

**Key Factors and Features Analysis of Popular SaaS ERP Systems for Adoptability**

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**Abstract:** The aim of the paper is to analyze the features of latest and popular Enterprise Resource Planning (ERP) systems available as Cloud computing feature Software-as-a-service (SaaS) for any scale of organization regarding the adoptability. The study covers the characteristics with some insights of their implementation and also discusses how these technologies can be adopted by any scale of organizations. During the study, a literature review was carried out and previous studies also examined for better understanding of this topic. According to the research the SaaS, is the fastest growing deployment type of cloud based software and Virtualization is the key concept of cloud computing. SaaS gains too much high growth rate in recent time especially in COVID-19 pandemic. SaaS companies have been growing rapidly. According to the current research 80% of companies shifting their existing apps to SaaS by end of this year. The more and more companies shifted their legacy software into SaaS platform due to its viability, profitability, privacy and security. A research gap exists regarding the impact of human behavior along with technological acceptance in the implementation. The research shed some light on services of cloud computing. The conclusions are based on categorization of features such as UI/UX, Price, Integration, Implementation and Services and it is vary organization to organization.

**Index Terms:** SaaS, ERP, Software Subscription, Cloud Based Solutions, Virtualization, Web Services.

## 1. INTRODUCTION

SaaS (Software-as-a-Service) is purely on-demand cloud based application that is hosted on cloud and more suitable form for ERP (Enterprise Resource Planning) Or the SaaS is the model of Cloud based computing where software is not physically sold it executes on the web servers of the service providers and provided on web through subscription is known a Service charges. Its features provided through web Services on rent along with the storage capacity in different packages. The SaaS Applications provide the opportunity to all sizes of businesses to use the power of software at any place at any time with higher speed and ease of their availability. Whereas the is the type of software for enterprise level organizations where the paperless office is the theme of their overall work operations.

Cloud computing is the current trend of computing which gain too much attention in academic researches and as well as in the software industry. A SaaS service may have large numbers of active users, and thus a SaaS Infrastructure / architecture needs to support large number of users with scalable and reliable performance. SaaS based ERP solutions provides advantages like availability, performance, reliability, scalability, security, support, interoperability, modifiability, usability and testability. [1]

SaaS requires a Manageable, stable and reliable internet connectivity to access web-based service. The interest in cloud based SaaS applications among small medium enterprises in the developing countries is slightly low and sometimes discouraging. The major benefit for implementation of cloud ERP is low cost and access to a pay-per-use

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model that never requires a huge investment the web based cloud technologies are the future, therefore, unavoidable. The Organizations can choose the package as per their available budget as the Cloud based SaaS comes with a package of specification. A cloud provider's cost analysis is more complex because of the changeable resource pool according to the requirement of ERP System and work load management. [2]

The ERP ensures reliable mixture of information used by an organization, including the primary as well as secondary data such as bookkeeping, human resource data, Process Activities data and client data. It plays very important role in success / failure of an organization [3] As per Fig. 1 the basic components of ERP includes Applications, Storage, Networking, Server and all these are based upon Databases.

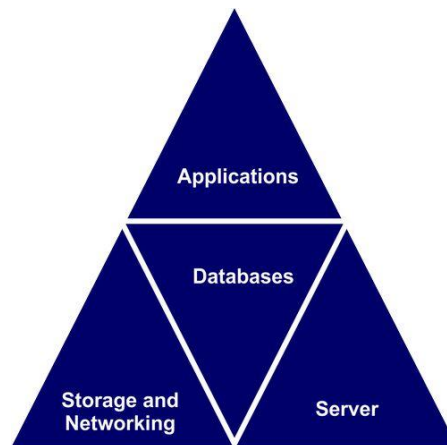


Fig.1. Components of SaaS Applications

According to [4] the ERP solution are now the backbone of many enterprises to record business data from different departments in a single centralized database and allows business stack-holders to generate the reports that simplify the overall business processes.

The Fig. 2 represents the detailed spectrum of ERP Deployment options in which major part of the deployment in current trends is Cloud ERP due to higher market demand.

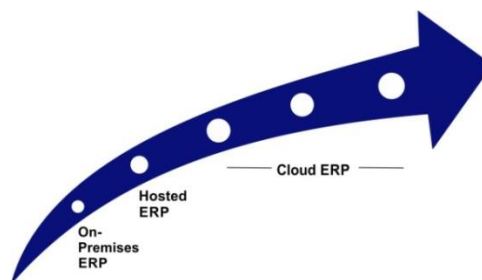


Fig.2. The Spectrum of ERP deployment options

SaaS ERP usually based on multi-tenant architecture, in which multiple buyers share the same instance, or copy, of the software application, underlying hardware infrastructure and database, but the data of each tenant is securely separated. The service provider controls when the features of software will be updated, whenever update take placed all the registered users get updates at the same time. Features of the software are standardized for every buyer and cannot typically be easily customized.

The SaaS ERP is also available as single user mode where every buyer gets its own copy of software which may be installed on service provider's cloud or buyer's own private cloud. In this type of SaaS the buyer typically has some control over updates. Large enterprises mostly select Single Tenant ERP Solution due to privacy and Security reasons.

ERP systems allow best utilization of business resources to save time and effort in managing operations. [5]. The SaaS ERP provides tremendous benefits to an organization but still many organizations remain anxious about its implementation ironically, These worries are outcome from a series of unanswered queries due to lack of sufficient and comprehensive detail about Cloud. [6]

## **2. ERP IMPLEMENTATION**

According to the ERP implementation is always big issue addressed by the available information about this subject. This sector remains always highly positive over the last few years. This is why it is crucial not only know how to roll out the ERP platform but also be prepared for any issues that one may encounter along the way [7]. During the Implementation the team should understand evident enjoyment, nervousness and performance among the stockholders in the organization towards the behavioral objective to use SaaS ERP. [8]. The organization should provide the adequate training to their employees so that organizational resistance can be avoided during Cloud ERP implementation. [9]

ERP packages undertake integration of all information about finance, business, accounting, human resource, supply chain and customer information. The companies seem to be more willing to subscribed SaaS services for non mission critical software applications which are involved with relative to minimum data security and privacy concerns as well as little requirement of integration with available installed software applications in premise.

The Companies also consider cloud based ERP system to save their resources and put their focus on business instead of resource planning and allocation for their software systems. But the Customization of Cloud ERP is the big challenge. Top Management Support has been identified in the literature as the most crucial success factor in its implementation. [10]

The Initial benefits which companies gains from the cloud systems are mentioned in Fig. 3:

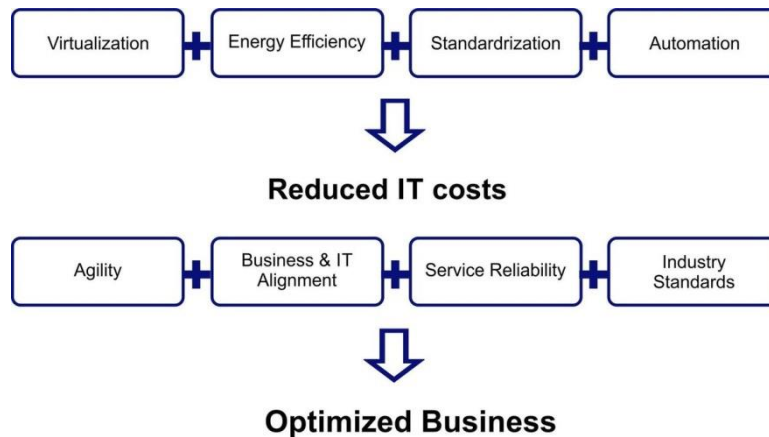


Fig.3. ERP Business Efficiency achievement.

### **2.1. Quality of Products**

The Quality is the key component of every business. The Consumer always returns whenever the products meet with standards and quality. Development of Quality Products consists of two major operations; Application Engineering (AE) and Domain Engineering (DE) when both activities performed well the quality of the products would be as per requirements of the [4] domain.

Usually a single, reliable cloud ERP system across all production units is used to improve their production quality. The standardized Enterprise systems usually often tested and apply from production processing to financial Accounting solution, making it very complex to conclude maintained quality throughout the organization. Cloud based ERP software gain rapidly growth in this area by the means of its scalable record system rely on the database which is

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centralized. Quality becomes most applicable priority; observance becomes more convenient and improved user experience.

The Quality of product maintain through on the basis of some important factors. Such as:

- a) *Real-Time Processing*: All sizes of businesses from small to medium and large-sized manufacturing companies, all are focusing real-time efficiency and production process monitoring quickly. Manufacturing Improvement through execution and orders delivered on time to their customers increased the percentage of work completion. The dependency on high speed internet service is also affect the performance of SaaS ERP Systems. [11]. Organizations can also benefit from cutting edge technologies such as Cloud and Edge computing to provide the capability to process and store large amounts of data. [12]
- b) *Shorter Lead Time*: The ability to rapidly deal with the incorporate the system design changes and schedules always was good factors for every business. Companies usually showing the capability to support little active times and reconfigure their plans to maintain their customers supply changes which assures increased in business and repeated orders. The Cloud based ERP System support and provides decision support information upto last minute of their production processing.
- c) *Real-Time Analytics*: The Current era is all about Business Intelligence. And Analytics is the key factor of every B.I Tool. The analytics regarding intelligence in the manufacturing have been more essential for running a modern manufacturing based business. The insight of every business is provided by analytics and BI. When the insight information generated and that particular event occurs in real time, enabling service providers and manufacturers to understand more regarding their operations than ever before.
- d) *Portability*: Portability is the key benefit for companies who want to manage their manufacturing operations. The access of cloud based ERP solution through any device like Mobile phone, Tablet & Computers through Internet connection anywhere in the world. All kinds of employees can work on same system simultaneously from their desks to production floors and let their work done without any interruption. This type of portability is only offered by cloud based ERP systems.
- e) *Low Cost*: The emergence of cloud based SaaS ERP Systems has both physical and financial implications for on-site ERP systems. [13] The Cloud based ERP System are lost cost as compared to legacy software due to their nature as they are not sold as a whole just like legacy software systems. Companies have to pay some fixed amount at particular agreed time but the payment is always reoccurring. The Fig. 3 showing that how SaaS ERP optimized business by reducing cost in terms of Virtualization, Energy Efficiency & Automation. The optimized business model based on agility principles which align the path of growth for business reliability according to the standards of the industries
- f) *User Experience*: The operating procedure of any task in business is complex of any degree but the software is solving in a way that how the users of that solution perceive it that is called its user experience. The cloud based ERP Solution usually designed in a manner which follows the User Experiences from Industry professionals and applied it to software system which makes their solution more users friendly. The Cloud based ERP systems usually designed with responsive web design so they can fit at any screen and provides excellent user experience.
- g) *Performance*: Manufacturers improved their business performance to gain more growth. They are planning and executing their strategies in accordance with the availability of the data generated in real-time from web based

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cloud ERP Systems. The success of every business is depends upon how quickly they can convert their customers into fans.

- h) *Flexibility*: The Cloud based ERP System provides great flexibility for their users, they can managed their profiles with ease, the can rescale their resources of users, storage and bandwidths. They have wide availability of modules to attach or deattach whenever required in accordance with organizational requirements. Large, complex, and fast-growing data are often referred to as big data the SaaS ERP can efficiently able to handle all types of dataset as per requirement of an organization by rescaling the required resources easily. [14]

### 3. STANDARD FEATURES

Cloud computing methodology of distributed computing is popular now days due to its ability to minimize the cost of computing and maximum output. [15] Like majority of the software systems the cloud based ERP systems also provide common features in accordance with the industry of the customer. The Common features help every customer to manage or accelerate their business operations with automation. The fig. 4 represents the standardized features of SaaS ERP in which financial and Procurement are core features whereas Project Management and CRM are secondary features.



Fig.4. Standard features of SaaS ERP.

The features categorized as standard are crucial for every organization in a way that:

- a) *Project Management*: The Project management (as mentioned in fig. 4) is the key for the success of every business the ERP Provides step by step procedures from very beginning of the project to finalization of the project like proposal, quotations, work progress, expenses, and each and every thing related to the project will be managed by Project management module.
- b) *The Financial*; The up-to-date information regarding receivables, payables, ledgers, Costing and Balance Sheet as well as profit & loss accounting to understand the business performance and current status is always fully managed by cloud based ERP system.
- c) *Procurement*: All the processes relevant to the supplier management, Inventory management & Contracts will be managed under the umbrella of procurement.
- d) *CRM*: The Client Satisfaction is the sustainability of every successful business the more the customers satisfied with the services of company the more they connect with company and happily used its service a very long time. Different Marketing Strategies initiated and controlled, Market automation, contract management, Sales Forecasting, campaigns, Sales Dashboard are also maintained through CRM.

### 4. POPULAR SaaS ERP SYSTEMS

The highly effective Market of ERP is dominated by giant vendors including Microsoft, SAP & Oracle. Many ERP vendors had a very strong presence in the every scale of organizations.

Due to wide range of ERP Systems available it is difficult to ranked SaaS ERP System but according to the market demand the ranking is based upon these parameters

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- a) Integration
- b) Customization
- c) Analytics
- d) Usability
- e) Industry Experience
- f) User Experience

### 4.1. SAP ERP

SAP stands for Systems Applications and Products in Data Processing. It is software information system that can combine all the key business processes of an organization into a single centralized system.

According to history, in 1972 it was founded by 5 former employees of IBM in Mannheim, Germany [4] to analyze, design and develop ERP application software, with the mission of real-time processing of business information and standardized their routine operations. Since its beginning SAP has released several versions as mentioned in Table 1. The digit 3 in the release R/3 indicates the 3-tier client-server architecture. The latest released version of this ERP is SAP Business Suite 7.

*Table 1 – Releases of SAP ERP Year wise*

Release Year	Releases
1973	R/1
End of 1970s	R/2
1992	R/3
1998	R/3 Release 4.0B
1999	R/3 Release 4.5B
1999	R/3 Release 4.6B
2001	R/3 Release 4.6C
2003	R/3 Enterprise Release 4.70
2004	ECC 5.0 ERP (mySAP ERP 2004)
2005	ECC 6.0 ERP (mySAP ERP 2005)
2009	Business Suite7 (ERP 6, Enhancement Package 4)

The popular features of SAP ERP are:

- a) Advanced visual analytics with combination of data to generate business insight;
- b) Engage users more effectively by reducing turnaround and cycle times.
- c) Improved the process of planning and set the path to ensure following of schedule.
- d) Customized functionalities according to the planned growth of company.

### 4.2. Oracle ERP Cloud

Oracle ERP Cloud is a SaaS based web application package on a cloud. It was developed in 2012 by Oracle Corporation. Oracle ERP Cloud designed and developed for the enterprise operations of an organization. Oracle ERP Cloud supports hybrid deployment as well as it can be accessible by all types of cloud implementation.

It is very popular ERP Solution and have extensive list of features such as Procurement, Financial, Production, Supply chain management, warehouse floor management. It supports any type of business as it is design in mind as general purpose ERP system. It can integrate all department of industry with ease and information sharing among them is a simple process due to its easy user interface company owners and employees feels comforts while using it.

As per the official website, the Oracle ERP Cloud suite consists of total nine customized modules, which are:

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- a) Finance
- b) Accounts
- c) Procurement
- d) PM – Project Design & Management
- e) RM – Risk Analysis & Management
- f) EPM – Enterprise Performance Management
- g) AIA – Artificial Intelligence Apps for ERP
- h) SCM – Supply Chain Management
- i) NS – Net Suite

The Accounting and finance module is a strong combination of detailed accounting capabilities with transparency and data compliance at its core, automation, and precision in billing procedures and smart business intelligence using dashboards to improve the business forward using performance measures and industry-specific standards.

The Oracle ERP designed & developed to support internationalizations and have capabilities of multi currency, language, and subsidiary. Many of the world's renowned Universities get benefits from oracle Cloud ERP such as Stanford University, University of Kansas and University of Wyoming and other notable customers are Bank of America and Reuters.

The Popular Features of Oracle ERP Cloud are:

- a) Reduce cost through automation of main-processes such as attendance, inventory management, and other record-keeping costs through automation of manual processes.
- b) Enforce improved policies easily by real-time tracking of their implementation in organization.
- c) Employees can submit, view and track submissions quickly and manage timecards which means a reduction in both under and over-staffing;
- d) Make critical decisions based on the available data analysis;
- e) For effective management of organizational knowledge maintain a central repository.

### 4.3. Microsoft Dynamics

From the innovation of the Windows Operating System and ease of the use of Office Suite, The Microsoft software solutions have always been an important part of business activities in the modern technological world.

Microsoft enters in ERP market in 2001 after acquisition of Great Plain software which considered being the base of Microsoft Dynamics. Microsoft has used their extensive experience to quickly gain a positive presence in the ERP market, going up against existing giants such as Oracle and SAP. In mere less than 10 years, Microsoft sold its ERP product to 1 million customers worldwide.

Fast-forward to 2014, and Microsoft has complete suite of ERP products in the Dynamics line, each one focused at a specific market. Microsoft categorizes the ERP Product line into two groups. NAV, GP and SL are targeted at small to mid-sized businesses, while AX is mainly for the enterprise organizations.

Some of the popular features of Microsoft Dynamics are:

- a) Built-in intelligence in Business Central to monitor business and respond accordingly.
- b) Manage accounts & finance activities such as account statements, accounts balances payable / receivable, fixed assets management, banking accounting, ROI Calculations, Aging & Cash flow management.
- c) CRM helps to improves business opportunities, campaigns, and customer's contacts.
- d) Automation of dispatches with order & inventory management.
- e) Record & Tracks workers data with the HR management module.
- f) Project Design & Development module to reduce process waste accurately.
- g) Predict business progress and outputs.



5. REVIEW / COMPARISON OF FEATURES

The review / comparison are on the basis of general comparison and Price / Costing Comparison each one of the comparison consist of different variables to better understand the features.

5.1. General Comparison

The general comparison is mentioned in Table 2 and the features which are selected for comparisons are on the basis of current market trends and user requirements

Table 2 – Features of General Comparison

Feature	SAP	Oracle	Dynamics
UI / UX	Complicated UI with Standardized features	Standardized Features with difficult to understand User Interface	Flexible features with user-friendly interface
Pricing	Quotation based	<ul style="list-style-type: none"> <li>• Free Trial</li> <li>• \$80 to \$175 per month</li> </ul>	<ul style="list-style-type: none"> <li>• \$8 Per Month</li> <li>• Quote based</li> <li>• Onetime Pay</li> </ul>
Integration & Implementation	Integrate with other SAP Products and 3 <sup>rd</sup> Party apps	Integrate with oracle Apps and 3 <sup>rd</sup> Party apps easily	Easily Integrate with other Microsoft Products, 3 <sup>rd</sup> Party support for Amazon, Magento & Shopify are also available
Services	Complete Support without training	Complete Support with training	Complete Support with training

5.2. Cost Comparison

The Cost / pricing of each ERP product is differ from each other. The Total cost is divided into three parts:

5.2.1 **The Start-up Cost:** It incurred during implementation which includes:

- a) Software User Licenses
- b) Hardware
- c) Training
- d) Existing Data Migration
- e) Customization

5.2.2 **The Operational Cost:** It incurred during operations which includes:

- a) Maintenance & Support
- b) Backups
- c) Disaster Recovery
- d) Patches
- e) Training
- f) Enhancements & Upgrades
- g) Security



5.2.3 **The Retirement Cost:** It incurred when software is planned to retired from its services, which includes:

- a) Data Backup & Export
- b) Inactive User Licenses
- c) Archived System.

Most of the companies did not considered the indirect cost that's why they often exceed the budgeted cost associated with transformation with a new system. There is a need to check Cost at every step for their budget allocation of ERP System as some ERP vendors such as Microsoft & SAP offers module wise prices which enables companies to keep track of their cost against the allocated budget.

### Conclusion:

According to the study carried out the general comparison for the features of the popular SaaS based ERP System categorized in UI/UX, Pricing, Integration, Implementation, Services. Every product has merit and demerits according to the categorization the one is better than other according to price but it may be lower in integration or implementation. These human behavior also impacts along with the categorization of features. The factors such as qualification and abilities of their employees as well as their availability of funds are also played a very important role for adoptability of ERP. The SAP is the oldest player among the Oracle and Dynamics and has near about 50 years of experience in this field but it is costly and it hard to understand for novice user due to its complex UI. Microsoft Dynamics is easy to understand ERP product that is based on Microsoft's simplest methodology to bring easy to understand / operate software products for end users. Oracle has strong experience of market in programming and database industry and currently its ERP product is much evolved and gains popularity for its UI/UX but its needs more advanced hardware architecture which increased its cost. The Organization's mission and vision also plays an important role for the adoptability of the ERP System.

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