

A Cloud based Assurance Framework for Implementation of ERP in SMEs: A Literature Survey

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Abstract— Enterprise Resource Planning (ERP) system is an integral component of IT infrastructure in many organizations. They are the vital asset to any organization in carrying out various operational tasks with greater reliability and efficiency. Most of the Indian SMEs have adopted the traditional ERP systems and have incurred heavy cost while implementing these systems. Cloud computing has changed the era of doing the business in the global market. SMEs will not have to invest more for the implementation of cloud ERP they can utilize the resources as a service and pay as per their usage. Cloud ERP is nothing more than ERP software that had been implemented on cloud. This paper present to review a deeper understanding of Cloud ERP, emerging technologies such as Cloud Computing, Software as Service (SaaS), to frame the multi-tenant assured framework which are more relevant and beneficial for SMEs.

Keywords— ERP, Component, Cloud Computing, Cloud ERP, Multi-tenancy, SaaS ERP adoption

I. INTRODUCTION

A recent trend for ERP is the shift from on-premises infrastructure to the cloud environment through utilization of cloud computing technologies. ERP system collects records, help the enterprise to integrates, manages, share and transfer data and information across all functions units inside and outside the enterprise. Cloud computing is a kind of computing application service that is like e-mail, office software, and enterprise resource planning (ERP) and uses ubiquitous resources that can be shared by the business employee or trading partners. Thus, a user on the internet can communicate with many servers at the same time, and these servers exchange information among themselves (Hayes, 2008 [1]). There are several reasons for SMEs to select the cloud based ERP. Some of the reasons are:

- Top management doesn't want to spend it on traditional ERP System.
- No need to buy the servers, in-house software development and skilled IT Professionals.
- Becoming more complex and challenging to manage the ERP.
- Organizations want economical and beneficial ERP system.

Cloud computing takes place over the internet and provides scalability, reliability, availability and low cost of computer

reassures. Cloud infrastructure including application, database & web servers hosted by a third party service provider. Adopting a cloud based ERP system is challenge for SMES to select a suitable cloud service provider (CSP) through internet in which hardware & infrastructure is taken care by a third party expert whose security and privacy mechanism meets the security mechanism for an organization. Within the hype of cloud services, ERP systems delivered as Software as a Service (SaaS) is receiving more focus from ERP vendors. In context of globalization, partnerships, value networks and the huge information flow across and within SMEs are adopting ERP systems to integrate business processes throughout an organization. The utilization of SaaS solutions can lead to many benefits for enterprise users with profound consequences in improving IT performance.

II. ERP

Enterprise resource planning (ERP) is a multi-module application software system that allows a company to manage its business with potential benefits of improved process flow, reduced inventories, better data analysis, better customer service, and improved profit margin using one integrated software solution [2]. It allows an enterprise to better function as a single entity rather than as many separate departments and work processes. ERP improve the functionality of its business process by carrying out various tasks with greater operational efficiency and reliability.

They also facilitate to keep data updated and available across the organization, both internally and externally, to allow seamless flow of information. They are the ultimate aspiration of the business community as they provide collaboration with partners, external applications and information systems. ERP is suitable for all the three levels of Management i.e. strategical, statistical and operational level. Now days, ERP can be applied to any type of organization, operating in any kind of field.

III. CLOUD COMPUTING

Cloud computing is a model for enabling convenient, on demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction [3]. A market registry, flexibility, exchangeability and integration of services are important issues for cloud computing service delivery success.

Cloud computing on a pay-per-use basis by dynamically growing or shrinking the virtualized resources and providing them as a service to the users over the internet. Cloud Computing are composed of five essential characteristics (networks, servers, storage, applications, and services), three service models.

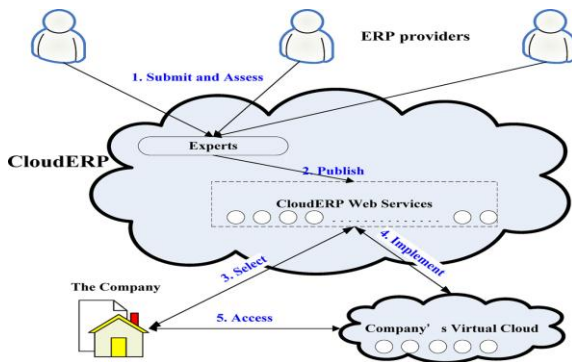


Figure 1. A cloud ERP Workflow

The cloud computing services provided three models:

Software as a Service (SaaS) : SaaS provides complete applications on Cloud Computing environment. i.e Google Gmail, salesforce.com, Customer Relationship Management (CRM) service .

Platform as a Service (PaaS): With PaaS, customers can develop, test, host, deploy and maintain their applications in the same integrated environment. i.e Google App Engine, Microsoft's Azure.

Infrastructure as a Service (IaaS): With IaaS, customers use cloud infrastructure according to their demands for

particular time and pay only for what they use. i.e Amazon Elastic Compute Cloud (EC2),VMware vCloud Data centre.

IV. CLOUD ERP

Cloud ERP is the combination of Enterprise Resource Planning (ERP) Systems and Cloud Computing. Cloud ERP solutions are provided via the Software-as-a-Service model. Cloud ERP systems are offered at a lower cost in implementation of online services with their complex functionalities and data security concerns, which is financially convenient for the SMEs to adopt. One of the most famous cloud ERP software in the market is SAP Business By Design. Clouds can be classified into four Deployment model public, private, community and hybrid clouds. In public clouds, the infrastructure and other cloud services are made available to the general public over the Internet .Private cloud's infrastructure is owned and used by a single organization. In community cloud, infrastructure is shared between many organizations with common concerns such as security, policy. Hybrid cloud is a combination of two or more cloud infrastructures that remain unique entities, but are bounded together to provide advantages of multiple cloud structure.

V. MULTI-TENANCY AND ADOPTION OF SAAS ERP

Multi-tenancy is a term that defines the use or sharing of the same application or resources by two or more (multiple) consumers that may come from the same or different organization. Multiple independent users or consumers share the same physical infrastructure and in a scenario where the tenants which may have opposing goals share a pool of resources, securing the multiple tenants' sensitive data and information becomes a challenge of security. SaaS is a one-to-many (e.g. one single instance to many tenants) software delivery model. SaaS application must be multi-tenant aware means every tenants use the SaaS software as if they are the only one tenants, while many other tenants may be also using the software at the same time. Most SaaS platforms are implemented by traditional J2EE programming. SaaS application from three aspects: multitenant aware; service customization; service integration. The SaaS environment delivers more freedom to the customer to change provider or exit if the solution and/or service are not satisfactory. SaaS ERP system offers an attractive range of services required by SMEs to counter their problem of resource constraints and the complexity of business processes embedded in the traditional ERP. Multi-Tenancy is one of the main emerging application infrastructure technologies that are being leveraged to support Cloud Computing and SaaS. The service provider can update all tenants at the same time, this means that every organization can update at latest version of software at all times. To develop the secured multi-tenants framework refers to protecting the information and

information system from unauthorized access, use, modification, destruction.

VI. LITERATURE REVIEW

A literature review is a method for gathering knowledge from the existing literature. The literature review in this paper is based on a narrative review approach and is analyzed in the tabular format. The research procedures are comprehensive and systematic. This approach is characterized by adopting explicit procedures and conditions that minimize bias. The review papers are from reputed published journals. The search process was narrowed down through the criterion that the articles needed to be published in peer-reviewed journals or conference proceedings.

Table 1: List of Topics Analyzed and corresponding usable Publications

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| 1. | Integration of ERP and Cloud Computing in SMEs | [4], [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16] |
| 2. | Identify the Critical Factors by merging ERP and Cloud Computing in SMEs | [17], [18], [19], [20], [21], [22], [23], [24], [25] |
| 3. | Review the data security issues for adoption of Software as a service based ERP software in SMES | [26], [27], [28], [29], [30], [31], [32], [33], [34], [35], [36] |
| 4. | Development of Multi-tenant cloud based framework for an ERP in SMEs | [37], [38], [39], [40], [41], [42], [43], [44], [45] |

Table 2: Summary of Reviewed Papers published in various journals with their conclusion

| Author | Paper | Journal | Conclusion |
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| Chin-Sheng Chena, Wen-Yau Liangb,, Hui-Yu Q1 | A cloud computing platform for ERP applications | Applied Soft Computing journal, Elsevier, 2014 | This paper proposed a Cloud ERP platform and outlined a method for composing web services for ERP providers and enterprise users. The selection process to propose a Web ser-vices composition method for Cloud platform providers in order to automatically customize an EPR service in response to a enterprise customer's need. |
| Rajeev Sharma, Dr. Bright Keswani | Study of Cloud based ERP services for Small and Medium Enterprises (data is processed by text mining technique) | Revista de Sistemas de Informacao da FSMA n. 13 (2014) pp. 2-10 | The research is focus on most of the business strategy verticals, the industries behaviours and their ERP services over the cloud. Using latest technologies outsourcing and the customization of service offering will be reshaped; the legislation related to cloud outsourcing will be developed. |
| Xun Xu | From Cloud Computing to Cloud Manufacturing | Robotics and Computer-Integrated Cloud Computing Manufacturing from Cloud journal, Elsevier,2012 | Two types of the cloud computing adoptions in the manufacturing sector have been suggested, the manufacturing with direct adoption of cloud computing technologies and cloud manufacturing, latest the manufacturing version of cloud computing. The few essential features of cloud computing related to the end-users, cloud as a platform, and cloud providers are discussed. |
| Rajkumar Buyya, Chee Shin Yeo, Srikumar Venugopal, James Broberg , Ivona Brandic | Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility | Article in Press, Future Generation Computer Systems,Elsevier,2009 | The proposed architecture for the market-oriented allocation of resources such as virtual machines within Clouds. A vision for the creation of global cloud exchange for the trading services based on strategies of Service Level Agreement (SLA) between customer and cloud service provider. They highlighted difference between High Performance Computing (HPC) workload and Internet-based services workload. |

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| Gurpreet Singh, et.al | A Study of Impact of ERP and Cloud Computing In Business Enterprises | Proceedings of the World Congress on Engineering and Computer Science 2013 Vol. I WCECS 2013, 23-25 October, 2013, San Francisco, USA | Enterprise Resource Planning (ERP) software could integrate Business to improve the availability of operational and strategic planning information within the constraints imposed on organizations in the SME category. Cloud Computing involves the delivery virtualized IT resources as services over the Internet on a “pay as you use” basis. |
| Ergun Gide, Raj Sandu | A Study to Explore the Key Factors Impacting on Cloud Based Service Adoption in Indian SMEs | 12 th International Conference on e-Business Engineering 2015, IEEE | This paper provides an understanding of the extent to which innovation characteristics, technology context, organizational context, and environmental context influence the decision of Indian SMEs to adopt Cloud based services. |
| Sarvjit Singh, Dr.AmandeepSingh Marwaha | Framework of ERP System Implementation For SMEs In Punjab | International Journal of Computer Applications & Information Technology Vol. I, Issue II, September 2012 (ISSN: 2278-7720) | An IT governance framework of ERP system implementation is developed based on information technology governance methodology, which includes six components (i.e., enterprise strategy and organization, ERP-related organization and desirable behaviour, ERP-related governance arrangements, ERP-related governance mechanisms, ERP-related business performance goal, ERP-related metrics and resource accountabilities.). |
| Dr. G.N. Purohit, Dr. M.P. Jaiswal, Ms. Surabhi Pandey | Challenges Involved in Implementation of ERP on Demand Solution: Cloud Computing | IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 4, No 2, July 2012 | The challenges while implementing the cloud based ERP on demand popular SaaS based solutions (salesforce.com, Net suite, ROMCO, Google Apps) in an organization. Case Analysis of FUJITSU customer service centre and ROMCO on demand ERP also discuss. |
| Monika Sharma, Ashwani Mehra, Haresh Jola, Anand Kumar, Dr.Madhvendra Misra, Ms.Vijayshri Tiwari | Scope of cloud computing for SMEs in India | JOURNAL OF COMPUTING, VOLUME 2, ISSUE 5, MAY 2010, ISSN 2151-9617 | The paper present per user annual cost as a parameter to compare the cost of using the traditional ERP solution and the cloud computing modeled SaaS based ERP systems. Analyze cloud computing services are more adaptable than traditional ERP systems is also accepted by SMES in India. |
| Dimitris Mourtzis , Babis Schoinochoritis , Ekaterini Vlachou | A New Era of Web Collaboration: Cloud Computing and its Applications in Manufacturing | International working Conferencing “Total Quality Management-Advance and Intelligent Approaches” | The cloud manufacturing literature has been performed in this paper. Cloud computing, web collaboration, IoT, virtualized resources and social communications have been identified as key enabling technologies that are transforming the conventional product-oriented manufacturing business model to a service-oriented one. |
| Prashant D.Deshmukh, G. T. Thampi, V.R. Kalamkar | Investigation of Quality Benefits of ERP Implementation in Indian SMEs | Elsevier , Procedia Computer Science 49 (2015) 220 – 228 | Systematically investigates effects of training, project management, hardware and software, skills of workforce and top management’s support on quality aspects. The model developed though Quantitative analysis using SPSS can help the SMEs to set the precedence of factors for acquiring the Quality Benefits of ERPCRM implementation. |
| Prashant Gupta, A. Seetharaman, John Rudolph Raj | The usage and adoption of cloud computing by small and medium businesses | Elsevier, International Journal of Information Management ,2013, 861-874 | The ease of use and convenience is the biggest factor cited by SMEs to adopt cloud. The use and adopt cloud is improved security and privacy. The usage and adoption of cloud is the cost reduction. SMEs consider less reliable in sharing and collaboration of data on cloud for their business privacy as comparison to old conventional methods. |

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| Abdullah A. Al-Ghofaili, Majed A. Al-Mashari | ERP System Adoption Traditional ERP Systems vs. Cloud-Based ERP Systems | International Conference on Innovative Computing Technology, IEEE, 2014 | This paper proposes three alternative approaches (Traditional ERP Systems, ERP on SaaS and ERP on IaaS) for the organizations to select from based on security rate, investment level and organizational size (small, midsize or big), so that the adopting process of the ERP system is going to be successful for the organization. |
| Mohamed A. Abd Elmonem , Eman S. Nasr, Mervat H. Geith | Benefits and challenges of cloud ERP systems - A systematic literature review | Future Computing and Informatics Journal 1 (2016) 1-9, Science Direct | This paper, follow the Systematic Literature Review (SLR) research method to explore the benefits and challenges of implementing ERP systems over a cloud environment. |
| Devesh Kumar, Harsh Vardhan Samalia, Piyush Verma | Exploring suitability of cloud computing for small and medium sized enterprises in India | Journal of Small Business and Enterprise Development, 2017 © Emerald Publishing Limited | A conceptual framework was designed on the basis of factors identified in the existing theoretical models from the literature review. The model can help the SMEs in evaluating their readiness for adopting cloud computing |
| Marko Mijac, Ruben Picek, Zlatko Stapic | Cloud ERP System Customization Challenges | Central European Conference on Information and Intelligent Systems | The goal of this paper is to reveal perceived challenges regarding customization of Cloud ERP systems by conducting a literature review. |
| Shima Ramezani Tehrani and Farid Shirazi | Factors Influencing the Adoption of Cloud Computing by Small and Medium Size Enterprises (SMEs) | S. Yamamoto (Ed.): HIMI 2014, Part II, LNCS 8522, pp. 631–642, 2014. © Springer International Publishing Switzerland 2014 | The main objective of this study is to determine the factors influencing cloud computing adoption by Small and Medium sized Enterprises (SMEs). The results of regression reveal that decision maker's knowledge about cloud computing is the main influential factor in decision making about its adoption. |
| Fiona Fui-Hoon Nah, Janet Lee-Shang Lau, Jinghua Kuang | Critical factors for successful implementation of enterprise systems | Emerald Insight, Business Process Management Journal, Vol. 7 Iss 3 pp. 285 - 296 | A comprehensive review of the literature, 11 factors were found to be critical to ERP implementation success. The classification of these factors into the respective phases (chartering, project, shakedown, onward and upward) in Markus and Tanis' ERP life cycle model is presented and the importance of each factor is discussed. |
| Shivam Gupta, Subhas C. Misra, Akash Singh, Vinod Kumar, Uma Kumar, | Identification of Challenges and their Ranking in the Implementation of Cloud ERP: A Comparative Study for SMEs and Large Organizations | Emerald Publishing Limited, International Journal of Quality & Reliability Management | The findings may help organizations to get a broad idea about the challenges which are critical for the implementation of cloud ERP. The challenges identified were awareness, customization, useful data extraction, organizational change, long term costs, business complexity, loss of IT competencies, legal issues, integration, security, monitoring, migration, network dependency, limited functionality, performance, integrity of provider, perception, and subscription costs. |
| Fengze Zhong , Dr. Max Erik Rohde | Cloud Computing and ERP: A Framework of Promises and Challenges | 25th Australasian Conference on Information Systems, 8th -10th Dec 2014, Auckland, New Zealand | A set of key promises and challenges to help IT decision makers and researcher to gain a better understanding of cloud computing and ERP. The framework identifies four dimensions of cloud ERP to be assessed: Efficiency, Flexibility, Ubiquity, and Security. |

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| Guo Chao Alex Peng, Chirag Gala | Cloud ERP: a New Dilemma to Modern Organisations | Journal of Computer Information Systems | This paper aimed to explore potential benefits and barriers associated with the adoption of cloud ERPs. The findings, identified that the economic and technical benefits promised by cloud vendors are attractive, the success of cloud ERP adoption can be affected by critical challenges related to diverse organisational factors as well as with current legal and technical complexity in the cloud environment. |
| Jacek Lewandowski, Adekemi O. Salako, Alexeis Garcia-Perez | SaaS Enterprise Resource Planning Systems: Challenges of their adoption in SMEs | 2013 IEEE 10th International Conference on e-Business Engineering | This paper aims to identify and evaluate common problems experienced in the implementation as well as post-implementation stage of Software as Service ERP systems by Small and Medium Enterprises. Qualitative data was collected from five European and US companies, which implemented SaaS ERP, by means of a set of semi-formal interviews and online questionnaire. |
| Ravi Seethamraju | Adoption of Software as a Service (SaaS) Enterprise Resource Planning (ERP) Systems in Small and Medium Sized Enterprises (SMEs) | Information Systems Frontiers A Journal of Research and Innovation Springer, vol. 16, Science+Business Media New York 2014 ISSN 1387-3326 | The determining factors and challenges influencing the adoption of SaaS ERP software fit to the business, the vendor's participation in co-creation of value for customers and the generic benefits of implementing an cost effective SaaS model for ERP system in SMEs. |
| S L Saini, Dinesh Kumar Saini, Jabar H. Yousif and Sandhya V Khandage | Cloud Computing and Enterprise Resource Planning Systems | Proceedings of the World Congress on Engineering 2011 Vol I WCE 2011, July 6 - 8, 2011, London, U.K. | Review of development of Low cost ERP Solution to Indian industries on Mobile using latest technologies such as Mobile computing, SaaS, Cloud Computing etc. Study the various coming problems in implementation of Mobile ERP system & provide the solution to the problems. |
| Haralambos Mouratidisa, Shareeful Islama, Christos Kalloniatisb, Stefanos Gritzalisc | A framework to support selection of cloud providers based on security and privacy requirements | The Journal of Systems and Software, Elsevier, 2013 | A novel framework by providing a structured process to support elicitation of security and privacy requirements and selection of a cloud service provider. A framework supports understanding of the organisational context by identifying goals, actors, tasks, resources, and plans. The organizational context helps to identify and analyze security, privacy constraints, security and privacy goals, threats and vulnerabilities relevant to a cloud based system. |
| Frank Doelitzscher ^{1*} , Christoph Reich ¹ , Martin Knahl ¹ , Alexander Passfall ¹ and Nathan Clarke ² | An agent based business aware incident detection system for cloud environments | Journal of Cloud Computing: Advances, Systems and Applications, Springer 2012, 1:9 | This paper provide a high-level design of the SaaS architecture, an introduction into the proposed Security Business Flow Language (SBFL). It is shown that autonomous agents and behaviour analysis are fertile approaches to detect cloud specific security problems and can create a cloud Security audit system which act as a Service incident detection system. |
| Reza Sahandi ¹ , Adel Alkhalil ² , and Justice Opara-Martins ² | SMEs' Perception of Cloud Computing: Potential and Security | International Federation for Information Processing (IFIP) 2012, IFIP AICT 380 | A survey of SMEs conducted in the UK shows the potential and concerns of SMEs in the adoption of cloud computing services, but there are still some issues with regards to security, data privacy and vendor lock-in are discussed. This could have affected the speed of cloud computing being adopted. |

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| Anna Lenart | ERP in the Cloud – Benefits and Challenges | Springer-Verlag Berlin Heidelberg 2011., LNBIP 93, pp. 39–50, 2011. | The aim of the paper is to analyse the benefits and the challenges of Cloud ERP in the SaaS model. Firstly, SaaS as a business model of cloud computing is described. The issues concerning traditional and Cloud ERP are also discussed. |
| Mohamed Almorsy, John Grundy, Amani S. Ibrahim | Adaptable, model-driven security engineering for SaaS cloud-based applications | Springer Science +Business Media New York , PP-1-38,19 August 2013 | Our approach is based on using a set of multi-level service description models (SDM), developed by service providers, to describe different perspectives of their applications; a set of security specification models (SSM), developed by the service provider, to capture security objectives, requirements and environment security controls using Domain-Specific Visual Languages. |
| Faraz Fatemi Moghaddam, Nogol Memari, Aida Hakemi, Hamidreza Latifi | A Reliable E-Service Framework Based on Cloud Computing Concepts for SaaS Applications | IEEE Conference on e-Learning, e-Management and e-Services, December 2 - 4, 2013, Sarawak, Malaysia | The proposed model has been designed by introducing multi-clouds and three main agents to increase responsiveness, efficiency, security, and access control. Based on the theoretical analysis, the suggested framework could be practical to decrease the limitations of e-services and increase the reliability of cloud computing environments |
| Gurpreet Kaur, Manish Mahajan2 | Analyzing Data Security for Cloud Computing Using Cryptographic Algorithms | International Journal of Engineering Research and Applications ISSN : 2248-9622, Vol. 3, Issue 5, Sep-Oct 2013, pp.782-786 | This paper analyze the performance of security algorithms, namely, AES, DES, BLOWFISH, RSA and MD5 on single system and cloud network for different inputs. These algorithms are compared based on two parameters, namely, Mean time and Speed-up ratio. |
| Liang Zhong, Tianyu Wo, Jianxin Li, Bo Li | A Virtualization-based SaaS Enabling Architecture for Cloud Computing | Sixth International Conference on Autonomic and Autonomous Systems, 2010 | This paper present the vSaaS, a platform of a virtual personal desktop environment base on OS-level virtualization and remote display technologies. The comprehensive experiments are conducted to demonstrate the feasibility and performance of the vSaaS implementation. |
| Gorka Gallardo, Josune Hernantes, Nicolas Serrano | Designing SaaS for Enterprise Adoption based on Task, Company, and Value-Chain Context | IEEE Internet Computing , July-August 2018 | A framework, including company and value-chain perspectives, can discuss some of the differences in adoption rate among different application types. SaaS providers evaluate the fit of a new application in a SaaS deployment model, and identified two general strategies—reducing implementation complexity and increasing collaboration—that will help increase adoption rates for existing applications.. |
| Rotimi Rowland Ogunrinde1, Yusmadi Yah Jusoh2 | Investigating Cloud ERP Providers Selection for SMES in A Multi-Tenant Environment | International Journal of Enhanced Research in Management & Computer Applications, ISSN: 2319-7471, Volume 3, Nov 2014 | The selection of Cloud ERP Service Providers based on approaches and framework available in the literature, with the focus on the security and privacy mechanisms that meets the security requirements of SMEs. |
| Yazn Alshamaila, Savvas Papagiannidis, Feng Li | Cloud computing adoption by SMEs in the north east of England: A multi-perspective Framework | Journal of Enterprise Information Management, Vol. 26 Issue: 3, pp.250-275, 2013 | To explore and improve the business related decision analysis and formulating better strategies for an SMEs to choose cloud computing services By adopting TOE framework the three context of framework (Technological, Organizational and Environmental) connected to each other. |

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| Indu Saini, Ashu Khanna, S. K. Peddoju | Cloud and Traditional ERP systems in Small and Medium Enterprises | International Conference on Information Systems and Computer Networks, 978-1-4799-2981-8/14, IEEE,2014 | In this paper, two hypotheses are developed to compare the average annual per user costs of using ERP systems in two ways, traditional and Cloud approach. The results of t-test on the collected data clearly shows that the per-user average annual cost of traditional ERP systems is higher than the per user average annual cost of cloud based ERP systems in case of small and medium enterprises. cloud based ERP systems are less expensive than on-premises ERP systems. |
| Xiaoyan Jiang, Yong Zhang, Shijun Liu | A Well-designed SaaS Application Platform Based on Model-driven Approach | Ninth International Conference on Grid and Cloud Computing, 2010 | The paper present the overall framework, a series of model engines, model templates, and model description files, then describe how they work together to realize the multitenant aware, service customization and service integration over the well-designed SaaS platform, and finally concludes by an example for menu to illustrate our approach. |
| Shivam Gupta, Sameer Kumar, Sanjay Kumar Singh, Cyril Foropon, Charu Chandra | Role of cloud ERP on the performance of an organization: contingent resource based view perspective | Emerald Insight, International Journal of Logistics Management | The performance is categorized as supply chain and organizational that comprises of financial and marketing performance. Contingent Resource Based View theory was used to develop a theoretical framework in which supply base complexity acts as a moderating variable on the relationship between cloud ERP and the performance. |
| Pedro Soto-Acosta, Simona Popa, Isabel Martinez-Conesa, | Information technology, knowledge management and environmental dynamism as drivers of innovation ambidexterity: a study in SMEs | Emerald Insight, Journal of Knowledge Management | This study is to assess the effect of technological, organizational and environmental factors on innovation ambidexterity and its influence on the performance of manufacturing small- and medium-sized enterprises (SMEs) as well as the moderating effect environmental dynamism on this relationship. |
| Tripti Mahara | PEST- Benefit/Threat Analysis for selection of ERP in Cloud for SMEs | ASIAN JOURNAL OF MANAGEMENT RESEARCH, Volume 3 Issue 2, 2013 | The factors in PEST framework categorizes as political, economical, social or technological. A factor can either be benefit or a threat to SMEs. If a factor is a benefit, it will create a positive influence on the SMEs to go for this solution. But if a factor is a threat, a SMEs can take appropriate measure to mitigate the threat. This framework will assist SMES to assess the ERP on cloud as a viable option for their organization. |
| Durgesh Sharma, Suresh K. Garg, Chitra Sharma | A cloud computing-based framework for internationalisation of SMEs | International Journal Cloud Computing, Vol. 2, No. 4, 2013 | The paper presents a community cloud-based framework for crafting the IT strategy and further accelerating the adoption of IT among the Indian auto manufacturers. The framework can be used for achieving effective supply chain integration in the sector. |
| Ahmed A. Al-Johani , Ahmed E. Youssef | A Framework for ERP systems SME based on Cloud Computing Technology | International Journal on Cloud Computing: Services and Architecture (IJCCSA) ,Vol.3, No.3, June 2013 | The goal of this research is to merge ERP and CC benefits together to reduce the factor of expenditure cost and implementation delays through a proposed framework. The proposed framework follows multi-instance based cloud infrastructure that initiates different ERP instances for different industries. |

VII. CONCLUSION AND FUTURE SCOPE

This review paper summarizes the research papers associated with the study to explore a list of factors that influences the enterprises to adopt cloud ERP, describes the benefits and challenges to identify and categorize the critical factors responsible for the implementation of cloud based ERP. Analysis from the various studies that multi-tenant cloud framework plays a significant role in the adoption of cloud services. SaaS ERP system is fast and cost effective way of delivering business application. Security of virtualized infrastructure and Data Privacy from unauthorized access to sensitive information from cloud operators are the key challenges in cloud environments. Some researchers have worked in the area of ensuring security in the multitenant domain.

For future work, we find out more flexibility deployed in SaaS applications available in the cloud. Firstly, need to identify the selection target of economical and beneficial cloud SaaS provider. Secondly, design a propose Emerging cloud ERP Multi-Tenant framework for SMEs with higher rating of ERP users satisfaction. Thirdly, we seek to develop a prototype based on the proposed framework, capable of linking between ranking and selection of such type of Cloud ERP providers that worked upon the requirements of SMEs based on the security and privacy mechanism in a multi tenant environment. This framework includes real case studies and expert reviews, that could be more applicable when it comes to the industrial environments.

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