Cloud computing with ERP - A push business towards higher efficiency

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Abstract

In modern era the pace of shift in technologies trends and demands of companies is very fast. Earlier, most of the enterprises used ERP systems which were integrated software packages with a common database that supported business processes of companies. In addition, they were the backbone of large business enterprises. However, along with several advantages some challenges such as high installation cost, huge initial investments, high cost of maintenance, trained technical staff, regular system updating and data management and licensing are also associated with its usage. Furthermore, many companies today are thinking to move the whole ERP over to the cloud. Cloud-ERP is being preferred by most of the companies because of its capability to analyze massive data sets without making a significant capital investment in hardware, licensing and so on. It has been gaining increasing attention over the last few years and is being hosted in a platform over the internet. Most of the enterprises are concentrating towards using this technology because of its flexibility, easy to use, cost of setup and provision of much more features that could be accustomed to almost every type of business. The preset study covers the direct and indirect aspects of Cloud-ERP software systems. The primary data was collected from the employees of various IT companies, through a well-designed and a structured questionnaire. One way ANOVA was used to test the significance of the results. It was found that the adoption of cloud ERP had a significant affect on business and enhanced the efficiency of business and had a significant positive impact on the day to day operations of enterprises. The positive perceptions of employees indicated the clear transition of companies toward adopting cloud-ERP in their business operations.

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Introduction

Earlier, most of the enterprises were highly emphasizing on use of ERP as it was the mirror image of major business processes of organizations, such as customer order fulfillment and manufacturing and establishing integration between different departments of organization effectively etc. It was an integrated computer based application used to manage internal and external resources including assets, financial resources, materials & human resources to improve efficiency of enterprise (Johansson, 2015). It was built on a centralized database and was normally utilizing a common computing platform. The main features of ERP were flexibility; centralized database, supporting third party software, routinization, standardization, and integration. Managing information for high quality delivery to decision makers at right time, automating process of data collection, smooth flow of information across departments, developing and maintaining an enterprise wide database, faster response time, etc. However, along with several advantages, ERP vendors suffered from the perception that their software was difficult and costly to implement. In order to overcome such issues, the vendors were being forced to move from client/server to browser based architecture. But today, Cloud computing could be considered as a model for enabling ubiquitous, convenient, on-demand network access to shared pools of configurable computing resources (e.g., networks, servers, storage, applications, and services) that could be rapidly provisioned and released with minimal management effort or service provider interaction. It could promote availability and is basically composed of five essential characteristics, three service models, and four deployment models (Haddara, 2015). Besides, self-provisioning, pay-per usage, on-demand availability, scalability and resource pooling are the major business advantages of cloud-computing in the emerging competitive arena for companies.

To overcome the problems arising from ERP; enterprises are moving towards using Cloud ERP in their business functions. Cloud ERP is designed to address the inflexibility of existing ERP softwares by allowing businesses to choose the deployment option that fits their specific needs. Cloud ERP is a flexible and cost-effective option for small and medium-sized businesses and offers extensive benefits for growth and expansion (Ruivo, 2015). It is an enterprise resource planning software that is hosted in a platform over the Internet. The present study tries to explore the key reasons of transition from ERP systems to the Cloud-ERP and the factors

which encourage enterprises to switch over to Cloud-ERP. In this regard the survey is designed to measure the drastic changes due to the emergence of the new IT system and its impact on the business operations of enterprises. Besides the study also tries to cover the direct and indirect aspects of Cloud-ERP software system on business operations of enterprises.

Major benefits of Cloud-ERP

Major opportunities that arise from Cloud-ERP implementation are as follows:

- Rapid scalability and deployment capabilities (providing just-in-time computing power and infrastructure)

- Decreased maintenance/upgrades cost and schedules

- Improved resource utilization—elasticity, flexibility, efficiencies

- Improved economies of scale

- Improved collaboration capabilities (Salim S. A., 2015)

- Ability to engage in usage-based pricing, making computing a variable expense, rather than a fixed capital cost with high overhead

- Reduced information technology (IT) infrastructure needs—both up-front and support costs

- Capacity for on-demand infrastructure and computational power

- Green friendly –reduced environment footprint

- Increased speed to implementation

Review of Literature

(Indu Saini, 2012) discussed the scope of cloud computing for Small and medium Enterprises (SMEs) in India by comparing the on premise ERP systems implemented in some SMEs with the available cloud solutions. The study was primarily an effort towards discussing the problems before SMEs in harnessing the benefits of ERP systems and suggesting cloud as a solution to some of their problems. The cloud computing model made the use of complex business solutions like ERP easier as it now could be installed and maintained by experienced IT companies on their premises. It removed the need for SMEs to invest in IT assets or retain IT persons. It showed that cloud based ERP solutions were less costly and more adaptable than the on-premises ERP in context of SMEs. (Sapna Shukla, 2012) focused on the SAAS based ERP, its advantages and disadvantages and it gave all the benefits of integration, all time data access, and hassle free set up at a lesser cost. Small and medium sized manufacturing and

production companies were optioning the cloud based ERP solutions. Her study also covered some case studies which indicated the benefits that the companies could reap and the amount of time required in terms of days and not years. The companies had a 24X7 access. They were able to achieve integration and the business became more efficient. (Raihana, 2012) gave an insight into the nature of cloud computing impact on ERP implementations and attempted to find how external cloud services (SaaS) could make ERP work at a lower cost and with simpler, faster and better experience, faster and better. She also identified the scope and benefits of cloud ERP and found that cloud ERP applications were getting a tremendous demand from companies battling the business challenges. She also found that Cloud ERP was a maturing deployment model that provided a greater opportunity to capitalize on ERP investments which encouraged standardization through visible economic drivers and provided the opportunity for greater focus on strategic activities. (Lin, 2013) focused on the business model and business strategy that vendors could achieve in the Cloud Computing market by starting from a classification of possible Cloud Computing business models to the processes of transformation towards these business models for IT vendors. By applying SWOT method, feasible business strategy for Cloud Computing industry was derived and studied among Business strategy for cloud-software with factors like service vendors, datacenter vendors, storage equipment vendors, mobile device vendors. In particular with a clear picture of business strategy for the emerging Cloud Computing technology, vendors could position themselves for a market sector of their competitive advantage. (Christiana. C. Okezie, 2012) presented cloud computing in a simplified context and developed an efficient framework for enterprise web application integration in organizational models using private cloud offering. They focused their research on an implementation framework of the cloud computing system and provided a solid foundation on the application-level development methodology. They showed that cloud computing was very flexible and supported the pay-as – you –go scheme. It offered moderate performance and were low cost, scalable and rapidly deployable. (Michael Hauck) presented challenges and opportunities of the Cloud Computing technology. They focused that cloud computing introduced new trade-off decisions in the context of quality-driven software service architectures like trade-offs between service quality attributes, such as availability, distributed data consistency, service runtime performance, privacy and studied the level of privacy that could be provided practically using combinations of architectural and cryptographic approaches.

(FTSE, 2010) discussed the cloud used by government, business and universities – both

overseas and in Australia – and found that there were valuable opportunities in cloud computing: for the government, researchers and business. Cloud computing facilitated the efficient management and use of very large databases and greatly reduced the cost of computation when segmentation of the task and parallel processing was possible and found that there were valuable opportunities in cloud computing– for government, researchers and business. (Sean Marston a, 2011) listed down some of the key issues with respect to costs, substantial capital investments in information technology, strategy issues in cloud computing and regulatory issues etc. They found that Cloud computing demanded a thoughtful and a coordinated response from all governmental agencies. They showed the SWOT analysis on cloud computing and focused on its key advantages. (Salim, 2013) explored the transition factors relevant to the distinct phases of cloud ERP adoption which was built on two process research studies. (Guttmann et al. 1998; Klein and Sorra 1996) found that transition factors were classified as "necessary" or "sufficient"; where "necessary" transition factors needed to exist in order for the firm to move to the next stage, while "sufficient" meant assisting in the movement. Their study not only consolidated, but also extended the existing literature on the technology adoption process for complex organization-wide technologies. For practitioners, their study could assist ERP and cloud vendors in prioritizing and upgrading their business quality at any point in time during the adoption process, which would thus increase the likelihood of cloud-based ERP adoption among SMEs. (Clohessy) explored the ERP innovation potential of cloud computing for the Irish government as a viable mechanism for replacing the traditional implementation process of enterprise resource planning. They found that Cloud ERP was positioned as a revolutionary approach to deploy an ERP solution. The main benefits associated with deploying a cloud ERP in comparison to traditional ERP deployment included low implementation, continuing, licensing and support costs, faster implementation of IT projects and increased agility. While the recent transition of the Irish e-Government to cloud computing was laden with opportunities and risks it was imperative to identify the public sector mission critical applications that would derive substantial benefits from moving to a cloud based solution. (Sean Marston, 2010) identified the strengths, weaknesses, opportunities and threats for the cloud computing industry and the various issues that affected the different stakeholders of cloud computing and gave a set of recommendations for the practitioners who would provide and manage this technology. Finally they outlined some of the key issues facing governmental agencies who, due to the unique nature of the technology, would have to become intimately involved in the regulation of cloud computing.

(ERP on Cloud: Implementation strategies and challenges, 2012) discussed about the ERP implementation strategies and challenges in a Cloud Environment. and found that ERP was an important business software used in all major enterprises and was a useful tool to coordinate the available resources, information and activities to complete business processes. Its importance in an enterprise had led to an increased demand for the ERP software. The authors found that ERP in a CLOUD environment helped Medium and small enterprises to use it as per their requirements which lead to more efficient business process. (Lenart) analyzed the challenges of Cloud-ERP and the issues concerning traditional ERP and Cloud-ERP . He found that Cloud Computing was one of the most important revolutionary changes in Information and Communication Technology whose roots could be traced to technology and business trends also. (S L Saini, 2011) reviewed the development of Low cost ERP Solution to Indian industries on Mobile using latest technologies such as Mobile computing, SAAS, Cloud Computing etc. They studied the available hardware for implementation & simulations were done on developed systems and different future problems were studied. The problem faced during working of Mobile ERP were also studied and mobile ERP advantages & limitations were discussed in detail. (Petra Schubert, 2011) argued that the phenomenon of cloud computing lead to a decisive change in the way business software was deployed in companies. Their reference framework contained three levels (IaaS, PaaS, and SaaS) and clarified the meaning of public, private and hybrid clouds. The three levels of cloud computing and their impact on ERP systems operation were discussed.

Research Gap

A survey of respondents from IT companies with different educational qualifications, Designations and awareness about Cloud -ERP was conducted. It was found that vast review of literature was conducted in Cloud computing and ERP systems. However, the importance of Cloud-ERP and majors causes behind transition from ERP systems to the Cloud-ERP have not been conducted by researchers in their previous studies. Hence, the following study tries to explain the factors which encourage enterprises to switch over Cloud-ERP and attain business opportunities in a proficient manner. The studies show that adoption of cloud ERP had significantly enhanced the efficiency and had a significant impact on business. The focus lies on how cloud computing can improve business performance and usability.

Objective of the study

- To explore the major issues arising due to the implementation of ERP system at the workplace
- To investigate the key reasons responsible for transition from ERP systems to the Cloud-ERP
- To identify the major advantages of Cloud-ERP in term of getting business intelligence and enhanced security & reliability and cost savvy functions effectively.

Hypothesis framed for the study

H_{01}: There is no significant difference of perception of IT employees towards transition of current businesses from ERP systems to the Cloud-ERP

H_{02}: There is no significant influence of the experience of respondents on the use of Cloud-ERP in business intelligence and the provision in the execution of innovative functions.

H_{03}: There is no significant influence of the experience of respondents related to use of Cloud-ERP on the perception towards it being user friendly & easily accessible.

H_{04}: There is no significant influence of the total IT experience on the perception towards security& reliability and cost savvy features provided by Cloud-ERP.

Methodology used for the study

The study tried to use both primary and secondary data for the study. The secondary source were all the published data available on the relevant websites and the primary data was collected using a well tested and a structured questionnaire. In this regard, a total of 200 questionnaires were distributed to employees of various organizations in the IT industry to know their perception about usage of Cloud-ERP for business purposes. Purposive sampling technique was taken because researcher has specific purpose behind conducting this study. 100 male and 100 female respondents were selected. Of all the questionnaires, we received 160 filled questionnaires of which only 130 were found to be complete in all respects sand were hence used for the study. The data collected was tabulated and the Cronbach alpha test was conducted whose value was found to be 0.71 indicating the reliability of the responses. Descriptive statistics was used to understand the responses regarding the adoption of the Cloud-ERP and the variation in the responses received with respect to its affect on business. Respondents were requested to submit assessments based on a Five -point Likert scale and all items were measured by responses in agreement/ relevance with statements, ranging from 1- Strongly Disagree to 5 - Strongly Agree. F – test ANOVA was used to analyse the difference

in the perception regarding the benefits of cloud ERP .

Data Analysis and interpretation

Table 1: Demographic profile of the respondents

Demographics		Frequency	Percent
Age (in Years)	< 20 years (Trainee)	6	.7
	21- 30 years	56.6	69.7
	31- 50 years	12.5	15.4
	> 50 years	11.5	14.2
	Total	13.0	100.0
Gender	Male	100	76.9
	Female	30	23.1
	Total	130	100.0
Education	Intermediate (Diploma)	1	.8
	Graduation	71	54.6
	Post Graduation	49	37.7
	PHD	9	6.9
	Total	130	100.0

Total IT Experience (in years)	Fresher	35	26.9
	1-3 years	48	36.9
	4-7 years	20	15.4
	above 7 years	27	20.8
	Total	130	100.0
Designation	Higher management	5	3.8
	Middle management level	8	6.2
	Team-leader	6	4.6
	IT executive	79	60.8

Interpretation: Most of the respondents who participated in the survey belonged to the age group of 21-30 years (56.6). The male respondents participated more actively than the females as 77% of the total completed responses were males. Most of the respondents were graduate (54.6) and were working in the IT industry for the past 1-3 years (48). Respondents were designated at different positions and were from all the higher (5), middle (8), the team leads(6) and IT executives(79) and share their perceptions about the impact of Cloud-ERP on the business operation of organizations.

		Reduce front expenses like maintenance cost, licensing cost	Automatic upgrade	Modern user experie-nce	Ease and fast deploy-ment	Pay per usage	Scalability	Quick access from anywhere anytime
Experience related to cloud computing	None	33	31	30	36	54	48	41
	1-3 years	23	20	12	20	36	24	19
	4-7 years	4	6	5	9	14	13	7
	>7 years	6	6	2	4	6	5	3

Interpretation: The survey tried to understand the perception of the IT employees, their experience and about they think about the benefits that would accrue on adopting Cloud ERP. Respondents having lesser experience found that the new system would be beneficial for their enterprises in terms of reducing front expenses like maintenance cost, licensing cost (33), automatic upgrade (3), modern user experience (30) and pay per usage(54). Most of the respondents who had Cloud or ERP technology experience stated that scalability and quick access from anywhere were the other major advantages attained by using Cloud based ERP in their day to day business operations. On the basis of overall experience of IT employees, it could be said that this technology would be highly beneficial for businesses in the context of performing data integration and quality capabilities and improved customer experience.

H_{01}: There is no significant difference of perception of IT employees towards transition of current businesses from ERP systems to Cloud-ERP.

Table 3: One Way

Anova (1)

Factors important for choosing Cloud-ERP		SS	df	MS	F	Sig.
Reduce front expenses like maintenance cost, licensing cost.	Between	.822	3	.274		
	Within Groups	31.67	126	.251		
	Total	32.49	129		1.09	.356
Automatic upgrade	Between	5.036	3	1.679		
	Within Groups	27.43	126	.218		
	Total	32.47	129		7.71	.000
Modern user experience	Between	.995	3	.332		
	Within Groups	29.54	126	.234		
	Total	30.53	129		1.41	.24
Ease and fast deployment	Between	.686	3	.229		
	Within Groups	31.69	126	.252		
	Total	32.38	129		.91	.438
Pay per usage	Between	.766	3	.255		
	Within Groups	16.16	126	.128		
	Total	16.92	129		1.99	.119
Scalability	Between	.499	3	.166		
	Within Groups	28.92	126	.230		
	Total	29.423	129		.72	.539
Resource pooling	Between	.846	3	.282		
	Within Groups	26.846	126	.213		
	Total	27.692	129		1.32	.270
Quick access from anywhere anytime	Between	.395	3	.132		
	Within Groups	31.913	126	.253		
	Total	32.308	129		.52	.669
Others	Between	1.466	3	.489		
	Within Groups	19.334	126	.153		
	Total	20.800	129		3.18	.026

Interpretation: In almost all the cases the significant value was found to be more than .05 thereby rejecting the null hypothesis and indicating a significant difference in the perception of the employees towards transition of businesses from the existing ERP systems to the Cloud-ERP. It could be concluded that not all the respondents feel that the reduction in the expenses like maintenance cost, pay per usage, resource pooling, quick

access from anywhere anytime and ease and fast deployment encouraged enterprises to switch from traditional ERP systems to a new Cloud base ERP system. Though most of the IT executives and higher management of IT companies strongly agreed with the advantages of this new emerging technology in business operations they differed in their perceptions. Some of the respondents were neutral regarding quick access from anywhere anytime and scalability features of Cloud-ERP. From the overall responses of respondents, it could be said that all the above factors are responsible for transition from ERP systems to the Cloud-ERP in term of getting business opportunities.

H_{02}: There is no significant influence of the experience of respondents on the use of Cloud-ERP in business intelligence and providing freedom to execute innovate functions.

Table 4: One Way Anova (2)

		SS	df	MS	F	Sig.
Support modern user experience and socially enable business through	Between	4.386	3	1.462	1.117	.345
	Within Groups	164.88	126	1.309		
	Total	169.27	129			
Provide business intelligence and ability to meet business needs	Between	5.01	3	1.671	1.701	.170
	Within Groups	123.8	126	.982		
	Total	128.8	129			
Cloud-ERP provides freedom to innovate offers and automatic	Between	13.91	3	4.643	3.340	.022
	Within Groups	175.18	126	1.390		
	Total	189.1	129			

Interpretation: From the above it could be concluded that the experience of the respondents had a significant influence on their perception that cloud ERP provided a freedom to innovate offers and automatic upgrades and updates. In all the other cases it was found that the experience of the respondents had no influence on the perception that usage of could ERP supported modern user experience and socially enabled businesses and provided the necessary intelligence amd ability to meet business needs. In addition, cloud computing technology made it easier for enterprises to deliver ERP software as a service (SaaS) for customers who want to acquire cloud ERP and not have to manage hardware, software, and upgrades while reducing up-front expenses.

H₀₃: There is no significant influence of the experience of respondents related to use of Cloud-ERP in user friendly & easy accessibility

Table 5: One way

Anova (3)

		SS	df	MS	F	Sig.
Cloud-ERP provides more flexibility and increase deployment speed	Between Groups	8.58	3	2.860		
	Within Groups	171.489	126	1.361	2.10	.103
	Total	180.069	129			
Improved system performance and accessibility	Between	10.638	3	3.546		
	Within Groups	160.754	126	1.276	2.78	.044
	Total	171.392	129			
No software to install or upgrade and enable cross platform compatibility	Between Groups	4.383	3	1.461		
	Within Groups	113.648	126	.902	1.62	.188
	Total	118.031	129			
Data Access from cloud anytime anywhere without losing through cloud-ERP	Between Groups	10.527	3	3.509		
	Within Groups	169.696	126	1.347	2.60	.055
	Total	180.223	129			

Interpretation: The respondents did feel that use of Cloud-ERP is beneficial for businesses in the context of increasing user friendliness and enhanced accessibility. Positive perceptions of CIO, mangers and team-leaders of IT companies indicated that after deploying this new system, management of IT firms would be able to take benefits of more flexibility and increase deployment speed and easy upgrade and enable cross platform compatibility related features of Cloud base ERP system in a proper manner. Besides that, this new system will provide opportunity to all types of companies to data access from cloud anytime anywhere without losing any information. Researcher Own and Clohessy (2011) findings were matched and both indicated that Cloud-ERP would be beneficial for enterprises in terms of improving resource utilization, enhanced collaboration capabilities, reduced environment footprint and reduced information technology (IT) infrastructure needs.

H₀₄: There is no significant influence of the total IT experience on the perception towards security& reliability and cost savvy features provided by Cloud-ERP

Table 6: One Way

Anova (4)

		SS	df	MS	F	Sig.
A front expense reduces through cloud-ERP	Between Groups	8.527	3	2.84	1.953	.124
	Within Groups	183.35	126	1.45		
	Total	191.88	129			
Improved in security, privacy and scalability through cloud-ERP	Between Groups	1.089	3	.36	.268	.848
	Within Groups	170.48	126	1.35		
	Total	171.57	129			
Support modern user experience and socially enable business through cloud-ERP	Between Groups	4.386	3	1.46	1.117	.345
	Within Groups	164.88	126	1.31		
	Total	169.27	129			
Cloud-ERP provides freedom to innovate offers and automatic upgrade and update	Between Groups	13.929	3	4.64	3.340	.022
	Within Groups	175.18	126	1.39		
	Total	189.11	129			
Cloud-ERP service can deliver on expectation	Between Groups	15.80	3	5.27	3.502	.017
	Within Groups	189.50	126	1.50		
	Total	205.30	129			
Improved system performance and accessibility	Between Groups	10.638	3	3.55	2.779	.044
	Within Groups	160.75	126	1.27		
	Total	171.39	129			
Cloud-ERP provides freedom from IT constraints	Between Groups	17.29	3	5.76	4.831	.003
	Within Groups	150.32	126	1.19		
	Total	167.61	129			

Interpretation: The total IT experience of the respondents had as significant influence on the various aspects of security, reliability and the cost savvy features provided by cloud ERP. That cloud – ERP could innovate, could deliver on expectation, could provide improved system performance and accessibility and could provide freedom from IT constraints was not influenced by the IT experience of the respondents. But the experience did influence the

perception that front end expenses reduced through adoption of cloud ERP, there was improvement in   security, privacy and scalability through the adoption of cloud ERP, that adoption of cloud ERP supported modern user experience and socially enabled businesses. Improvement in security, privacy and scalability, reduced front expense and improved system performance and accessibility were the other major features of Cloud-ERP that helped firms in customizing security services, 24/7 support and getting benefits of reliability and cost savvy features of new IT system in a proficient manner. On the other side, indirect impact of cloud base services on businesses could be seen in the form of better corporate image, improved customer goodwill, customer satisfaction and so on.

Conclusion and Management Implications

It could be seen that the adoption of cloud ERP had significantly enhanced the efficiency and had a significant positive impact on business. Though there was difference in the opinion and perception on the benefits of the adoption of cloud ERP, there were clear signs that companies were interested in adopting cloud-ERP. The bottom line is that ERP software need to be deployed in a cloud environment to become a "Cloud ERP Software". Cloud based ERP benefitted the customers by providing application scalability and reduced hardware costs. Customers could build an internal cloud to reduce the ongoing hardware costs while maintaining greater control over integration. The study tried to cover the direct and indirect aspects of the Cloud-ERP software system, the direct aspects including improved efficiency, information integration for better decision making, faster response time to customer queries and the like etc. The indirect aspects included better corporate image, improved customer goodwill, customer satisfaction and so on. The outcome of the study could be beneficial for enterprises in terms of taking decisions toward adopting Cloud-ERP to get better business opportunities. Students and scholars could be benefited by increasing their knowledge level about Cloud base ERP, its current trends and future opportunities.

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