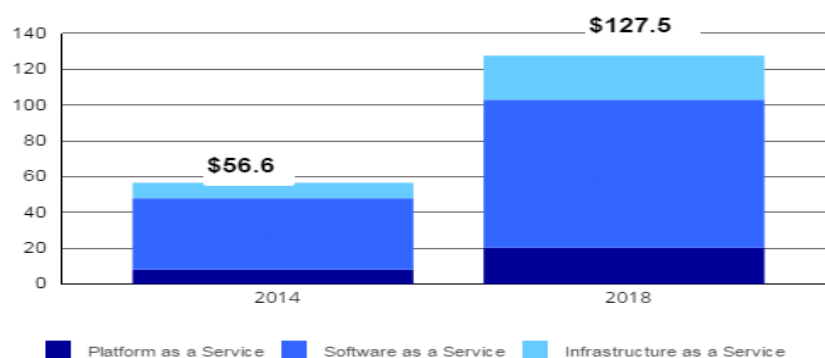


Fig 6 – IDC Forecast report

This year ninth 2015 survey on open source technologies led by North Bridge, Black Duck in collaboration with Forrester research, Jeffery Hammond and almost 43 different research organizations including few leading open source communities and vendors [8]. They have got almost more than 1300 responses from different users, vendors, IT professionals across country. There is clearly an indication of great growth of open source technologies in terms of acceptance and implementation. Below is the high level output of survey.

2015 Future of Open Source Survey Results

78% of respondents said their companies run part or all of its operations on OSS

66% said they take an open source-first approach to software

64% of companies currently participate in open source projects

Over the next 2-3 years, 88% of companies are expected to increase contributions to open source projects

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55% believe open source delivers superior security compared to proprietary solutions

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Fig 7 – 2015 OSS future surveys

V. POLICY ON ADOPTION OF OPEN SOURCE SOFTWARE BY GOVERNMENT OF INDIA

You can understand the importance and growth of OpenSource technologies by seeing recently government of India, Ministry of communication and information technology, department of electronic and information technology has released a policy to encourage and adoption of open source technologies and software's got all Government of India projects [7]. Government of India has recently launched a digital India program to digitize every field and sector of India by connection them with the technology. Considering the related high cost and customization complexities, Government has decided to adopt for open sources technologies as much as possible for seamless customizations and integrations, as well from less cost perspectives. Further, National Policy on information technology 2012 has also mentioned it as one the main objective to "Adopt open standards and promote open source and open technologies" [9] [10].

There were three main objective identified behind adoptions of Open Source Technologies –

- To provide a policy framework for quick, efficient and productive implementation of open source technologies.
- To ensure long and strategic control in e-Governance applications from long term perspectives.
- To reduce the TCO (Total Cost of Ownership) of projects.

it's mandatory and clearly stated that all government organizations should publish specific requirement on adoption of open source technologies in all RFP's and a vendor should provide a proper justifications in case proposing any non OSS software. Based on facts with respect to technology, skills, complexity, availability, support etc. department will decide to go with non OSS software's in exceptional cases with sufficient justifications [11].

VI. OPEN SOURCE MISCONCEPTIONS AND CONCERN

Due to open source technology and freely availability, there is lots of misunderstanding and concerns are still there in mind of large public. It's a general tendency where you will definitely get doubt on offers where you are getting something free or in much less cost which is beyond expectations. However as I said, it's all not true. It's just misconceptions and you have to do a thorough due diligence on each point to get complete proper understanding on each. I have highlighted some of the concerns and misunderstanding below [12].

- Open Source Software's are free
- There is no support available for Open Source Software's
- Open Source Software's are less secured as paid software
- Open Source Software's functionalities are less
- Open Source Software's are less secure
- Open Source Software's doesn't met the scalability

- Open Source Software's tough to understand and use
- Integrations with Open Source Software's is very hard
- Open Source Softwares are hard to Learn
- Open Source Software is inferior in comparison with paid software

VII. OPEN SOURCE DO AND DON'T

Some generic do and don't before adoption of open source technologies are as below –

DO

- First create a group of dedicated peoples to perform a due diligence on each open stack technology you wanted to implement
- Ask then to perform a due diligence from each perspectives like from existing risks, issues, implementation, current support, future support, credentials of support provider etc.
- Implement it on one of your testing environment and perform a high level testing's for each and every functionality you wanted to utilize [14].

DON'T

- Don't rush to download and implement any open source technology or software without doing complete due diligence especially on Support, Cost, Term & Conditions and Risks.

VIII. OPEN SOURCE LIMITATIONS AND CHALLENGES

Open source means contribution of large public around the world, or you can say large number of independent volunteers around the world. It's actually good where lots of brains work together to make a particular thing perfect. However, a large number of independent open source communities and individual contributor's make certain things complex as well. Below are some open challenges related with the open source technologies [15] [16].

A. More contributors More Risks

Since it's an open distribution where anyone can develop and contribute his own contribution with respect to any module, so it's making it bit risky to control version, security, risk & governance.

B. More contributors Less Progress

More contributors make less progress because lots of independent volunteers shared their own version of a particular module and to evaluate & release a common version take time.

C. More contributors Less Security

Sometime contributions from different independent developers raise concerns over security as well since the all have their own infra for development which lacks proper standard, compliance & governance.

D. Accepting & Understanding License

Since there are multiple distributors and contributors so it makes it bit complicated to understand & accept open source licensing model.

E. Lack of Vendor Support

Support is one the concern with open source technologies. However many of the organizations provides support for popular open source technologies, but a proper support forum for all open source technologies is still a challenge.

F. Mitigating Legal, Operational, and Security Risk

Due to multiple contributors and owners, it make difficult to organization to use & control it. The uncontrolled structure of open source makes it not in compliance with different organizations governance & compliance structure.

G. Lack of Internal Technical Skills

You have to build your internal technical competency & skills before adopting any open source solution.

H. Compatibility with hardware's

Proprietary software's work much better with your hardware's as they are well developed, tested and certified with certain set of hardware's however it's still a challenge with open sources software's since it's all developed by open source communities and independent developers in their own different hardware's.

IX. CONCLUSION

Despite of certain disadvantages, drawbacks and aggressive debates on open source software's and technologies, open source technologies is in continuation of winning the hearts of billions of IT professionals and organizations, especially in the field of cloud computing, where you wanted to have some solution with you, to control your cloud environment. No doubt the revolution it has established in the era of IT will continue to grow rapidly in the future as well. Almost all of IT organizations are looking for some open source technologies which can help them to addresses the challenges they are facing with respect to the proprietary software's, but still there are challenges and due to lack of proper due diligence and knowledge, they are potentially exposing themselves to security & compliance risks. All organizations must have to enforce some policies and automated management of open source technologies to get complete understanding and advantages of open source technologies, however there has to be some common standard and governance body to control open source communities and forums for the large public benefits.

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