

ERP in SaaS realm: Benefits and Challenges

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ABSTRACT

Enterprise Resource Planning tools allow companies to centralize and manage their data and workflow in various processes like manufacturing, accounting, human resources, finances. And with the advent of Cloud computing, it provides simpler, easy to deploy, and pay as you go ERP implementations which allows organizations the flexibility and cost effectiveness for change and resource management. Software-as-a-Service (SaaS) is the most accepted and adopted of cloud services which is a major alternative for on-premises softwares. However, cloud ERP has short comings in data security, profit generation and accessibility to internet, especially for developing countries. This paper focuses on the evolution of ERP software and how its collaboration with the Cloud Computing has brought upon a generational shift in the way organizations work today and highlights some of its main benefits and challenges.

Keywords: ERP, Cloud computing, Cloud ERP, SaaS adoption

INTRODUCTION

Businesses today move at a pace never seen before. Cutting edge technologies enable enterprises to redesign their business processes and models to achieve scale and collaborate globally. It allows organizations to automate business processes and make better and faster decisions. Owing to so many innovations and progress in technology, leaders need to make the most of data to know how to focus, how to make the most from their resources and how to optimize results. Various surveys have shown that the adoption of Enterprise Resource Planning can increase the much-needed data transparency (Al-Jabri and Roztock, 2015) by making information accessible and shareable between individuals (Alavi and Liedner, 2001) teams, and organizations (Braunstein, 1999). Information Systems today are anticipated to help companies meet their strategic objectives of development and sustain their presence within the global market (Mhlanga et al., 2012).



Fig. 1. ERP system overview

Leading the technological revolution is the cloud computing technology which has shown immense potential to industries of all types (Raut et al., 2019). Many departments like human resources, customer relationship management have gravitated towards cloud computing and are pulling in the other departments along as employees, managers and business partners alike are appreciating the accessibility of data that cloud provides. As expectations for better solutions rise across the organizations, departments in the back office like finance, planning and supply chain management are also discovering similar advantages in Cloud ERP in order to offer managers an authentic reference that can be used in the decision-making process of their organizations (Lenart, 2011).

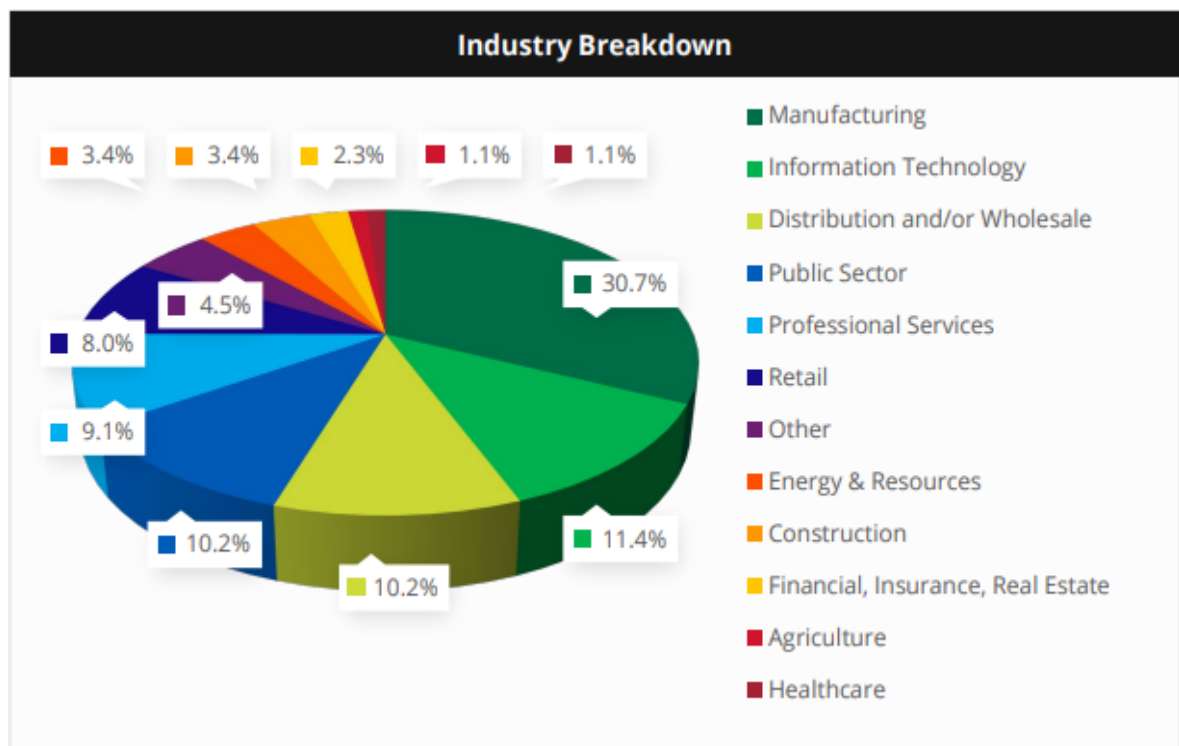


Fig. 2. Industry breakdown of ERP market

Cloud based ERP solutions assists businesses to drive efficiency in operations, optimize processes, reduce costs and enable data-driven decision making. Organizations

can find solutions that up until now they have been struggling to resolve. Higher management questions which have greater repercussions like, workforce and resources management or budgeting, predicting patterns and forecasting market trends and shifts can all be answered due to the complete access to data to generate information.

But is ERP in cloud the best option? Although Cloud ERP has many advantages, the rate of acceptance and adoption is not as high as anticipated and its implementation is a complex and risky process (Ramburn et al., 2013). In this paper, I attempt to analyze different ERP implementation processes, deployment of cloud computing and demanding questions of how ERP is emerging in the developing countries as per the needs of the organization. This literature review also discusses the Cloud ERP benefits and challenges like global access and visibility, low cost of system performance, customization and capability of configuration among others. (Mijac et al., 2013; Seethamraju, 2015) and the data and security risks involved (Gala et al., 2014).

Evolution of ERP

The evolution of ERP systems goes back to the 1960s and growing from the branch of Inventory Control systems (ICs).

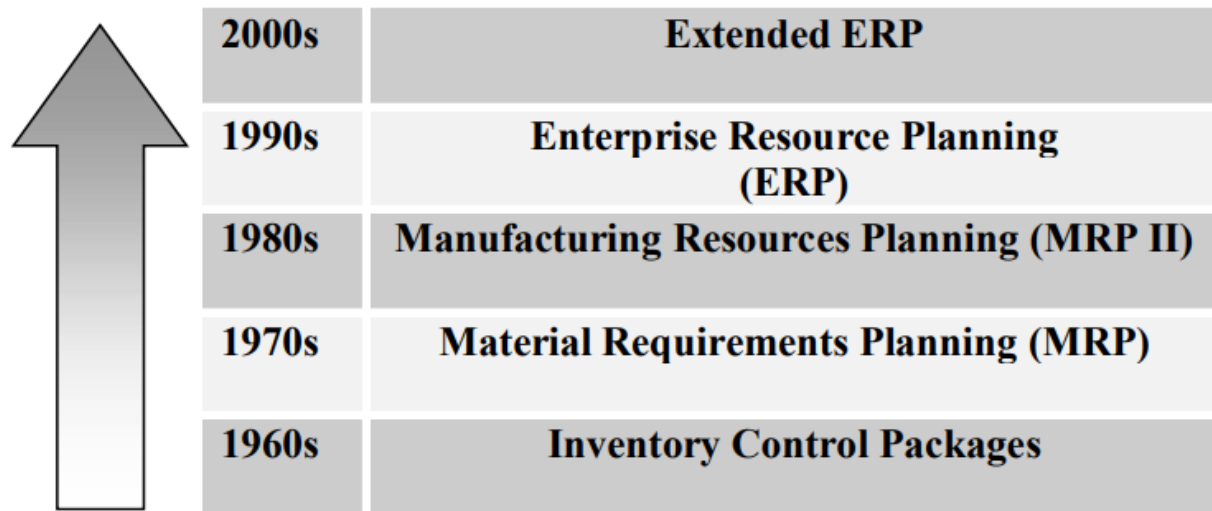


Fig. 3. Evolution of ERP system

ERP later evolved into Material Requirement Planning (MRP), Manufacturing Resource Planning systems (MRP II), Enterprise Resource Planning systems (ERP), Enterprise Resource Planning (ERP II) supporting the company's Internetworking and current requirements.

ERP is fundamentally a management software that integrates a business' essential departments. It can be considered as an adhesive that connects all the different computer systems within any organization to streamline flow of information. Any large organization has several necessary and essential departments like planning, purchasing, sales, marketing, finances, accounting, human resources and more. ERP software enables each department to share information and processes with others throughout the entire organization giving each the access to the same data at one central location which

simplifies business processes tremendously by providing transparency and reducing data redundancies.

For example, any large organization's order management team can receive accurate information and input from the sales department in real time to accelerate product delivery. Customarily, each department will have its own system which is optimized to manage its particular business functions. With the help of ERP, each department will still have their own systems, but it can also connect and share information dexterously with the rest of the company. ERP software facilitates collaboration across all business units. As ERP tools are becoming more popular, large software applications are constantly developed to assist companies implement them within their organizations. ERP software reduces cost to the company in regards to redundant and incompatible technologies as it integrates all the data from all departments in one accessible database system with centralized control.

The worldwide license and maintenance revenue for ERP systems was US\$21.5 billion in 2000, illustrating a growth of 13.1% from the 1999 market value of \$US19 billion (Broatch, 2001). The following chart explains the year by year comparison of the ERP market trend. It can be observed that when average annual income was under \$1B, companies reported a greater focus on the business process management, but this corresponded to lower ability to stay within the budget. It can also be seen that organizational issues have always been persistent.

	2018 ERP Report	2019 ERP Report	2020 ERP Report	2021 ERP Report
Top Industries	Manufacturing and Distribution	Manufacturing and Information Technology	Manufacturing and Information Technology	Manufacturing and Information Technology
Annual Revenue	\$439M	\$1.78B	\$1.98B	\$28.4M
BPM Focus	49% improved most processes	30% improved most processes	37% improved most processes	50% improved most processes
OCM Focus	13% had an intense focus on OCM	18% had an intense focus on OCM	23% had an intense focus on OCM	23% had an intense focus on OCM
Budget Adherence	36% stayed on budget	55% stayed on budget	62% stayed on budget	40% stayed on budget
Top Reason for Budget Overruns	Unanticipated technical/organizational issues	Scope expansion	Scope expansion	Additional technology
Schedule Adherence	21% stayed on schedule	42% stayed on schedule	53% stayed on schedule	54% stayed on schedule
Top Reason for Schedule Overruns	Organizational Issues	Organizational Issues	Organizational Issues	Organizational Issues

Fig. 4. 2018 – 2021 ERP market report

On the whole, ERP has been in the market for more than 40 years owing to its extreme efficiency and ease of application integration and data transparency that it provides to any organization. And now with technological advancements, ERP systems have transformed into an agile cost-effective tool which aides to higher business growth and providing immediate results to all business needs. The transformation has largely scaled down the complexities and lags and improved business processes to refine their value propositions with enhanced speed and responsiveness, data agility and overall cost efficiency. And the acceptance of ERP has seen a exponential shift with the rise of cloud computing.

The adoption and implementation of Cloud ERP gained more traction especially in the midst of the novel coronavirus 19, that spread across the globe in early 2020, where sustainability of businesses and organizations from an economic perspective had become a very big question. The emergence of Cloud ERP was found increasingly important in this year, (Ahn et al., 2020). The capabilities of Cloud ERP have smoothly ensured business continuity by allowing employees to access their business systems from anywhere and at any time to let employees work in isolation, ensuring they do not get isolated.

Cloud Computing

Cloud computing is the advancement of technology which connected networks, servers and processing power on a global scale that has led to an exemplification of computing.

It is a paradigm that lets on-demand network access to all the shared computing resources of an organization. As most of the population is connected to the internet today, cloud computing is a model for managing, storing and processing data online over the internet. The increase of globalization has also facilitated most organizations to decrease their cost, increase their productivity and profitability in order to retain their competitive position (Misra and Mondal, 2011).

Some cloud computing characteristics include On-demand service, which allows the customers to use it whenever they want it or the network access which allows them to use internet as a medium, have shared resources where resources are pulled together and can be used by multiple clients and improve scalability that permits elasticity of resources to increase or decrease the capacity as per the current requirement of the organizational departments.

Service models of Cloud Computing -

Cloud computing offers different pay as you go services depending on the three delivery models to provide cost efficient, hassle free options to all types of organizations. When arranged in a pyramid form, they follow the order as seen in the figure below:

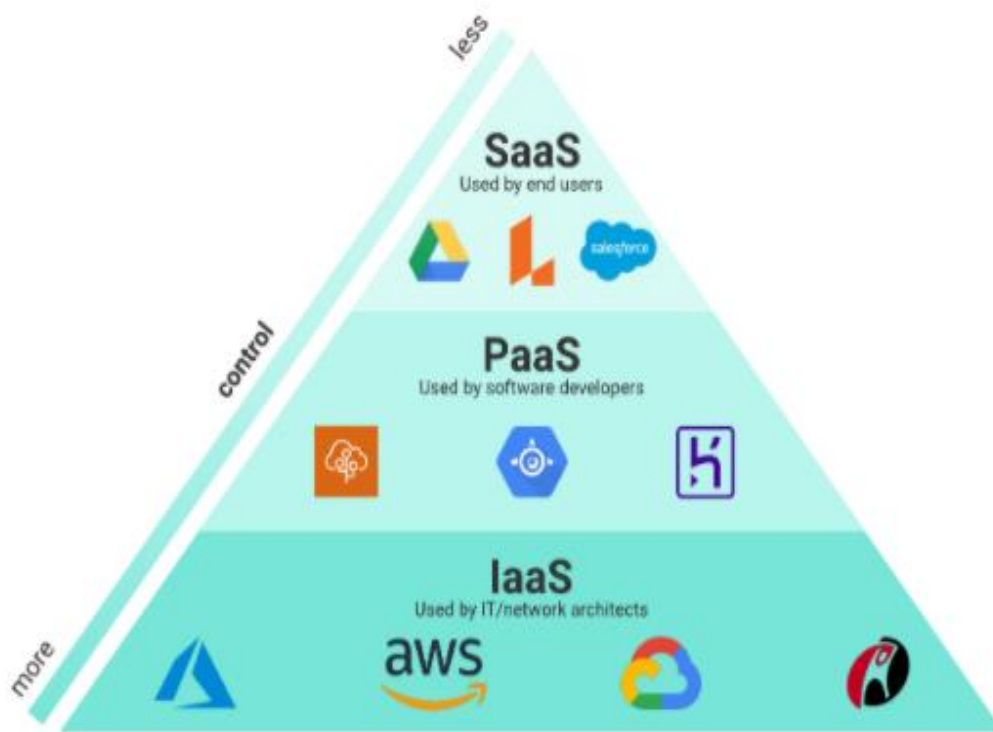


Fig. 5. Cloud service models

SaaS - Software as a Service: It involves cloud services for hosting and managing the company's software applications. Software and hardware requirements are fulfilled by the vendors. In other words, the company does not have to manage any of the infrastructural aspects of the solutions to an extent where the company needs to invest in any IT equipment. It allows users to work from any place as it is universally accessible from any platform and also great for multi-tenancy only to the drawback that internet performance may dictate the overall performance.

PaaS - Platform as a Service: It provides cloud platforms in a runtime environment for developing, compiling, testing and managing applications. This service model allows the customers to deploy applications without having to acquire, manage and maintain the

corresponding architecture. PaaS only requires organizations to administer the applications and the data, all the rest of the elements, namely the runtime, middleware, servers and storage are conducted by the cloud service provider.

IaaS - Infrastructure as a Service: It is a model where customers get access to basic computing resources which are commonly used IT administrators. If there is an organization that needs resources like storage or virtual machines, IaaS can heed to such requirements. The organization will have to manage the applications, data, runtime, middleware and the operating system and the rest is managed by the cloud provider enhancing scalability and flexibility.

Deployment models of Cloud Computing:

Public Cloud: It is the most widely used cloud computing model for web applications, file sharing and non-sensitive data storage. The giants which are leading in public cloud computing own, administer and manage all the hardware and maintain the devices in huge data centers. Public cloud is also the cheapest model out there and besides the initial nominal fees, users only pay for the service they use. However, there are security and privacy concerns in this model with lower reliability and limited resources.

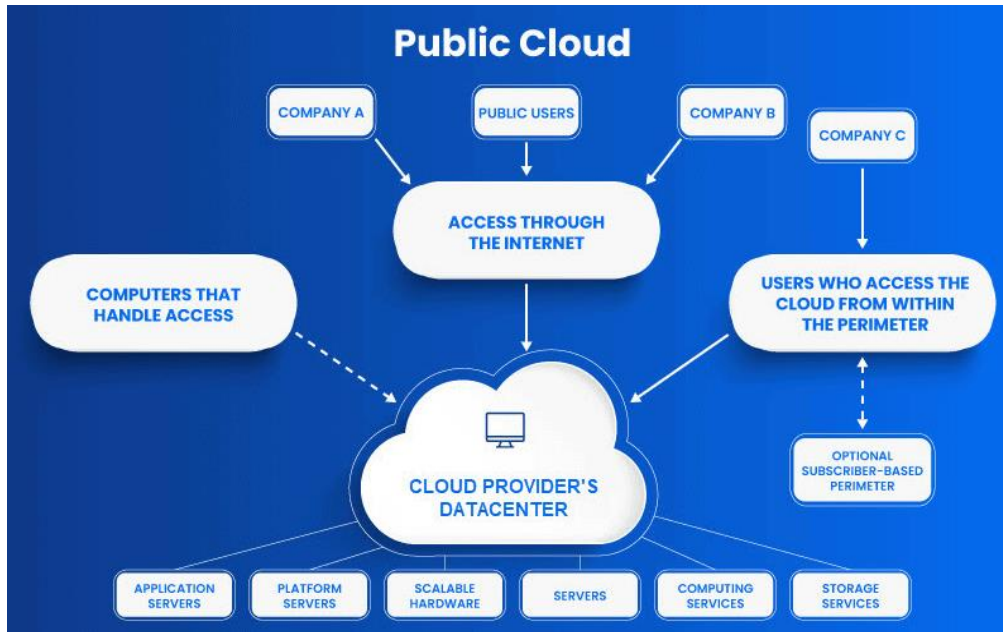


Fig. 6. Public cloud model

Private cloud: Unlike public cloud, this model belongs to a particular organization and it controls and manages it in a centralized work system. Private cloud provides customization per each client requirements and has better data privacy and security, but it also has fixed scalability and high maintenance cost.

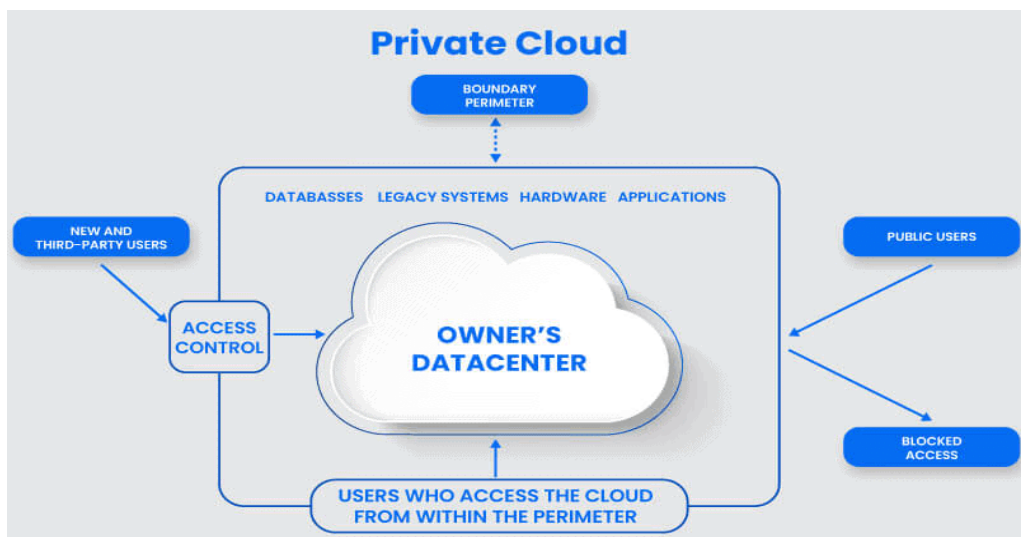


Fig. 7. Private cloud model

Hybrid Cloud: As the name suggests, this model combines two or more cloud models. This type is cost-effective as this solution reduces the operational costs as it uses public cloud for most of the workflows but it is complex and is specific to each use case.

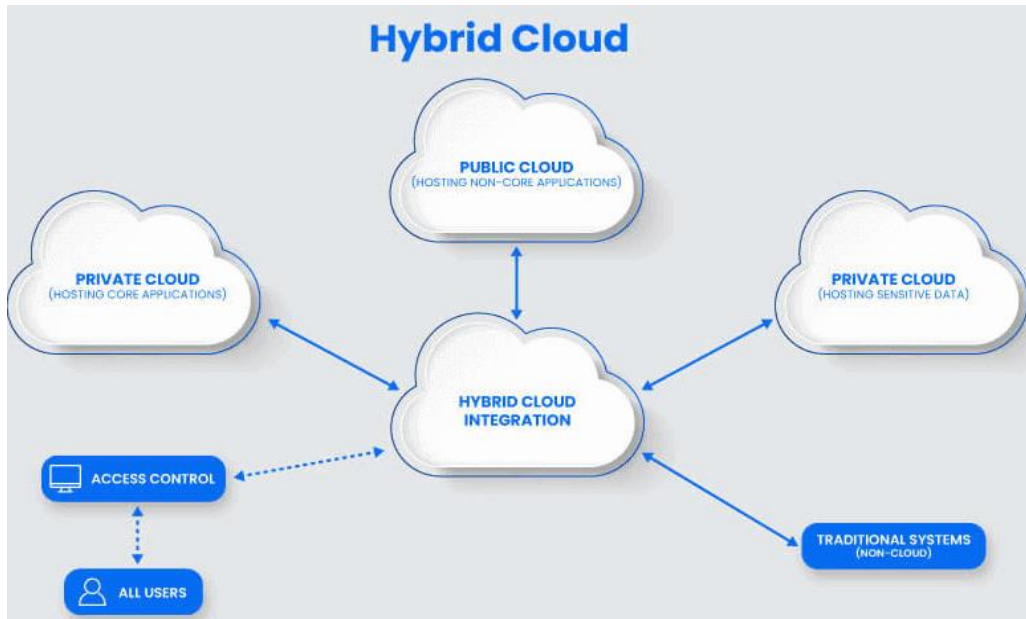


Fig. 8. Hybrid cloud model

Types of ERP Implementation

Certain factors are crucial for organizations to study when deciding how to implement their ERP software such as ownership costs, investments for purchasing to get the hardware and the software including time, man power and money for its implementation and maintenance.

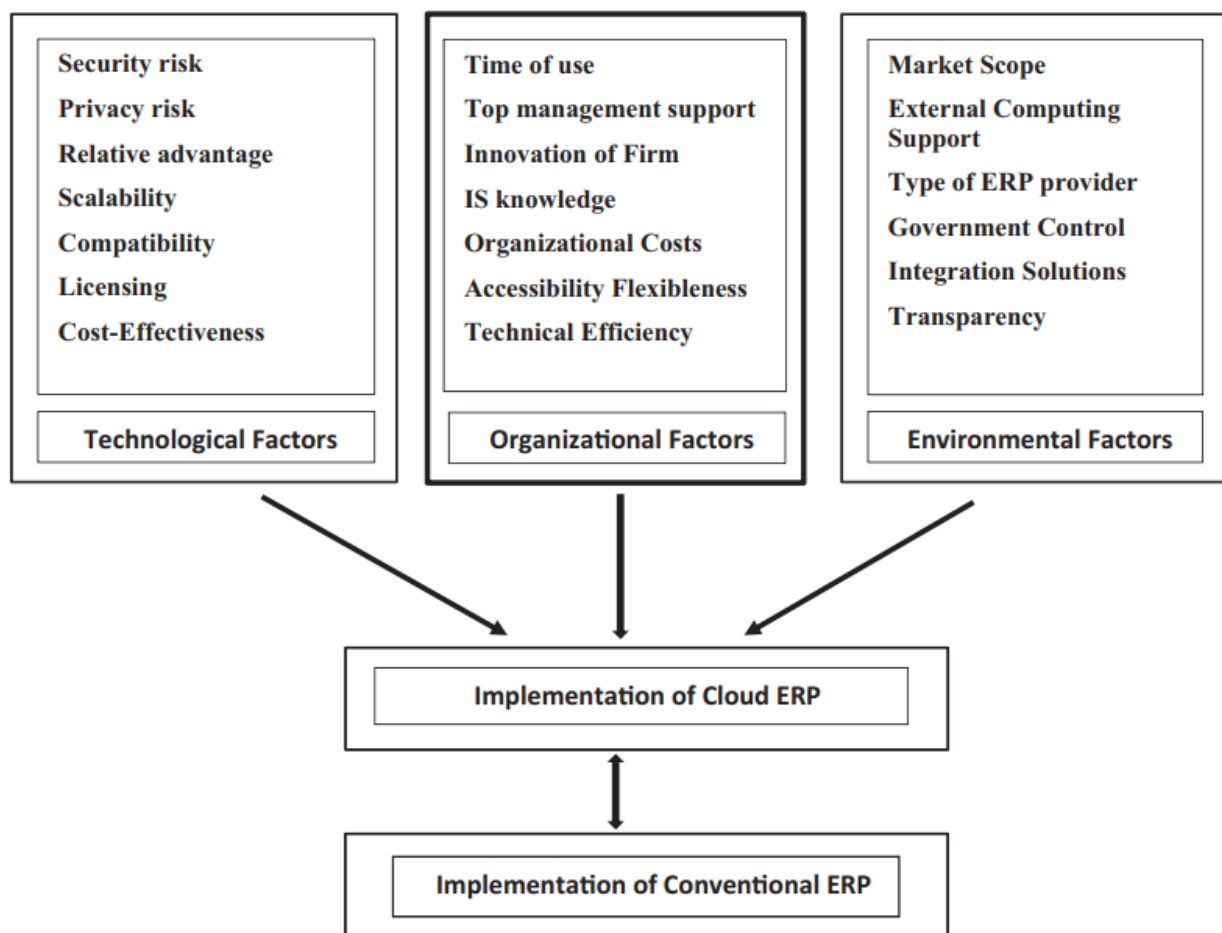


Fig. 9. Technology Acceptance Model (TAM)

Above is the Technology Acceptance Model (TAM) designed by Davis (1985), which examines the inclinations of companies in regard to the Cloud ERP adoption

instead of the implementation of the on-premises ERP system. The framework examines the important factors that impact the acceptance of new technologies: technology, organization, and environment and their sub facets. The TOE framework is very popular in research of adoption of cloud-based ERP and cloud computing. (Juiz et al., 2019)

While choosing a new ERP software, one of the essential principles is considering how to deploy the software, either on premise or on cloud

On premise ERP: In this type of deployment, the implementation, updating, maintenance, running, everything is taken care by the organization internally. After the software is bought, it is installed on the company's servers, thus, increasing additional power servers, and auxiliary equipment such as of database software and operating systems with added costs. With no third-party involvement, the organizations have complete ownership.

Cloud ERP: Cloud ERP is provided under the Software as a Service (SaaS) model to the organization where ERP software and the corresponding data are managed centrally by the ERP vendor and accessed by users through any web browser. In this model, organizations do not have to shell out for any additional infrastructure or licenses. With the payment of a nominal annual fee, a cloud provider maintains servers, network and software for the organizations.

Cloud based ERP implementation has proven to have a major impact on the businesses as follows.

Operational Considerations

TOPIC	ON PREMISE	CLOUD
Implementation	Lengthy	Less lengthy, but still requires implementation and integration
Implementation Costs	High upfront costs (infrastructure and license fees)	Lower upfront costs (license fees only)
Customizations	Possible	Very limited, if at all – standardized solution
Ongoing Costs	Investment in expert resources and infrastructure	Less ongoing investment, but beware hidden costs
Change control	Greater control over implementing changes	Less control, or none

Data Management Considerations

TOPIC	ON PREMISE	CLOUD
Data Security	Sensitive data in systems controlled by you	Sensitive data in systems controlled by cloud provider
Data Locations	Instances and data locations controlled by you	Instances and data locations controlled by cloud provider
Updates	Ability to control timing of updates and changes	Less or no ability to control timing of updates and changes
Competencies	People with knowledge of systems and operations remain	Less need for people with knowledge of systems
Compliance	Higher ability to manage compliance risks	Loss of some control over managing compliance risks
Performance/Availability	Higher degree of control over availability	Dependent on SLAs from provider

Cloud ERP can be considered as a utility. The overall expenditure in Cloud ERP is less than 50% as compared to on premise because of their pay as you go business proposition. Cloud ERP gives customers a more scalable solution by being flexible and expandable as per users' demand in a timely manner (Elragal and ElKommos, 2012). Using advanced technologies like Cloud ERP also improves the business processes to make it easier, fast and more efficient along with higher organizational productivity and performance (AlBar and Hoque, 2019; Senarathna et al., 2018).

Cloud ERP in Developing Countries

Even with the major increase in ERP implementations in developed countries like Germany and the United States, there are many developing countries which are still fairly new in this technology. They have many comprehensions like ERP is only for the large multinational organizations, or it is complicated and expensive to implement Cloud ERP, or whether it is meant for only a few industries. And although ERP systems have proved to be cost efficient and improve data driven decision making, it has its own challenges, and they appear to be more so in the developing countries. Multiple factors are noticed to influence the effect of acceptance for ERP implementation in the developing countries. Cloud ERP adoption depends on the innovation factors namely, relative advantage, compatibility, cost and security. Shatat and Udin (2013)

Following are the factors that fundamentally affect the adoption and implementation of Cloud ERP in developing countries -

- Environmental factors: The factors involved in this aspect are the current economic conditions and the growth rate along with the industrial growth and government regulations and norms.
- Infrastructural factors: Sectors like transportation, telecommunication, mobile telecommunication, the public database systems and internet are considered here.

- Organizational factors: Company's internal perspective, their level of IT maturity, the size of the firm, lack of business process management and exposure to technological progress are also major influencing factors.

In developing countries, businesses usually are deficient in Information Systems and Project management expertise. SMEs or Small and Medium-sized Enterprises contribute majorly to the national revenue generation and therefore, availability and the ability to afford are the main pain areas. Any ERP is not standalone architecture and needs to be immersed within the organizational environment in order to deduce maximum value. (Huang et al., 2010) Many underlying factors like change in government policies, promising foreign investments to speed up infrastructural growth and healthy competition for demand is necessary to improve the ERP adoption.

However, the market growth has been tremendous in itself. With respect to India, Rajan and Baral (2015) commented that the implementation of Cloud ERP in a sample of Indian organizations is positively associated with organizational support and computer self-efficacy and compatibility and as well as strongly influences on employees' performance. Sandu, Gide and Karim (2017) argued that the use of Cloud ERP showed high potential for the developmental growth and utilization of business performance of the Indian-based SMEs.

A quantitative study of 300 Malaysian SMEs in both manufacturing and service sectors, (Qian et al. 2016) with the help of Technological Organizational Environmental

(TOE) structure addressed that higher management vote was positively related with the higher adoption of Cloud ERP in manufacturing SMEs only.

Benefits of Cloud ERP

Cloud-based ERP offers an array of benefits like flexibility, collaborative ability, scalability, and ease in business process improvements. With that in mind, let's explore each of the top 10 reasons business leaders choose cloud SaaS ERP from Epicor to drive growth. Therefore, companies are switching to SaaS ERP deployment for irrespective of their size of business and global reach.

Following are some main benefits:

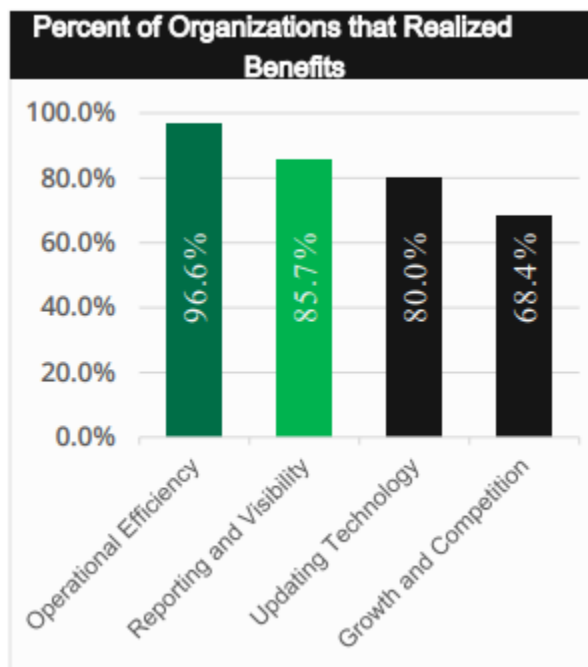


Fig. 10. Cloud ERP top beneficial factors

Efficiency: Organizations have reported major process efficiency benefit which improves productivity by data accessibility and transparency, standardizing operations and optimizing inventory lines.

Visibility: Cloud ERP provides real time data access along with ensuring data and regulatory compliance.

Technology benefits: IT maintenance is very expensive and as SaaS frees organizations from having to maintain and update the software, organizations save a lot of cost, time and resources.

Growth over competition: With immediate access to any data and information, businesses can improve customer experience by better interactions with the manufacturing and suppliers and resolving problems in a timely manner.

Global access to information: improves mobility and productivity while allowing employees to collaborate on projects on their terms.

Higher Storage Capacity: unlimited storage and companies can pay as they grow per their increase in requirements.

Challenges of Cloud ERP

The prominent challenges in any implementation of Cloud ERP tool varies on the basis of whether the implementation is absolutely new or is an upgrade of shift from an existing tool and expanding in SaaS. Either way, the primary challenges are common in both approaches.

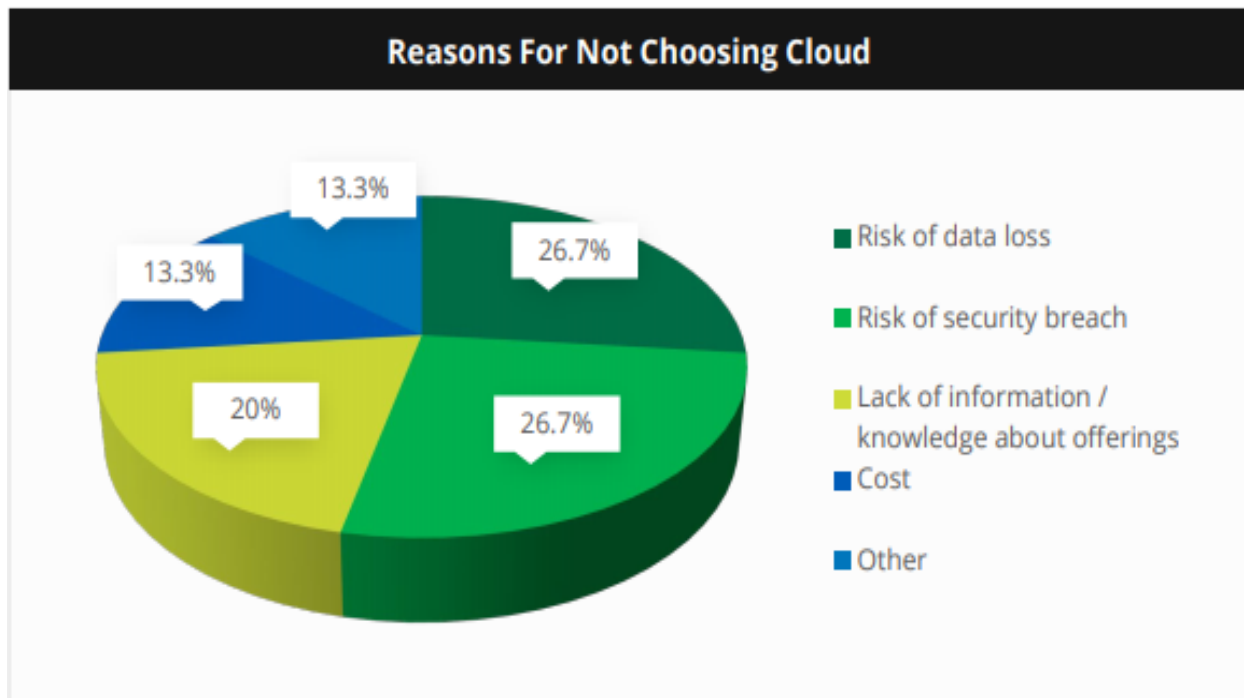


Fig. 11. Cloud ERP top challenges

Following are the main challenges to implement cloud ERP:

Annual fees: To implement cloud ERP the organizations have to pay for the subscription user services and needs to be paid periodically to keep services alive.

Performance issues: in the cloud, as the clients or the organizational systems and the main vendor servers are geographically apart from each other and run only over internet,

any network failures or other connection problems could halt the total working of the process which will directly affect the cloud ERP functioning and performance.

Compliance issues: This is an issue specially in developing countries where following the technological growth with data, energy and environmental standards are major road blocks for Cloud ERP and there are not many regulations to manage such difficulties.

Functionality constraints: Traditional ERP systems have been evolving since past 4 decades and have grown more stable and have gained advanced maturity. In order to attain this level of acceptance and maturity will take a lot of time for Cloud ERP.

Data Security: With the transition from the on premise to Cloud ERP, organizations should implement the additional controls for security and visibility. As ERP applications are customized, there are various potential security vulnerabilities faced by the customer while expanding the vendor's functionality.

Conclusions

We are in the times where business goals, and functions are becoming extremely complex, owing to rapid developments and change in the market demands.

ERP systems have meant to be huge, costly, and difficult deployments for many of the organizations till a few years back, which would require added hardware and software infrastructure investments. Cloud computing proffers a major shift in the way organizations manage their resource and data. The collaboration of ERP in SaaS model, thus, has provided greater flexibility, IT efficiency and agility.

With respect to developing countries, cloud ERP proves beneficial cost-wise and enables smarter application of limited IT resources, allowing them to concentrate on analytics, evaluation and collaborations of tools as they work. The significant factors that improve the ERP acceptance are project communication, data accessibility and user and resource involvement.

Furthermore, ERP processes will need constant re-engineering to be able to be compatible with the capabilities of the current technology. A robust management change is important in ERP upgrades. Benefits and process improvement is seen to increase as organizations have adopted their work management based on COVID-19. Many organizations, throughout decades, study the downturn as an opportunity to invest and evolve for their future growths which is highlighted as the benefits and overall acceptance of Cloud ERP has gained more traction in the Covid-19 pandemic time where Cloud ERP made it very feasible for organizations to completely change their way of working and shifting to all remote access.

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