An Analysis upon Various Challenges of Cloud Computing With ERP System

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Abstract – Enterprise Resource Planning (ERP) systems are an integral component of IT infrastructure in many organizations. A recent trend for ERP is the shift from on-premises infrastructure to the cloud environment through utilization of cloud computing technologies. The characteristics of cloud computing induces many promises to cloud-based ERP systems - making 'Cloud ERP' a favourable alternative to on-premises ERP systems. However, moving ERP systems into the cloud also presents many challenges. This paper aims to evaluate the promises and challenges of cloud-based ERP systems from a review of the literature and propose a framework to be of utility for IT executives and researchers to assess the key promises and challenges of cloud environments for ERP systems. The contribution of this paper is threefold. First, we identify a set of key promises and challenges to help IT decision makers and researcher to gain a better understanding of cloud computing and ERP. Second, our framework identifies four dimensions of cloud ERP to be assessed: Efficiency, Flexibility, Ubiquity, and Security. We propose that all these dimensions encompass promises and challenges to varying degrees. Third, we propose research opportunities for IS researchers in the domain of cloud-based ERP systems based on the identified four dimensions.

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.

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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. 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 .

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 . 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. 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:

- 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.

To deploy the ERP system has three ways that is onpremise, on-demand (SaaS) and hosted. Purchasing and implementing traditional ERP system (on-premise) is always costly and difficult job for any organization and involves a great risk and consume more time. Implementing traditional ERP means deploying new infrastructure, purchasing servers, hardware and software thus it is always a costly affair for any organization.

The typical ERP system framework is shown below:

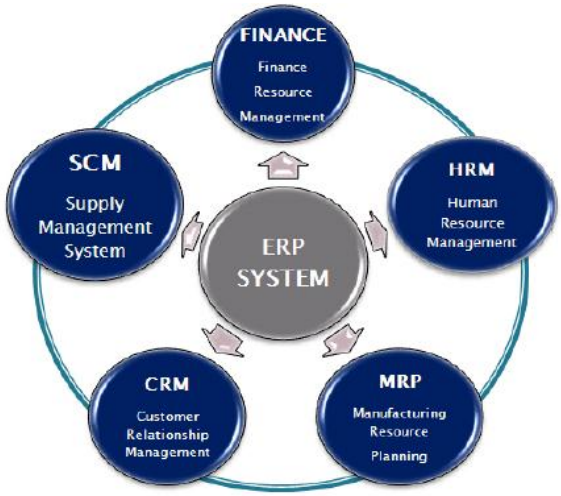

Figure 1 : Typical ERP system framework.

There are many IT companies who are in the Cloud ERP and few known IT companies are Salesforce, Microsoft, TCS, Ramco Systems, etc. TCS Cloud ERP is for the Manufacturing, Retail, Education and Wellness. Changing business dynamic, increasing competition, and globalization constantly shape the manufacturing space. Enterprise needs to produce quality products at optimal prices, for which you need to enhance product development. Integrating Information Communication and Technology (ICT) initiatives with business helps in achieving through seamless operations. Giving new opportunities by connecting extended supply chains and extracting more value from the product lifecycle, they help them to achieve the cost-efficiency. TCS solution is offered through the innovative business model – 'TCS – ION', which facilitates in innovation, customer acquisition, and revenue growth, while addressing the future ICT needs they have the following strategies:

- Provide real-time visibility and traceability
- Improve productivity
- Enhance customer service
- Informed decision-making

Cloud computing represents a state-of-the-art technology that delivers IT resources via the Internet. Organizations retrieves services from a pool of virtualized IT resources, allowing for an on-demand, pay-per-use billing model (Armbrust et al. 2010; Buyya et al. 2009). The growth rate of the market for cloud computing is forecasted to be high in the near future. The market of public cloud services is predicted to grow from US$26 billion in 2012 to US$160 billion in 2020 (Choudhary and Vithayathil 2013).

Cloud-based ERP systems ('Cloud ERP') present a new delivery model for ERP systems that is based on cloud computing technology. It aims to offer similar functionality to on-premises ERP solutions enhanced with features unique to of cloud computing. Cloud ERP is gaining popularity and causing legacy ERP system to lose market share. It has, for instance, been argued that the first-quarter sales and earnings report of SAP AG in 2014 has missed analysts' estimates due to the rise of cloud ERP systems (Ricadela 2014).

Despite the increasing impact of cloud ERP, this is still a new and emerging domain. There are only few studies conducted on the adoption of cloud ERP and on the promises and challenges of this new paradigm. Existing literatures mainly examine ERP and cloud computing as two separate research domains. For ERP systems, there is an abundant amount of studies focusing mainly on issues related to on-premises systems. For cloud computing, there are numerable studies focusing on cloud computing in general but the different types of cloud services are often neglected. Subsequently, not many studies have specifically looked at different forms of cloud applications, including cloud ERP.

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 the ERP systems failed to gain success. 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. 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 . 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.

CLOUD ERP

Cloud ERP is intended to address the rigidity of existing ERP programming by permitting organizations to pick the organization choice that fits their particular needs. Cloud ERP is an adaptable and financially beneficial choice for little and medium-estimated organizations and offers far reaching profits for development and extension. Cloud ERP is facilitated ERP on a cloud provider.

One can never satisfy the WHY? But before answering any of these questions we should know what the expense of ERP implementation is, does these expenses incorporate software, hardware, advisor, training, implementation and maintaining The decrease of these expenses relies upon the diminishment of organization's IT frameworks costs or infrastructures cost. These frameworks include software, hardware, storage, network and other frameworks. We can outsource hardware's and software's. Outsourcing is a

deposit of control, supporting and giving IT frameworks needs by some organization outside of an organization. Some of its frameworks are Software including applications, Management, Services and hardware including computing power, Storage, Backup and Networks. So for the study what we have come across is that Cloud ERP is not important but if someone is looking for a beneficial deal here it is. As Cloud based ERP profits clients by giving provision versatility and lessened equipment costs. Also, Cloud Computing technology made it simpler for cloud ERP based sites to convey our ERP programming as Software as a Service (Saas) for clients who need to procure cloud ERP and not need to oversee equipment, programming, and redesigns while lessening in advance expenditures. Clients can assemble an internal cloud to decrease continuous equipment expenses while supporting more amazing control over coordination or integration and by getting access to their data server. If this thing has so many benefits then why not one can use it and save some money and invest in some needed place. There are many ways one can have Cloud ERP, as one we have discussed above i.e., outsourcing. In outsourcing the hardware and software are given by companies outside of an organization and these organizations do all works about upholding and management. Organizations can get to these services by utilizing committed line gave by telecommunication organizations or utilizing VPN (Virtual Private Network) connection over the internet. Another way is utilizing services that are given by Cloud providers. Cloud ERP is simply an ERP given by Cloud suppliers. In corporate world, we have two sorts of Cloud ERP, in the initial one, ERP software is exhibited as an accumulation of services in the saas term. These services are called ERP on Saas, and because of the low investment cost in the service, SME's that doesn't have much to invest can use the benefits of ERP on Saas. On the other hand, we ought to think about the cut off points of this sort of services. In this sort of usage, organizations are confronted with limitation on business process re-engineering in organization and customization of ERP. It is exceptionally prescribed to do BPR (Business process Re-engineering) by utilizing service suppliers experience and principles to guarantee the organization process flow and ERP structure match. Besides, on the grounds that suppliers have entry to all authoritative information, we are confronted with security and protection issues. Some of these issues incorporate notoriety destiny imparting i.e., reputation fate sharing, access to data for a few issues like authorization and debacles. By this we can overlook the exceptionally prescribed profits of such services and further we suggest a few parameters for organization to help them pick what sort of services they can pick relying upon their points of confinement and obligations. Around a few organizations that give these services we can name SAP by design, PLEXONLINE, Sale force, Infor and NETSUITE. There are many ways to implement cloud ERP in which there is a method where ERP is implemented on Iaas offered by Cloud service providers. In this circumstance, such service could be placed topographically inside an organization or set up at that place where implementer or supplier is hosted. But it have its own pros and cons like if we placed it inside the organization then they will have high security and accessibility yet then again, the organization is confronted with high expense of implementation and maintenance. In this type of situation where the organization or Enterprise needs high security as they have so many branches to connect, then this is really effective. Whereas there is another way in which ERP is hosted by the providers, we acknowledge security concern to decrease the execution costs or implementation cost. In both ways, in light of the fact that of utilizing Iaas, ERP license ought to be purchased by the organization and implemented by implementers, so that customization and adaptability will be increased. In most organizations that give this kind of services, ERP additionally will be given.

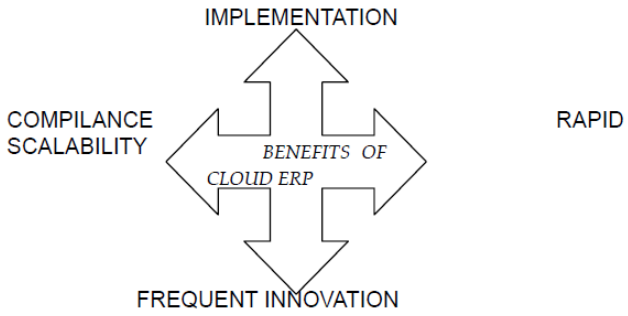

FIGURE 2: BENEFITS OF CLOUD ERP

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 . 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 :

- 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.

CHALLENGES

In this section, we will discuss the challenges brought by shifting ERP systems into a cloud-environment. These challenges stand as barriers to the adoption of cloud ERP. Our investigation of cloud ERP challenges. Specifically, we will look at ERP challenges, cloud computing challenges, and cloud ERP challenges.

ERP Challenges -

Despite the increasing use of ERP for organizations, some long existing challenges of ERP make the adoption of ERP often a difficult decision. This section presents the key challenges of ERP that we found in the ERP literature. Specifically, we discuss how software functionality can mismatch the requirements of the business (Challenge 1), and the complexity involved in the implementation process (Challenge 2).

Challenge 1: Software Design Misfits - It is often discovered during implementation of ERP systems that there are gaps between the functionality offered by the ERP software package and the requirements of the business. These gaps are often described as software design misfits (Ng 2013; Soh et al. 2000; Wang et al. 2006). These misfits are often associated with failures in understanding business requirements and managing change appropriately, and the complexity of ERP systems amplifies the impact of software design misfits. Poor estimation and lack of an effective methodology in the system design phase lead to cost and time overruns. For example, a study conducted in a hospital revealed that the patient management module of the hospital's ERP system did not have the required billing and collection functionality. An add-on module for patient management had to be developed at a later stage to resolve this issue, which incurred cost and time overrun.

Challenge 2: Complex Implementation Process - Software design misfits are one of the many examples of the potential issues during the implementation of ERP projects. ERP implementation is often very expensive and time-consuming, often involving significant capital investments and drastic changes to existing business practices. Failures in ERP implementation often cost organizations millions of dollars. For example, a former $5 billion drug distributor, FoxMeyer Drug, went bankrupt in 1996 due to failure of implementing ERP software package. FoxMeyer Drug filed a $500 million lawsuit against SAP claiming the ERP software package was a significant factor of the firm's financial breakdown.

Cloud Challenges -

Cloud computing is an emerging and not yet a fully mature paradigm. A large proportion of existing studies on cloud computing are thus conducted to identify or address varies issues and risks embedded in the adoption of cloud computing. This section presents the key challenges of cloud computing that we found in the cloud computing literature. Specifically, we discuss why security controlled by third party is a concern for organizations (Challenge 1), how vendor lock-in affects the organization (Challenge 2), how cloud services perform inconsistently (Challenge 3), and why poorly defined service-level-agreements (SLAs) can be hazardous for organizations (Challenge 4).

Challenge 1: Security Controlled by Cloud Services Provider -Security is one of the main issues that companies are concerned about in regards to cloud computing adoption. In particular, maintaining security in access control, privacy, and identity management has become a priority for companies considering the adoption of cloud computing (Takabi et al. 2010). The resource sharing nature of cloud computing means activities in the cloud are hard to trace in the short-lived virtualized environment- especially when users have no control over the physical location of data.

While security is one of the main considerations, there are many other aspects that organizations consider carefully when they are selecting the cloud services provider. This is partly due to the fear of switching cost incurred in the case

that they wish to change to other cloud services providers. Organizations often see vendor lock-in as a major issue to the adoption of cloud services. Vendor lock-in in cloud computing occurs when users of cloud services find it difficult to transition to an alternative vendor, usually due to the proprietary technology of a particular cloud service (Hofmann and Woods 2010). Crucially, data in the cloud is usually stored in a proprietary format and cannot be exchanged with other cloud services. Thus, companies often stay with a cloud services vendor to avoid switching cost. Organizations also have to consider whether the vendor will operate in the long term to support continuous provision of cloud services (Hofmann and Woods 2010). For example, Amazon's Dynamo service stores data in a proprietary format. The data can only be processed by Amazon and cannot easily be transferred to another vendor.

Challenge 3: Unstable Performance - In order to avoid switching cost, organizations are very careful about the selection of their cloud services providers and the performances of the cloud services is one of the key measures that organizations assess. Performance in cloud computing refers to the availability, reliability, speed, and outage risks of cloud services. Performance variability is an issue which is often neglected in discussions of cloud computing. However, it has been shown that performance of cloud services is often unstable at different time of the day. Cloud services providers are also not yet capable of guaranteeing high availability. This can be a critical factor for high turnover, international businesses for which even 99% or 99.9% uptime holds the potential of possible enormous losses. These factors indicate that cloud computing is not yet capable of delivering performance on par with on-premises solutions.

Challenge 4: Poorly Defined Service-Level-Agreements (SLAs) - The above mentioned challenges such as security controlled by the cloud services provider, and unstable performance of cloud services can potentially create many problems for organizations. Therefore, the cloud service user and the cloud services provider need to have a legally binding contract that contains essential guarantees for companies to use and be able to rely upon the services. These legally binding contracts are referred to as Service-Level-Agreements (SLAs). The lack of a well-established SLA can result in cloud service providers denying responsibility when conflict or issues arise (Marston et al. 2011). At the current state, SLAs often provide very few protections to the clients.

Challenges of ERP in the Cloud -

Most of the individual challenges for ERP and cloud computing discussed above naturally apply in an environment where both of these paradigms are merged. Referring to the challenges discussed before, software design misfits, complex implementation process, security controlled by cloud services provider, vendor lock-in, unstable performance, and poorly defined SLAs are all embedded in the cloud ERP model. However, there are a number of challenges which are particularly accentuated in a cloud ERP environment. We will discuss two such challenges in this section; specifically why customization (Challenges 1) and integration (Challenges 2) are difficult to achieve for ERP in the cloud environment.

Challenge 1: Standardized Software Packages not Easily Customizable - Cloud ERP solutions are often difficult to customize as they come in standardized packages. Customization in cloud ERP refers to the degree to which the software packages are customized to fit the specific requirements of the organization. The cloud infrastructure is owned and management by the cloud services provider and the users have thus very limited control over the system (Peng and Gala 2014). Therefore, cloud ERP may not be suitable for companies with very specific requirements. For example, existing cloud computing platforms are not designed to accommodate specific requirements such as having distributed data centres at specific locations. This kind of requirements contradicts with the characteristics of cloud computing of having a centralized infrastructure.

Challenge 2: Integration Impaired in Strict Cloud Environment - The high level of standardization in cloud solutions not only limits the customizability of cloud ERP systems, it also makes integration of heterogeneous services very difficult. The cloud infrastructure is owned and managed by the cloud services provider and systems can often only be integrated if the cloud provider explicitly supports this.

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 . 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.

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 .

Previous researches have questioned the suitability of the monolithic standardized software packages for accommodating the diversity of complex organizations (Berente and Yoo 2012; Wagner and Newell 2004). Our paper explored cloud-based ERP systems, which are arguably more standardized and regulated than legacy ERP systems. Do these systems offer promises to organizations which outweigh their limitations? Our research indicates that, overall, this can be the case but that caution must be exercised in adopting cloud ERP – caution both in assuring that the benefits of this technology are realized and that challenges and risks are mitigated.

The contribution of this paper is threefold. First, we have identified a set of key promises and challenges for cloud computing, on-premises ERP, and cloud ERP. These promises and challenges help IT decision makers and researchers to gain a better understanding of what the benefits and drawbacks are for cloud computing, on-premises ERP, and cloud ERP. Second, we have synthesized the key promises and challenges into a framework. The framework provides an overview of the key dimensions of cloud ERP. These dimensions can be utilized by IT executives or researchers to systematically assess the promises and challenges of cloud ERP systems. Third, we have suggested a set of research opportunities in the field of cloud ERP.

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