EAAS - ERP AS A SERVICE

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Abstract- Enterprise Resource Planning (ERP) systems are usually very expensive for any organization to implement and maintain. Implementation of an ERP system is a major investment and commitment for any organization. Small and medium size companies cannot afford the cost of purchasing, implementing, and hiring ERP consultant and domain experts and cannot provide the required resources and infrastructure to support ERP system. Till now it is assumed that only big businesses can afford such systems. For such small and medium size companies, cloud based ERP may be the best option to avail the capabilities of ERP system without investing huge amount on various resources used and infrastructure to set up. This paper explores the pros and cons of the cloud ERP.
Keywords - ERP, cloud computing, IaaS, PaaS, SaaS, EaaS.

Introduction

The way of conducting business is changing very fast in the global world. Now every company want to enter the global market. They want to understand the latest market trend, choices of customer and want to make their product a brand and create their goodwill in the market. Business problems are very complex and always need lot of money and effort. Every company wants to satisfy the customer in every aspect by providing more and more facilities through their products and also by lowering the total cost of the product. To do this, company needs software, which is specialized in performing tasks from planning to manufacturing and to supply product to the customer at low cost. Enterprise Resource Planning (ERP) is one out of the many solutions for such problems.

There are three ways to deploy ERP system: on-premise, on-demand (EaaS) and hosted. Purchasing and implementing traditional ERP system (on-premise) is always costly and difficult job for any organization and involves a great risk and consume more time. Implementing traditional ERP means deploying new infrastructure, purchasing servers, hardware and software thus it is always a costly affair for any organization.

On-demand ERP is less expensive than traditional ERP. The software itself is not licensed or owned by the end user, it is provided as a service. On-demand ERP works on cloud platform reducing cost of deploying resources and infrastructure and minimizes the risk of failure.

Licensed applications are hosted by an outside third party. This may be in a separate instance on a separate piece of hardware or in a separate virtual instance dedicated to the company where the application is hosted on hardware shared by multiple companies.

ERP System

An enterprise resource planning (ERP) system is a packaged business software system that enables a company to manage the efficient and effective use of resources (materials, human resources, finance, etc.) by providing a total, integrated solution for the organization's information-processing needs. It supports a process-oriented view of the business as well as business processes standardized across the enterprise [1]". It is built on a centralized database and using a common computing platform, ERP systems consolidate all business operations into a uniform and enterprise-wide

system environment [2]. It includes different administrative functions such as production, finance, logistics, marketing, sales and human resources [3] fig 1.
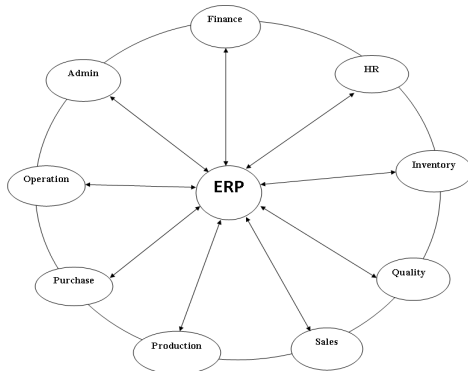

Fig 1- Functions/modules of ERP system

ERP provides two major benefits that do not exist in non-integrated departmental systems: (1) a unified enterprise view of the business that encompasses all functions and departments; and (2) an enterprise database where all business transactions are entered, recorded, processed, monitored, and   reported [4]. This system increases the requirement of interdepartmental cooperation and coordination. But it enables companies to increase effective communication and responsiveness to all stakeholders [5]. An ERP system facilitates the smooth flow of common functional information and reduces cycle times.

Although traditional ERP provides number of benefits i.e. reduction in the cycle time, lead time, help the company to ship products on time with less cost and improve quality but implementation of ERP system is always a headache for any company. The implementation of ERP is a complex exercise, and many adopters have encountered problems in its different phases. Sometime implementation fails due to cost/time overrun.

Companies need to hire costly ERP consultant for successfully implementation and have to allocate dedicated resources. This system might sometime take a long time to implement, more than a year. A lot of money has to spend on the maintenance of the ERP system.

Cloud Computing
Cloud Computing is defined as an Internet-based computing, where there is a large group of interconnected computers (Cloud), that share their resources, software, and information (computing), on demand, according to the user needs[6]. The National Institute of Standards and Technology (NIST)[7] characterizes cloud computing as " a pay-per-use model for enabling available, convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

Cloud Computing provide various services which makes the clients device, tools and application independent such as Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) Fig 2. Different types of clouds exist such as private, public, hybrid, community, internal, and external cloud [8].

ERP System and Cloud
ERP system is a combination of software and hardware that support business processes across the organization and even beyond it. Most of the cloud providers categorize the services into three different levels of IaaS, PaaS, and SaaS.

a) IaaS for ERP system
IaaS provide capabilities likes processing, storage, networks infrastructure components such as firewalls and configuration services and other fundamental computing resources to ERP users [9, p34].

b) PaaS for ERP systems
PaaS offers the resources required to develop applications via Internet without downloading and installing the software. It is basically used by application developers, testers, deployers and administrators to develop and testing softwares'. PaaS also provide more service such as web service integration, database integration, security, scalability, storage [9, p32].

c) SaaS for ERP systems (EaaS)
ERP system is provided on SaaS model. The role of both cloud service provider and ERP vendor are merged in this setting (vertical integration). This enables the user to use application, running on cloud infrastructure and access at client through web [9, p30].
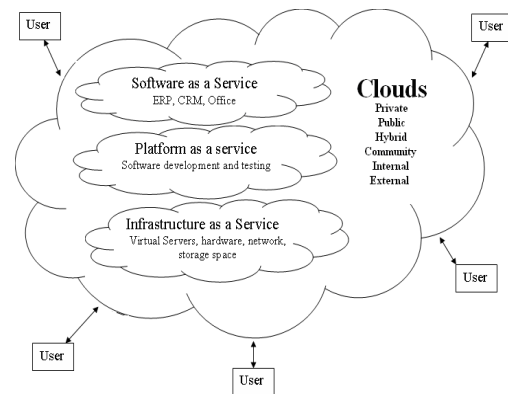

Fig 2- Cloud Computing

SAP Business ByDesign, Lawson software on Amazon's Elastic Cloud Computing (EC2) platform, Ramco OnDemand is few big cloud ERP providers.

Different parties involved when providing ERP as a Service to the users are [8]:
1) Cloud service provider (the company running the cloud environment).
2) ERP vendor (the company developed and sell licenses for the software)
3) ERP implementation partner (the company that supports the user company with the implementation), and the
4) User company (the company that implementing ERP for their daily business processes & use)

Cloud ERP (EaaS) vs. Traditional ERP
After implementing on-premise ERP, many companies realize that they have never achieved expected benefits. Achieving ROI is a milestone for an enterprise. Mostly companies track the cost of purchasing and implementing project but they hardly track the post implementation cost (maintenance cost). The high annual mainte-

nance cost of traditional ERP is now 20-22% per year that companies have to pay regardless of their business conditions [10]. The companies do this because they already invested huge amount in deploying ERP system in their company and now they want to add more functionalities and keep up-to-date with latest patches and version. Cloud computing is benefited to the companies in many ways. Here are the several benefits of using cloud computing and applications on clouds:

1. Minimized initial investment
Deployment of ERP includes three types of cost [11]:
i)   Hardware and Software cost
ii)   Implementation cost
iii) Business and IT resource cost
When implementing ERP system on-promise, company has to bear the cost of new hardware and software and usually cost of implementation is always high for traditional ERP. Company has to provide number of dedicated resources like man power, machine etc. for implementation. Implementing ERP through cloud enable quick delivery of computing resources, providing a cost-efficient and effective processes, applications and services that makes the IT management easier and more responsive to the requirement of the business. Implementing a new EaaS solution usually takes very less time and effort compared to an on-premise package, and does not require setting up network infrastructure to integrate ERP modules. No dedicated man powers and resources are needed to deploy new system. Maintenance cost is also low as vendors provide support at a very low cost because they will also be compensated by the ongoing operation fees.

2. Reduced implementation time and increase ROI
Implementing EaaS solution usually takes only a few weeks or days as compared to several months for on-premise implementation. This is mainly because ERP system has already been deployed on cloud and networked among modules and is ready to use. Company deploying the service only need to configure the system according their requirement which makes the solutions less complex compared to the traditional ERP system. Activities like data migration and data analysis remain the same as for any new system. This enables companies to realize the business benefits earlier, which, in turn, results in a more return on investment (ROI), and a reduced total cost of ownership (TCO) over the course of the investment.

3. Seamless Upgrades
With traditional licensed ERP software, organizations have to wait for next release of new version of the application to ripe the benefits of latest features, upgrades, or security patches. Companies usually do the AMC with the vendors so that they get the new version as soon as it is released. Again companies have to pay good amount to upgrade the system. EaaS eliminates this problem. Under this delivery model, the provider continuously adds the latest features and upgrades, which means that the user always get the latest version of the application without waiting for new version and extra cost.

4. Reduced Dependence on Internal IT Resources
Cloud ERP systems typically require significantly fewer technical resources to manage than onsite ERP solutions because the hosting provider manages the software, hardware, and network administration. This reduces the pressure on the organization's IT department.

5. Easier to use
An EaaS system is designed as web application and is very easy to use. Ease of use is a key requirement for user acceptance and ensures that the system is actually used as designed.

6. More advanced functionality
Sometime it is required to add more functionalities in ERP system according to the need of the company that are not bundled with it. Hence the company also has to bear the cost of this new third party software. Many EaaS solution providers also allow the users to use the third party software to fulfill their business needs to increased functionality. For example, the automatic organization chart generation offered by SaaS HR solutions such as SuccessFactors. If any company wants to use third-party software, they only have to pay cost for add-on solution, implement/integrate and support. SaaS solutions, combined with SOA (Service-Oriented Architecture) for integration, enable an integrated best of breed approach.

7. Facilitates mobile computing
Mobile support is much more easy and simple as the primary computing platform resides in the cloud. A system that resides in the clouds can be accessed from any device (mobile, ipad, and tablet) through internet.

8. Facilitates application interoperability with trading partners
When a system that operates in the cloud and use SOA for integration, it is easier to interoperate with trading partners, whose systems also resides on the cloud.

9. Dynamic scalability
Expending and contracting the existing system on-premise is a big headache. Company sometime need to purchase new server or other computing resources to meet the new processing load. Network structure need to redefine / redesign. Cloud computing provides flexibility to expand and contract system resources as business need varies. Additional computing resources are easily available to meet peak load processing at very economical price. This gives the view to the companies having "infinite computing resources" virtually. Company only pay for use of computing resources on an as-needed basis.

10. Elimination of an up-front commitment
One of the key advantages of cloud computing, especially SaaS, is to provide the facility to the user to try new software before they actually buy it. This is very useful when a company wants to compare the functionalities of similar software before making the final decision.

11. More rapid recovery and restore capabilities
When using the application like ERP system, company also need to deploy the backup and recovery software for the databases. While working on system, if any hardware component starts giving trouble, no company keeps hardware on standby so that troubled hardware can be replaced and that doesn't affect the business. This is a hidden cost that company unaware of. While using the cloud computing for backup and restoring an application, data, or hardware is much easier as every cloud provider provides the facility of backup and recovery of data. This improves overall business flexibility.

12. Ability to reach extended user communities
With the use of cloud computing it is much easier to connect clients or individual customer with the ERP system.

The implementation of Cloud ERP and Traditional ERP differ in many ways. The flow chart in figure shows how implementation of cloud and traditional ERP differs [12] Fig 3, 4. Table 1 shows the differences between cloud and traditional ERP system.

Table 1- comparison between Traditional and Cloud ERP

	Traditional ERP	Cloud ERP
Deployment	Local server	Cloud server
Implementation cost	High	Low
Maintenance cost	Relatively high, Purchased annually	Low, included
Control over ERP	Easily controllable	Relatively tough to control Cause ERP is in the cloud.
Integration	Dependent on vendors.	Done by cloud provider and ERP vendor
Licensing cost	High	Low
ERP up gradation	Costly	Low cost, because it is maintained.
Dependency on internet	No	Yes
Software license	Company owns it	Company rents it
Hardware & Software	Company purchases it	Included
Number of users	Unlimited	Unlimited
Customization	Simple	Complex

EaaS makes the enterprises financially sound especially for Small and Medium size organizations. Cloud ERP saves almost 50% cost over traditional ERP in five years [13].

Table 2- Cost of cloud ERP over traditional ERP in five year

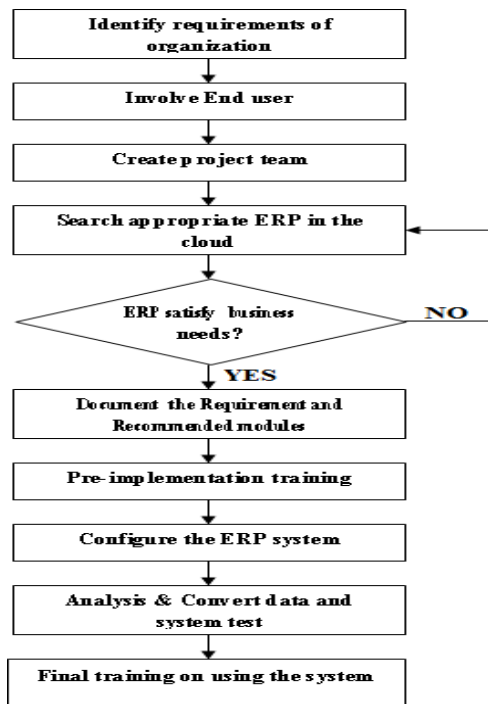| No. of Users	Traditional ERP (On-premise)	Cloud ERP
5 users, 2 remote users	45.29 lakh	24 lakh
10 users, 3 remote users	91.59 lakh	39 lakh
25 users, 3 remote users	126.79 lakh	66.5 lakh
50 users, 5 remote users	194.91 lakh	104 lakh

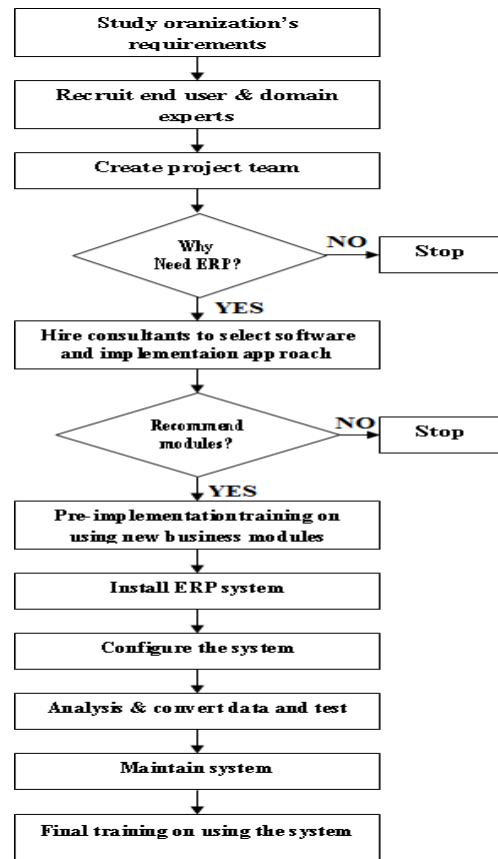**Fig 3-** Cloud ERP (EaaS)

Fig. 4- Traditional ERP

Customization in cloud ERP

Customization is a one of the main problem of EaaS. Cloud system is based on multi-tenant architecture. Multi-tenancy means that a computing resource can be used by more than one company or user. These consumers can be located in the same organization, or can be from totally different companies. Multi-tenancy gives a cloud computing platform cost advantages because all resources can be shared, which enable companies to save time and money. This architecture also reduces the vendors maintenance cost, but may constrain user to customize their application and interface according to their needs. If any company wants to customize their ERP system, they have to use either single instance ("On Demand") or multi instance architecture. Every company has their own business needs that may be different for each other. Some time they need to add new functionalities or making changes to the existing functions. Multi tenant and multi instance architecture can be used together to ripe the benefits of both to provide ERP as a Service. Multi tenant architecture allows consumers to share same instance of an application without customization while multiple instance allow consumer to customize application. To successfully implement ERP, customization should be minimal. But it requires some time to set according to the business and organization needs. When an instance is shared by any company and the function they customized for them self only can be stored separately and linked to the company instance so that it is available only to the company who customized it and isolates it from other companies.

Conclusion

EaaS could be considered as better alternative compared to the traditional ERP system. As in this paper we looked that EaaS makes the ERP implementation very economic, and reduces the total cost by almost 50%. With the advent of cloud computing, company need not purchase hardware, software, other computing resources, and costly consultants. Even user can try running similar kind of applications before making final decision to deploy it. EaaS clearly shows the advantages in terms of cost, flexibility, and time of deployment as compared to traditional on-premise ERP system.

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