

# Competition and Challenge on Adopting Cloud ERP

Fumei Weng and Ming-Chien Hung

**Abstract**—ERP provides businesses flow management and includes manufacturing, accounting, sales and customer relationship management. The new ICT technology, cloud computing, offers an alternative for businesses to conduct ERP. The traditional ERP implementation methodology involves various processes and procedures, which constitute the conditions or means for formulating the actual implementation of ERP projects. It is a time-consuming project. Cloud ERP is then a very good proposition for a start-up, and is simple to deploy, organization need not to bear additional server and other dependent costs. It is also easy and quick to implement an ERP to a business organization. However, on cloud ERP, the challenge of data security, business profit, Internet accessibility, and the total cost become initial issues for businesses to choose a fit one. This study provides a framework for businesses to adopt the cloud ERP.

**Index Terms**—ERP, cloud ERP, SaaS, cloud computing.

## I. INTRODUCTION

Every organization is in a global world where all the businesses are very much familiar to use information communication technology (ICT) for processing daily work [1]. Cloud computing now is a virtualized ICT resource and dynamically reconfigurable to meet the specific needs of the adopting organization. The Cloud computing enables enterprises to unleash their potential for innovation through greater intelligence, creativity, flexibility and efficiency, all at reduced cost. Some cloud software are widely accepted and implemented by organizations. They include customer relationship management (CRM), such as Salesforce.com, Microsoft CRM, and Human Resources, such as ADP, Ultimate Software Group, PDS. Now the next generation of ERP (Enterprise resource planning) has been seeing a high level of interest for organizations.

Cloud ERP offers businesses speed of implementation and lower costs of entry. It is the shortest possible route to a new ERP system. One of the main advantages of cloud ERP is the low cost of entry. No need to purchase expensive equipment or make sure that you have sufficient infrastructure to handle the system. Simply downloading a software application onto computers and allow a hosting company to provide the service. Despite widespread interest in adopting cloud ERP, many organizations are “flying blind” with respect to making them secure, potentially putting their operations, intellectual property and customer information at risk [2]. In this study, an approach is recommended by taking advantage of both the outsourcing process and the implementation process of

traditional ERP, firms might have a conceptual approach to apply cloud ERP.

Traditional ERP implementation methodology, one hand, involves various processes and procedures, which constitute the conditions or means for formulating the actual implementation of ERP projects. The top management of the company must participate as a control factor in each phase of an implementation and provide appropriate conditions for the ERP implementation. Balanced interactions between a consulting company and the top management of a company lead to the optimizing of the ERP implementation. Apart from the implementation process, the fully control management on data and functionality are the discrepancy between traditional ERP and cloud ERP. Cloud ERP provides non-control for adopting organization on the version of the system. It is kind of easier for business but limits the specific/ customized function.

There is one more issue, on the other hand, in terms of data security. Security is a vast issue for ERP. Cloud ERP vendors will provide security to their cloud, application and database separately. Security and encryption may be provided by the different vendor to make a reliable system [3]. Companies still have been concerned that putting financial and operational information in the cloud increases the possibility of exposing sensitive data to hackers and outside entities.

Cloud computing gives businesses more control and flexibility over the technology they deploy and the way they deploy it. It helps organizations reduce costs and focus resources on gaining strategic advantage. While deployment strategies differ, it is critical that an organization’s infrastructure is managed as a utility made up of secure, scalable and standards-based building blocks of integrated IT resources from storage to servers and network management tools [4]. In this study, an approach to implement cloud ERP for organizations is proposed and discussed.

## II. TRADITIONAL ERP

ERP combines internal and external management across an organization, including manufacturing, finance/accounting, sales and customer relationship management. ERP systems automate these activities with its software application to facilitate the flow of information between all business functions inside the organization efficiently.

Unfortunately, ERP systems are not successfully implemented in many companies. For example, in Indonesia, more than 80% of the companies implementing the ERP systems did not succeed in their implementations and more than 50% of the companies implementing the ERP systems in the world failed to gain the optimal return value. While in China, only 10% of the companies gained success. Some researchers show that 50% of the companies implementing

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the ERP systems failed to gain success [5].

There is a long list of companies that have problems in implementing ERP systems, such as the well-known and successful Dell computers, Apple computers, or Whirlpool [6]. An inappropriate application and implementation of the ERP system can harm the performance of an organization. Some researchers report that the success rate of the ERP implementation is very low, and in some countries, the failure rate is up to 90%. Therefore, it is very important to find out a framework for the evaluation of ERP as managerial and organizational aspects rather than technical aspects [7]. Even more, aspects, such as managerial and organizational, can decrease the risk of failure in the implementation of the system in an organization.

The ERP implementation methodology involves various processes and procedures, which constitute the conditions or means for formulating the actual implementation of ERP projects. The most famous ERP methodologies are developed by the biggest worldwide ERP systems, such as systems, applications, and products (SAPs), Oracle Financials, and PeopleSoft. SAP ERP system is an ERP system that covers most of the world markets of information systems. SAP has developed an accelerated methodology, known as accelerated SAP (ASAP), and it is detailed in this study to provide a concept of implementation.

SAP procedure model consists of the following stages: (1) Organizational and conceptual design; (2) Detailed design and customization of the system; (3) Preparation of production; (4) Support to production. Such a methodology requires a detailed design of the existing system, implemented existing functionality and business processes.

The fast implementation and short return on investment in the ERP can be beneficial, if external consultant companies and companies' project managers stick to plans and budgets do the right things, and avoid traps. Instead of maintaining the previous business processes, it is more preferable to use the standardized software with built-in business processes as the bases for organizational changes and the reduction of number of different business procedures. Implementing cloud ERP might be different from traditional ERP, but the approach provides a guide line for it.

### III. ONTOLOGY OF CLOUD ERP

Cloud computing is defined as an online form of computing, similar to Web 2.0 where users can access applications via a browser. Even the application is installed and data is stored on a server which is not in-house [4]. Cloud computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the data centers that provide those services.

The services have been indicated as Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). In the IaaS model, customers rent only the computer infrastructure. In the PaaS model, both infrastructure and programming tools are hosted by the vendor. The platform can be used for the implementation of a Web-based application on the hosted infrastructure. In the SaaS model, customers pay for software hosted by the vendor. Services are provided to multiple customers in both models,

but the SaaS provider does not offer dedicated infrastructure and the customer does not know where the software is located [8]. SaaS is a kind of IT e-outsourcing solution which can reduce the cost of service delivery [9].

The Cloud ERP offers an easy way and low cost on implementing. There is a difference between Cloud ERP and SaaS ERP (EaaS): "Cloud ERP is hosted service delivered over the Internet." The ERP system in the EaaS model resides in the cloud, which provides computing power to run the ERP system [10]. The system is available to the user on demand once the subscription fee is paid. For secure access, the user needs an Internet connection. SaaS is not a required component of ERP software but organizations can purchase the more flexible Cloud ERP system when it is offered in a SaaS model. An organization can have Cloud ERP without SaaS (cloud infrastructure or cloud platform), SaaS ERP without cloud (web-based ERP) or SaaS ERP enabled by cloud (cloud application) [10]. Different types of Cloud ERP are illustrated on Fig. 1. In this study, cloud ERP is a general term and referred as three of them.

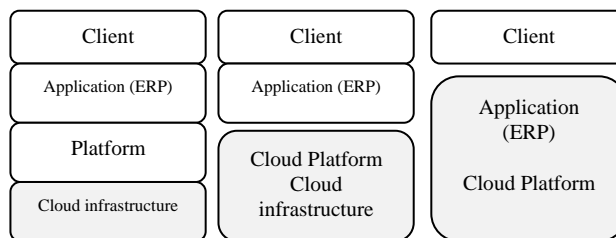


Fig. 1. Types of Cloud ERP [8].

### IV. CLOUD ERP

One of the main advantages of cloud ERP is the low cost of entry. Businesses don't have to purchase expensive equipment or make sure that they have sufficient infrastructure to handle the system. They simply download a software application onto your computers and allow a hosting company to provide the service. Cloud ERP also has very low IT support requirements [11]. The physical hardware is kept at the hosting company, so businesses don't have to worry about testing the system on a regular basis and making sure that all of the equipment is in working order. The ERP hosting company performs this service for its customers.

On the negative side, on-demand ERP may not necessarily integrate with legacy systems. This can be a significant problem if your office uses a lot of old computers. If businesses have obtained a dedicated cloud service then you should be all right, but a shared system probably won't have that capability.

Another drawback about on-demand ERP is that it is fully reliant on the internet to function. If your wireless router should malfunction or internet provider be unable to offer service for some reason, you will lose access to all of your ERP data until the system is restored.

Many organizations today are turning to the cloud ERP systems in increasing numbers. There are many reasons why they are choosing the cloud. These are the reasons we hear

most often [9]:

- Do not want to buy the servers and hire the IT resources.
- Becoming more complex, and challenging to manage.
- Organizations have complex ERP system need something easier and more economical.
- Top management doesn't want to spend it on an ERP system.

Above reasons might lead organization adopt cloud ERP, some other reasons keep them away from ERP. Some problems have need to notice for adopt cloud ERP.

#### V. PROBLEMS ON DEPLOYING CLOUD ERP

To better understand how organizations are securing their information assets in a cloud computing environment, Ponemon Institute sponsored by Symantec, conducted a national survey named 'Flying Blind in the Cloud: the State of Information Governance' in 2010 [2]. The survey was completed by 637 U.S. IT security practitioners and focused on the following issues:

- Organizations' use of cloud computing services.
- The importance of cloud computing in IT, and data processing objectives.
- Policies and procedures to protect sensitive information in the cloud.

The major findings of this study include:

- Few organizations take proactive steps to protect their own sensitive business information with cloud computing vendors.
- Organizations are adopting cloud technologies without the usual vetting procedures
- Employees are making decisions without their IT department involved.
- In most organizations, large gaps exist between which people are most responsible for vetting or evaluating cloud computing vendors, and which people should be most responsible.
- Moreover, only 20 percent of organizations reported that their IT security teams are regularly involved in the decision-making process for allowing the use of cloud services.

According to the above finding, organizations adopting cloud ERP are suggested to assess what specific, proactive steps they should take to protect sensitive information stored in the cloud. Followings are the recommendation for adopting cloud ERP.

- Organizations should ensure that policies and procedures clearly state the importance of protecting sensitive information stored in the cloud. The policy should outline what information is considered sensitive and proprietary.
- Organizations should evaluate the security status before sharing confidential or sensitive information.
- Organizations should always allow security team to participate in the purchasing and implementing processes.
- Organizations should expand their governance activities beyond traditional IT areas to better protect their business.
- Organizations should define policy of information and

applications they are willing to put in the cloud.

- Cloud computing vendors should provide more transparency into their security infrastructure.

Security topic brings up an important issue on adopting cloud ERP. The solution of providing security conveys the organizations and cloud ERP vendors.

#### VI. CLOUD VS. TRADITIONAL ERP

Traditional ERP is implemented on the platform of premises of a company's server. It provides an efficient possibility to meet organization's own business flow. On the other hand, cloud ERP defines a standard business flow for all business. As there are many cloud ERP packages, businesses can choose the one meet their business flow. Unfortunately, the flow would not be altered since after then.

Traditional ERP experience a challenge to deploying and maintenance. Traditional ERP is very much controllable by the business organizations, because it is under their supervision. Cloud ERP controlling depends on the support of the vendor. Vendor can ensure the control of ERP on behalf of business organizations.

Traditional ERP has an easy accessibility both technically and user prospect. It does not depends on internet rather intranet. Alternatively, cloud ERP depends on internet. So if the internet bandwidth is low or it's technically departed then support cloud ERP is in trouble [12].

Considering the cost effectiveness and ease of use, cloud computing is yet to prove itself as a reliable and mature ICT services model. ICT service is not only to cut the IT infrastructure costs, it will provide businesses to reap benefits from faster implementation of IT projects, improved agility to adjust to ever changing market environment and reduce IT costs at the same time [1].

The main benefit of traditional ERP is that you have total control over the system. You can make any changes that you want and switch around various configurations as needed. You can also ensure that the information is secure since it will be kept inside your own building.

Another advantage of traditional ERP is that the system will work even if you lose your connection to the internet. Your employees will have access to everything they need to perform their duties and keep the company running. All the system needs is a power source, and you can purchase a generator as a security measure.

Unlike on-demand ERP, a traditional ERP solution has a high cost of entry. You'll need to purchase a lot of expensive hardware and potentially upgrade the computer wiring at your office to handle it. That said, traditional ERP solutions have fairly low ongoing costs, so you'll probably save money over time [13].

Traditional ERP also has pretty high IT support requirements. You'll need to make sure to have a dedicated staff who can maintain the equipment and know how to fix problems if something should go wrong. So which one is the best? It all depends upon the situation. If you are a small business who has limited resources, on-demand ERP is generally the way to go. If you are a larger business who wants a high level of control, then a traditional ERP solution may be the better choice. The differences between

convectional and cloud computing is described in Table I.

TABLE I: DIFFERENCES BETWEEN CONVECTIONAL AND CLOUD COMPUTING [14]

Conventional Computing	Cloud Computing
Applications	End User cloud services
i. Client-side apps	i. Rich internet application
ii. Client/server apps	ii. Web 2.0 technologies
iii. Web interface to local server app	iii. Software-as-a-service
iv. Data and process reside on PC or on local server	iv. Data and process resides at service provider
Developer tools and techniques	App-components-as a- services
i. Client-side development tool	Internet-hosted software services
ii. Service-oriented architecture	Web-hosted development tools
iii. Composite application	iii. Community development tools for shared templates and code
iv. Proprietary APIs, Such win 32	iv. Proprietary service provider APIs and schema
Middleware	Software-platform – as-service
i. App server	i. Hosted app platform
ii. File and object stores	ii. Hosted data, file, and object stores
iii. Database	iii. Hosted database
iv. Integration server	iv. Software-integration as-a-service
Physical infrastructure	Virtual-infrastructure as- a-service
i. Server	i. Virtual server
ii. Disks	ii. Storage shares
iii. Networks	iii. Virtual LAN Configurations
iv. System management	iv. Management-as-a service

VII. DATA SECURITY AND SYSTEM PERFORMANCE

Cloud computing provides businesses an alternative to implement ERP. It saves a lot of cost for businesses. One of the biggest impediments to the adoption of cloud ERP is the data security. Reports of security breaches of credit card and personal customer data at large online companies have contributed to this concern. The good thing is that, at this time, we aren't aware of any specific case where sensitive data was exposed from a cloud ERP provider. Still, companies have been concerned that putting financial and operational information in the cloud increases the possibility of exposing sensitive data to hackers and outside entities [15].

To address this concern, cloud vendors have put significant resources into improving the security of their systems. Many cloud ERP vendors are adopting compliance with Statement on Standards for Attestation Engagements No. 16 (SSAE 16), "Reporting on Controls at a Service Organization," which replaced Statement on Auditing Standards No. 70 (SAS 70), "Service Organizations." This attest standard developed by the American Institute of Certified Public Accountants (AICPA) includes requirements for in-depth audits of internal controls over data and network security, backup and restoration procedures, and system availability.

Because cloud ERP vendors can't afford to lose data for their clients, their focus on security is typically much higher

than if you were to set up security for an in-house/on-premises solution. Nevertheless, the strategy for maintaining security varies by vendor, so be sure you review the security policies of the cloud ERP vendor before signing the service level agreement (SLA).

For larger organizations that want to take advantage of the benefits of cloud technology but are still concerned with regulatory compliance, security, and control issues, there's a growing trend to form a "private cloud." This involves a single company or group of companies with common requirements that set up a cloud to deploy software solutions that are accessed only by that private group.

VIII. THE LOGISTICS OF SECURITY

There are several basic parts to the security of a cloud service that are actually preferable to having a premise based system.

- Physical Security - The main benefit is that all data is typically stored in a hardened and secure environment. Your servers will be protected, typically in an environment that utilizes the same physical security measures as most banks.
- Electronic Security - Typically, cloud based or hosted ERP systems employ secure encrypted connections or Virtual Private Network (VPN) connections for particularly sensitive information.
- Remote Access – In the past, if employees had remote access to the accounting and bookkeeping systems they were logging in on an unsecured connection and logging into your company's premise based servers, which were typically unsecured as well.

A hosted, cloud based ERP actually solves many security issues in today's business world. The capability to remotely log in and access your ERP is a necessary component, and the fact that security measures are built in on several levels can be a valuable asset.

As current cloud offerings mostly focus on Open System or Microsoft Technologies or Linux based solutions. ERP or Applications that are running on AIX, Solaris, HPIX, etc, may not be available in the current offerings. All applications and legacy system cannot be ported directly without migration to the cloud [16]. So only few that non-critical business applications companies can move or can consider moving on the cloud whose data theft may not harm the organization in a major way.

IX. CONCLUSION

Cloud computing technologies may seem like a relatively new concept because of the rapid-fire adoption of late, but they are actually an improvement on existing concepts that have been present in business for some time. ERP is among the more logical choices to maintain in a hosted environment because of the added levels of control and security that business will be able to implement.

Is the cloud ERP right for any organization? There's no one-size-fits-all scenario. To answer it, some factors should be evaluated. They are resource availability, functional

requirements, IT infrastructure, data security, Internet connection, and the total cost. If companies require deep functionality, have specialized requirements that require customization need to maintain complete control of the software, don't have a reliable and fast Internet connection, or have a strong IT infrastructure and support, then on-premises ERP are most likely to be the best fit. On the other hand, if a company has relatively standard functional requirements, a reliable and fast connection to the Internet, a need to quickly scale up and down the number of users, or a desire to outsource IT infrastructure and support, then a cloud solution fits well [17].

On analyzing the criterion and parameters for cloud, management connectivity, security, and cost are the key driving factors. For the small- and medium-sized businesses, it is absolutely essential as cost benefit is very high in comparison to bigger organizations.

Few concerns that are at the top of implementing cloud ERP:

#### A. Data Security

It is still not very convinced with the security of the data. There is a need of a security model to convince the top management over the control of confidential information to avoid unauthorized usage of data.

Prior to deploying cloud technology, organizations should formally train employees how to mitigate the security risks specific to the new technology to make sure sensitive and confidential information is not threatened.

#### B. Accessibility

Bandwidth issues and the kind of applications running in an organization are still hampering many companies from realizing the complete potential of the cloud ERP.

#### C. Benefits of Cloud ERP

Different vendors are quoting different costs for an hour per user in a standard configuration. So, depending on the technology, applications, services, and business needs, this cost may go very high.

#### D. Uncommon Threats

The biggest challenge for IT department is the seamless integration of applications on cloud with the application running on some other infrastructure. Furthermore, it is also equally difficult to find sources with optimum skills and knowledge to ensure smooth operations or handle any discrepancy.

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