

A Model of Cloud-Based Enterprise Resource Planning (ERP) for Small and Medium Enterprise

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Abstract

Cloud Computing is an uprising technology in the rapid growing IT world. The adaptation of cloud computing is increasing in very large scale business organizations to small institutions rapidly due to many advanced features of cloud computing, such as SaaS, PaaS and IaaS service models. So, nowadays, many organizations are trying to implement Cloud Computing based ERP system to enjoy the benefits of cloud computing. To implement any ERP system, an organization usually faces many challenges. As a result, this research has introduced how easily this cloud system can be implemented in an organization. By using this ERP system, an organization can be benefited in many ways; especially Small and Medium Enterprises (SMEs) can enjoy the highest possible benefits from this system.

Keywords

Cloud Computing, Cloud Comparison, Cloud Models, Enterprise Resource planning (ERP), Small and Medium Enterprise (SME)

1. Introduction

Cloud computing is one of the most popular models of data sharing which enables convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction [1] [2]. Simply, Cloud Computing is a combination of different techniques and technologies that provide services through Internet [3]. Any web-based application or service offered via cloud computing is called cloud service. The most important objective of cloud computing is to provide secure, scalable and cost-effective on-demand computing infrastructures

and services with high-quality [4] [5]. There are different types of services that are available in cloud computing, such as Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) [6]. Software as a Service (SaaS) is the model in which an application is hosted as a service to customers who access it via the Internet. On the other hand, Enterprise resource planning (ERP) is a business process management software that typically integrates all facets of an operation, including product planning, Sales, Purchases, Items and Inventory, Manufacturing, Dimensions, Banking and General Ledger, in a single database, application and user interface. The cloud has been advancing gradually into the enterprise and the ERP systems have been evolved from traditional on-premise systems to the hosted systems and to cloud-based systems consequently. This change is more relevant to small-scale business that focuses more on saving direct cost, convenience of use and functionality of the system without the investment of time. Cloud-Based ERP is an efficient approach that uses cloud computing platforms and services to bring about a revolution in businesses.

2. Literature Review

Many researchers have conducted research on the cloud-based ERP system. We have studied many research papers on the topic from a variety of sources. We have focused some of them in this section. Naveen Chandra *et al.* [7]. They have identified and classified the benefits and drawbacks of traditional ERP system and tried to focus on different types of benefits and drawbacks of traditional ERP system compared with Cloud-Based ERP systems. R. Meganathan *et al.* explored on Reviews on Comparison of Cloud-Based ERP Infrastructures [8], and critically investigated the issues and obstacles that refuse to accept ERP within the organization and proposed some advantages of Cloud-Based ERP particularly cost, maintenance, technical competence to influence the organizations to accept Cloud-Based ERP systems. Fengze Zhong *et al.* [9], have proposed three types of scopes to evaluate the promises and challenges of cloud-based ERP systems. Primarily, they have identified a set of key promises and challenges to help IT decision makers and researcher to gain a better understanding of cloud computing and ERP. Secondly, they have identified promises and challenges of Efficiency, Flexibility, Ubiquity, and Security of cloud ERP. Finally, they proposed research opportunities for IS researchers in the domain of cloud-based ERP systems based on their identified four dimensions. Another some potential researchers Dr. Dhiraj Jain *et al.* [10], have tried to discuss on drawbacks of traditional ERP systems like, system setup costing, maintenance cost, higher salary of skilled staffs, system updating cost and data management costing and they have shown benefits of adopting cloud ERP in their business operations through collecting data and surveying on employees of different IT organizations by providing statistical result. Vandit Hedau *et al.* [11], have emphasized on some lacking of traditional ERP system on SMEs and compared the tradition ERP system with Cloud ERP for SMEs. From the above study, we have found some problems of traditional ERP and some

benefits of Cloud ERP system. Finally, we have developed a model which is found better than other developed models giving focus on SaaS model. This ERP system will be stored in the cloud system. Different types of users of the organizations will connect through the organization's customized security system, which is one of the different techniques than other systems.

3. Computing Service Models

Cloud computing delivery services models can be divided into three archetypal models and different derivative combinations [12]. The "SPI Model" is a model which is the combination of three fundamental models where "SPI" refers to Software, Platform, Infrastructure (as a Service), respectively [13]. All the models are discussed below:

- Software as a Service (SaaS)
- Platform as a Service (PaaS)
- Infrastructure as a Service (IaaS).

3.1. Software as a Service (SaaS)

SaaS is considered one of the highest level cloud computing service model. It is a collection of remotely accessible software service [14]. It allows the customers to use cloud service providers applications running on the cloud computing infrastructure through the internet and the applications maintained and managed by the particular providers. In the SaaS model, maximum applications provided by the vendors can be run directly from a compatible web browser without downloading and installing the applications in an individual computer [15]. For this reason, software maintenance and support cost can be eliminated.

3.2. Platform as a Service (PaaS)

PaaS is a middle layer of the cloud computing service model. The integrated development of environment, framework, architecture, development tools, programs, and services is offered by the PaaS [14]. The client cannot control the underlying infrastructure except controlling the applications. PaaS provides a number of benefits for the developers or programmers. The developers enjoy the upgraded operating system or environment features frequently. Any developer can join and work together from any corner of the world in the software development project. Services can be obtained from diverse sources that cross international boundaries. An organization's expenses can be reduced by using facilities of PaaS.

3.3. Infrastructure as a Service (IaaS)

IaaS is the bottom layer of the cloud computing service model. IaaS deals with different computer hardware devices like processor, memory, network storage, virtual machine, data center, etc. as a service [14]. The Business organizations or IT organizations can use these resources as a service to deliver business solutions or to manage organizations. All the equipments are owned by the service provider

and the service provider is also responsible for housing, running and maintaining all the equipment [16]. There is no responsibility of users or clients for the equipment. The client only pays on a per-use-basis rather than buying expensive servers or equipment. Due to benefits of IaaS, now business organizations are adopting this Information Technology infrastructure rapidly. **Figure 1** shows all layers of Cloud Computing services.

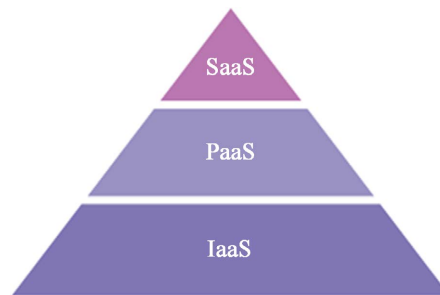


Figure 1. Cloud computing service layers.

4. ERP

Enterprise Resource Planning (ERP) system is one of the most popular business management systems of all types of business management systems and has been dominating in the business organization for more than two decades [17] [18]. Generally, ERP systems automate and integrate all types of business management activities in a single system by providing benefits of real-time capabilities and flawless communication for business in the small and medium organizations so that organizations can achieve operational excellence, improve productivity and competitive advantages [19]. ERP software also economically benefits the business organizations [20]. It reduces the operational cost of an organization and economically benefits the ERP users. That's why the use of ERP is increasing in the Small and Medium enterprises (SMEs) radically.

5. Factors behind Using Cloud-Based ERP

The use of technology in organizations is increasing rapidly day by day, because, the company's main aim is to reach maximum prospective customers using latest techniques and technology so that the business organizations can achieve their targeted profits from the current competitive business. Presently, the organizations are adopting ERP software to enjoy the advantages to achieve their goals, such as: cost reduction, better customer service, improved productivity, better quality, enhanced resource management, better planning and decision making and organizational empowerment [21]. There is a query in the market that how cloud computing particularly Software as a Service (SaaS) model would replace and sweep the traditional on-premise software delivery model in future? [22], Information Technology (IT) can help them achieve these goals, because the companies are continuously searching for ways to reduce costs and operate more efficiently in order to remain competitive in their markets [23]. Nowadays, the reality

is that cloud computing is playing an increasingly vital role in business organizations because Cloud computing is the latest technology and the services of which can be very comfortably afforded by the SMEs since ERP can be hosted on Cloud and rented on pay-per-use basis, which does not need a great deal of initial capital to ensure business stability in a highly competitive market [24]. Besides these, some other factors also influence diverting traditional ERP to Cloud-Based ERP [25], such as:

i) Flexible Payment

The payment policy of the Cloud Computing system is a pay-per-use basis. Here, the client has to pay actual uses charge rather than fixed license fees as charged by the traditional ERP vendors. Prices are very competitive. This is one of the major advantages of moving to the cloud.

ii) Maintenance cost

There is no maintenance cost as all kinds of maintenance activities are conducted by the cloud service provider.

iii) IT security

Security of IT equipment and software is a very concerning issue currently. Organizations have to invest a huge amount to provide security of IT devices and software but this type of cost can be reduced by the cloud environment.

iv) Data access availability (24 × 7)

The ERP software can be accessed by the authorized person by 24 × 7 from anywhere.

v) Platform independence

The ERP software can be accessed by the authorized person from any place using various types of OS. **Figure 2** diagrammatically illustrates the benefits

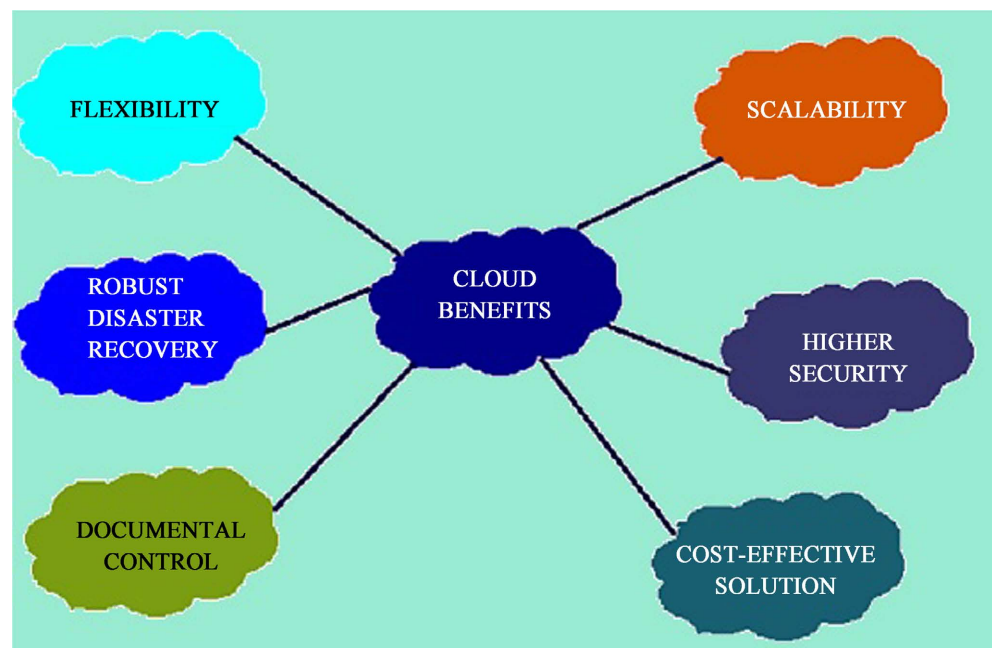


Figure 2. Benefits of cloud ERP system.

of Cloud-based ERP system.

6. Comparison between on Premises ERP and Cloud ERP

The Comparison between Cloud-Based ERP and On premises ERP has been shown in **Table 1** based on their Infrastructural cost, implementation cost, license cost, maintenance cost, data security, scalability, customization capabilities and up-gradation cost [26]-[30].

Table 1. Comparison between on Premises ERP and Cloud ERP.

Criteria for Evaluation	Cloud-Based ERP	On Premises ERP
Cost of Infrastructural development	Comparatively Low	High
License cost	Cheaper	Higher
Maintenance cost	Not required	Extremely needed
Availability	Available 24 × 7	Limited Access.
Implementation time	Generally, take a very short time to implement.	To implement a system required a long time.
ERP modules Up-gradation Cost	Low	High
Data Security	High	Low
Data and environmental standards	Depend on vendor	easy
Dependence on Network performance	Highly dependable	Less dependable
System recovery and disaster management	easy	Not so easy
Customization	Simple	difficult

7. Growth and Performance of ERP

The below bar chart in **Figure 3** shows the top reasons for implanting ERP in



Figure 3. Growth and improving performance.

many organizations [31]. The reasons are improving business performance, making employees' jobs easier, ensuring reporting/regulatory compliance, making better integrated systems across locations, replacing old ERP system, keeping the company growth, ensuring better serve to the customers, standardizing business operations, reducing working capital, etc.

Among all, the "Improve business performance" is the topmost reason which is 17% out of 20%, The second highest one is "Make employee job easier" which is 14%, position the company growth and ensuring better serve customers are the 9% and 8% respectively. So, the chart presents that the organizations are using Cloud-Based ERP rapidly to achieve their goals and increase their business.

8. Goals of the Research

- i) To present an overview of SaaS model for Cloud-Based ERP.
- ii) To focus on medium and small-scale businesses for saving direct cost.
- iii) To set-up the Account of different companies or branches simultaneously without any cost.
- iv) To update disaster recovery—Cloud makes it easier to send application updates at a faster rate. In the case of system or server crashes, data stored over the cloud can be recovered
- v) To manage Software and its associated data centrally (in the Internet "cloud").
- vi) To access the software from a remote location.

9. Method of the System Design

Figure 4 illustrates the model of Cloud-Based ERP system. The ERP system will be stored in a cloud computing system. Different types of users like HR, Finance, Sales, Logistics, Marketing, Accounts users of an organization can access into the ERP system from cloud environment using the laptop, desktop or mobile apps. The user is able to use the ERP system in an organization through the internet by passing through organization's customized security system and the security system must be integrated with antivirus software, firewall and others as per organization's policy or ability so that any unauthorized user or perilous user cannot access into the ERP. The admin user can control all types of users and can control, manage and setup the entire ERP system.

10. Implementation of the System

10.1. Flowchart

The flowchart in **Figure 5** shows the activities of the system. Users have to login into the system by giving user id and password. Then, users will get access into the system as per their level like Administrator, Salesperson, Sales Manager, Inventory Manager etc. by their id and password being checked so that the unauthorized user don't get access there.

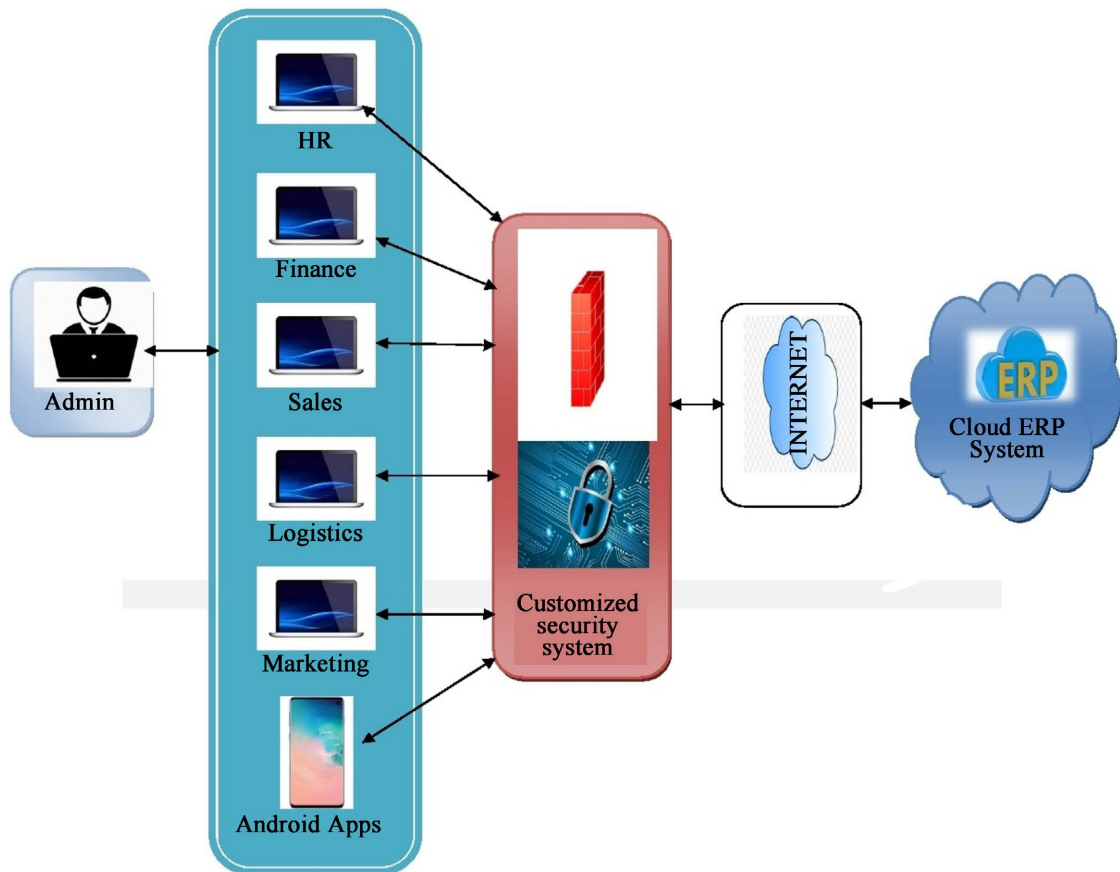


Figure 4. Diagram of cloud ERP system.

10.2. User Interface Design

The user interface is the front-end application view to which user interacts in order to use the software. It is the part of the software and is designed in such a way that it is expected to provide the user insight into the software. UI provides a fundamental platform for human-computer interaction [32].

10.3. Working Area of the System

This research work can be implemented for small and medium enterprise (SME). It typically integrates all facets of an operation: including product planning, Sales, Purchases, Items and Inventory, Banking and General Ledger, etc. using a single database and application. This work focuses more on saving direct cost and the user-friendly functionalities of the system which can also consume time. This Cloud-based ERP is an effective approach that makes efficient use of cloud computing platforms and services to manage a business with more flexibility. **Figure 6** shows the main user interface of the system.

Users can access into different types of application based on their preference and can accomplish their tasks smoothly.

Next, there are options for the admin to give setup and permission to different users, Company, User Accounts, Access, Display, Transaction Reference, Taxes,

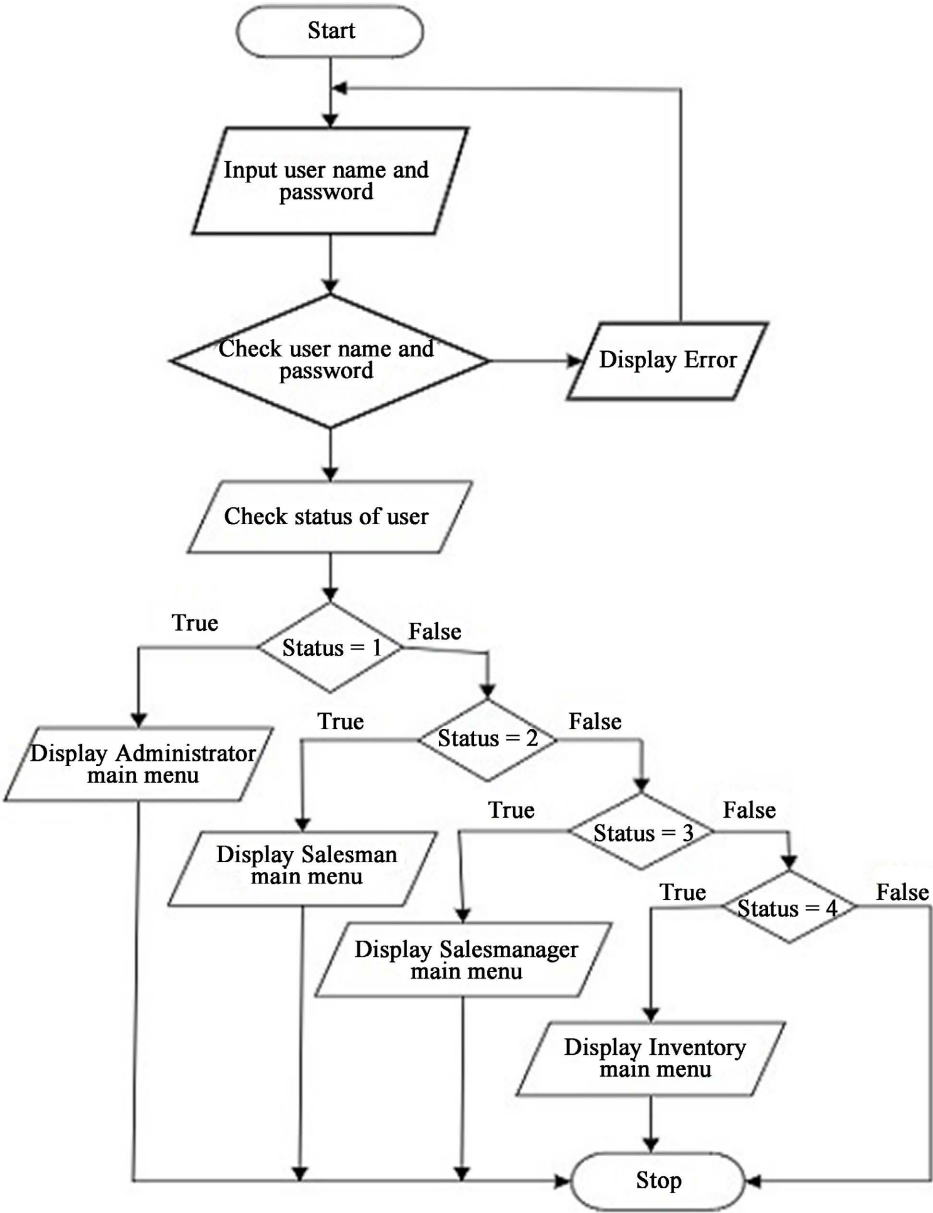


Figure 5. Flowchart of cloud ERP.

Tax Group, System and General Ledger Setup and Fiscal Year Setup, etc. After completing these tasks by the admin, users can access into different level of tasks.

11. Result and Discussion

This paper explores the potentials of implementing this project in facilitating business activities smooth and cost-effective manner. The front page is the preface window of the system to notify the user to login with User Name and Password according to organization’s policy as like as Figure 7.

After login into the system with registered user id and password, an user can access the dash board where they can start entering data. Besides these, the admin can login with providing admin user and password and access the admin panel

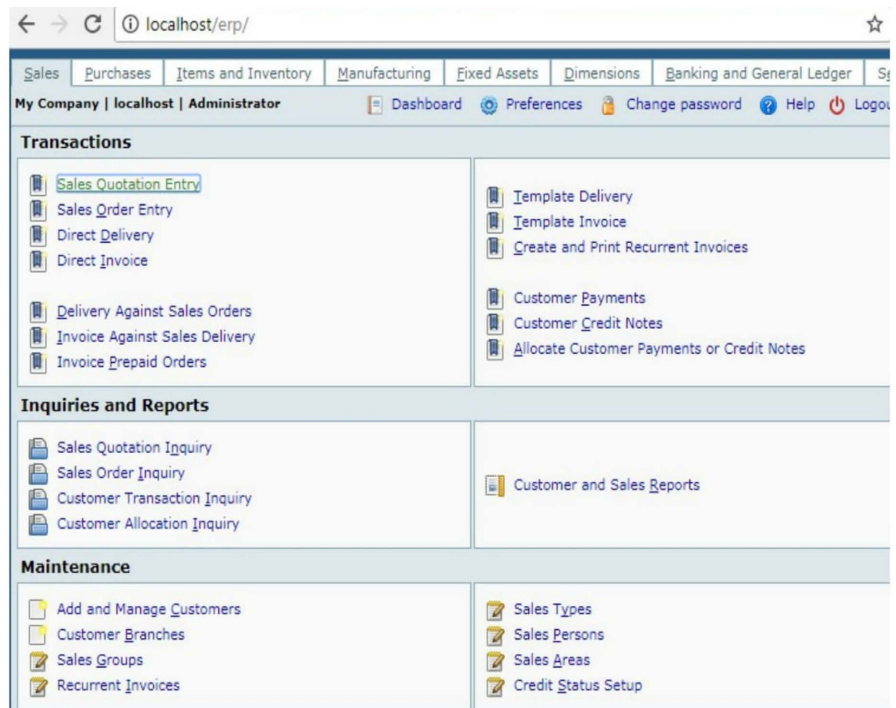


Figure 6. User interface for cloud ERP.

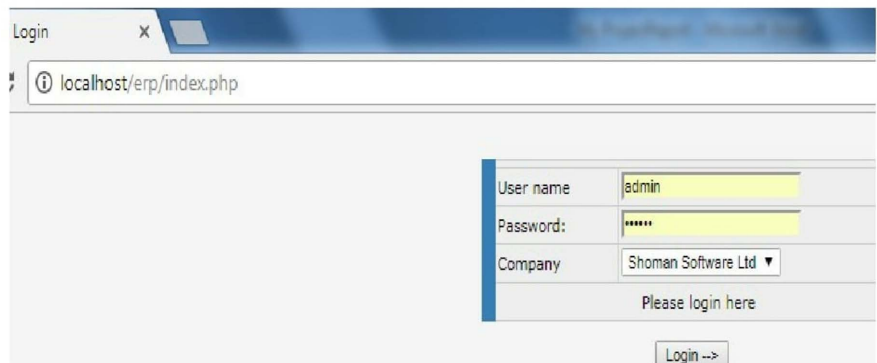


Figure 7. User login front page.

and has the privilege to setup and access the whole system like create user’s account, view, Transaction Reference, Taxes, Tax Group, System and General Ledger Setup, etc. as **Figure 8**.

In the Transaction References Setup option, a company can give Bank Payment, Fund transfer, Sales order and Sales invoice, etc. After that, using Items Entry choice, a user can enter different types of items of an organization and this will be reflected in other related areas. Sales is another working area of the system. User can give entry of sold products and after giving entry it will automatically be updated into others related areas so that organization can manage everything automatically and smoothly within a short time.

Moreover, a comparative study of Cloud-Based Enterprise Resource Planning (ERP) for Small and Medium Enterprise against other systems is shown in **Table**

2. In this comparison, we tried to compare different aspects of Cloud-Based Enterprise Resource Planning (ERP) each other's and try to focus on why the developed system is better than other developed models.

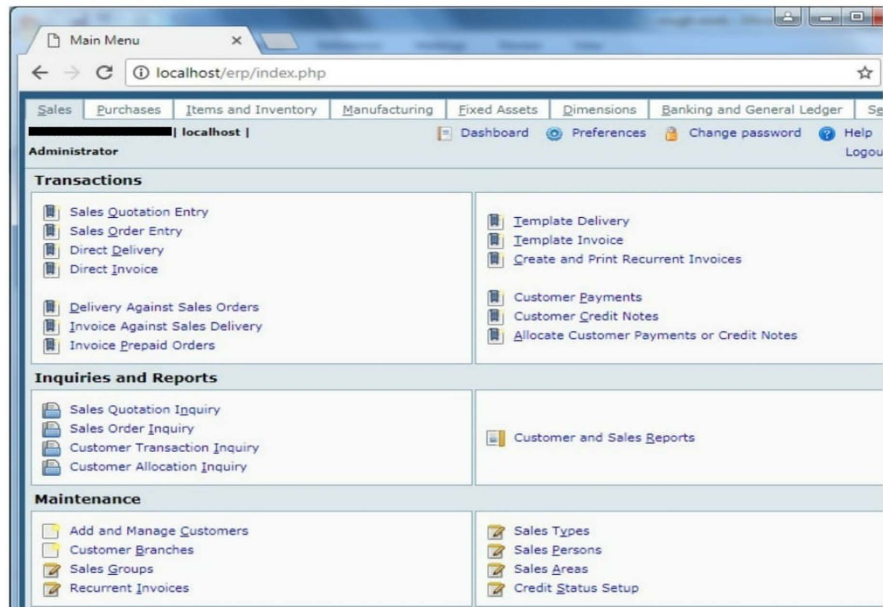


Figure 8. User dashboard.

Table 2. Comparative analysis of the developed system against other systems.

	Customized security system	Integration of different types of users	Cost effectiveness
A Model of Cloud-Based Enterprise Resource Planning (ERP) for Small and Medium Enterprise	Applied	Applied	Applied
Design of Cloud Computing based ERP model [33]	No	Applied	No
Cloud Computing and ERP: A Framework of Promises and Challenges [9]	Applied	Applied	No
Cloud computing with ERP—A push business towards higher Efficiency [34]	No	No	No
Moving ERP Systems to the Cloud —Data Security Issues [35]	Applied	No	No

12. Conclusion

The model “Clouds-based ERP” is a very easy and user-friendly unique system. Here, we have developed and implemented a cloud-based ERP system and shown how it can be useful to different customers. The ERP is provided with standard modules, like Sales, Purchases, Items and Inventory, Manufacturing, Dimensions, Banking and General Ledger and Setup. Its functionality is appropriate to small

and medium companies for managing purchases, controlling their stock, issuing offers, registering orders and sending invoices. It also shows how we can manage and maintain cloud-based ERP from the cloud server and android application. We have tested the system using different testing techniques, and found very smooth and effective.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Jain, P. (2012) Security Issues and their Solution in Cloud Computing. *International Journal of Computing & Business Research*.
- [2] Glas, M. and Andres, P. (2010) An Oracle White Paper in Enterprise Architecture Achieving the Cloud Computing Vision. Oracle Corporation.
- [3] Lamba, H.S. and Singh, G. (2011) Cloud Computing-Future Framework for E-Management of NGO's. *International Journal of Advancements in Technology*, **2**, 400-407.
- [4] Singh, G., Sood, S. and Sharma, A. (2011) CM Measurement Facets for Cloud Performance. *International Journal of Computer Applications*, **23**, 37-42. <https://doi.org/10.5120/2867-3714>
- [5] Schaper, J. (2010) Cloud Services. *4th IEEE International Conference on Digital Eco-systems and Technologies*, Dubai, 13-16 April 2010, 91. <https://doi.org/10.1109/dest.2010.5610668>
- [6] Rani, D. and Ranjan, R.K. (2014) A Comparative Study of SAAS, PAAS and IAAS in Cloud Computing. *International Journal of Advanced Research in Computer Science and Software Engineering*, **4**, 458-461.
- [7] Chandra, N. and Rastogi, P. (2018) Analysis of Benefits and Drawbacks of Traditional ERP versus Cloud-Based ERP Systems. *International Journal of Latest Trends in Engineering and Technology*, **9**, 52-56.
- [8] Meganathan, R. (2017) Reviews on Comparison of Cloud-Based ERP Infrastructures. *International Journal of Engineering Development and Research*, **5**, 605-608.
- [9] Zhong, F.Z. and Rohde, M.E. (2014) Cloud Computing and ERP: A Framework of Promises and Challenges. *25th Australasian Conference on Information Systems*, Auckland, 8-10 December 2014.
- [10] Jain, D. and Sharma, Y. (2016) Cloud Computing with ERP—A Push Business towards Higher Efficiency. *SSRN Electronic Journal*, **4**, 140-155. <https://doi.org/10.2139/ssrn.2755457>
- [11] Hedau, V., Malviya, A. and Chakraborty, N. (2013) Cloud-Based ERP for Small and Medium Scale Enterprises. *International Journal of Engineering Research Technology*, **2**, 753-757.
- [12] Kavitha, K. (2014) Study on Cloud Computing Model and its Benefits, Challenges. *International Journal of Innovative Research in Computer and Communication Engineering*, **2**, 2423-2431.
- [13] Hameetha Begum, S., Sheeba, T. and Nisha Rani, S.N. (2013) Survey on Cloud computing. *International Journal of Advanced Research in Computer Science and Software Engineering*, **3**, 18-22.

- [14] Singh, S., Jeong, Y. and Park, J.H. (2016) A Survey on Cloud Computing Security: Issues, Threats, and Solutions. *Journal of Network and Computer Applications*, **75**, 200-222. <https://doi.org/10.1016/j.jnca.2016.09.002>
- [15] Taufiq-Hail, G.A.-M., Alanzi, A.R.A., Mohd Yusof, S.A. and Alruwaili, M. (2021) Software As a Service (SaaS) Cloud Computing: An Empirical Investigation on University Students' Perception. *Interdisciplinary Journal of Information, Knowledge, and Management*, **16**, 213-253.
- [16] Arora, P., Wadhawan, R.C. and Ahuja, S.P. (2012) Cloud Computing Security Issues in Infrastructure as a Service. *International Journal of Advanced Research in Computer Science and Software Engineering*, **2**.
- [17] Mulla, S.M., Kadam, S.B., Shaikh, K.B., Shinde, N.M. and Yelapure, M.P. (2017) Implementation of ERP System on Android Using Cloud Computing. *International Journal of Innovative Research in Computer and Communication Engineering*, **5**, 5630-5635.
- [18] Alshalfi, A. (2018) ERP Systems and Its Impacts on the Business Operations. *American Journal of Information Systems*, **6**, 1-4.
- [19] Ogunrinde, R.R., Jusoh, Y.Y., Pa, N.C., Wan Ab. Rahman, W.N. and Abdullah, A. (2016) Cloud Enterprise Resource Planning Selection Model for Small and Medium Enterprises. *Advanced Science Letters*, **22**, 1939-1943. <https://doi.org/10.1166/asl.2016.7768>
- [20] Saini, S.L., Saini, D.K., Yousif, J.H. and Khandage, S.V. (2011) Cloud Computing and Enterprise Resource Planning Systems. *Proceedings of the World Congress on Engineering 2011*, London, 6-8 July 2011.
- [21] Laukkanen, S., Sarpola, S. and Hallikainen, P. (2007) Enterprise Size Matters: Objectives and Constraints of ERP Adoption. *Journal of Enterprise Information Management*, **20**, 319-334. <https://doi.org/10.1108/17410390710740763>
- [22] Arnesen, S. (2013) Is a Cloud Erp Solution Right for You? Strategic Finance.
- [23] Johansson, B., Alajbegovic, A., Alexopoulo, V. and Desalermos, A. (2015) Cloud ERP Adoption Opportunities and Concerns: The Role of Organizational Size. 2015 48th Hawaii International Conference on System Sciences, Kauai, 5-8 January 2015, 4211-4219. <https://doi.org/10.1109/hicss.2015.504>
- [24] Ogunrinde, R.R., Jusoh, Y.Y., Pa, N.C., Wan, W.N., Rahman, A.B. and Abdullah, A. (2017) QoS-Based Cloud ERP Selection Model for SMEs. *Journal of Telecommunication, Electronic and Computer Engineering*, **9**, 21-25.
- [25] Sangeetha, D. and Chandar, S.P. (2015) ERP in Cloud for Small and Medium Enterprises. *Twelfth AIMS International Conference on Management*, Kozhikode, 2 to 5 January 2015, 1006-1012.
- [26] Al Hayek, W.Y. and Odeh, R.A.A. (2020) Cloud ERP VS On-Premise ERP. *International Journal of Applied Science and Technology*, **10**, 55-60.
- [27] Kiadehi, E.F. and Mohammadi, S. (2012) Cloud ERP: Implementation of Enterprise Resource Planning Using Cloud Computing Technology. *Journal of Basic and Applied Scientific Research*, **2**, 11422-11427.
- [28] Navaneetha Krishnan, C.M. (2013) A Comparative Study of Cloud-Based ERP Systems with Traditional ERP and Analysis of Cloud ERP Implementation. *International Journal of Engineering and Computer Science*, **2**, 2866-2869.
- [29] Agarwal, S. and Ojha, S. (2015) Comparative Analysis of Cloud ERP and Traditional ERP. *International Journal of Engineering, Business and Enterprise Applications*, **14**, 46-49.

- [30] Ramasamy, M. and Periasamy, J. (2017) Explore the Impact of Cloud Computing on ERP Systems used in Small and Medium Enterprises. *International Journal of Advance Research in Computer Science and Management Studies*, **5**, 87-91.
- [31] Wiz (2020) Reasons for Implementing ERP.
<https://mxgsoft.com/technology/reasons-for-implementing-erp/>
- [32] (2019) Usability.
<https://www.usability.gov/how-to-and-tools/methods/user-interface-elements.html>
- [33] Somani, R.K. and Dadhich, R. (2013) Design of Cloud Computing Based ERP Model. *International Journal of IT, Engineering and Applied Sciences Research*, **2**, 39-43.
- [34] Jain, D. and Sharma, Y. (2016) Cloud Computing with ERP—A Push Business towards Higher Efficiency. *Annual Research Journal of SCMS*, **4**, 140-155.
- [35] Saa, P., Costales, A.C., Moscoso-Zea, O. and Lujan-Mora, S. (2017) Moving ERP Systems to the Cloud—Data Security Issues. *Journal of Information Systems Engineering & Management*, **2**, 2-9. <https://doi.org/10.20897/jisem.201721>