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Cloud-Based Erp Systems Used In Higher Education Institution: Benefit, Challenges, And Selection

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Abstract: *Cloud ERP is an approach to enterprise resource planning (ERP) that rely on cloud computing platforms and services to deliver a business with a more flexible business process revolution. ERP systems are nowadays looking at a robust IT solution for the higher institution. ERP covers an excellent route to modernize the internal and external processes of enterprise and promotes qualitative development in the work and work process. In the cloud-based ERP, the software vendor houses and manages the software and enterprises pay a subscription fee for the services generally on a monthly or annual basis. This paper systematically investigates the benefits challenges and selection of the Cloud ERP that serve higher institutions successfully also guide to choose the right solution for the higher institution.*

Keywords: Benefits, Challenges, Cloud computing, Could-based ERP, Higher institution, Selection.

1. INTRODUCTION

The Internet is evolving rapidly, from a traditional medium of merely providing information to users, to an indispensable requirement for the users who want to store data, perform computing and even run software applications at any time from any part of the world this is possible with the advent of technologies such as "Cloud Computing", which is considered to be the fifth generation of computing after client-server computing, mainframe computing, personal computing and the web (Alzaid & Albazzaz, 2013; Rajan & Jairath, 2011; Khmelevsky & Voytenko, 2010). The excessive cost related to information technology resources by offering many benefits for training such as availability, scalability, agility, elasticity, and reliability for on-demand services to make teaching, learning, collaboration, information and research more accessible. The fast-growing interest and application of cloud computing specifically in education present an opportunity for both students and lecturers to enhance their productivity (Badie, Hussin, & Dahlan, 2014; Tejal & Mathur, 2014; Gital & Zambuk, 2011). Furthermore, it allows the client to store their critical information and access it on demand from anywhere via the internet (Khalil H et al., 2016). The cloud services and applications enable the client to store and access their local data in the remote data centre by using their personal computers, or mobile devices (R. VelumadhavaRaoa, K. Selvamanib, 2015).

Higher Institutions are public or private organizations that provide programmes to individuals who have completed high school or secondary school, and the academic programmes may include undergraduate and postgraduate courses; and training courses for skills development (Dunga, 2013). Higher institutions are dependent on information technology regarding content delivery, communication, and collaboration. In today technological world, students are demanding more information technology services from their respective institutions. Moreover, information technology is changing rapidly and has put an additional financial burden on the institutions. One of most prominent challenges colleges and universities face in providing education is the lack of infrastructure, maintenance of that infrastructure (if available), and maintaining a wide range of hardware and software equipment (Mohsen et al., 2017). Cloud computing can help provide those solutions at a reasonable price. In higher educational institutions, the stakeholder term refers to anyone who has access to educational services, including students, lecturers, researchers, staff members, etc. Figure 1 shows the primary stakeholders of cloud computing in higher educational institutions.

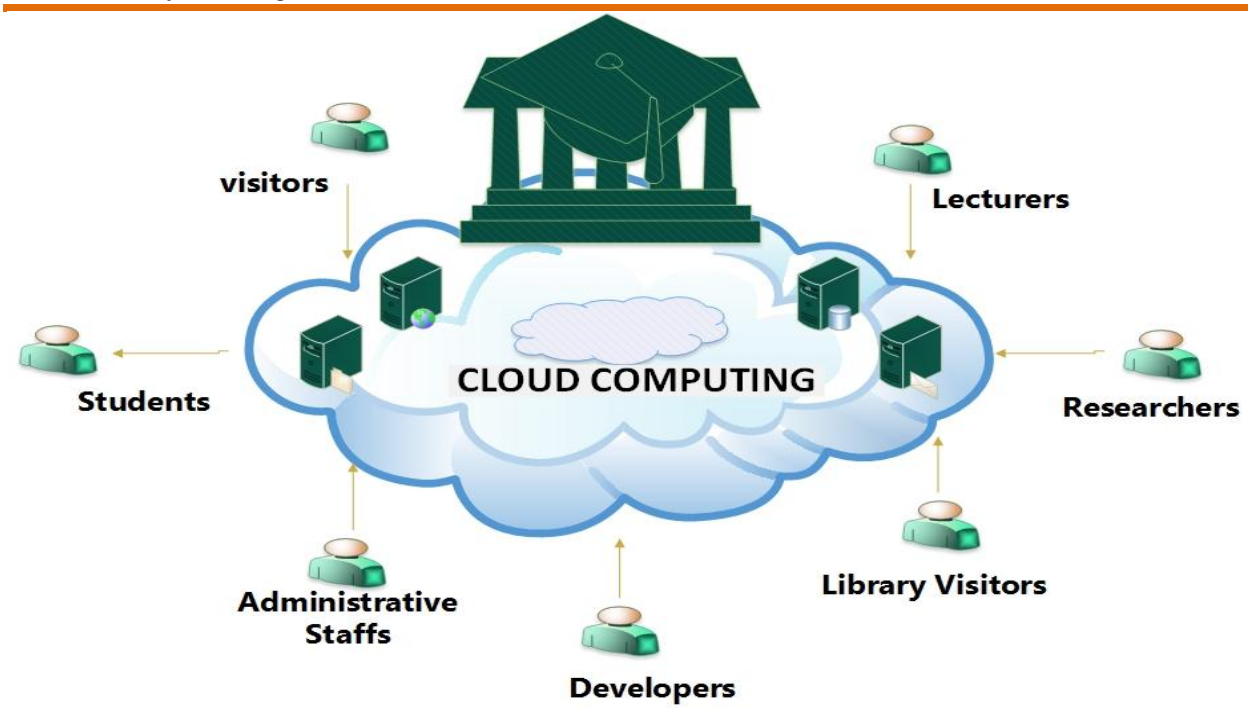

Fig. 1: Stakeholders in cloud computing in a higher institution.

Cloud-based ERP as well called as Software-as-a-Service (SaaS) is delivered as a service by the cloud service providers (Meganthan et al., 2017). With this type of implementation, a higher institution's ERP software and its related data are stored and controlled virtually (on the Internet "cloud") by the ERP vendor and are accessed by clients using a web browser. For cloud-based ERP, preliminary costs are typically considerably less because higher institutions only deploy the application they need to use. The cloud ERP provider hosts and manages all of the IT infrastructure and security for the organization ensures the system is uninterruptedly running, and that productivity improvements are rolled out painlessly to company solution without disturbing their earlier implemented customizations (Meganthan et al., 2017). Furthermore, the payment for the ERP services is delivered through subscriptions that have to be paid as per user on a monthly or yearly basis (Deshmukh et al., 2015).

2. HIGHER INSTITUTION CLOUD-BASED ERP SOFTWARE MODULES

Higher institution cloud-based ERP software is a system that has several management information systems software embedded together to make up enterprise software which is separately purchased or subscribed based on the institution-specific needs and technical capabilities of the higher institution. Each ERP module focused in the particular area of academic and non-academic processes such as HR or Academic Module, Affiliation Module, Central Evaluation Module, Degree Module, Financial Accounting Module, Inventory Module, etc. Most of the standard ERP module includes inventory, accounting, human resource management, finance, Examination, etc. Higher institution chooses the ERP modules that are economically and technically realistic and cost-effective.

2.1 Academic Module

The academic module is a commonly use management system in a higher institution which helps to monitor the progress of each, and every candidate enrolled for Research Degree study till they receive their degree. It helps the university with online information on candidates enrolled and at different stages and maintains track of supervisors and examiners.

2.2 Affiliation Module

Affiliate modules help in facilitating all the online information of all other institution, which has an affiliation with the higher institution. At any time, through this module, the higher institution can determine the institutions under temporary and permanent affiliation, a higher institution for which temporary membership is permanent and, compliance in a higher institution about the higher institution requirement and norms.

2.3 Central Evaluation Module

Higher institutions have quality assurance in various departments which make use of the central evolution management system that helps in automate all the entire evaluation process of examining answer sheets of all courses, courses that were taught and where not taught. It provides online information to some copies evaluated, the amount spent on evaluation, active and non-active students, active and non-active lecturers and, balance copies to be checked along with the target progress chart based on the number of teachers available for evaluation. System generated answer sheet evaluation bill ensures accurate payment to teachers.

2.4 CRM Module

Students are the most integral part of a higher institution. It is necessary for the higher institutions to manage interactions with alumina, current and future students. It aims at providing 360 degrees of student data. It helps you to know the students better and includes many features such as activities, history, related contacts, addresses of the students, and their relations with the higher institution competitors. The flexible database structures enable you whatever information you would like to keep on the student and maintain such information for your future reference. CRM module can also offer an effective students complaint management tool including repairs processing and document management (Meganthanet al.,.2017).

2.5 Degree Module

Higher Institutions are a public or private institution that provides programmes to individuals who have completed high school or secondary school. This module helps in to automate the Degree distribution process of the University including entering of Students request for New Degree/Degree amendments and keeping track of Degree issued and pending for modifications.

2.6 Examination Module

This module Provides computerization of examination monitoring and result preparation for the higher institution, of undergraduate and postgraduate students, along with pre (coursework) and post-exam work. It also helps keep track of all the online information of every student result statistics in various formats for all levels.

2.7 Financial Accounting Module

For better financial management of the higher institution, this module provides online insight to income and expense at management level, it collects date from several functional departments, and produce valuable financial activates reports. Through budget monitoring and controlling University can manage all their expense strictly by the budget provision and avoid variations. Also facilitates the online issue of cheques for payments to be made by University and online issue receipts for payments received from students/college / other sources. Produces valuable financial activates report such as general ledger, audit-trail balance, balance sheet and quarterly financial statements.

2.8 Inventory Module

Inventory module helps in to consolidate the processes of maintaining the suitable level of non-consumable and consumable stock in a storeroom. The activities of inventory control comprise in finding inventory requirements, setting targets, providing replacement techniques and possibilities, observing item usages, integrating the inventory balances, and reporting inventory status. Integration of inventory control module with sales, purchase, finance modules permits ERP systems to produce attentive decision-making level reports (Meganthan et al.,.2017).

2.9 Library Management Module

Library management module in higher institution helps in library functions like book searching, managing members, issuing books, tracking borrowed books, and circulating books. Our module is mainly for distributing books, category wise books storing, and publisher’s details calculate fine and maintain the transaction history.

2.10 Payroll and Human Resource Module

Payroll and Human Resources module which helps in streamline the management of human resources and human capitals. Payroll and HR modules routine, maintain a complete employee database including contact information, salary details, attendance, performance evaluation and promotion of all employees. Advanced HR module is integrated with knowledge management systems to optimally utilize the expertise of all employees (Meganthan et al.,2017).

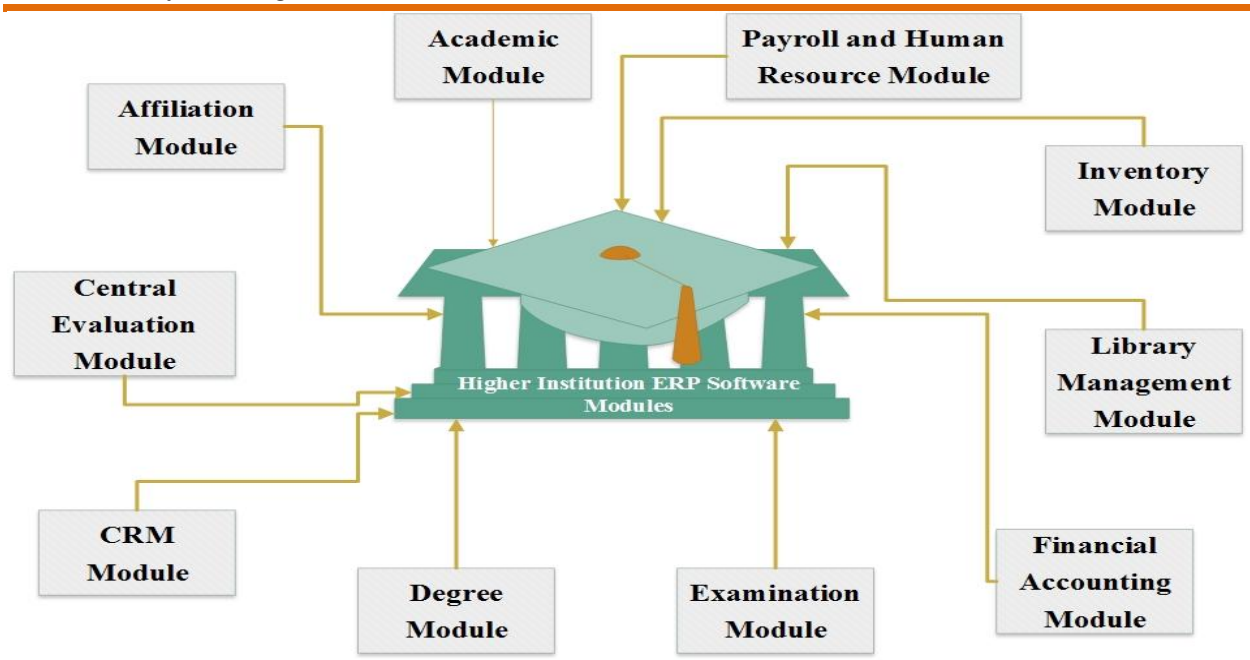

Fig. 2: Higher institution ERP Software Modules.

3. HIGHER INSTITUTION ERP DEPLOYMENT MODELS

3.1 On-Premise ERP

On-Premise ERP solutions are deployed within the company hardware and servers and then controlled by their IT experts.The company owns the hardware and software. On-premise ERP solutions typically involve more upfront and continuing investments to procure and manage the software and the associated equipment, servers, and facilities required to run it. (Meganthan et al., 2017)

3.2 Hosted Application Server Active Software Packages

The ERP system which is hosted on a remote rented server and uses the application through an active internet connection.Web-based ERP is set up as a single tenant, meaning that the business has its virtual application and database servers.Scalability of this services is always time-consuming. Integrating additional new modules, software updates, and other system enhancements will require substantial migration time (Meganthan et al., 2017). The active software package is a host, that provides sources hardware, platform and support staff Arnesen, S, (2013). The active software package is a Single Instance, a Single-Tenant legacy software application which means that supports individual students and staffs. The students and staff have access to dedicated servers, the flexibility of accessing the application tends to be regularly upgraded Arnesen, S, (2013). On the other hand, cloud computing makes use of Multi-Tenancy architecture in which a single instance of a software application which serves multiple students and staffs. Many cloud customers share the same resources. A disadvantage of this might be that the customers have more limited control than they would about a Single-Tenant application. The cloud-based application also tends to be subject to regular upgrades Arnesen, S, (2013). Cloud computing increases the availability and accessibility of an enterprises data and computer-based systems meaning that they can be accessed at any time from anywhere Sahin, PwC, (2014), N.Y., (2013)

3.3 Cloud-based ERP

Cloud-based ERP as well called as Software-as-a-Service (SaaS) is delivered as a service by the cloud service providers.With this type of implementation, a higher instruction's ERP software and its related data are stored and controlled virtually (on the Internet "cloud") by the ERP vendor and are accessed by clients using a web browser. For cloud-based ERP, preliminary costs are typically considerably less because higher institutions only deploy the software to their requirements and then access it through their computer's internet connection.The cloud ERP provider hosts and manages all of the IT infrastructure for the organization, ensures the system is uninterruptedly running, that the data is securely protected,and that productivity improvements are rolled out painlessly to higher institution solution without disturbing their earlier implemented customizations (Petra Schubert and Femi Adisa 2017; MalizaSalleh et al., 2012).The higher institution has a fast-growing requirement which including web Access and mobile sales, researches, recruitment and e-learning management, data mobility has become vital for higher institutions. The ability to utilize the higher institution's applications and data from different locations and using various devices is a technology trend that cannot be avoided in the modern Internet era Guo Chao Alex, P, & Gala, C, (2014) Sahin, PwC, (2014), Mahara, TN, (2013).

4. COMPARISON OF CLOUD-BASED ERP VS ON-PREMISES ERP

The criteria used for comparing the cloud-based ERP with on-premises ERP are Infrastructure cost, implementation cost, license cost, maintenance cost, data security, scalability, customization capabilities, upgrading (Meganathan, 2017).

Table 1 Comparison of Cloud-Based ERP with On-Premises ERP

Criteria	Cloud-based ERP	On-Premises ERP
Infrastructure Investment	No capital expenditure required for hardware infrastructure.	This system requires an upfront capital investment is necessary for the hardware.
Upfront License cost	Cheaper upfront cost. Flexible licensing	Required. Limited licensing
Maintenance cost	Not Required	Required
Availability	Access anywhere and anytime through internet	Limited Access. Access through a private network
Scalability	Limited Access. Access through private network more scalable and flexible	Limited and Rigid
Implementation time	The implementation process takes lesser time. Limited customization leads to less implementation time.	Implementation process can take significantly longer. The organization completely controls the implementation process.
Cost of Implementation	Short-term: cheapest alternative Long-term: Depends	Expensive
Cost of use	Pay-per-actor: • Small company - not a significant value • Large company - expensive	Maintenance cost
Upgradation Cost	Free of cost	It required additional cost for upgrading
Data/Information Security	For SaaS and PaaS the vendor Completely controlled in control but for IaaS is both the client and the vendor that have to the role to play in the security.	The higher institution has total control over the security.
System customization	Less customizable in general. Customization is frequent and comparatively cheaper as the vendor takes care of all necessary updates and upgrades.	the higher institution can customize the system to a large extent and need to be well versed with all security protocols
Maturity	Relatively new	Well-studied and well establish
The flexibility of computer power	Flexible capacity	Set capacity
Utilization of computer power	good	Bad
Size of IT department	Medium	Big
Focus on IT department	Software focus	Mixed focus

Data security usually is the utmost concern for potential ERP customers. They are seeing how critical the data stored in an ERP system is, including their financials, corporate trade secrets, employee details, information about their clients and more. However, purchasers were once uncertain of the security of cloud-based solutions; many today are becoming less. Trustworthy cloud service providers have high standards in position to retain data safe. To further ease concerns, potential organizations can look for a third-party security audit of a vendor they are considering. This can be precisely convenient if the vendor is unfamiliar.

5. CLOUD BENEFITS IN HIGHER INSTITUTION

There are various advantages may be granted when adopting cloud computing technologies in higher education institutions. Some universities have adopted cloud computing in their programs for economic purposes, while other institutions use the cloud to

provide scalable and flexible IT services (Niall Sclater, 2010). The key benefits of cloud computing in education can be categorized according to stakeholders who use cloud resources and services in higher education institutions:

5.1 Benefits for students:

The first beneficiary of the cloud technology in the educational institutions must be students (Atif Ishaq, M.N. Brohi. (2015). Some of the cloud benefits directed to students are reviewed:

- Cloud computing releases services for students with new capabilities that were not served well by traditional ways. Nowadays, the students can store anything electronically such as their schedule, class notes, reports and any other documents. Furthermore, they able to back up their files to the cloud and retrieve them when needed.
- Students can earn e-copy of textbooks and have access to quality learning materials of their courses. This solves the problem of the student's reluctance to gain books due to their high-cost prices. Furthermore, cloud-based books solve the problem of using outdated materials in many of institutions and allow students to access the most updated learning resources.
- The lab's applications and auxiliary resources that may be implemented on the Internet enable students to perform lab's tasks from anywhere and by low-cost personal devices. Therefore, the students do not need any more to buy expensive hardware or install special software.
- Students have the opportunity to access the system easily at any time to get courses online, attend the online exam, and upload their assignments and projects through the cloud to the instructors.
- Real-time collaboration between students themselves as a team or between students and their instructors on the other hand.

5.2 Benefits for faculty

The faculty also can get various advantages over cloud-based applications (Poonam et al., 2014):

- Cloud technology offers instructors a secure and flexible platform to prepare their course tutorials, presentations, conferences, articles, etc.
- The faculty may be able to exchange experiences by establishing remote seminars to overcome the lack of skills among some faculty members.
- Providing opportunities for instructors to work from home and use their own devices to finish assignments, prepare on-line tests, grading, and scheduling.
- Collaboration with other instructors and sharing educational resources to avoid conflict and duplication of effort.
- The system helps in getting feedback from students about the educational process.
- Cloud provides for researchers a discussion area and accessibility to global computing resources and sufficient storage capacity.

5.3 Benefits for Management

The management also can get various advantages over cloud-based applications:

- Easy access to all records at one place.
- Channel to interact with staff, teachers, parents, students.
- Saving person-hours and increasing productivity.
- Unhindered, smooth management.

5.4 Benefits for Administration

The Administration also can get various advantages over cloud-based applications:

- Easy access to reports.
- The system helps in getting accurate and timely data.
- Publication & Circulation of reports.
- Saving person-hours for productive work

The ERP space in higher education is moving rapidly. The future integration of Internet technologies, ASP hosting services, and expanded ERP systems could help transform the way higher education institutions operate in the 21st century and move closer to realizing the goal of any time, anywhere computing.

6. CHALLENGES FOR CLOUD-BASED ERP

The key challenges in implementing a Cloud-based ERP solution vary to some extent depending on whether the implementation is from scratch or migration from an existing solution to a cloud as SaaS. Moreover, the key challenges are common to both methods (Purohit et al., 2012; James et al., 2017; FathimaHaseen Raihana, 2012). Cloud computing technology in education in a way that

would allow for its significant and rapid growth. The most significant challenges for early adoption of technology by educational institutions are lack of resources/expertise, security, and compliance. As more colleges and universities are placing more workloads in the cloud, the need for expertise has grown. Training of IT and development staff will help to an address this challenge. Although data centres do take strong security measures, concerns about the security of the cloud remained. There is a broad span of interests in cloud computing security including network security, data security, compliance, governance, and more. Gonzalez et al. surveyed state of the art in cloud security and concluded that the top three major security problems facing organizations in cloud adaptation are legal issues, compliance, and loss of control over data (Gonzalez et al., 2012). Other studies identified top cloud security threats as listed below (Winkler 2011, 2012; Raguram, 2014):

Trusting vendor's security model
Loss of physical control
Data dispersal and international privacy laws
Quality of service guarantees
The potential for massive outages
Malicious Insiders and Abuse of Cloud Services
Service Traffic Hijacking: Phishing, buffer overflow attacks, and loss of passwords
Reliability of cloud service providers service
Governance: data control, security control, and lock-in
Network security: transfer security, firewalling, and security configuration
Data security: cryptography, redundancy, and disposal

The cloud infrastructure is always is an open and shared resource. Therefore, it is a primary target for cyber attackers. Cloud computing systems and services are subject to malicious attacks from both insiders and outsiders. Side-channel attacks, identity hijacking, and distribution of malicious code have all been observed. Therefore, the management of security in cloud environments needs to be carefully analyzed and maintained. The costs of managing the cloud and the speed of uploading files. The price in the cloud could increase rapidly such as for specific customizations to meet education needs. Uploading large data can take a long time which causes frustration and inconvenience for day-to-day business. Other challenges include governance and control, the complexity of building a private cloud, defining What Services Should Move to the cloud, and performance issues.

7. SELECT THE RIGHT CLOUD ERP SYSTEM

Selection of a Cloud ERP system suitable for a higher education institution is a time-consuming task. There are different models in the cloud which higher education institution needs to be aware of to help choose the best cloud ERP system. The following steps are identified as best practices for selecting the right cloud ERP system for the higher education institutions.

I. Gather Business Requirement for Cloud ERP system.
II. Study and gather all information cloud ERP about vendors, ERP modules and its technical specifications, Support, security model, deployment time, pricing, licensing, maintenance cost, software up gradation policy, disaster recovery mechanism, the location of data and processing, post-purchase support, customer testimonials, scalability, and elasticity.
III. Evaluate and shortlist the ERP vendors based on the study.
IV. Ask the vendor for demo and free audit trail to experiment.
V. Ensure the vendor solution fulfils the functional requirements and negotiate the package price.
VI. The last stage is to purchase the suitable cloud-based ERP module.

8. CONCLUSION

Cloud computing represents an opportunity for universities to take advantages of the enormous benefits of cloud services and resources in the educational process. Cloud computing will be supportive in refining the cost, maintenance and technical competence ofERP implementations in a higher education institution. Higher education institution with cloud-based ERP as SaaS. Higher education institutions' will not be necessary to maintain and control the hardware and software used. Higher education institutions are permitted to pay as they use the service, rather than making a capital investment. Content delivery, communication, and collaboration outside of the enterprise, sourcing, procurement, teaching, learning, and research are suitable for cloud computing. However, apart from the benefits, it comes with some challenges, but with proper planning with the right expert team, the problems will be handled.

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