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The Literature Review of Cloud-based Enterprise Resource Planning

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Abstract. Enterprise Resource Planning also called ERP is a system that is integrated into business processes in a company, some of the benefits of implementing ERP are higher productivity, better insights, accelerated reporting, lower risk, simpler IT and improved agility. However, ERP also has several disadvantages such as high costs, maintenance costs and this became a common problem when using the ERP system. One way to cut high costs is to use cloud computing. Cloud computing is pools of configurable computer system resources and higher-level services that can be rapidly provisioned management effort, often over the internet, cloud computing also can be the solution for companies that want to implement ERP system with low prices. In this paper, we collect several journals about cloud computing and ERP system and combine that into one literature, and this paper discusses methodology, metadata analysis and future journals related to cloud computing and ERP system

1. Introduction

The implementation of ERP in an organization brings multiple benefits if it is being implemented properly, benefits are: higher productivity, better insights, accelerated reporting, lower risk, simpler IT and improved agility. Currently, with the rapid growth of Information and Technology, ERP uses latest technologies to such as AI and machine learning to provide intelligence, visibility, and efficiency across every aspect of a business. It is even predicted that in the current time to a certain time in the future, ERP will be using cloud system combined in its operation whether in high-tech SMEs or big companies. Although, there have been some studies concerning about the data privacy and availability and dissent between high-tech SMEs owners and big companies CEOs, it is because the cloud offers for the maintenance cost is better than the traditional one [1]. It is a common knowledge that the implementation of ERP costs a relatively high price, added with its licensing and maintenance costs, this became the common problem when it comes to financial aspects of organizations [2].

Considering that the budget cut-offs on financial aspects makes the cloud system a big shot for the organization to have all access in ERP system by not spending as much money as on the non-cloud system. The main purpose of this paper is to inform the world about the new concept of ERP that is being integrated with cloud system by having references from multiple-related journals. This paper discusses about the application of ERP that integrated with cloud computing that provides essential new approaches, that is able to reduce the cost problems faced by organizations.

1.1. Enterprise Resource Planning

Resource Planning (ERP) means the inclusion of processes needed to run a single company: finance, human resource, manufacturing, supply chain, services, procurement, and others [3]. The role that ERP plays here is integrating those processes into one system ERP systems are software tools used to manage the organization data. ERP integrates all necessary information from multiple integrated databases to provide the organization to have information integrity [4]. Such a model for ERP was actually come from a marketing model namely 4Ps. 4Ps stands for people, product, promotion, and price. This model was used widely back in the 1980s and 1990s, then modified to 4Ps: people, product, process, performance to match the existing ERP system [5].

Moreover, the conceptual components of ERP consist of four components that are implemented through a methodology: software, process flow, change management, and customer mindset, which all integrated through ERP. This simply could be said that ERP is more than just a plain software package. It is also notable that there are many scientific publications regarding ERP that keep increasing from time to time, and it did not always discuss the software but its connection with HR influences, strategy, organization and culture [2].

1.2. Cloud Computing

The term cloud is referring to a network or internet, which implies that the cloud is something that is available remotely in a certain intangible form. In these days, almost all of the online services, social media use the cloud as their databases and it all keeps running in the cloud, for instance, web conferencing, e-mail (Gmail, Yahoo, etc.), Instagram, Facebook, etc. Cloud computing depends on the web computing where it provides an interface (application) hosted by internet to be able to access the shared-data from the cloud.

Cloud computing provides its clients with plenty of capabilities to access whatever it is stored in the shared-cloud without requiring to purchase the interface (application). Thus, could be said that cloud computing takes a role in lessen both running and installation costs. In addition, the cloud users (clients) are able to access the data anyplace as long as there is interface with a system available on the spot [6].

Cloud computing has quite a lot of characteristics as follow; (1) The client is able to access data as long as there is interface with a system available; (2) Cost is reduced since the provider of infrastructure is the third party: and (3) Resources and cost sharing is possible within a large collection of users, allows them to efficiently utilize the system [7].

1.3. Cloud Enterprise Resource Planning

Cloud ERP is basically a type of Enterprise Resource Planning software that is hosted on a cloud computing platform, rather than on-premises within an organization's own data center. Cloud computing defined as a new method that is similar to "cloud" which is very flexible one in terms of managing demand and accessing the stored data resource using smaller effort than the classic one[8].

The computing costs of cloud system is reduced due to the system enables the resources of data is shared largely in the cloud server so that an enterprise that implement this system doesn't need to invest on a physic server. The cloud computing system enables resources to be accessed at any time, by any person, and in any place as long as there is an internet to it, this also increasing the reliability, availability, and flexibility of the data. [8]

2. Methods

Literature review will gather the existing studies according to the key idea for the future study[9]. The purpose of literature study is used for literature interspace determining and for advanced knowledge boundary [10]. This study used a systematic method for collecting data from reliable sources and analysed the literature based on the content to give depiction and the direction for future works. The study followed a three-step method including identifying the data, screening the initial data, and finalizing the result data. This study collected data from Google Scholar and ScienceDirect databases and used Scimagojr.com for metadata analysis. Google scholar is a literature search engine developed by google. ScienceDriect is a website that contains journals and papers such as review articles, research articles, encyclopedia, book chapters, etc. that has been indexed by Scopus database. Scimagojr.com is a portal developed by Scopus Database used as scientific domain assessment of the journals.

2.1. Identification of the data
The data were collected from Google Scholar and ScienceDirect Website. The year for the articles is between 2012 until 2019. The keyword for the study term is Cloud ERP. There are 19200 results from google scholar and 1343 results from ScienceDirect Website that related to the initial search term and limitations.

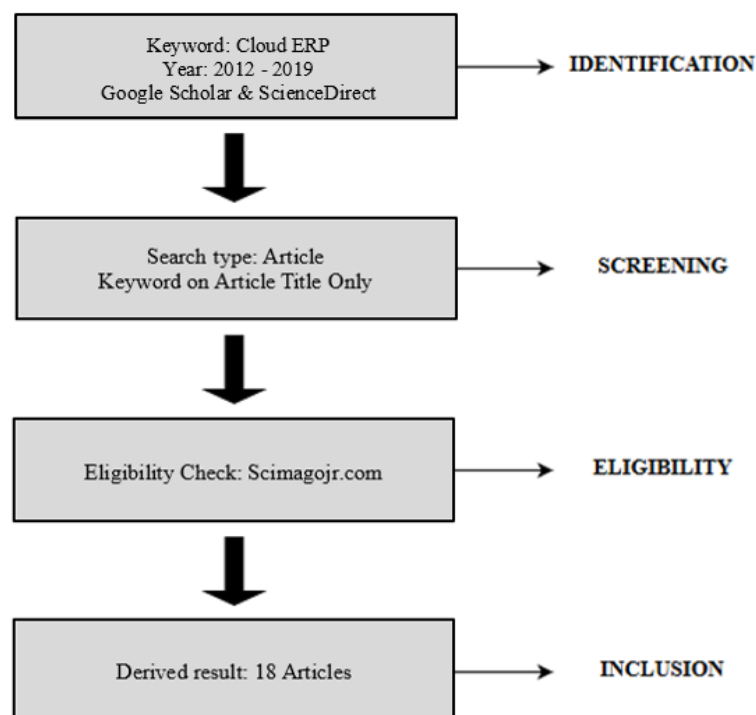*2.2. Screening the initial data*
The initial result is still consisting of Encyclopedia, Book chapters, Conference abstract, News, and others. In this stage, the result data will be excluded except the articles review. The advance search will directly choose the article review as the type. Moreover, the keyword search was also limited to article title only. The result gives 353 articles from Google scholar and 999 articles from ScienceDirect Website that can be brought to the next stage.

2.3. Eligibility
The study used scimagojr.com to determine the eligibility of the resulted articles objectively. Scimagojr.com is used for assessing the article's domain which will prove that the articles are from the reliable sources. Besides, a subjective study is also done to filter the eligibility of the articles. A total of 18 articles is becoming the result of this stage.

2.4. Inclusion of the data
The derived result of the articles includes 18 articles that is selected based on the best matches with the Cloud ERP. These 18 articles are used for the qualitative analysis.

Figure 1 Flowchart of systematic method

3. Observations and Recommendations
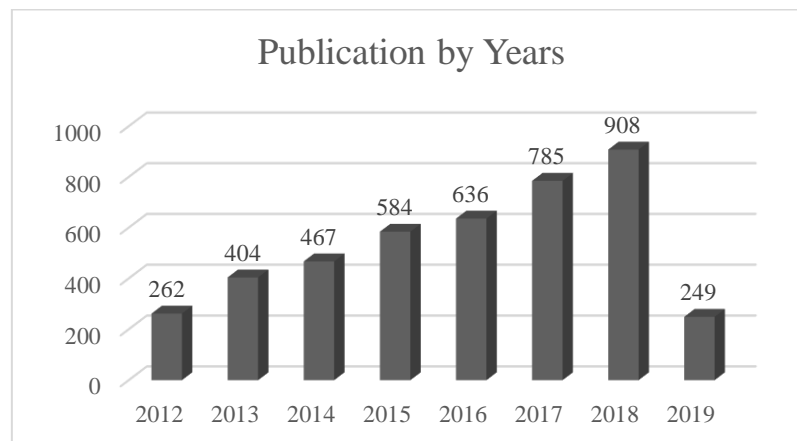*3.1. Metadata Analysis*
3.1.1   Publication by Year

Figure 2 Publication by Years

Figure 2 shows that from the year 2012 to the 2019 the growth of Cloud Enterprise Resource Planning articles is perpendicular to its year, means that every years the articles publishing increases. In the year 2012 there are 262 articles and in the year 2018 there are 908 articles this shows the growth of 646 articles in 6 years. This year there are 249 articles published, this does not cover up the possibilities of publishing until the end of 2019. The conclusion is the interest of Cloud Enterprise Resource Planning is still a growing interest.

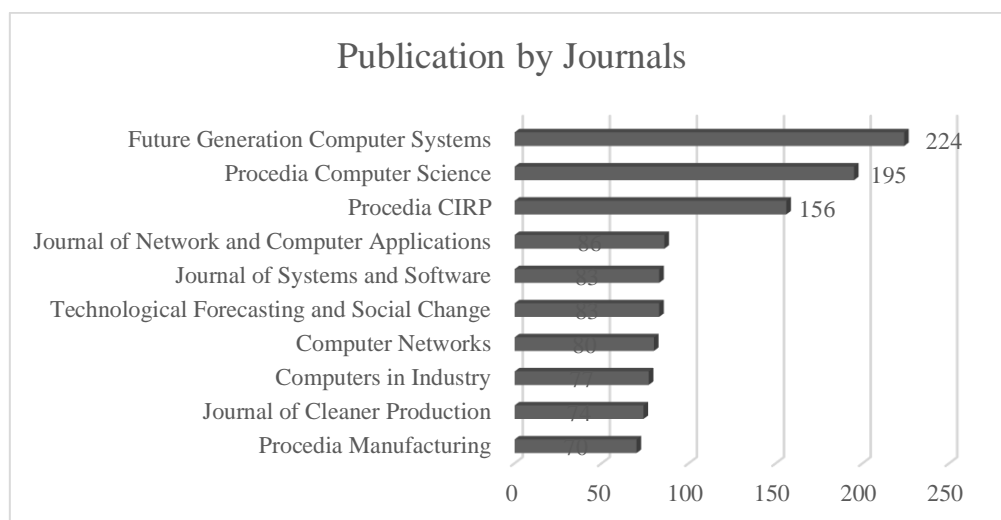*3.1.2 Publication by Journals*

Figure 3 Publication by Journals

Figure 3 shows that from year 2012 until year 2019 Cloud Enterprise Resource Planning papers were published in many kinds of Journal. Future Generation Computer Systems is the most publisher with 224 articles. These journals are checked using scimagojr.com to obtain the information about the journals.

Table 1 Journals Information

Journals	Country	Subject Area and Category	Publisher
Procedia Manufacturing	Netherlands	Computer Science Computer Networks and Communications Hardware and Architecture Software	Elsevier BV

Journals	Country	Subject Area and Category	Publisher
Journal of Cleaner Production	Netherlands	Business, Management and Accounting Strategy and Management Renewable Energy Sustainability and the Environment Industrial and Manufacturing Engineering Environmental Science	Elsevier BV
Computers in Industry	Netherlands	Computer Science Engineering	Elsevier BV
Computer Networks	Netherlands	Computer Science Computer Networks and Communications	Elsevier BV
Technological Forecasting and Social Change	Netherlands	Business, Management and Accounting Business and International Management Management of Technology and Innovation Applied Psychology	Elsevier BV
Journal of Systems and Software	Netherlands	Computer Science Hardware and Architecture Information Systems Software	Elsevier BV
Journal of Network and Computer Applications	United States	Computer Science Computer Networks and Communications Computer Science Applications Hardware and Architecture	Elsevier Inc.
Procedia CIRP	Netherlands	Engineering Control and Systems Engineering Industrial and Manufacturing Engineering	Elsevier BV
Procedia Computer Science	Netherlands	Computer Science	Elsevier BV
Future Generation Computer Systems	Netherlands	Computer Science Computer Networks and Communications Hardware and Architecture Software	Elsevier BV

`Table 1` explains that the majority of referenced journals are published by publisher Elsevier B.V. The publisher provides multimedia publishing services for educational, professional science, and healthcare communities worldwide. The company was founded in 1880 and is based in Amsterdam, the Netherlands. Elsevier B.V. operates as a subsidiary of RELX Group plc. Elsevier publishes around 400,000 articles per year in 2,500 journals. The archive holds more than 13 million documents and 30,000 electronic books. The total annual downloads are 900 million.
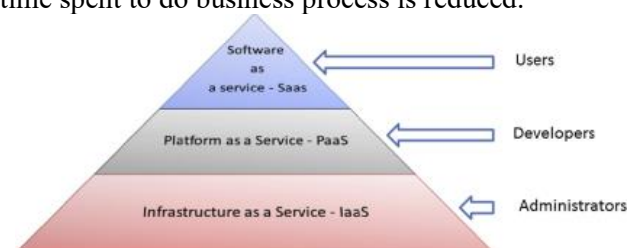
3.2. Qualitative Analysis
3.2.1   *Cloud Enterprise Resource Planning Overview*
Figure 4 shows that Enterprise Resource Planning is integrating many aspects in an enterprise. Many works could be done using only a software so that the time spent to do business process is reduced.

Figure 4 ERP system overview [11]

Figure 5 Cloud Service Model [12]

3.2.2 Benefits of Cloud Enterprise Resource Planning

It is a common knowledge that implementation of ERP is only applied for huge organizations. However, according to [13] study, the party that will benefit the most from Cloud ERP delivery model adoption is the SMEs. Moreover, Panorama's 2012 ERP reveals that the market-share of ERP has increased only in a year from 6 to 18 percent [13]. The benefits of implementing a cloud system in this digital era are[12]:
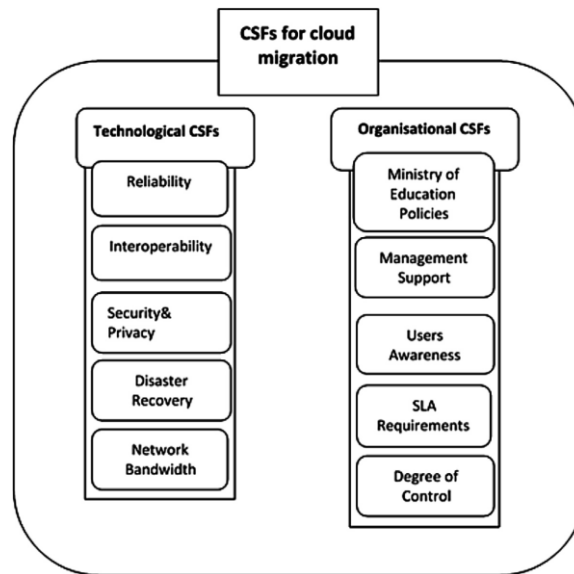
a.　Lower upfront costs: using Cloud ERP could reduce upfront cost because the company just need to pay for internet access to use the cloud

b.　Lower operating costs: the implementation of Cloud ERP could reduce the operational cost that is not needed because everything is already listed in the database

c.　Focus on core competencies: Cloud ERP could improve the flexibility of the company performance because the cloud system can identify the main business focus that relates to its purpose

d.　Improve accessibility, mobility, usability: Cloud ERP could improve mobility, accessibility and usability using an interface that is easy to understand

e.　Easier integration: the main purpose of ERP is integration, so the implementation of a cloud system is so much relevant to ERP

3.2.3 Challenges of Cloud Enterprise Resource Planning

Basically, in the use and application of Cloud ERP, there are some challenges for companies or agencies that implement this system. The challenges of implementing Cloud Enterprise Resource Planning are [12]:

a.　The first thing is that a company that applies Cloud ERP certainly has to subscribe to the cloud services and the company has to make regular payments, one of the things that must be paid is the cloud server itself.

b.　The second challenge that must be faced security issue, cloud system relies on the internet and the internet is very dangerous things that is vulnerable and requires a high level of security in order to protect the company's database from unwanted things such as malware, and hacking activities that done by a person. With an internet basis, the company is also demanded to have a high internet access speed, internet network failure will certainly be a problem for companies that use Cloud ERP

c.　Another challenge faced by companies is hidden costs, namely transition costs, monitoring costs, and coordination costs which of course will increase operational costs for the company.

d.　The last thing to consider is the selection of a cloud system that will be applied by the company, each cloud system has a different level, so with that, the company must also determine the appropriate user whether a user is capable of a cloud system, and it becomes a challenge for company.

Figure 6 shows that factors that affect Cloud ERP these factors could be studied further for the implementation result.

Figure 6 Technological factors for Cloud ERP [14]

4. Conclusion and Future Research Potentials

According to 18 papers that we have been studying, we obtain the core of the problem of Enterprise Resource Planning, factors that affect Cloud ERP, and reason to use Cloud ERP. First is the lifecycle of Enterprise Resource Planning, commonly as ERP. It cannot be denied that this era is a digital era where everything is connected to the internet. The speed or connection to the internet is becoming an important matter. Asides from that, the ERP ease of implementation is needed. The solution to make ERP remain relevant in this digital era is to implement a system called "cloud". This system allowed everything to be centred and rely on it to the internet. Reliability, flexibility, and availability of time and cost could be improved by using a cloud system. The future research potentials are further study of the implementation of Cloud ERP needs to be carried out and explored further because we already know the benefits of the implementation. Particularly in the Internet of Things (IoT) aspect such as data base design, security, usability and its effectivity to provide valuable information to its users.

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