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Benefits and challenges of cloud ERP systems – A systematic literature review

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Abstract

Enterprise Resource Planning (ERP) systems provide extensive benefits and facilities to the whole enterprise. ERP systems help the enterprise to share and transfer data and information across all functions units inside and outside the enterprise. Sharing data and information between enterprise departments helps in many aspects and aims to achieve different objectives. Cloud computing is a computing model which takes place over the internet and provides scalability, reliability, availability and low cost of computer reassures. Implementing and running ERP systems over the cloud offers great advantages and benefits, in spite of its many difficulties and challenges. In this paper, we follow the Systematic Literature Review (SLR) research method to explore the benefits and challenges of implementing ERP systems over a cloud environment.

Keywords: Cloud ERP; SaaS ERP; SLR; Cloud ERP benefits; Cloud ERP challenges

1. Introduction

Enterprises nowadays invest in different aspects, the expected Return On Investment (ROI) can be in the form of reducing cost, maximize profits and helping in decision support. One of the investment aspects is the investment of implementing ERP systems. ERP System collects, records, integrates, manages and delivers data and information across all functional units of the enterprise. It helps break down information between inventory, production, planning, materials, engineering, finance, Human Recourses, sales, marketing, operation and all other departments in the enterprise. The result of implementing ERP system could be in the form of higher quality, reduced time-to-market, improved communications, supporting in decision making, shortened lead times, higher productivity and lowered costs. Lowered costs can help the enterprise to improve customer service and increase sales and market share as well as profits. Modern ERP systems are built for use over the internet. It enhanced with e-commerce capabilities and the ability for integration and collaboration with suppliers, partners, customer portals, and enhanced tracking of incoming row material and outgoing final products to extend the visibility and control inside and outside the enterprise. Many enterprises estimate the cost of an ERP project as only the cost of the software license. Practically there are many issues to consider the budget of implementation ERP system, for example, software license fees, hardware, implementation services and maintenance fees and training fees. The implementation of ERP systems is a costly process which increases with the enterprise size.

2. What is ERP?

ERP is a software system aims to integrate all functional units of the enterprise in a cooperative way. It may also extends

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to include parties outside the enterprise for example supplier and customer to involve them in the integration process as shown in Fig. 1. According to Ref. [1] ERP is a key element of an infrastructure that delivers a solution to the business. In Ref. [2] ERP defined as a comprehensive software packaged that seeks to integrate the complete range of a business's processes and functions in order to present a holistic view of the business from a single information and IT architecture.

With time passing ERP systems faced a lot of evolution and upgrade processes to enhance its functionality and increase the integration capabilities. The vendors of ERP like Oracle, SAP, PeopleSoft, J. D Edward, etc. developed different modules to cover and support all functional units of the enterprise. According to Ref. [2], traditional ERP systems can be classified into two categorizes on-premise ERP and hosted ERP. On-premise ERP, the system loaded and run over the enterprise infrastructure such as servers, network, platforms, computers, etc. The enterprise runs, operates and manages the ERP system according to software license model. Running cost, operational cost and maintenance cost are covered by the enterprise as well as disaster recovery. Hosted ERP can be defined as a service offered to an individual or an organization by a provider that hosts the physical servers and running that service somewhere else. The service is most of the time offered through a direct network connection that may or may not run via the internet [4].

3. Cloud computing

Cloud computing is a very promising trend of computing which left the attention in the academic researches and as well as in the software industry. Cloud computing is a computing environment which provides availability, scalability, and flexibility of computer reassures at a deferent level of abstraction with low running cost. Cloud computing can be defined as a computing method to provide computing as the utility to meet the everyday needs of the general business community. Cloud Computing refers to the applications, the hardware and software delivered as services over the Internet [5]. The cloud computing services provided in three models [6], Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS), Fig. 2 shows the cloud service models.

Software as a Service (SaaS), targets the end user or business. It concerns the delivery of a software application over the internet to multiple users. Cloud ERP systems belong to this category and our work will be focused in this category.

Platform as a Service (PaaS) is the delivery of middleware which contains tools, services and platforms targeted the software developers, to allow them to build SaaS application.

Infrastructure as a Service (IaaS) is the delivery of computing power hardware and software targeted towards administrators. The enterprise pays as it needs and upgrades its usage according to the growth of its business.

4. Cloud ERP

Cloud ERP solutions are provided via the Software as a Service model. Different ERP systems offered in the market as a cloud-based ERP systems [7]. ERP system considered as a cloud-based when it influenced by the characteristic of cloud computing. The cloud based ERP system should be accessed via the user browser over the internet without installing or configuring the system at the user side. One of the most famous cloud ERP in the software market is SAP Business ByDesign.

5. Research method

The literature review was conducted using Kitchenham's et al. methodological guidelines [8,9]. Conducting a systematic review is organized into three stages: planning, conducting and reporting. The milestone in systematic literature reviews is the explicit and the clear definition of a review protocol in the planning phase that guides its execution. It aims to reduce researchers' bias and helps in structuring the retrieved results. The protocol defines:

- The research questions for the literature review (focus).
- The search strategy (sources and timeframe for searching, a rationale for choosing particular sources).
- The search strings (terms used for searching).
- The selection and quality assessment criteria's (general restrictions, inclusion and exclusion criteria for selecting a relevant subset of the publications found).
- The data extraction process (storage procedures for retrieved files, data extraction forms).

The review protocol should be validated by experienced researchers. In our case, the review protocol was conducted by one of the authors of this research and was validated by two senior researchers.

6. Literature review conduct and results

6.1. Research questions

- RQ1: What are the benefits and the challenges that addressed by all investigated researches?
- RQ2: What are the benefits and the challenges which addressed by each research?
- RQ3: What are the benefits and the challenges that were repeated in most of the researches?
- RQ4: Does there any benefits or challenges reported over all years of the review interval?

6.2. Search strings and digital libraries

Only one type of searching methods was used to select appropriate and representative papers in the area of cloud ERP

Fig. 1. ERP system overview [3].

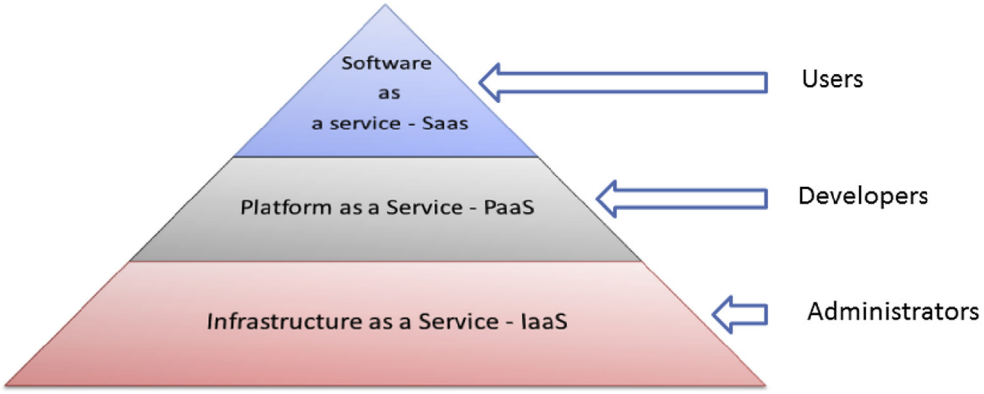

Fig. 2. Cloud service models.

systems. An automatic searching was based on five main sources of scientific papers databases: IEEE Xplore (IEEE), ACM Digital Library (ACM), Science Direct (SD), SpringerLink (SL) and Google scholar (GS). The review included literature published from Jun 2011 to Jul 2016 reporting on research issues for cloud ERP.

The following search terms were used: “cloud ERP”, “advantages and challenges of cloud ERP”, “SaaS ERP”, “ benefits and drawbacks of cloud ERP”, “ benefits and challenges of cloud ERP”, “Software as a Service”, “ERP” and “Enterprise resource planning”. We excluded the researches that did not address the benefits and drawbacks of cloud ERP. We used the terms benefits and advantages as equivalent as well as drawbacks, challenges, and disadvantages as equivalent terms.

Totally, the search process retrieved 45 publications. Table 1 represents the number of retrieved papers from each database. We included all papers that retrieved from different databases, for any papers that retrieved from more than one database, we considered it once.

6.3. Exclusion criteria and selection

The following exclusion criteria's were defined in order to select the candidate papers:

- CR1: we excluded all papers that were not already published in a peer reviewed conference, journal, report or workshop.
- CR2: we included only the publications written in English.
- CR3: we included the publications published in the time frame from Jun 2011 to Jul 2016.
- CR4: we excluded all the paper that didn't address the benefits or challenges of cloud ERP.

Table 2 presents the total number of included papers per year which obtained from different databases after applying our exclusion criteria.

Table 3 presents the included papers associated with its digital library and publication year.

Table 1
Retrieved papers from each database.

IEEE	ACM	SD	SL	GS	Total
9	0	2	4	30	45

Table 2
The total number of included papers per year.

2011	2012	2013	2014	2015	2016	Total
4	8	4	9	5	1	31

Table 3
The included papers in the literature review.

SID	Title	Digital library	Year
S1	The impact of cloud computing on ERP implementations in higher education [10].	GS	2011
S2	ERP in the cloud − benefits, and challenges [11].	SL	2011
S3	Cloud computing and Enterprise Resource Planning systems [12].	GS	2011
S4	Cloud computing for Standard ERP systems: Reference Framework and Research Agenda [13].	GS	2011
S5	ERP on cloud: implementation strategies and challenges [14].	IEEE	2012
S6	Benefits and drawbacks of cloud-based versus traditional ERP systems [15].	GS	2012
S7	In-house versus in-cloud ERP systems a comparative study [16].	GS	2012
S8	Advantages and disadvantages of adopting ERP systems served as SaaS from the perspective of SaaS Users [17].	GS	2012
S9	Cloud ERP: implementation of enterprise resource planning using cloud computing technology [18].	GS	2012
S10	Challenges involved in implementation of ERP on demand solution: cloud computing [19].	GS	2012
S11	Cloud ERP − a solution model [20].	GS	2012
S12	Cloud enterprise systems: a review of literature and its adoption [21].		2012
S13	Exploring factors for adopting ERP as SaaS [22].	SD	2013
S14	A comparative study of cloud-based ERP systems with traditional ERP and analysis of cloud ERP implementation [23].	GS	2013
S15	Potential concerns and common benefits of cloud-based Enterprise Resource Planning (ERP) [24].	SL	2013
S16	Implementing cloud computing in ERP [25].		2014
S17	Cloud computing as an operational model for ERP services: definitions and challenges [26].	GS	2014
S18	A framework for evaluating cloud Enterprise Resource Planning (ERP) systems [27].	GS	2014
S19	Cloud ERP adoption opportunities and concerns: a comparison between SMEs and large companies [28].	GS	2014
S20	Cloud ERP: a new dilemma to modern organizations? [29].	GS	2014
S21	Cloud and traditional ERP systems in small and medium enterprises [30].	IEEE	2014
S22	Study of cloud based ERP services for small and medium enterprises [31].	GS	2014
S23	Implementation of ERP in cloud computing [25].	GS	2014
S24	Competition and challenge on adopting cloud ERP [32].	GS	2014
S25	Cloud computing and ERP: a framework of promises and challenges [33].	GS	2014
S26	Determinants of cloud ERP adoption in Saudi Arabia: an empirical study [34].	IEEE	2015
S27	A cloud computing platform for ERP applications [35].	SD	2015
S28	Cloud ERP adoption opportunities and concerns: the role of organizational size [36].	IEEE	2015
S29	Barriers and drivers in cloud ERP adoption among SMEs [37].	GS	2015
S30	Cloud computing and Enterprise Resource Planning (ERP) systems in cloud environment [38].	SL	2015
S31	An analysis of the perceived benefits and drawbacks of cloud ERP systems: a South African study [39].	SL	2016

6.4. Data extraction

We extracted data from our primary studies according to the SLR questions. As an answer to the research question RQ1 the following section presents the benefits and challenges that addressed by all investigated researches.

6.4.1. Benefits of cloud ERP

Lower upfront costs: Due to the separation of computing recourses from enterprise location, the enterprises do not need to pay for building the computing environment it just pays for accesses the environment over the internet.

Lower operating costs: The cloud service providers (CSP) are responsible for operating and providing the cloud services that will lead to isolating the operation processes from the enterprise as well as the operation costs.

Rapid implementation: CSPs offer wide range of ERP solutions, these solutions can satisfy most of the enterprise needs. Choosing between different solutions and product takes place according to the enterprise business needs. The implementation process accelerated due to this selection process.

Scalability: Cloud services are high elastic; the enterprises can scale up or scale down the used resources according to its current needs.

Focus on core competencies: Cloud ERP systems help the enterprise to manage their business more efficiently and give the enterprise a chance to focus on other concerns related to their core activities.

Using advanced technology: Working over the cloud allows the enterprise to access and use specialized technology and advanced computing resources that available over the cloud.

Rapid updates and upgrades: Update or upgrade cloud solutions accomplished faster than traditional ERP application. The CSPs perform all upgrade processes according to the enterprise requests.

Improved accessibility, mobility, and usability: Applications over the cloud work in an open environment, which increase the accessibility options. The increases accessibility, in turn, increases the usability of the cloud ERP inside and outside the enterprise.

Easier integration with cloud services: There is a huge number of cloud application offered to satisfy the enterprise's needs. Due to the nature of ERP systems which connects different parties inside and outside the enterprise, the integration with other services becomes easier at the cloud.

Improved system availability and disaster recovery: CSPs provide well-defined policies and plans for backup, restore, recovery and all other functions that concerned with the availability and disaster recovery.

Cost transparency: Pay-per-use or subscription models according to enterprise plan. The enterprises pay only for what they use; there is no need for paying what they don't use or what don't cover the enterprise's needs.

Sales automation: Due to the geographical separation between clients and CSPs, the sales issues could be accomplished automatically over the cloud.

Using security standards: Some of CSPs implement standards for encryption and decryption, that lead to moving the security issues and effort from clients to CSPs.

Free trials: Many cloud ERP providers allow the potential clients to try the ERP systems before buying it. These trails increase the certainty of the cloud ERP usability.

6.4.2. Challenges of cloud ERP

Subscription expenses: To use cloud ERP the enterprises should subscript for the used services, the subscription fees are paid periodically as long as the enterprise uses the services.

Security risks: Due to high availability over the cloud for cloud services the security risks increase as well. Handling security issues for could ERP is a challenging and complex process.

Performance risks: Over the cloud, the clients and CSPs are separated geographically from each other and connected to each other via the internet connection. Network failures and many other connection problems could happen over the cloud. That will be reflected directly in the cloud ERP performance.

Customization and integration limitations: CPSs offer the ERP solutions in packages with limited customization and integration options. These limitations do not exist in traditional ERP systems.

Strategic risks: The enterprises take the strategic risk for the dependency on the CSPs and should comply with them policies.

Compliance risks: Complying with data, energy and environmental standards are other difficulties faced by cloud-based ERP and there are no enough regulations to handle these difficulties.

Loss of IT competencies: In order to move to cloud ERP many activities will be moved from IT department to the cloud ERP provider. The result of this moving could be IT competencies as well as face the IT department's resistance.

Functionality limitations: With the time passing traditional ERP systems gain more stability and become more mature and achieve advanced maturity level. To achieve this stability and maturity for cloud ERP, time is needed.

SLA issues: Defining Service Level Agreements (SLAs) is a very hard and complex process for cloud ERP; it should consider all aspects of the provided services including the integration and customization.

Sensitivity of the information: Many enterprises consider its data and information as a private property and can't be stored outside the enterprise.

Control over cloud ERP: Cloud ERP systems are located geographically outside the enterprise and the control process is tougher than traditional ERP.

Hidden costs in the contract: Cloud ERP systems contracts may contain hiding costs for example transition cost, monitoring cost and coordination cost.

Loss of technical knowledge: When implementing cloud ERP systems the IT employee may lose the technical understanding of the service over time.

Migration between CSPs: CSPs offer a lot of similar ERP packages with different costs, moving between different CSPs is a big challenge which may be faced by Cloud ERP clients.

Need for ERP as service standards: Cloud ERP market is still new. There are no clear regulations and standards for managing it between cloud ERP providers and clients.

Knowledge about the cloud: Usually its clients afraid of the new technologies and the impact of implementing this new technology on them business. Cloud ERP providers should give enough attention to describing the cloud ERP services and facilities and to make it clearer for the customers.

Startup support: To facilitate the moving from traditional ERP to cloud ERP clients and customers need support from the cloud ERP provider to facilitate this moving.

Organizational challenges: The process of implementing cloud ERP systems may face organizational challenges rather than technical challenges, for example, top management involvement in and poor cross-functional communication.

Choosing between cloud ERP systems: Many cloud ERP systems available at the market today, these ERP systems are developed by different vendors. Choosing between these systems is a challenging process. Choosing the individuals that will be involved in evaluating and choosing the suitable cloud ERP system is a challenge as well.

The research question RQ2 declared as: What are the benefits and challenges which addressed by each research? Table 4 presents the addressed benefits in each research while Table 5 presents the addressed challenges in each research.

As an answer for research question RQ3, Fig. 3 shows the discovered benefits and presents this benefits ordering by repetition in different investigated researches. Fig. 4 shows the discovered challenges and it also presents this challenges ordering by repetition in different investigated researches. Lower upfront cost benefit repeated in 30 researches, while lower operating costs repeated in 26 researches. Rapid implementation repeated in 21 researches, and Scalability repeated in 20 researches.

The security risks as a challenge repeated in 23 researches, while performance risks repeated in 19 researches. The customization and integration limitations repeated in 19 researches.

The research question RQ4 declared as does there any benefits or challenges reported over all years of the review interval? Table 6 shows the number of researches that reported each benefit per year during the review interval. Table 7 shows the number of researches that reported each challenge per year during the review interval.

Table 4
The benefits in each research.

SID	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27	S28	S29	S30	S31
Benefits																															
Lower upfront costs	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lower operating costs	√	√		√	√	√	√	√	√	√	√	√	√	√	√			√	√	√	√	√		√	√	√		√	√	√	√
Rapid implementation		√	√		√	√	√	√		√			√	√	√	√		√	√			√			√	√	√	√	√	√	√
Scalability	√			√	√	√	√	√		√		√		√		√		√			√	√	√		√		√	√	√	√	√
Focus on core competencies			√			√		√				√		√		√			√		√		√	√						√	√
Using advanced technology						√		√								√			√	√			√					√			√
Rapid updates & upgrades		√			√	√	√		√	√		√		√						√			√	√			√		√		
Improved accessibility, mobility, and usability	√	√	√		√	√		√	√	√	√		√	√	√				√	√		√	√		√		√		√	√	√
Easier integration with cloud services	√					√									√				√						√						
Improved system availability and disaster recovery	√		√			√		√			√			√	√				√				√						√	√	√
Cost transparency					√																								√		
Sales automation			√																												
Using security standards	√																														
Free trials																√															

Table 5
The challenges in each research

SID	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27	S28	S29	S30	S31
Challenges																															
Subscription expenses						√		√						√			√														
Security risks		√		√	√	√	√		√	√		√	√	√	√		√		√	√			√	√	√	√	√	√	√	√	√
Performance risks	√	√	√	√	√	√		√	√					√	√				√					√	√	√	√	√	√	√	√
Customization and integration limitations	√	√		√		√		√	√	√		√	√		√	√		√	√	√				√	√			√	√		√
Strategic risks		√				√		√																	√						√
Compliance risks					√	√		√	√					√														√	√		
Loss of IT competencies						√																						√	√		√
Functionality limitations	√	√				√								√			√														
SLA issues	√		√		√	√						√				√	√	√							√				√		√
Sensitivity of the information		√						√				√																√			
Control over cloud ERP	√	√							√	√		√		√																	√
Hidden costs in the contract								√																							√
Loss of technical knowledge								√																							
Data ownerships												√					√		√	√			√	√	√				√		
Need for ERP as service standards and regulations																√	√							√					√		
Knowledge about the cloud																√				√									√		
Startup support																	√														
Organisational challenges																				√									√		
Choosing between cloud ERP systems																								√							

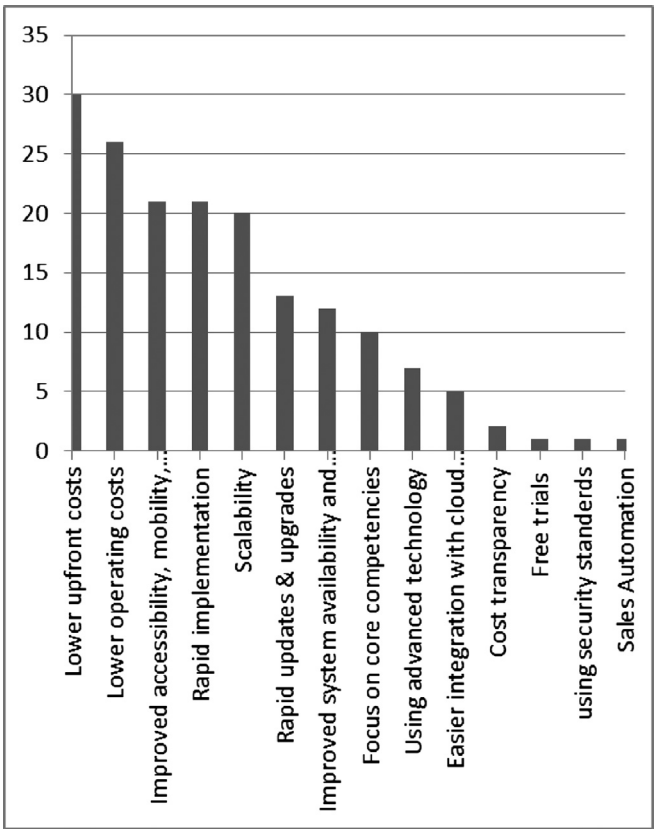

Fig. 3. Data extraction for RQ3 repeated benefits.

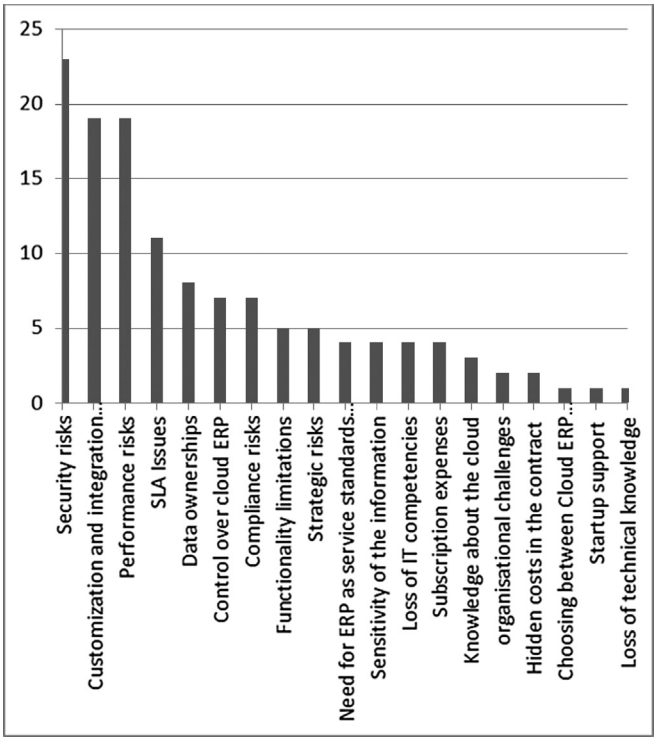

Fig. 4. Data extraction for RQ3 repeated challenges.

Table 6
Discovered benefits per year.

Benefits	2011	2012	2013	2014	2015	2016	Total
Lower upfront costs	4	8	3	9	5	1	30
Lower operating costs	3	8	3	7	4	1	26
Rapid implementation	2	5	3	5	5	1	21
Scalability	2	6	1	6	4	1	20
Focus on core competencies	1	3	1	4		1	10
Using advanced technology		2		3	1	1	7
Rapid updates & upgrades	1	6	1	3	1		13
Improved accessibility, mobility, and usability	3	6	3	5	3	1	21
Easier integration with cloud services	1	1	1	2			5
Improved system availability and disaster recovery	2	3	2	2	2	1	12
Cost transparency		1			1		2
Sales automation	1						1
Using security standards	1						1
Free trials				1			1

Table 7
Discovered challenges per year.

Challenges	2011	2012	2013	2014	2015	2016	Total
Subscription expenses		2	1	1			4
Security risks	2	6	3	6	5	1	23
Performance risks	4	4	2	3	5	1	19
Customization and integration limitations	3	5	2	6	2	1	19
Strategic risks	1	2		1		1	5
Compliance risks		4	1		2		7
Loss of IT competencies		1			2	1	4
Functionality limitations	2	1	1	1			5
SLA issues	2	3		4	1	1	11
Sensitivity of the information	1	2			1		4
Control over cloud ERP	2	3	1			1	7
Hidden costs in the contract		1				1	2
Loss of technical knowledge		1					1
Data ownerships		1		6	1		8
Need for ERP as service standards and regulations				3	1		4
Knowledge about the cloud				2	1		3
Startup support				1			1
Organisational challenges				1	1		2
Choosing between cloud ERP systems				1			1

As shown in Table 6 the following benefits are reported over all years of the review interval:

- Improved system availability and disaster recovery.
- Improved accessibility, mobility, and usability.
- Lower upfront costs.
- Lower operating costs.
- Rapid implementation.
- Scalability.

As shown in Table 6 the following challenges are reported over all years of the review interval:

- Security risks.
- Performance risks.
- Customization and integration limitations.

7. Discussion

Cloud ERP systems are still new technologies which need standards, rules and regulation. The most important challenge over the cloud is the security challenges; Cloud ERP systems inherited this challenge. Security issues in cloud ERP represent a big challenge, the high availability options expose cloud ERP systems to security threats. Only one research [10] suggested using encryption and decryption techniques to improve the security standards for cloud ERP.

Sharing the computing resources over the cloud may lead to performance risks and bottlenecks. Improving security standards in cloud ERP systems will be reflected also in the performance.

Most of the studied researches reported the cost reduction benefit. This benefit is not suitable for all enterprises; it is suitable for the enterprises that don't have ERP system or computing infrastructure, and in this case, the reduction will be in the form of reducing the upfront costs. For the enterprises that have their own ERP system and infrastructure, they will compare the cost of the ERP system maintenance with the cost of annual subscription for cloud ERP services, which intended to reduce the operating costs.

Cloud ERP clients usually need to develop or customize features to satisfy them special requirements. CSPs offer ERP solutions with generic core features and they do not invest on individual customizations, therefore cloud ERP clients face customization challenge.

In cloud ERP systems SLA represents a contract between cloud ERP provider and cloud ERP clients. Hovers there are differences between CSPs and cloud ERP clients in understanding the SLA issues.

Cloud ERP providers consider that SLA is an enough contract for what the clients bought; also they consider that SLA covers the level of service the clients will expect. Clients agreed that SLA is necessary as contract between them and cloud ERP providers, but they see it not enough to cover the huge and hidden details of ERP systems. Reaching a central point of understanding the SLA issue between cloud ERP providers and clients is a must to facilitate the implementation and maintenance of cloud ERP systems.

Many enterprises do not feel secure to store their sensitive data over the cloud and allow cloud ERP provider to control it. The enterprise's data considered as a private property for the enterprise, exposing this property to risks make the moving to cloud decision more default. For the large enterprises that have their own infrastructures and implementing high-security standards, they prefer to stay working with in-house ERP systems. However, today many cloud ERP providers offer high-security levels for their cloud solutions that Small and Medium Enterprises (SMEs) cannot implement themselves and therefore SMEs could take advantage of this high-security levels [28].

Cloud ERP systems offered in packages with generic features to satisfy the requirements of wide range of the expected clients. These ready packages facilitate the implementation processes which reflected directly on the implantation time and led to rapid implementation.

ERP systems reflect the size of the enterprises business, this business size is subject to change over time due to many external and internal factors. Cloud ERP systems offer scalability to cover the changes in the enterprise business size. The scalability options not only support to cover the changed business size but they also save the costs of unneeded resources.

Using cloud solutions aid the idea of improving acceptability, cloud ERP systems are more and easily accessible than traditional ERP systems due to the existence of the system over the internet. These accessibility options open the doors for increasing number of security threads, comparing between accessibility options and the security threads are an important issue when choosing to work with cloud ERP systems.

Cloud ERP providers offer a different plan for backup and disaster recovery, which increase the safety of the cloud ERP database. Cloud ERP providers intended to perfume most of the administration tasks while the cloud ERP clients lose the control of this administration and control tasks.

Cloud ERP systems help the enterprise to focus on other concerns related to their core activities. On the other side implementing cloud ERP may lead to the losing of IT competencies and the IT department's resistance.

Cloud ERP systems rely on many advanced technologies, by subscribing to cloud ERP system the enterprise will be able to take the benefits of these technologies. Dealing with these advanced technologies require improving the technical knowledge of the enterprise team.

The cost transparency is of the main benefits of cloud ERP solutions, enterprise pays for what it use and for the actual number of users. However, the hiding costs are one of the challenges that face the cloud ERP clients which could be discovered at the contracts or later at run time.

There are huge numbers of cloud services that help to satisfy the enterprise's needs by integration, however, CPSs offer the cloud ERP solutions in packages with limited customization and integration options. Adding more integration feature will be followed by additional costs.

8. Conclusion

We have introduced SLR of recent researches on benefits and challenges of cloud ERP; our SLR covers the published research during the interval from Jun 2011 to Jul 2016. The key identified benefits are lower cost, scalability, fast and rapid implementation, improved accessibility, high availability and easier update. The other benefits reported from different researches are using advanced technology, rapid updates & upgrades, improved accessibility, improved mobility, improved

usability, easier integration with cloud services, cost transparency, sales automation, using security standards and free trials.

The key identified challenges are security risks, performance risks, customization and integration limitations, functionality limitations, SLA issues and data ownerships. Other challenges were reported from the investigated researches which are subscription expenses, strategic risks, compliance risks, loss of IT competencies, sensitivity of the information, control over cloud ERP, hidden costs in the contract, loss of technical knowledge, need for ERP as service standards and regulations, knowledge about the cloud, startup support, organizational challenges and choosing between cloud ERP systems.

Before moving to the cloud ERP system, the cloud ERP clients should balance between the benefits and challenge. One benefit cloud lead to many challenges and on another side, some challenges cloud be solved by some benefits. In the discussion section, we presented the relation between the studied benefits and challenges.

The high rated challenges represent research points, which should be considered to improve the implementation and operation of cloud ERP systems.

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