■ **CASE REPORT**

Educational ERP Systems over Cloud Data Security, Threats & Risk Analysis

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ABSTRACT

Enterprise resource planning is an organizational management software for managing the data related to the functioning of an organization in a streamlined manner. ERP was initially designed for the business and industry sector, but with its wide applications in various sectors, it has been continuously been adopted by organizations of other domains too. A major domain that is quick to adopt the ERP system is the educational sector, wherein the institutions are adopting the ERP systems to manage their resources. ERP systems are majorly based on in house server and need huge investment. The educational institution has thus been found hesitating to implement the system. A new approach has been to use a Cloud-based ERP rather than use an inhouse-server to store data, as the cloud is being used for reducing the amount of investment needed for the set-up. This research studies data security, threats and risk analysis and concerns of the educational institutions while employing the Cloud based ERP systems. Also, the authors have suggested a mid-path solution to overcome these concerns and risk factors - A hybrid mode of ERP system combing both the traditional and cloud-based approach.

KEYWORDS | ERP, educational ERP, cloud-ERP, information-security

INTRODUCTION

THE Enterprise resource planning (ERP) is a software that combines all business-related procedures and functions at a combined IT platform for easy management which helps the business to function efficiently and effectively.[1] ERP is an old term in the manufacturing and production industry that dates back to early of the 1960s when the ERP was in the form of an Inventory Control system where it acted as accounting software, later in the 1970s this inventory control system was modified into MRP - Material Requirements Planning which was a package that provided support to the planning and control unit of the business production houses. This system was replaced by a more advanced MRP II system in the 1980s. This new advanced system was aiming towards the integration of technology with the manufacturing to increase the manufacturing of products.[2]

In the new world keeping up with technology, the cloud ERP systems were introduced in the early 21st century with advanced technology. These technologies can be accessed from any kind of device such as mobile tablet and computer which has internet facility. These applications

come with two major advantages: a) The one with cloud integration ERP shows all departments. b) The centralized DBMS help all business communications such as record, monitoring, and processing. [3,4,5]

In businesses, ERP systems keep a track of their resources such as raw materials, finance, production capacity, and the standing of business assurances like salaries, sale-purchase orders, etc. This system makes sure that the relevant data is shared with the associated departments of the business and links them together with the core data. In other words, ERP not only ensures the data flow amongst the various departments of the business but also manages the information sharing with the stakeholders of the said business.[6] It has been observed that the ERP modules may interface with the business or organization's own data management process resulting in an increased degree of effort to match the data.[7] But despite the shortcomings and the risks involved while employing the system, a huge rise has been observed in the last decade globally wherein the organizations have been employing the ERP systems to streamline their workings, especially in Higher Education.[8]

ERP in the educational sector is an application that joins all the modules and departments of an educational institution into a single system whose access is available with the fraternity members of the said institution and also with students, their parents, and other stakeholders.[9] Each individual who is part of the institution has his/her unique and distinct user id and password. All the activities can further be monitored by the said administration with the usage of master id and password access. The educational ERP structure is entirely different from that of the business sector.[10] It comprises programs, fees, library, events, hostel, faculty data, examination.

The main aim of the educational ERP system is to provide a platform that encompasses all the functionalities together at a user-friendly interface. The educational ERP system digitizes all the information and data of the institute which are updated by admin login only and grant access to all the students and faculties.[11] Educational ERP reduces the need of maintaining the data on paper and keeping a check on the store for ensuring data security. The digitized details once entered into the system are stored on the server which can be accessed only with valid login credentials.[13]

It has been observed by the authors that despite the rise in the implementation of ERP in the educational sector from the literature review, it can be deduced that 60 to 65 percent of ERP systems have a failure rate and 30 to 35 percent of ERP implementations are canceled for various reasons. In the area of the higher education system, the implementation and success of ERP is very critical, failure of ERP system is comparatively higher as well. [14,15,16,17] There can be numerous factors responsible for this rate of failure the end-user training, cost input, step-wise implementation rather than the big-bang approach, and lastly the technical training of the users.

Related Work

In an increasingly competitive world, organizations are forced to focus on the primary goal rather than on the support services that are leading to a rise in such services by a third party. Thus, making this one of the main reasons to seek the need for cloud-based ERP systems.[17] It has been observed that the organizations that have migrated from traditional ERP systems to cloud-based ERP systems have been able to manage their costs efficiently and effectively improve their functioning. This supports the argument that using an ERP system in an organization could support the growth of the organization by enhancing its resource and service management system.[18]

Gartner defines cloud-based services as capabilities of scalable systems that can be delivered to users using internet services [19]. Due to the increased demand for cloud-based ERP systems, a new market for the new subscription-based delivery model of ERP or SaaS ERP has emerged. This model of ERP is similar in function to the traditional ERP systems.[20] The SaaS ERP is accessed through the internet. The information and the system application is controlled using a cloud service by the third party that offers its services to the client at a monthly or annual subscription fee.[21] Figure 1 depicts a comparison of traditional ERP systems and cloud-based ERP systems in terms of costs, complexity, and implementation time.

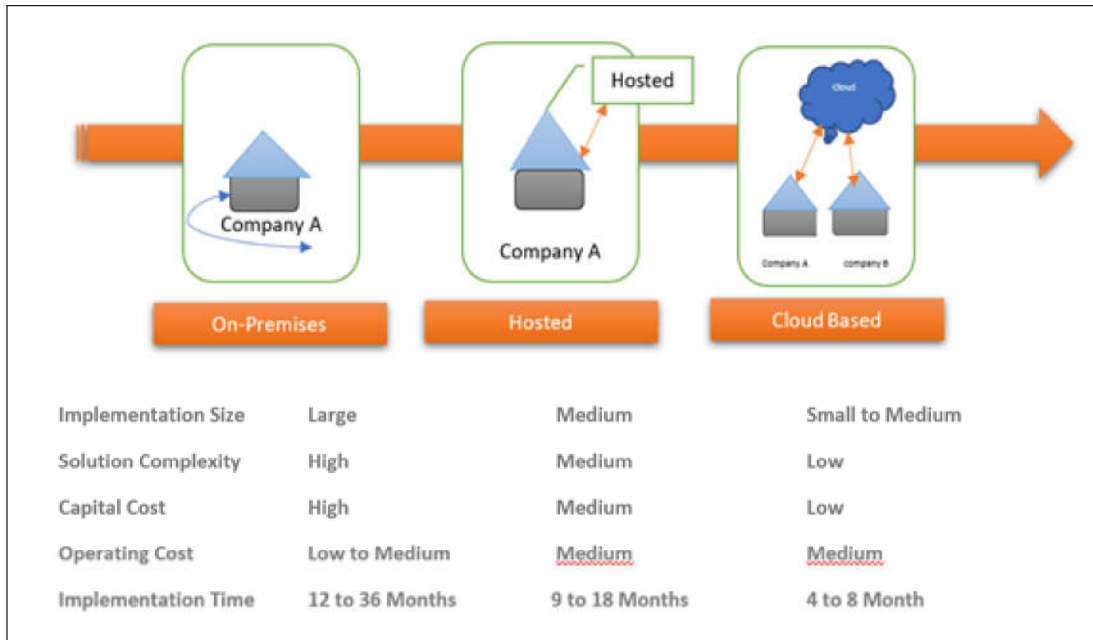In brief, the advantages of cloud-based ERP

Figure 1: Comparison of Traditional ERP system and Cloud-based ERP system

over traditional ERP can be summarised as follows:[22]

- It permits small organizations to implement a complete ERP system without using much space.
- It saves on infrastructure costs, software maintenance and upgrade costs.
- Cloud-based ERP decreases the need for staff for ERP support and maintenance.
- Cloud-based ERP system is implemented faster, due to its agile approach.[23]
- It offers more scalability.
- It enables more mobility.

Despite having the aforementioned advantages, there are some concerning disadvantages of cloud-based ERP systems:

Issues in relation to Data Security

As ERP systems manage the essential data needed for the functioning of an organization, these organizations need to make sure that their data are secure in the cloud. As pointed out by Bishop that the security of any computer-based service depends on the integrity, confidentiality, and accessibility to the data stored cloud-based ERP systems are influenced directly by the security level ensured by the service provider.[24, 25]

Confidentiality

Weng and Hung (2014) discussed that when an organization implements a cloud-based ERP system, it must be ready to mitigate the risks surrounding the usage of cloud technologies and work on the tools to prevent unauthorized access of information stored.[26] Johansson (2015) disclosed that organizations are uncertain about storing their confidential data and information stored with the third-party service providers, who have not assured direct control over information. Another issue of concern is that the primary organization has no control over the staff of the cloud service provider, thus making it a worry over who could be accessing their data at the third-party vendor's end.[18]

Integrity

Another major concern experienced is to ensure the uniformity of the information stored. Puthal *et al.,* (2015), informed that the failures and errors that may occur from the cloud provider can easily affect the integrity of data. They also argued that the generally accepted method for data validation in the cloud is via public auditing, wherein the data validation can be done by a third party to check the integrity of the services.[27] A similar

Figure 2: The major data security issues involved with Cloud-based ERP systems

concern was pointed out by Akande *et al.,* that the methods of verification of data and the levels of permission to manipulate the information are of utmost concern.[28] Figure 2 summarizes the major data security issues in cloud-based ERP systems.

Result and Discussion

Cloud-based ERP technology provides an attractive and cost-effective alternative to the traditional ERPs by offering a competitve edge in flexibility, scalability, ease of implementation, and cost savings.[29] Most major obstacles to the implementation of cloud-ERP are the risks surrounding information security and integrity of the data.

SaaS model of cloud-ERP is vastly growing in popularity, but the fears over information integrity and confidentiality need to be addressed before its implementation by any organization. Furthermore, the literature also highlights that the implementation rate for cloud-ERP is dependent on the organization type and functions.[30] As ERP system plays a very important role in the functioning of an organisation, the obstacles related to the implementation rate of SaaS-based ERP can be negatively impacted.

From the literature, it was showcased that the smaller organizations benefit from the cloud-ERP due to their low investment, and the issues about the risks in its implementation take a backseat.[31] Also, since smaller organizations are not able to employ proper IT experts and adapt apt security measures for traditional ERP systems, the cloud-

ERP approach helps them to outsource these to third-party vendors thus saving money and efficiently utilizing their resources.

On the contrary, the larger organizations are more concerned about security issues of the cloud-ERP in relation to their sensitive and confidential data, which they have to share with the cloud service provider. They are more concerned about the security breach and its impact on their image amongst the stakeholders. As a result of these concerns the larger organizations are found to be a bit reluctant in adopting Cloud-ERP systems. A midway approach was suggested by Utzig *et al.,* wherein the approach was to approach cloud-ERP with 50 to 60 percent shift over 10 years with side-by-side existence of traditional ERP system.[29] Recently, a new approach has been gaining popularity amongst the larger organizations which is a 2-tier strategy for ERP also known as the hybrid cloud-based ERP. Ruivo *et al.,* (2015) maintained that approximately 77percent of organizations will employ the hybrid cloud-based ERP system, but currently, only 20 percent of such organizations have the plans and structure needed for this implementation.[32] This was evidently supported by Peng and Gala (2014) who also argued that the hybrid ERP system is an efficient solution for the organizations adopting the cloud approach as they can keep their core functioning modules and data on an in-house ERP server and rest they can share on the cloud-based server, before completely shifting to the full cloud-ERP system.[33]

Hybrid cloud-based ERP is, in a true sense, a mid-path between the traditional approach and the cloud approach wherein the best of the both approaches have been combined into one. This approach gives organization the freedom to choose which data they want to share on the cloud and which one they want to keep on an on-premise server. Thus, eliminating the risk of breach of confidential data via the cloud. Clarke *et al.,* (2014) shared that the biggest advantage of the hybrid approach is that it gives organizations the flexibility to reallocate their resources after moving the part of ERP and the associated services to the cloud enabling them to work more effectively. This approach also allows the organizations to enjoy the benefits of Cloud-ERP while minimising the

risks of storing of sensitive and confidential data on the cloud. [33]

CONCLUSIONS

Due to the great advantages of cloud-based ERP, the educational institutions are considering using it for their institutions. Latest ERP platforms overcome a few of the weaknesses of old-school ERP systems. And due to the low-cost investment and scalability of cloud-based ERP systems, even the smaller educational institutions are looking favourably at this approach.

However, cloud-based ERP systems are concerned about the integrity and security risks with regards to the data. Large institutions have been a bit wary of adopting this system, storing sensitive data on the third-party server being a major concern. Another concern with third-party being involved is the misuse of data and security breaches at the third-party servers, which make the switch to cloud-based ERP system rather difficult.

The takeaway of this work is to suggest a mid-path by combining both traditional and cloud-based ERP systems. This type of approach will allow the institutions to store their sensitive data by using an in-house server and less sensitive information on the cloud server of the ERP system. This hybrid approach will ensure the security and scalability of the data of the institution with ease-of-access to the data via the on-premise server and a wide range of access to ERP from different locations of end-users due to the cloud server usage. Also, the cloud-based ERP enables the administration to install different modules of ERP as per the need of the institution as it evolves along with the education policies of the government. The hybrid approach also enhances the mobility of the ERP system, as the cloud server provides high system performance and more customization of the system according to the needs of the institution. Hence, the hybrid traditional-cloud-based ERP systems are more suitable for educational institutions to ensure data security and ease of access. **IJFMP**

REFERENCES

1 **Bahar Yelken** *2005. ERP System Implementation: A c BEKO A.ġ. ĠSTANBUL KÜLTÜR UNIVERSITY FACULTY OF ENGINEERING & ARCHITECTURE, DEPARTMENT OF INDUSTRIAL ENGINEERING*

2 **Bambang P.K., Bintoro Togar Mangihuut Simatupang Utomo Sarjono Putro Pri Hermawan** *(2015). Actors' interaction in the ERP implementation literature. Business Process Management Journal. 2015, vol 21 issue 2.*

3 **Birnbaum, R., & Edelson, P. J.** *(1989). How colleges work: The cybernetics of academic organization and leadership. The Journal of Continuing Higher Education, 37(3), 27-29.*

4 *Chapter 7* **An Overview of Enterprise Resource Planning** *(ERP), PRIME VISION / C.A. FINAL / ISCA / AN OVERVIEW OF ENTERPRISE RESOURCE PLANNING (ERP)*

5 **Christian Leyh.** *Chapter 6: tailoring of ERP systems readings on enterprise resource planning.*

6 **Sun, A., A. Yazdani and Overend, J** *(2005). "Achievement assessment for enterprise resource planning (ERP) system implementations based on critical success factors." Int. J. Production Economics 98:*

189-203

7 **Lehrstuhl für Wirtschaftsinformatik** *2010, what you should know about ERP, Technische Universitat Munchen.*

8 **Althonayan Mona** *2013, Evaluating Stakeholders Performance of ERP Systems in Saudi Arabia Higher Education. DEPARTMENT OF INFORMATION SYSTEMS AND COMPUTING BRUNEL UNIVERSITY.*

9 **Abugabah, A., & Sanzogni, L.** *(2010). Enterprise resource planning (ERP) system in higher education: A literature review and implications. World Academy of Science, Engineering and Technology, 71*

10 **Pranab Garg, Dr.Himanshu Aggarwal** *"Comparative Analysis of ERP Institute Vs Non Erp Institute; Teacher Perspective, IJMBS-2011.*

11 **M. Markus, L, C. Tanis and P. Van Fenema,** *"Enterprise resource planning: multisite ERP implementations," Communications of ACM, vol. 43, pp. 42-46, 2000.*

12 **V. Anand, A. Poojary, R. Mondal, P. Prajapati, S. C.R. Pal,** *ERP System for College, International Journal of Computer Science Trends and Technology (IJCST) – Volume 5 Issue 2, Mar – Apr 2017. PP 59-62.*

13 **Amgad Badewi, Essam Shehab.** *(2013). Cost, benefit and financial risk (COBEFR) of ERP implementation. Proceedings of the 11th international conference on manufacturing research (ICMR 2013), 19th-20th sept 2013 pp 207-212*

14 **Amid, M.Moalagh, A.Ravasan** *"Identification and classification of ERP critical failure factors in Iranian industries", ELSEVIER, 2012.*

15 **Davide Aloini, Riccardo Dulmin, Valeria Mininnno** *(2007). Risk management in ERP project introduction: review of the literature. J. Information and management, 2007 vol 44 pp 547 -567.*

16 **Divya Tuteja.** *(2014). Implementation and updation of ERP systems in India: A survey. International Journal For Advance Research In Engineering And Technology. 2014, vol 2 issue III*

17 **Subashini, S.** *and* **Kavitha, V.** *(2011). A survey on security issues in service delivery models of cloud computing. Journal of network and computer applications, 34(1), pp. 1-11. https://doi.org/10.1016/j.jnca.2010.07.006*