

Cloud Enterprise Resource Planning System

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Abstract: Due to continual innovations, information technology (IT) is rapidly changing. One emerging IT technology is cloud computing. The phenomenon of cloud computing changes the way IT departments work and the way businesses consume IT systems in specific Enterprise Resource Planning (ERP) systems. This has led to the need for research in the cloud ERP system field that can study cloud ERP system adoption in companies. This research studies cloud ERP system adoption factors, advantages, and disadvantages. It aims to: (1) develop a clear image about the cloud system, (2) establish a level of understanding about the cloud ERP system, (3) establish a level of understanding about the cloud ERP system adoption, (4) study the cloud ERP system's advantages and disadvantages, and (5) study the influential factors that affect cloud ERP system adoption.

To answer the research questions and fulfill the aims of the investigation, a quantitative and qualitative research methodology was adopted. Interviews were conducted with a focus group for two enterprise types: (1) enterprises that adopted the cloud ERP system, and (2) enterprises willing to adopt the cloud ERP system. The importance of having two sample groups is to gain companies IT expert experience in adopting a cloud ERP system and an in-house ERP system, and then differentiate between them. A survey was distributed to 150 participants. The study results reveal the reasons for adopting a cloud ERP system and the factors that can influence a company to adopt a cloud ERP. The two top reasons for adopting a cloud ERP were to: 1) improve system efficiency and performance, and 2) to integrate the mobile system. The results also reveal four main advantages of a cloud ERP system: 1) using advanced technology, 2) system accessibility and flexibility, 3) focus on core business activities, 4) deliver best practices, and 5) improve business efficiency. Lastly, the results illustrated that the two primary cloud ERP system disadvantages include additional costs and security risks.

Keywords: ERP, cloud system, cloud ERP system, SLA.

I. INTRODUCTION:

Enterprise Resource Planning (ERP) is the backbone of many industries that understand how to be competitive. ERP is the basis for understanding core

business functions as an integrated whole. ERP processes provide business intelligence that drives hiring and management practices and offers essential feedback on how well an enterprise is functioning. A better understanding of consumer behavior and concerns can be the difference between being a business leader or being out of business. ERP has always existed. However, in the early days, it consisted of a set of manual, instead of automated, processes.

A brief history of Human Resource Management software (HRMS) software describes an early component of automated ERP. Early HRMS vendors included Oracle and JD Edwards. They supported recruiting, internal training programs, payroll and reporting (1).

Medium sized companies can make use of cloud ERP to obtain the information-based power that was previously only available to very large companies. Existing ERP applications can be made significantly more powerful by adding mobile cloud technologies and business intelligence functionality. Smaller companies can access and manage large-scale data, allowing them to make better informed business decisions more quickly. Remote workers can access critical information, expanding access to core business intelligence to all participants, no matter where they are. The incorporation of cloud ERP brings two significant improvements to adopters: 1) cost, 2) operational efficiencies and 3) 24/7 real-time collaborative access to customers, vendors and partners (2).

Companies of any size, that are considering a move to the cloud, need to do so with careful consideration to be successful. Company size, solution complexity and security needs must be analyzed, as they relate to cloud porting. Significant factors in successful cloud-based ERP systems include size and complexity. As size increases, the complexity also increases, while the likelihood of implementation success decreases (3).

The cloud brings major improvements to the ERP. These improvements include mobility and its benefits, data analytics, collaboration and sharing in government and industry. A secure private cloud can be used for highly regulated and sensitive data. Virtual development test environments require payments to use the price model. The main barriers to ERP migration are security and incompatibility with multisource systems.

The adoption of the cloud infrastructure and cloud software has already taken place throughout the public sector and includes highly regulated Electronic Health Records. Cloud services and infrastructure has become a major US export (4).

II. RESEARCH OBJECTIVES:

Research objective are the following:
 To assess the success and aggregated factors that influence cloud ERP system adoption.
 To examine the relationship between cloud knowledge and cloud ERP adoption.
 To identify the most significant advantages and disadvantages of cloud ERP system adoption.

III. RESEARCH QUESTIONS:

The purpose of this thesis is to answer the following research questions
 What are the success that have been achieved and the aggregated factors that influence cloud ERP system adoption?
 Is there any relationship between user cloud knowledge level and cloud ERP system adoption?
 What are the most significant advantages and disadvantages of cloud ERP system?

i. SCOPE:

This research focuses on cloud ERP system adoption. The scope of this research involves an examination of the advantages and disadvantages of switching to a cloud ERP system, as opposed to using an in-house system stored on the company’s own computers. An examination of whether cloud ERP systems are the solutions to improving system functionality will also be examined. Furthermore, the research will focus on examining cloud ERP understanding through surveys and interviews with a variety of participants.

ii. IMPORTANCE OF THE RESEARCH:

This research will play a significant role in the decision-making process of companies in regards to the adoption of cloud ERP systems. It will guide companies through the advantages and disadvantages of the system. In addition, it will help the companies to analyse the challenges and benefits involved with the adoption of the system. Furthermore, it will support decision makers in determining if there is a good fit for a cloud ERP system in their company.

This research will play a significant role in the future development of cloud ERP systems and in understanding the decision procedures involved in the migration process. It will serve as a source of information for companies who wish to employ and improve their ERP system and who are considering the cloud approach as an option. Moreover, this research will play a significant role in the future development and adoption of cloud ERP systems.

iii. LITERATURE REVIEW

ERP system background:

The ERP system is a famous widespread solution in business. It has verified the integration and automation of processes, performance improvements, and cost reductions. This integrated system has made organizations keep up to speed with manufacturing processes and move from a product-centric focus to a customer-centric focus. ERP systems produce flexible and adaptable processes that sustain organizations diversification strategy and ensure faster responses to reach business needs (5). ERP is business management software that is designed to integrate the data sources and processes of an entire organization into a combined system. It gives organizations and companies an incorporated real-time view of its core business processes (e.g., production, planning, manufacturing, inventory management, development). ERP software is super multi-module application software that integrates activities across functional departments, from production planning, parts purchasing, inventory control, and product distribution to order tracking. In addition, ERP software allows for the automation and integration of business processes, by enabling data and information sharing to reach best practices in managing a business process. ERPs have different modules that run a variety of business activities (e.g., finance, accounting, human resources, supply chain, customer information) (6). The ERP system combines business functions to run in a unique database that is used to share information and accurately communicate. It has become highly important for internationally supporting business functions and operations. The ERP system has assisted many organizations to reach globalization, face challenges, improve productivity and improve business strategies (7). The Following figure shows an overview of ERP models.

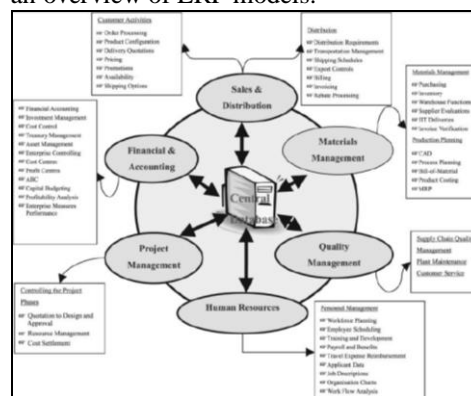


Figure 1: ERP system model

ERP system evolution:

ERP system evolution started in the 1960s. The ERP system’s roots are in the Inventory Control (IC) system. At that time, companies wanted a solution to control their inventory process and a standard inventory system package to manipulate their

inventories (8). In the late 1960s, Material Requirement Planning (MRP) was born. MRP was developed by a manufacturing company partnering with IBM. MRP was needed as a primary technique for planning and scheduling complex manufacturing materials (9).

In the 1970s, Material Requirement Planning (MRP) Systems were developed for product planning. This was an immature system. MRP systems were very expensive and required large numbers of employees and technicians. In 1972, the SAP Company was developed by five German engineers to create standard market business solution software. In the mid-1970s, there was a major ERP software company evolution. This evolution began with Oracle, Baan, IBM and SAP. The Baan Company was established to provide ERP financial and administrative services. Oracle was involved in ERP and SQL relational database management systems.

In the late-1970s, Manufacturing Resource Planning II (MRP II) was developed to be a flexible cost alternative to MRP. MRP II adopted a new market strategy for an increase in production, manufacturing, and planning (8) (9). In the 1980s, MRP II was used to emphasize optimized manufacturing processes to form a character-based ERP. MRP II formed a great strategy for process control, manufacturing, planning, and reducing costs. In the late 1980s, many ERP vendors started to implement MRP II systems (e.g., IBM, UNIX). From 1981 to 1984, ERP vendors reasonably implemented the MRP II system to make it multi-user and flexible, as well as to be used on different computers.

At the end of the 1980s, Computer Integrated Manufacturing (CIM) framework was established to form the structure of the main ERP models. This framework was integrated to facilitate and simplify information management for all organizational levels and functional areas (e.g., marketing, engineering, research, production, planning, physical distribution, business management) (9) (10).

In 1990, based on MRP and MRP II, the ERP system was developed as a Client/Server ERP to integrate business processes (e.g., manufacturing, distribution, accounting, finance, human resources, project management, inventory management, transportation services). In the mid-1990s, the ERP system reached a maturity phase in which the ERP continued to be developed for all organizational levels and areas, both in the front office and the back office. ERP started to form an entire organizational environment that was extended to reach an organizational competitive advantage (10).

In the late 1990s and early 2000s, the ERP Client/Server environment expanded to move to a Web server and deliver consistent processes. The ERP Market was originally dominated by large vendors (e.g., SAP, Oracle, and Microsoft). Many ERP vendors had a strong presence among the small to mid-sized enterprise market (e.g., Sage, SAP,

Oracle, Microsoft, Dynamics, NetSuite, EPCOR, UNIT4 Business Software, Open bravo). Most of these ERP vendors still exist today in the ERP market. Some reached a potential growth level (e.g., SAP, Oracle) (10).

The beginning of the web environment made ERP vendors utilize and extend the legacy ERP system and develop an extended system that advanced the business modules. The web and the internet formed a new solution to the ERP environment. It improved ERP business functions and modules. ERP systems reached intensive growth in 1999, where major small to medium sized enterprises adopted the new ERP systems that were offered. This introduced ERP to a new century that removed legacy systems and used ERP systems as a business solution (10) (11).

In 2000, enterprises determined the need to enable customers to observe products through the internet and make decisions faster and easier. Furthermore, enterprises wanted to reach higher quality transactions and lower prices. Therefore, the ERP system implementation introduced new business models that enabled both suppliers and customers communication and satisfaction. ERP systems elaborated to be ERP II with supply chain management (SCM), customer relationship management (CRM), and E-business models. ERP II created a new generation of ERP systems that simplified the new business challenges and opportunities (11).

ERP II formed a standard system concept that ERP vendors adopted. This concept contains the role of ERP II, business domains, business functions, business processes, system architecture, data processing and handling. ERP II was defined by the Gartner Group as "a business strategy and a set of industry-domain-specific applications that build customer and shareholder value by enabling and optimizing enterprise and inter-enterprise, collaborative-operational and financial processes"(12). Furthermore, the ERP II concept extended the business processes idea and implemented it in a way that manages, executes, evaluates, and redesigns processes effectively. Consequently, the business process management concept emerged to be a new business practice ERP model (12).

In 2001, the ERP market was highly affected by the occurrence of the 9/11 terrorist attacks in the United States and ERP demand decreased. In 2002, ERP systems were implemented to be accessed by different customers and suppliers internationally by using the web. In early 2004, a new ERP architecture "Service Oriented Architecture (SOA)" evolved to enable multiple system communication. The SOA architecture became a standard for ERP vendors to process business functions through it smoothly. From 2003 to 2005, ERP systems faced many system alliances between vendors. Competition in the ERP market occurred. ERP

vendors continued to develop new ERP software. SAP, Oracle, Inform, and Microsoft were the main key players in the ERP market at that time (11) (12).

Cloud computing:

Nowadays, cloud computing has become a leading model in the information technology (IT) field. It has transformed the technological environment for many organizations. Cloud computing is a recent technology that offers convenient access to on demand network sharing resources. This technology is configured through a network pool of computing services provided to users (e.g., servers, storage, backups, networks, applications, security). Cloud computing is a combined resource of services. These services are located on one site, which may be outside of the organization. These resources include hardware, software, and services. In this technology, there are different models available. The model that is used depends on the characteristic services provided and the deployment method (13) (14).

Many definitions currently exist for the cloud computing concept. Based on the U.S. National Institute of Standards and Technology (NIST), cloud computing is defined as: “ a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction” (15).

Cloud services are based on the applications, systems, software, and hardware resources at the organization. Whether cloud computing takes place inside or outside the organization to form a cloud service depends on the organization. There are different cloud types and cloud techniques that depend on the organization’s factors (15) (16).

The main concept of cloud computing is to reduce IT service costs, increase processing outputs, decrease processing times, and increase reliability, availability and flexibility. Cloud computing offers IT enterprises and organizations an opportunity to improve their conservative with old IT environment into new technology environment (15) (16). Cloud computing architecture:

This part will study cloud computing architecture by describing architecture layers.

According to, cloud computing architecture consists of four main layers which are Hardware, Infrastructure, platform, application layer as shown in the figure below (17).

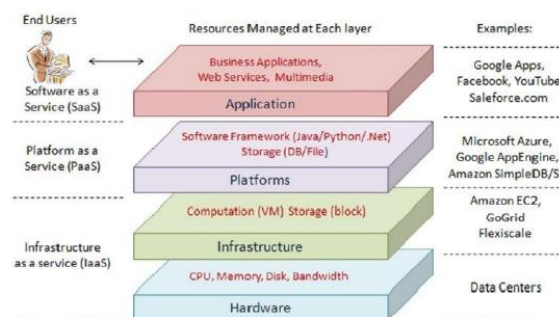


Figure 2: Cloud computing architecture

Hardware layer: this layer is responsible to manage cloud physical hardware resources such as servers, switchers, routers, power, and cooling system. Hardware layer is also called data center because it offers thousands of servers to be placed and organized. Main challenges in this layer are configuration, traffic management, power and cooling resource management.

Infrastructure layer: this layer is responsible is to generate storage pool and computing resources by separating physical resources through using virtualization technology. Infrastructure layer offers high support to cloud computing flexible characteristics such as dynamic resource assignment.

Platform Layer: this layer plays an important role since it is built on top of infrastructure layer. It includes operating systems, programming languages tools, and application frameworks. Platform layer play a midway role between application and virtual machine containers to minimize deployment applications experiments.

Application layer: this layer is the tops layer in cloud architecture and includes all cloud applications. Cloud applications influence dynamic scaling of cloud infrastructure to accomplish high cloud performance and low operating cost (17).

In summary, cloud architecture layers are designed to be coupled in order to work together to achieve high cloud compatibility.

Cloud computing features:

Cloud computing have five main distinguished features which are (18) (19):

- Lower entry cost

Investments in most cases are rented due to high system cost

Lower marketing time

Cloud hardware structure contains same hardware resources

Distributed cost because of application development

- Optimized response Time

structure optimized to meet customers need

Direct customer usage of cloud, resources, and service provided, it lead to lower processing time.

(18)

- Lower infrastructure and design risks

Infrastructure cost in in public cloud is covered by the service provider
Private cloud work load are transferred to public cloud

Customers have only to pay for services provided not for the cloud structure and design. (19)

- Higher innovation

Lower production time
Corporates with small companies to work actively and deploy services in data centers for enterprises.
Reduce new products cost
Cloud information system knowledge helps to improve manufacturing quality.

- Lower runtime

Reduce run time because of high number of servers that runs in parallel
Cloud computing process can be increased based on organization service request which will make all resources connected to the cloud to be used in faster access and run time.

Cloud deployment model:

Cloud types are based on organization service provided, hardware structure, software structure, application use by the organization, and customer need.

Cloud system based on deployment models (20) (21):

Public cloud: this type of cloud is public to be used by different users externally for different needs. Public cloud usually activated by an account the user creates then enjoy using cloud. Some public cloud vendors ask for payment in order to use the cloud (20) (21).

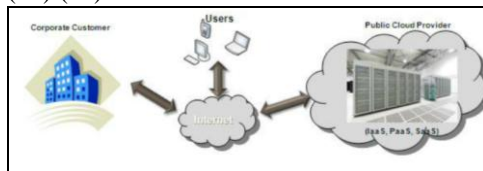


Figure 3: Public cloud model

Private cloud: it's a private cloud that is owned by an organization that can manage and operate the cloud. This type of cloud could be hosted internally in the organization or outside the organization. Private cloud is controlled only by the organization and no public users can access the cloud (20) (21).

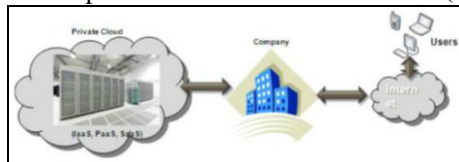


Figure 4: Private cloud model

Hybrid cloud: this cloud type is combination of one or more cloud type that is called hybrid. It can be used for different purposes such as the cloud

technologies used in universities by staff and students for large operations processes (20) (21).

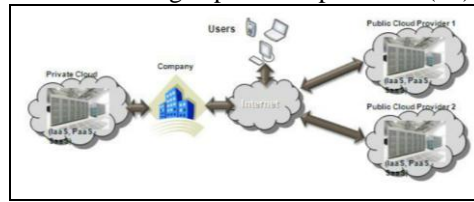


Figure 5: Hybrid cloud model

Community cloud: This cloud is a cloud that is shared by number of organizations or communities with shared interest. Community cloud offers users to share different resources and information that can be managed by an organization or third party (20) (21).

Service based cloud computing models:

SaaS (software as a service): SaaS is a computing module method that delivers computer programs for various users over the internet. It provides wide variety of software tools to the users. In this model, cloud is controlled, managed, organized by the provider while users don't have any control over structure and configuration. SaaS main advantage is remote software accessibility from any location (22) (23).



Figure 6: SaaS cloud service model

PaaS (Platform as a service): PaaS is a computing module that enables customers or users to have a platform that match their needs. This cloud service creates a platform access to users with multiple services agreements. Service provided are controlled and managed by the provider while the service configuration is done by user (22) (23).



Figure 7: PaaS cloud service model

IAAS (Infrastructure as a service): IaaS is a computing module that provides service to users

through cloud based infrastructure. Services provided such as storage, resources, network capabilities that client need according to the resources. In this module the cloud is controlled by cloud vendor or host on which client can't manage or control system configuration. IAAS usually is used by developers or IT organizations to deliver better business solution that enables computing resources (22) (23).

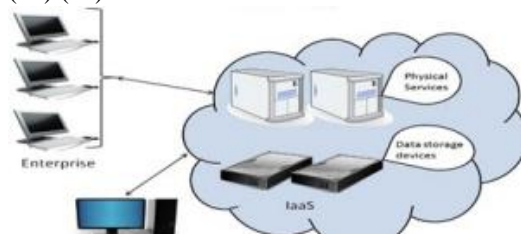


Figure 8: IaaS cloud service model

All above service models services different customers and cloud access will be based on the agreement between cloud vendor and customers. The following figure shows the difference between cloud computing service modules

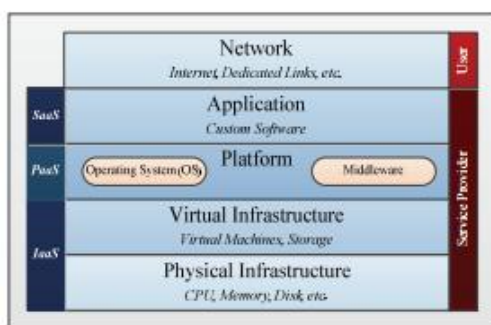


Figure 9: Cloud computing service models

Cloud computing essential characteristics:

Resource pooling: this cloud computing type is used as multi-tenant module that can serve multi users with integrated resources. It is mostly used for large data processing, as storage or memory, and for network bandwidth. Resource pooling cloud location is independent on which clients may not know the service provider location (24) (25).

Measured service: this cloud computing type is used for high competences and standards to work in high level of services such as memory or storage, and high speed backup. This cloud is controlled and managed by both consumer and provider with high level utilization transparency (24) (25).

Broad Network access: this type of cloud provides a service with standards to be accessed over the network by using mobile, PDA, or laptop devices. It is considered as client-server platform that is used for mobile phone network system (24) (25).

On-demand self-service: this type of cloud computing is considered as automatic cloud techniques on which consumers and service provider will not interact together. Cloud is managed automatically to be abled or disabled based on

consumer demand. This cloud type is mostly used for system backup on which organizations set time and date for the back up to be done on-demand automatically. Moreover, this cloud type is used for extra processing power as high powerful computing (24) (25).

Rapid elasticity: this cloud computing type is delivered by elasticity rapidly or sometimes automatically. It provides a scale out and scale in service rapid form that can be used anytime and as much as needed (24) (25).

Based on the last parts review, the following parts will study in details about why to move to cloud computing technology (2.5), cloud-based ERP system (2.6), Advantages and disadvantages of moving to cloud-based ERP system (2.7), and Cloud ERP security (2.8).

Why to move to cloud computing technology?

IT infrastructure costs are highly increasing. This cost includes maintenance, which is expensive. Cloud evolution has decreased the cost of IT and increased the cost efficiency (26). The cloud environment has more IT infrastructure flexibility, because of the many deployment modules. Nowadays, cloud technology has become a must in many organizations. It enables these organizations to keep up with the technological changes. The numbers of cloud adopters have increased. Before cloud adoption, the main concern was cloud security and accessibility (27). These two concerns have been solved, as each cloud module has its own security and data accessibility features.

As a result of cloud computing, IT requires less hardware. Three important cloud computing features include the following (28):

Cloud computing resource capabilities enable users to plan and worry about resource utilization and availability.

Cloud users do not need to make or sign any commitment to use the resources. Cloud service providers have to provide the details of the service delivered.

The cloud computing characteristics of on-demand services and elasticity provide users with another service: pay-per-use. This service provides users with cloud demanded services for a short period of time.

Advantages and disadvantages of moving to cloud based ERP system:

Some ERP customers feel that SaaS is not reliable enough yet for their mission critical systems. Despite this, numerous retailers are using SaaS-based products to take advantage of intelligence-based ERP applications, especially those with enterprise mobility and analytics capabilities (32). Businesses that do not move to the cloud may be left behind by their deficit of business intelligence.

The cloud, as a Process Reengineering Platform, addresses the cloud-based ERP reengineering. ERP in the cloud is likely to require significant business process reengineering. The cloud offers two significant technological advances that transform ERP: enterprise mobility and business analytics (33).

Advantages:

Flexibility:

Cloud remote access and mobile access feature add a great advantage to cloud usage and service level. In addition, cloud resource pool is available to be accessed by multi users at the same time. Cloud service flexibility to be accessed using mobile applications empowers organizations to innovate market (32) (33).

Optimized:

Optimum time management of files and data where they can be shared, saved, and transferred in few minutes through high processing (32) (33).

Reduction in cost:

This is one of the main advantages of cloud computing technology. Cloud is considered as cost-effective and cost-flexible as it decreases software and hardware. This provides cost power to organizations where they will never think about hardware devices only they need to host cloud. Moreover, cloud computing enables organizations to save license, help desk, and support fees (32) (34).

Using latest Technology:

Using cloud computing provides organizations great value to be using latest IT technology. Using latest technology and on-demand technology increase market and leverage business need (32) (35).

Storage capacity unlimited:

Using cloud computing provide unlimited storage capacity based on the user need. This advantage is the most essential one since companies need servers, infrastructure and hard drives but cloud can offer them these over cloud (32) (35).

No maintenance:

Companies using in-house ERP system used to have high maintenance cost and regular maintenance has to be done in time. By using cloud ERP system, the service provider will be responsible about the cloud system maintenance in case of upgrade or launching new system and it will be done automatically. This provides the company an easy way to upgrade or maintain anything in the system in time (32) (34) (35).

Disadvantages:

Disadvantages of Cloud ERP Systems are that cloud based ERP systems have been adopted enthusiastically by industries, as they represent an alternative to their internal ERP applications. These technologies offer many solutions for the industries that adopt them, but there are also many challenges. An interview that involves sixteen ERP and cloud consultants identified economic and technical benefits, but found that cloud ERP adoption can be

affected by challenges that are specific to each organization, as well as the legal and technical complexity of the cloud environment (36).

Companies that adopted cloud ERP system faced at the beginning main challenges and by time they figured that these are the disadvantages of the system. Main disadvantages are the following (36) (37) (38) (39) (40):

Addition cost

Cloud ERP offer many solution for different companies. In terms of cost, cloud ERP cost is less in terms of maintenance and IT resources but higher in terms of security and data privacy. Furthermore, cloud ERP system may offer additional cost while using the system such as maintenance, upgrade, security, bigger storage, and server (36) (37).

Security

One of the main issues of cloud is security. Companies adopting cloud ERP system have to make sure of full knowledge about anything related to system security so that they don't lose trusted data. Therefore, companies must know that their data will be in third part system that should be highly secure. The main issue was in many companies is choosing not well known service provider which can cause losing data security. Switching to cloud mean open network that may have many drawbacks that companies should be aware of (37) (38).

Limited customization

Cloud ERP system service providers provide companies with standard systems that not always can be customized. This is because cloud ERP is more complex than in-house ERP which means any customization can be expensive. Cloud ERP has limited customization users can not specify anything that service provider does not have it (39) (40).

Influence factors of cloud ERP adoption:

As a main part in this study, is to focus on influence factors for cloud ERP system adoption. Many researchers have identified factors that influence companies to adopt cloud ERP system. According to (), cloud ERP system adoption affect companies in both ways positive and negative. The following are main factors identified:

Lower cost

According to (41), company expenses to implement cloud ERP solution is reduced compared to in-house ERP. Cloud ERP implementation require IT infrastructure investments to build the main server, operating system and databases needed. In 2016, a research showed that in-house ERP system implementation cost 30 percent more that selected system budget (42). However, according to (43) implementing cloud ERP system lower 35 percent of the system cost to impact potential need in companies. Furthermore, cloud ERP system lower operational cost such as maintenance, update, upgrade, or configuration. In specific all operational

cost that companies used to pay individually will be done by the service provider which lowers the overall cost (42). According to (43), having an outsource maintenance and system management lower the IT cost in terms of staff which reduce the number of employee needed.

System availability

As cloud ERP system has an important feature which is resource pooling that offers various computing resources. This feature makes system resources available all time and propose a solution that can solve resources need (44).

System flexibility

Flexibility factor is one of the main factors that affect cloud ERP system adoption (42). Cloud ERP system provide users flexible system with various models to improve system operations. Service providers have many solutions such as pay per service or full system package (43).

Fast deployment

Cloud ERP system are not a complex system with complex functions that take time to be deployed (43). Cloud solution provides faster implementation process. Implementing cloud ERP system does not require install or test deployment since it is done over a fast internet connection. According to (44), a company used to have in-house ERP system when they implemented cloud solution they figured that deployment was faster and easier.

Enhance business focus

Using cloud ERP system were service provider manage maintenance, resources, and outsource management will make the company IT department focus on main functions. In this case, IT staff and managers will have time to spend on developing the company and focus on improve performance (44).

Accessibility and mobility

Using cloud ERP system offers system service accessibility through mobile and web interface in any place. Users of cloud ERP system work from any place and no need to be in the company to open the system. This factor enhances the system usability and ease of use (43) (44).

Cloud ERP security:

Security is raised as an issue. When enterprise function is moved to cloud there is loss of control. There is IT security risks and business risks. IT security managers need to reevaluate how they classify applications and data based on level of risk and understand the ability of cloud providers to meet their security requirements. When companies choose cloud based ERP, they are making a decision to trust a third party with their sensitive information (45).

Security concerns were found to be a challenge in the adoption of cloud-based ERP systems. However, as these issues are being resolved, more companies are beginning to develop hybrid systems that allow them to keep a portion of their data private, while allowing public access to other sets of data (45).

Information on cloud-based ERP systems and their implementation is limited due to the fact that there are few of the systems currently being used. Some companies are considering adopting them in the future, but there are a few case studies upon which to base decisions (45) (46).

However, one of the biggest challenges and barriers to adopt cloud ERP system is system security (46). In order for companies to adopt cloud ERP system they have to make sure that cloud offer same in-house ERP level or higher in terms of security. According to (47), the risk of security is almost the same in cloud and in-house ERP but companies need to understand cloud need and usability. Nevertheless, service providers are trying to improve their security by SLA agreement that can be determined and configured by the user (46) (47).

Related studies on moving ERP system to Cloud based ERP system:

Nowadays, Enterprises are seeking to use recent IS Technologies. Cloud Technology as a famous trend is highly catching enterprises need. Cloud ERP systems are constantly replacing traditional ERP systems through its ability to reach high feasible and reliable ERP system over the cloud. This part will introduce recent related studies on Cloud ERP adoption in Enterprises. The most important point that will be taken into consideration in this part is factor need to consider while adopting cloud ERP and factors influence adopting cloud ERP system (48).

From previous study (49), it was found that cloud ERP system is getting more attention on which ERP vendors started to introduce and integrate cloud ERP system. This was shown through survey that was done to insure the acceptance of cloud technology between ERP vendors. Major ERP vendors started to establish an innovative cloud ERP system. This is due to cloud compatibility as an Information System with ERP system. According to (50), moving to cloud ERP system makes system reach high feasibility and scalability.

A number of researches have been done to draw a study of cloud ERP adoption. These studies (50), (51), and (52) have tried to compare aspect of traditional ERP and cloud ERP architecture. It was found that cloud ERP architecture implementation cost is lower than old traditional ERP implementation. Furthermore, cloud ERP provides competitive advantage to the enterprise much more than ERP system. Merging ERP in to cloud help to reduce expenditure and implementation cost through proposed framework. This framework is a multi-instance framework that constructs high knowledge and service to the users. According to [32], the strongest motivation to any enterprise to move to

cloud are cost saving and less in-house skills required for maintenance and system support. These two studies (50) and (51) showed that cloud ERP system deliver mature system that has great functionality and ability. Moreover, showed that cloud provide solutions to improve overall ERP efficiency.

Most of the studies at the beginning they had potential concerns of adopting cloud ERP system. These concerns are reliable access to internet, security and data privacy. There are many factors that need to be taken into consideration before adopting cloud ERP system.

Based on these studies (52) and (53), factors that have considerable effect on adopting cloud ERP are cost, security, and privacy. Cost and security are important factors to consider while adopting cloud ERP. Therefore,

According to (53), cloud ERP system adoption need to be done accurately in order to achieve the highest advantage and performance. This study showed different factors that need to consider while adopting cloud ERP system.

According to (52), (53), and (54) different factors that need to be considered before adopting cloud ERP were shown which are:

Organizational factor

This factor includes why the enterprise wish to move to cloud and what are the dimension and condition that the enterprise seek to implement and improve.

It is very important for any organization to check their objectives and check how moving to cloud ERP will fulfill their objectives. According to (53), organizational factor is supported by top management decision to adopt new system technology. Furthermore, organizational size is an important part of the organization that needs to be studied to reach perceived advantage.

Technological factor

As technology is the backbone of using cloud ERP it is significant to study technological factor. This factor helps the enterprise to observe their Information System and check the system compatible criteria they need to implement. Furthermore, this factor is needed because it leads the enterprise through the way to choose which compatible cloud model will be used and which service will be delivered. According to (54), it is very important to consider in this factor privacy and security compatibility with existing system. This is because organizations should adopt systems that are applicable and compatible with their need to deliver best practices. The higher the system compatibility the higher positive impact of cloud ERP will be reached in the organization.

People factor

As employees play an important role inside an organization it is important to study factor that is related to them as employees and as system users.

This factor helps the organization to check employee technology skills that is needed for the new adopted system. According to (52), this factor will motivate the adoption of new technology on which the team member or employee will play crucial role on system need. Therefore, studying people factor will decrease the cost of employee and users training on new technology.

Many studies were done to introduce factors that influence adopting cloud ERP. This study (55), showed two important factors that will influence enterprise to adopt cloud ERP which are

Relative advantage

Compatibility

Another two studies (56) and (57) showed the following factors:

Cost

Usability

Flexibility

Best practices

Availability

Data integrity

A survey was done by (55), it showed that these three factors cost, usability and flexibility reached highest percentage of influence factors of adoption.

iv. METHODOLOGY:

The first task that needs to be undertaken in any research investigation is to develop a method that will achieve the answers to the research questions and fulfill the objectives of the study. The research methodology will lead to steps that involve the researcher to follow to finish the study (58). The researcher should understand two basic things: how to answer the research questions and what techniques or tools should be used to answer the research questions. The research methodology helps to achieve the research goals and to better understand the data collection tools that will be used (59).

The research methodology is part of the research process. It involves a discussion of the main methods to be used in the investigation and the necessary information that needs to be collected. This study involves qualitative and quantitative research, as they are the most important research methodologies. The next section will explain the two methods in more detail (58) (59).

Qualitative research methodology:

Qualitative research is concerned with exploring people behaviour, experience, or social case perspective. It is a method that is used to understand how people are experienced in a specific topic in order to give a result from social experiment (59). The key point on qualitative research is people interaction with the topic and the experience that will be observed. The main advantage of qualitative research is the investigation of human behaviour and interaction. Qualitative research is flexible on which

the result will be analysed in form or word rather than numbers. Furthermore, qualitative research result can be different based on different people interaction and data collection. Qualitative research can be mixed with quantitative research method in order to strength and improve research validity. The combination between two methods will make the research result more understandable and meaningful (60).

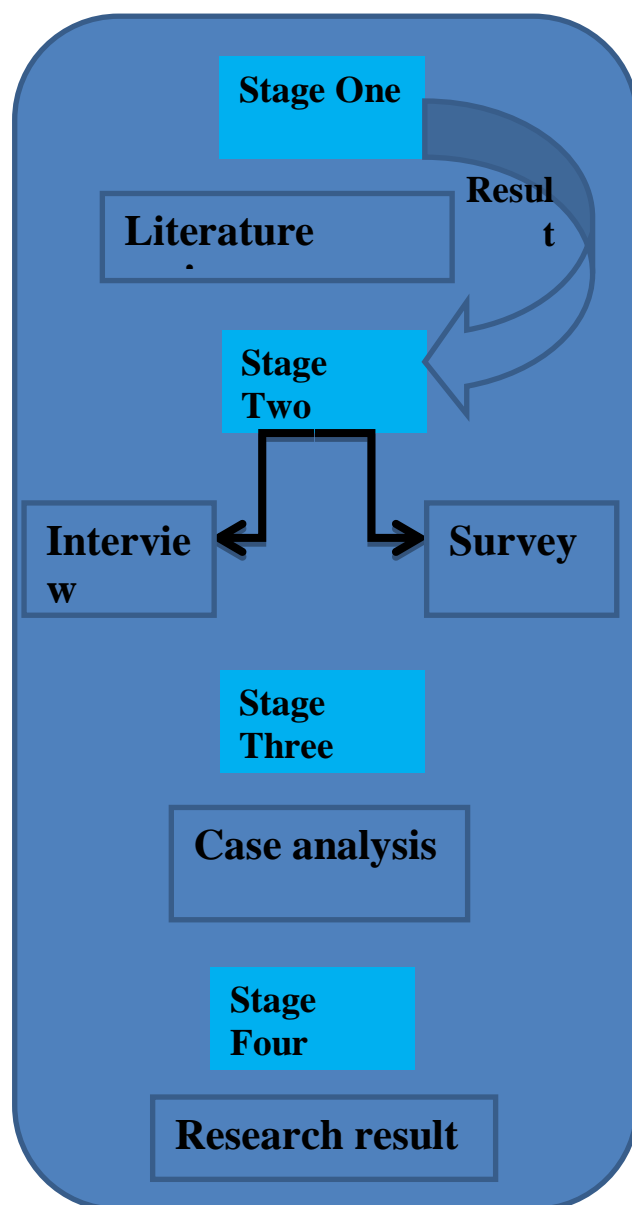
Qualitative research can bring different participants with different perspectives and experience. This is done because of the possibility to use different individual sample of people that have interest in the research or have experience in the field. Therefore, this will bring different experience level or different people perspectives that can strength the research result. The procedure of participants sampling allow researcher to check participant confidant and experience with the topic. Sampling procedure will assist the researcher to know the target participants and specific experience that is needed in order to reach exact result (59) (60).

Quantitative research methodology:

Quantitative research is concerned with measuring and quantifying a research based on numeric variables. It is used to measure experiments based on quantity of data that are distributed over a set of participants from different experience level. Quantitative research depends on data collection reliability and efficiency (58). This type of research is used when researcher want to find state of phenomena such as specific factors about the research. Quantitative research has two main types which are experimental design and non-experimental design. Experimental design is mainly used in scientific research while non-experimental is used in social science survey research. Non-experimental design is more flexible in terms of environment control and variables (59).

For the purpose of the research, this research will use non-experimental quantitative research. Non-experimental quantitative research will reduce people direct observation and actions to deal with variable data.

Graphical representation of research methodology:



This part will show methodology steps that will be used to achieve research objectives and answer research questions. Based on the literature review, some factors were discovered as a result of the studies. These factors will be used to examine research questions based on research methodology.

The following are main data extracted from literature review:

Extract advantages and disadvantages of cloud ERP system

Extract influence factors of cloud ERP adoption

The following figure shows graphical representation of research methodology on which literature review findings will be used in the next stage of the research. This graphical representation will show the importance of each stage. Each stage result will be used for next step until reaching result stage.

The above figure shows graphical representation of research methodology on which literature review findings will be used in the next stage of the research. This graphical representation will show the importance of each stage. Each stage result will be used for next step until reaching result stage.

Data collection:

Data collection is the stage that develops a complete implementation in the research in terms of information and result. The main concept of data collection is to decide what data to collect and how to find them. Data collection is the technique that is used to collect research data. Mostly used data collection tools are survey and interview (61).

Data collection technique should be combined with research methodology to provide effective data. In qualitative methodology data is collected directly through human interaction in several ways such as interview. Qualitative research data is collected in order to have deep understanding of participant perspective. Furthermore, qualitative research data is usually collected by direct or online interview with target participant sample (62). In quantitative methodology data is collected by using structured data in form of questions. Quantitative research data is collected in order to form a theory or view on research. In addition, quantitative research data used to make final report or statistical report of specific case (61) (62).

1- Interview:

Interview technique is widely used in qualitative research. It is a conversation with participant seeking knowledge and understanding about selected topic (63). Interview technique allows data to be collected in flexible and depth to generate understanding. It helps to understand the topic from different point of view and different experience level. Moreover, interview technique involves interrelations between interviewer and interviewee by using several types of question (64). Interview has many advantages such as direct interaction and response from participant, enable open communication, and deep

information gathering. On the other hand, interview disadvantages are time limitation and participant target skills and experience. Interviews have three main types which are structured interview, unstructured interview, and semi-structured interview. Structured interview is using set of fixed questions that have specific sequence that will not be changed or modified during interview. Unstructured interview is using unscheduled questions flow and number that will be asked during interview. Semi-structured interview is using a set of questions that are flexible to be changed or modified during interview (63) (64).

For the purpose of this research study semi-structured interviews will be done for the case of data collection. A number of questions will be developed and can be modified based on the participant answers during interview. This type of interview will make interview more flexible to add or remove questions during interview based on interviewee experience and responding (64).

Focus group sample:

Interview focus group is the target participant that researcher wish to make interview with them to gain better understanding about specific case. This sample group should be selected based on their experience, knowledge, and confidentiality in the research topic.

In this research two target sample group was selected for data collection.

First group, IT expert adopted cloud ERP system in their enterprise.

Second group, IT expert that are willing to adopt cloud ERP system in their enterprise.

The first group is selected based on the importance of gaining companies and experts experience in cloud ERP adoption. It is importance to have direct answers from IT experts about influence factors to adopt cloud ERP system. This sample focuses on cloud ERP adoption for new companies. Moreover, focuses on companies that used to have in-house ERP system then moved to cloud ERP system. In this way, clear information about cloud ERP adoption will result from this group. This group target is to have three interviews with IT experts adopted cloud ERP system in their enterprise.

The second group is selected based on the importance of getting the other side point of view about not using cloud ERP system. It is important to get IT expert experience of moving into cloud ERP and using in-house ERP system. This sample focus on IT experts in companies that are using in-house ERP system to check their interest in cloud ERP adoption and what is reason behind not using cloud technology. This group target is to have three interviews with three IT experts.

Interview question design:

Interview questions were designed within three main categories. The first category, general company questions to have a general understanding about business operations, company size, and business sector. The second category, general IT questions and cloud technology questions to have complete information about technology used. This category will show how company manage data and IT infrastructure. The third category, cloud ERP system adoption questions to have deep facts about system adoption and influence factors.

Interview questions are prepared and planned before the interview. Questions can be different based on interviewee experience and skills. The sequence of the questions is not important since the research is using semi-structured interview which give flexibility to both interviewee and interviewer (63).

Interview recording:

During interview it is difficult for the researcher to keep track all answers details and write them down. Recording interviews make researcher life easier during interview and after interview. This recording can be used to review and write answers after the interview and during writing result of the research. Recording interview should be done ethically by asking the interviewee approval to record the interview before starting (63) (64).

For this research, phone audio recording will be used to record interview conversation. During interview recording and notes taking will be done for enhanced data collection and understanding. At the beginning of the interview, the interviewer will explain purpose of the research and will show questions to the interviewee to make sure of participant interview purpose. All interview recording and notes will be used to write result of the study (64).

2- Survey:

Survey technique is used in quantitative research. It is a set of questions that are gathered to be distributed and answered by a number of participants. Survey technique is used to collect large quantity of data in order to discover people knowledge and understanding to research topic. Surveys are divided into two types either cross-sectional or longitudinal. Cross-sectional is the popular type that is used in most researches. This is because cross-sectional survey are much easier to conduct and more flexible. Longitudinal survey type is much complicated in terms of data collection and complexity (59). Survey technique has many advantages such as flexibility and practical way to gather data. Moreover, survey technique provides quick and fast data collection that can be used to create a theory of the result. On the other hand,

survey technique has disadvantages such as lack of validity and truthful of participant. Nowadays, surveys are done using online tool which give flexibility in writing survey and distributing it. Online survey is much easier way of distributing surveys since it offers a web link to direct online access to survey (63).

For the purpose of this research online survey technique will be done by using Survey Monkey online tool for data collection. A number of questions will be designed based on research questions and literature review findings in order to gather required research data. This type of online survey is much easier to conduct and distribute among various participant.

Sample:

Survey sample will be selected randomly from convenient sample of participants. This random sample will give possibility for large participant population which is much better for data collection. Sample size is highly influenced by number of factors such as degree of participant diversification and geographical range. Typical sample size in quantitative research varies according to participants responding and survey distribution. Random sampling will give researcher a probability of samples that will be gathered while ensuring possibility to judge reliability and validity of data (65). This type of random survey sample will give researched flexibility and effectiveness.

Survey population sample target participant are IT Managers, IT employee, IT/IS Student, and IT experts. This sample was selected to get range of understanding how Cloud ERP system is well known among IT major students and stuff. Sample population range should be between 100-150 survey participants (65).

Survey question design:

Survey questions were designed based on four main categories. The first category, general question like age, gender, and position to have general information about participant. The second category, general company questions to have an overview about participant background. The third category is general cloud computing questions to understand knowledge and experience in cloud technology. The fourth category, cloud ERP questions about in-house ERP verses cloud ERP. This is in order to understand cloud ERP advantages and disadvantages from participant perspectives. The way survey questions are categorized and designed will affect respondents' answers. Survey questions are designed and prepared to suite different participant level. Moreover, survey questions are designed to be attractive and short to have a sufficient fast answers. Survey questions will be closed questions to have a direct answer from participants. However, two questions were added as open-ended question to give

respondent possibility to add their opinion and experience about the question. Online survey monkey tool was used to design the final form of the survey. This tool supports the researcher by online survey link to be distributed to participants to participate in the survey. (65) (66)

3- Data analysis:

Data analysis is a complex and compound part of the research which will produce an important outcome. This research step is composed of set of strategies that assist the researcher to analyse the data collected to answer the research questions. The researcher in this phase has to compare and contrast findings through analytical strategies to interpret result. Data analysis strategies are different based on data collection methodology used. Analysing qualitative data is different from analysing quantitative data (67).

However, this research uses both qualitative and quantitative data collection. Therefore, data analysis will be done for qualitative and quantitative data separately since each method has its own strategy. The next sections will explain qualitative and quantitative data analysis separately (68).

Qualitative data analysis:

Qualitative data analysis is the process of bringing structured text-based data into phenomenon. It provides rich text and descriptive information that needs to be managed differently since they may appear in form of audio or video recording. Qualitative data is categorized by its subjectivity, richness, and inclusive text-based information. Moreover, qualitative data analysis is the process of knowledge extraction from text to create semantic concept in specific research field by researcher (68).

Interview data analysis should be analysed directly after the interview to contribute a higher level of accuracy increasing data quality. Fast acting analysis allow researcher to spend time after each interview in order to produce valuable outcomes. According to (69), data analysis method should be determined before data collection to have efficient data. Analysis process consists of three phases as shown in the following figure.

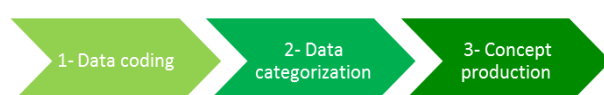


Figure 11: Qualitative data analysis

Data coding

The first step is to code interviewee opinions in form of words and statements. Data coding is done to useful piece of data that can be a sentence, single word, or a paragraph. Similar opinions will be marked as tags to be easily identified (68) (69).

Data categorization

The second step is to categorize marked and tagged opinions. Categories will be created based adoption influence factors and cloud ERP adoption. Data categorization enables compare and contrast with research findings in order to answer research questions (68) (69).

Concept production

The third and final step after coding and categorizing data is to create a concept that explains the phenomenon. The aim of this step is to conceptualize similar opinions that form the final research result. In this study, main purpose is to find out more knowledge about cloud ERP system adoption and ad option influence factors. For this purpose, the categorized points will be compared with literature review findings. Then both findings will be combined to form final research framework (68) (69).

Quantitative data analysis:

Quantitative data analysis is the process of analysing numerical data by using statistical technique. The main focus is to obtain statistical quantitative data from sample of population. Quantitative data analysis contains more description of data in form of statistical percentage of sample population (70). There are various techniques that can be used to analyse quantitative data based on study type. Quantitative data will be analysed using exploratory technique. Exploratory technique is analysing and exploring the relationship between data and quality. It involves descriptive information about each survey question by showing percentage of respondent and result of each response. Exploratory technique is wide famous simple data analysis way that shows questions rates of answers of the total sample for each question in the survey. In this technique data is represented in two formats: first, examining descriptive statistics in form of percentage and rate second, graphical representation of numerical data by using pie chart or bar chart (70) (71).

Survey data analysis is done when the sample of population reached target number of respondents. The data then should be descriptively analysed to allow the researcher to draw a general understanding about findings. Final stage in survey analysis is to write findings from in order to format final phenomena. Survey analysis usually takes more time and effort to produce statistical percentage of findings (71).

Research validity and reliability:

One of the important research processes is to keep track of quality of research findings. After data has been collected and analysed researcher has to make sure of information quality according to research validity and reliability measures. Validity and reliability measures are used to enhance study quality and to achieve a high level of trust from study participants (72).

Validity:

Validity refers to constructing the research based on measures to ensure that it will produce the accurate findings (72). There are many strategies that can be used for research validity. For qualitative interviews two validity strategies were used. First, member checking which is done after conducting interviews data and analyse it findings will be sent to respondents to get their feedback and comments. This is to ensure data reliability and interpretations. Second, peer review as in my case research supervisor acts as peer to follow the research process and make sure of asking essential questions (72) (73).

For quantitative survey content validity will be used. Content validity is the process of checking if the survey answers construct desirable findings that answer research questions. This type of validity will be used to revise all content of survey analysis to measure if it was answered by target sample of population. Content validity help to construct if the findings and valid to be used as final research phenomenon (73).

Reliability:

Reliability refers to measuring whether the study can be repeated (73). Research reliability is important to measure respondent answers. In qualitative interview, to increase data reliability audio recording is used and question guide is submitted to interviewee before interview. This is used to increase interviewee data credibility. In quantitative survey, percentage reliability test will be applied to take average of each question respondent answer and check if same answer was repeated. In this way the question with higher percentage 80-90% similar answer will be highly reliable (72).

Ethics:

Research ethics is the set of standards that will be used while conducting and reporting any research (74). This research focused on two ethical standards. First, informed constant which is about informing research participant before conducting survey or interview about the research. A research background and overview was given to all interviewees before interview. Also a short research overview was written at the beginning of the survey to introduce the aim of the study and target participants. Second, research confidentiality is about giving the participants information confidence to be presented

in the study. Interviewee was asked for interview recording and company information permission to be used for the study (73) (74).

vi. RESULT AND FINDINGS:

1- Interview findings:

The purpose of this qualitative interview is to identify and collect all possible data from experienced interviewee in order to answer the research questions and achieve research objectives. All through the investigation and collection of data, interviews were done according to methodology focus group participants. Each focus group had three different participants to get current practices on cloud ERP system.

Each focus group study had its own questions, result, and findings. The following section explains each focus group interview result and findings. However, Interview questions for both focus groups are listed in appendix section of this paper.

1.1. IT Expert adopted cloud ERP system in their enterprise

This focus group interview was conducted to obtain knowledge about expert experience in relation to cloud ERP system adoption. Four interviews were conducted with people from three different enterprises. Each interview was scheduled and planned according to communication with the secretary or the director of the IT department at the enterprise. The results and findings were conducted to determine the relationship between participant answers and the significant key findings of the research.

During interviews, notes were taken to highlight the important or key answers related to the literature review findings. Each important answer was labelled as a "finding" of the study. The labelled data was verified by audio recording to make sure it was precise. Participant answer evaluations were conducted to determine the relationship between the interviewees answers. This focus group showed that there are significant correlations between participant answers to different questions. This correlation will produce conceptual and complementary key findings.

Key Findings:

The interview findings confirmed that using the advanced cloud technology to deploy the ERP system will lead a business to higher system optimization. During the interview, the key influential factors, advantages, and disadvantages were discussed. This section presents the findings of the influential factors, advantages, disadvantages, and challenges for the cloud ERP.

- Reduce ERP cost:

The reduction in capital expenses that an enterprise will pay to implement a cloud ERP system is one major factor and benefit that was mentioned by the

interview participants. Participant 1 argued that the cloud ERP system cost creates a significant opportunity to deliver better service. Participant 1 also mentioned that the cloud ERP has a lower operational cost, because the maintenance, upgrades, and storage functions are operated by the vendor, with no additional cost, only a system fee. In addition, Participant 1 said that the cloud ERP system lowers the IT infrastructure cost for any new startup company and manages their necessary resources.

Participant 2 supported the same point of view and considered the cloud ERP system to be a better choice for a new startup company by offering important IT resources over the cloud. Participant 2 stated their cost experience with cloud ERP system adoption. It was illustrated that the capital cost required for implementing the cloud ERP system was lower than that of an in-house system. Furthermore, Participant 2 mentioned that the cloud ERP system reduces the overall IT cost and allows for a quick implementation. Participant 2 stated that one of the cloud ERP system cost benefits is the pay-per-use service, which is available for any service over the cloud.

Participant 3 mentioned that using the cloud ERP system reduces the maintenance, application, software and overall IT costs. In addition, Participant 3 said that some enterprises lack IT resources and their IT costs are high. This problem can be solved with a cloud ERP system.

Participants 1, 2, and 3 further argued about the opportunity of the lower ERP costs that the cloud technology offers. It was mentioned that even if the cloud cost was not reasonable, they have to invest in this technology to reach higher business integration with the newest technology trend.

Participant 4 disagreed that the cloud ERP system lowered costs. It was mentioned by Participant 4 that during the ERP adoption, the costs were higher than expected. The cloud ERP system reduces the IT infrastructure cost, but adds another cost in SLA agreements, privacy, security, and many other features.

- Enhance system speed and performance:

System speed and performance is an important factor that can lead to system adoption. During the interviews, Participant 1 stated that the cloud ERP system has a higher system speed in data processing. Participant 1 said that as long as an enterprise has a high internet connection system, the speed and performance will be high.

Participant 2 had a similar opinion about the cloud ERP system speed. It was stated that the cloud ERP system solves the IT infrastructure updating problems with in-house ERP, in which the server's backup, or hot connection, or update, wastes time and makes for a complex data extraction process. Participant 2 said that the cloud ERP response time and transaction speed is higher, even when the

system is making updates, which does not waste the consumer's time.

Participant 3 agreed with the enhanced system speed and performance of the cloud ERP system. Therefore, all three IT experts that were interviewed stressed that the cloud ERP system support system speed, with a powerful IT infrastructure, allows an enterprise to perform multiple tasks at the same time. The enhanced system speed increases consumer satisfaction and business productivity, as perceived by all interviewees.

Participant 4 argued that the fact that the cloud ERP system has a higher system speed and performance is because accessing the cloud ERP system requires a good internet connection. In the case of a lost connection, access to the system is too difficult. Using a cloud ERP system, an organization needs to have a better network environment that suits the cloud technology. In addition, Participant 4 mentioned that the system's overall performance is good, but there are some criteria which are available in the cloud system.

- More effective system:

The cloud ERP system effectiveness was illustrated during the expert interviews. Participant 1 indicated that the cloud ERP system was more effective, in terms of the system upgrade and backup. The cloud ERP system can be used by the enterprise without any need to install any software packages on the computers, which makes the system, run more effectively. Furthermore, Participant 1 specified that the cloud ERP system upgrade and backup can be conducted by the system provider. This feature makes the enterprise's IT department work more efficiently, and hence, they can concentrate more on new system features or customization.

Participant 2 believed that the cloud ERP system increases business efficiency and decreases the IT need to upgrade and backup the system. Participant 3 stated that the cloud ERP system improves the overall efficiency of the business operations, by replacing manual activities with virtual data that is managed by the system provider.

All interview participants agreed that the cloud ERP system was more effective and significantly reduced the time and IT resources needed to carry out any business operations. Participant 4 agreed that the cloud system was effective in terms of backups and updates, but was costly. Any feature that was supposed to be essential in any system was available on the cloud ERP system for an extra cost.

- Enhanced ERP usability and mobility:

During the interviews, the most common word that was stated was "cloud ERP mobility and usability," which makes the system highly needed to be implemented. Participant 1 argued that the in-house ERP system does not have a mobility and flexibility feature, which makes the system more static, requiring it to be used in a specific location. On the

other hand, the cloud ERP system is highly flexible and does not have any location restrictions for users to access the system.

Participant 2 stated that the cloud ERP system mobility is a prime advantage of the system. It can reduce any delays or mistakes in the data entry or transaction process. Furthermore, the cloud ERP system can be used according to user demand in any location, which gives an enterprise the ability to serve customers globally. Participant 3 stated the same opinion: that the cloud ERP mobility and usability makes the system better for interacting with different users in different locations. The cloud ERP system is a solution for enterprises that have different branches globally by giving possible access to different users at the same time.

Participant 4 mentioned that the system mobility is a good feature of the cloud ERP system, but does require a person to have a good internet connection. Some problems may appear while using the system on a tablet or a phone (e.g., a system takes time to launch, a system may lose some features). In terms of system usability, the cloud ERP system is not a soft tool that anyone can use. A person needs training and in-depth knowledge to be able to use the system. Furthermore, Participant 4 mentioned that the cloud ERP has a usable and easy to access user interface, with clear buttons and figures.

Cloud ERP advantages

Cloud ERP system advantages were mentioned by all participants differently.

- Flexibility and mobility:

Most participants agreed that the cloud ERP system has an important advantage: system flexibility and mobility. Participant 1 mentioned that system mobility is an important feature that increases system use over enterprises. Participant 1 also mentioned that system mobility offers faster and easier access to different users. Participant 2 stated that they were facing problems with the in-house ERP system. More specifically, it was not mobile and available in different situations. The cloud ERP system solved this problem.

Participant 3 mentioned that system mobility and flexibility results in on-site installations, updates or location restrictions being unnecessary. In addition, system mobility and flexibility made their inspection service much better by decreasing the barriers between the user and the system. Participant 4 mentioned that the cloud ERP is flexible and mobile, but not easily used. Furthermore, system interactions and user interfaces are not flexible enough to facilitate user access and use of the system. System mobility is a good feature and advantage, but it has some challenges in relation to the network and access time.

- System scalability:

Participant 1 said that the cloud ERP system scalability makes cloud services highly adaptable to

access different resources, as needed. Participant 3 mentioned that cloud scalability meets business changes and competitive business environment resource needs. Participant 4 stated that scalability is acceptable, since the system is able to continue the process, even when large transactions are demanded. On the other hand, Participant 4 stated that sometimes the system is not able to perform a higher level process which reduces the scalability and efficiency.

- System upgrade and implementation:

The participants mentioned that system upgradability is an important advantage of the cloud ERP system. Participant 1 said that the system upgrade is easy. The implementation of new features is also very simple. Participant 2 mentioned that using the latest version of the system can easily be conducted. This is better than the old style of buying the CD's of a new version of a system and wasting time. Participants 3 and 4 claimed that the cloud ERP system upgrade and implementation is an advantage, but can also be a challenge. It was stated by Participant 3 that the system upgrade should be part of the SLA agreement between the system provider and the users. Otherwise, this feature will be costly. Participant 4 mentioned that the system upgrade is an advantage, but still requires managers and IT management.

- Using advanced technology:

During interviews with experienced IT managers, it was frequently mentioned that using the cloud ERP means using the latest and most advanced technology. Participant 1 said that the cloud technology is the most recent technology that satisfies customers' needs. Participant 2 mentioned that the cloud allows enterprises to access many computing resources over the cloud technology. The cloud technology will transfer a business to another business environment with less hardware. Participant 3 said that the cloud technology changed their enterprise services. They now have fewer technology related time and location limitations. Moreover, Participant 3 mentioned that using the cloud technology allows the users to access the latest technology innovations. Participant 4 mentioned that not all technology solutions are suitable for all enterprises, but that the cloud ERP is a good one.

- Data integration:

Participant 1 mentioned that the huge number of cloud resources that are available to users makes the data integration process faster and easier. Participant 2 agreed that the cloud ERP system makes the data integration process faster and easier. Participant 2 also said that the cloud data execution process takes less time than the old system. Participant 3 mentioned that using the cloud makes service integration easier than it was with the in-house ERP system. This feature satisfies the enterprise needs.

Participant 4 mentioned that cloud data integration is not an advantage. Instead, it is a challenge that any enterprise may face during the cloud adoption process. That being said, the launch of the cloud ERP data integration process may take a long time.

- System recovery:

One of the most important advantages of the cloud ERP system is the system backup and recovery policy that can be added to the service agreement. Participant 1 said that the recovery policy is very important, since it plans for the recovery and backup time, which saves the data. This is important if any disaster happens. Participant 2 mentioned that this advantage saves data, files, and databases from being lost. It can also manage the report backups for future use. Participant 3 said that the system recovery feature is very useful and is conducted automatically, which saves time and data. Participant 4 mentioned that the system recovery process is a routine and should be conducted on a daily basis. Furthermore, Participant 4 mentioned that the recovery feature can be conducted by the IT staff, or the system provider, at an extra cost.

- Reduce cost:

A reduction in costs was introduced during the interview in relation to the cloud ERP system's cost and how adopters found the cost. All three participants stated that the cloud ERP system reduced the overall operation costs, IT costs, and maintenance costs. The interviewees were satisfied with the adoption of the cloud ERP system in terms of the cost. Participant 4 disagreed with the reduced cost feature. Participant 4 mentioned that the cost was normal, but that there were many hidden costs that would be added after launching the system.

Cloud ERP disadvantages

All interview participants agreed that adopting cloud ERP system have advantages that any enterprise will face after or during adoption. Interviewees argued different concerns of using cloud ERP system which are listed below.

- Additional costs:

Participant 1 stated that after the cloud ERP system is adopted, some additional costs may appear. This is due to the SLA with the vendor, which is sometimes too complex to understand. It is difficult to determine if the cost covers all of the features. Participant 1 said that they were forced to pay an extra amount after the SLA agreement to ensure that the security and backup package was covered. Participant 2 agreed. The total cloud adoption cost is written in the SLA, but some additional system features or customizations were not included. Additional costs may also appear when case users need more accounts to access the system, system customization, and security.

Participant 3 stated that the main disadvantage of the cloud ERP system is the inconvenient extra costs

that many appear while using the system. Vendor support for any case or issue is not free. The user or enterprise has to pay to obtain the solution for the issue. Participant 4 agreed with this disadvantage and mentioned that the cost of the system is a challenge that can be solved by a service provider making a clear SLA agreement which covers all of the costs.

- Security risks:

A core concern that has been mentioned by all participants is trust in the security of the system. The participants stated that, in the adoption phase, security trust is very difficult. This is because the system users face a lack of control over their own data. According to Participant 1, the main concern is that the data might be stolen or lost. Participant 2 mentioned that data is the heart of any enterprise. Hence, it is difficult to trust the outsource storage system.

Participant 3 mentioned that their main concern was whether the provider used the enterprise data for another illegal purpose. Participant 4 mentioned that cloud security is a major disadvantage. Users and cloud providers need to be completely honest with each other when working towards a great security agreement. Participant 4 stated that the security agreement must be studied. Users need to make plans to understand the system and data needs.

All participants declared that the security risk, or trust, is a psychological issue which will be solved over time. Participant 2 stated that some enterprises do not move to a cloud ERP, because of this concern. On the other hand, by using a cloud ERP system, enterprises can get access to advanced security technologies.

According to Participant 2, cloud security is the main disadvantage of using a cloud ERP. This is because not all vendors have sufficient security measures that are added into the SLA agreement. Participant 3 agreed with Participant 2's opinion and stated that it was true that the vendors SLA agreement did not cover all of the security levels. Therefore, system users will need to be aware of this if they are considering adopting the cloud system.

- Customization limitation:

The cloud ERP system customization process was mentioned by Participants 1 and 2. According to Participant 1, the cloud ERP system is an advanced technology, but vendors have limited customization opportunities. Furthermore, in the case where cloud ERP vendors do have customization features, these features are very expensive and may exceed the enterprise IT budget. Participant 2 mentioned that the cloud ERP system has limited modifications or customizations available, which forces the enterprises to adopt the certain predefined system. The following are four challenges faced by participants.

- Migration:

All participants said that the migration from the in-house system to the cloud ERP system is challenging. According to Participant 1, the main challenge in cloud ERP adoption is reading through the SLA agreements to make sure the enterprise will receive the exact services that they desire. Furthermore, the enterprise has to study the IT budget, because moving to the cloud ERP can be both costly and risky.

Participant 2 mentioned that migration from the in-house system to the cloud ERP system is a major concern and challenge for an enterprise. "Transition from in-house infrastructure, databases, networks, and computers to the cloud is not easy at all," stated Participant 2. The enterprise IT department plays an important role in this challenge. Participant 2 also said that the IT department has to study three things before the migration process is conducted. Firstly, they need to study the technical requirements (e.g., in-house system compatibility with the cloud system). Secondly, they need to study the system compatible model. Thirdly, they need to study the SLA agreement with the vendors.

Participant 3 mentioned that system compatibility is the main challenge of moving to the cloud. Furthermore, choosing the right vendor and cloud model is risky and can lead to a loss of data or money, in the case making an inappropriate selection.

Participant 4 mentioned that an enterprise must study the system needs, technological support, security risks, data integration, and cloud service model. This enterprise can then use the collected information to determine whether they should choose to migrate to the cloud or not. Furthermore, in case the enterprise did not study the migration factors and system needs prior to moving to the cloud, the enterprise should be aware that they may face the possibility of losing data and failing to migrate to the system.

- SLA:

All participants mentioned that the SLA agreements are challenging. According to Participant 1, sometimes the SLA is not easy to understand, because of all of the complicated services listed in the one agreement. Participant 1 said that the SLA is a very sensitive step. The enterprise has to know about all of the details about the system costs and the customization process.

Participant 2 stated that the SLA is usually very complicated. Sometimes it is missing costs or system features that have to be added to it. Participant 2 also mentioned that an enterprise has to know the exact features, customizations, security, and data privacy agreements before users' sign the SLA. Participant 4 mentioned that the SLA is a complicated document that needs to be explained by the service provider. The service provider should be honest about all of the SLA agreement statements to reach a better

harmony with the provider and the system. All participants mentioned that the SLA agreement occasionally has missing system details which results in additional future costs.

- Vendor trust:

According to Participant 1, choosing a cloud ERP vendor it is not an easy task. Vendor choice and trust is a challenge that an enterprise may face. Participant 1 mentioned that vendors need to explain the cloud technology perceptions to the customers. Furthermore, vendors have many cloud models. Sometimes different system versions have to be explained to the customers so they can select the system that is better for them. Participant 2 mentioned that, as the vendors explain their system, the customers will learn to trust their system. Participant 2 also said that vendor trust is very important, and should be, according to the SLA agreement.

Participant 3 mentioned that choosing the right vendor and agreeing on the exact SLA agreement is a very challenging process. The phase of choosing vendors is challenging to the enterprise IT department. They have to study the various vendors and select the best one for their business. Participant 3 mentioned that vendor trust is not easy to obtain, but will improve over time, after signing the SLA agreement. Participant 4 mentioned that trusting the cloud ERP vendor is simple, because everything is stated in the SLA agreement. This agreement discusses how feasible, flexible, and user friendly the system is.

- Start-up support:

All participants agreed that startup support is important to facilitate moving from the in-house system to the cloud ERP system. According to Participants 1 and 3, start-up support is highly important, since it supports the IT department's skills in using the system. It also supports data processing and transaction processes. Participant 1 stated that some vendors will provide system training during a specific target time to support customer use of the system. Participant 2 mentioned that start-up support enables system users to trust the service provider and feel confident about using the system. Participant 4 mentioned that the enterprise should have IT staff or system experts that should be trained to use the system for start-up support. Furthermore, start-up support is offered by the system provider based on the SLA agreement.

1.2. IT Expert willing to adopt cloud ERP system in their enterprise

A focus group interview was conducted to ask questions of people from enterprises that did not adopt a cloud ERP system. In other words, this focus group focused on enterprises that did not adopt a cloud ERP system, but that may be interested in adopting the system in the future. Interview results varied among participants. Some participants had a

clear understanding and background about the cloud ERP system, while others did not.

Key findings:

During the interview, participants were asked many questions about their background and understanding of the cloud system and the cloud ERP system. As a result, the four companies that participated had a clear understanding of the cloud ERP system. Some of them were highly satisfied with their in-house ERP system (Participants 1 and 4), while others were concerned about adopting and moving to the cloud ERP system (Participants 2 and 3). Key findings were revealed. The key findings include reasons not to adopt a cloud ERP, as well as the perceived advantages and disadvantages of a cloud ERP.

Reason for not adopting cloud ERP

Participants were asked "Why hasn't your company adopted a cloud ERP system?" The results were: 1) security risk, 2) SLA and customization, 3) in-house ERP system functioning well, and 4) fear of adoption costs.

- Security risk

Participant 1 discussed the importance of security in the cloud ERP system. Since it is a new system, the security measures might be lower than that of the in-house ERP system. Participant 2 stated that cloud security is a significant reason for not adopting a cloud ERP system. In addition, Participant 2 stated that there is a relationship between cloud ERP adoption and system security, since the users are always afraid to lose data. Participants 3 and 4 agreed. They stated that cloud security is very important to consider prior to adopting a cloud ERP. Participant 4 stated that user knowledge about the system and the way it operates can make system adoption grow more. Hence, it is all about user awareness.

- SLA and customization

Participants 1 and 3 discussed the SLA agreements and system customization. Both participants stated that these two factors are the main reasons for not adopting the cloud ERP system. Participant 1 discussed that the cloud ERP customization is costly and requires an SLA agreement. On the other hand, in-house ERP customization is easy to implement by the IT staff. Participant 3 discussed the SLA agreement barrier, since these agreements are too detailed and sometimes not understandable by users. Furthermore, SLAs needs to be explained by the service providers. Only then can the user get a clear understanding about the costs and systems that will be available. Participant 4 agreed that customization is harder in the cloud ERP, since service providers have limited features to work with.

- In-house ERP system functioning well

Participants 1 and 4 stated that their in-house ERP system was functioning well and that they did not need to implement a new system. On the other hand, Participants 2 and 3 stated that their system was

functioning well, but that they were planning to move to a new technology system. Participant 3 stated that cloud providers play an important and essential role in educating users about their systems, which highly affects system adoption.

- Fear of adoption cost

During the interview, all four participants tried to compare in-house and cloud ERP system costs. Most of them agreed that the cloud can decrease the cost of the system, for some points, and increase it, for others. Participant 1 discussed that the cloud ERP system cost is higher, since users need to adjust the SAL agreement of system privacy and security. Participant 2 stated that the cloud ERP system has less of a cost for infrastructure and hardware devices, but has a higher customization cost. Participant 3 stated that some companies think that the cloud ERP is expensive. However, all of the payments that would go to a cloud service are currently paid to their IT department (e.g., license costs, maintenance costs, hardware device costs). Participant 4 said that the cloud ERP system is a good solution, but companies have to study their budgets before moving to a new system.

Advantages of cloud ERP

Participants were asked about cloud ERP system advantages from their knowledge and background and the result are the following advantages:

- Flexibility and mobility

Some participants agreed that system flexibility and mobility is the main advantage of the cloud ERP system. Participants 2 and 3 stated this as the main advantage of the cloud ERP system. Participants 2 and 3 stated that they want to move to the cloud ERP system for this reason. Participant 2 said that system flexibility and mobility allows users to interact with the system faster and easier. Participant 3 said that the system can enable them to connect to the international company branches to work together at the same time. Participant 1 stated that cloud flexibility takes some features away from the system. As a result, the system does not function well. Lastly, Participant 4 said that flexibility and mobility are good features of the cloud system, but not the main advantages.

- Using new technology system

Participant 1 discussed that most of the companies nowadays are using a cloud ERP system, since it is a new technology system. Furthermore, adopting a new system has the main advantage of competing in the market and using new system features. Participant 2 stated that it is highly recommended for newly launching companies to use the newest and latest technology in the cloud, since it has a lot of advantages. Participant 3 said that using the cloud ERP system, as a new technology, can allow the technological resources to be available through the cloud.

- Better performance

Participant 2 discussed that the cloud ERP running time and access time is faster than that of the in-house system. Hence, it satisfies the user requirements. Participant 3 stated that the cloud ERP system advances the system performance of the organization by collecting all data in the cloud.

Disadvantages of cloud ERP

- Cost effectiveness

All four participants agreed that the cost of the cloud was not stable and may change based on user needs and the cloud service model. Furthermore, the cost may increase, based on the user specification, which does not satisfy the users. Customization costs can be high and have limited features, based on the ERP vendor.

- Hidden cost

Participant 2 stated that the cloud ERP has some hidden costs (e.g., training costs, configurations, system administration costs). Participant 2 also stated that these hidden costs should be written into the SLA contract, so that the users pay for it before implementing the system. Participant 3 discussed the high customization costs and limited features in the cloud ERP. Participant 3 also stated that some hidden costs include storage or infrastructure costs.

- Loss of technical knowledge

Participants 1 and 4 agreed that the cloud ERP’s main disadvantage is the loss of technical knowledge. This is because the cloud ERP system is a new system and some of the IT staff may have a clear understanding about the cloud ERP system’s maintenance or administration. This means that companies that adopted the cloud ERP system need to be trained about the system so that they do not fail to implement the system.

2- Survey findings:

This section examines quantitative data collected step by step through descriptive statistical analysis. The demographic information of the respondents will be presented in this section in details. This will provide a clear picture of respondents' background and whether they used cloud ERP system before or not. The level of understanding of cloud ERP system will be tested from survey questions as main finding variable. This is important because low level of cloud ERP understanding decrease the level of cloud ERP adoption in enterprises.

Response rate:

Survey was created using Survey Monkey website at 3 July, 2017. Then, survey was distributed online through web link to students, IT managers, and IT employee. The number of distributed link was 100 participants but received responses were only 70. For this case, survey was distributed again to get around 100 to 130 responses in total. The total responses received in the second time are 40 participants. After receiving total of 100 responses, target population sample wasn't reached to cover

three main population sample respondents. Therefore, survey was distributed again to IT managers, IT experts, and employees in different business sectors to get target audience responses. The following table shows response rate timeline.

	Survey sent	Survey received
First group	100	70
Second group	50	40
Third group	70	40
Total responses		150

Table 1: Survey response rate

Population sample:

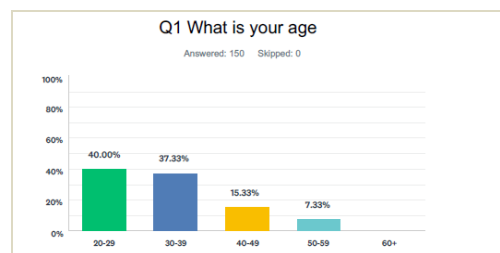
The population in this study was IT managers, IT employee, and IT/IS Student. This population sample was selected to identify participant perception of the understanding and knowledge in cloud ERP system. In this section, population sample statistical analysis is presented to provide clear image of respondents' age, gender, and position. Furthermore, company profile will be presented in this section. Important variables were related to each other's in order to provide clear image of all sample response rate.

- 1- Respondents profile:

Age:

Survey age question received 150 participant responses. From the data, respondents' age range varies were highest rate goes to age range between 20 and 29 and lowest rate goes to age range between 50 and 59.

Figure 12:Age participant responses



Age range	Number of respondents	Percentage
20-29	60	40%
30-39	56	37%
40-49	23	15%
50-59	11	7%
60+	0	

Table 2: Total number of age question responses

Age and position:

In terms of respondents' age and position, majority of the students were between 20 and 29 age range which is around (81%). IT employees' majority age ranges were between 20 and 39 (45%) while lowest rate goes to age range between 40-49 (5%). Last position tested was IT managers were age range varied between 20 and 29 (3%), 30 and 39 (25%), 40 and 49 (48%), and 50-59 (22%).

Table 4: Total number of gender responses

Gender	Number of respondents	Percentage
Male	76	51%
Female	73	49%

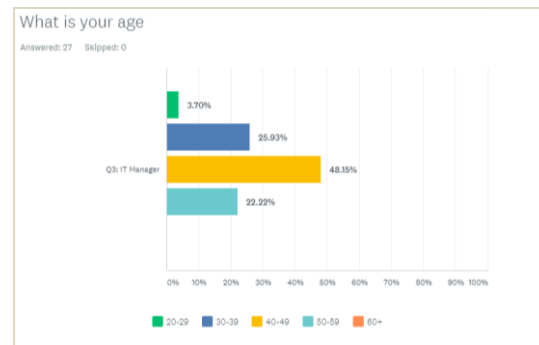


Figure 1515: IT Manager participant age responses

Gender:

Gender question received 149 responses. From the data, respondents' gender participation range was almost parallel male (51%) and female (48%).

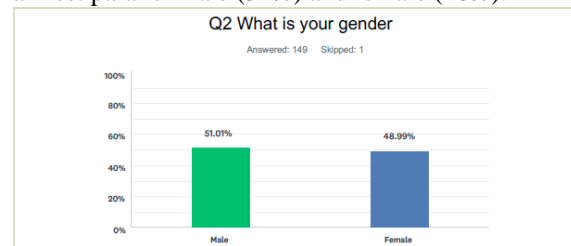


Figure 16: Gender participant responses

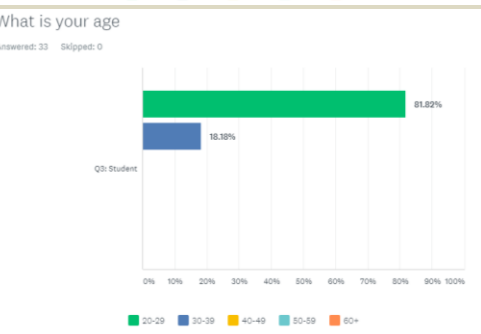
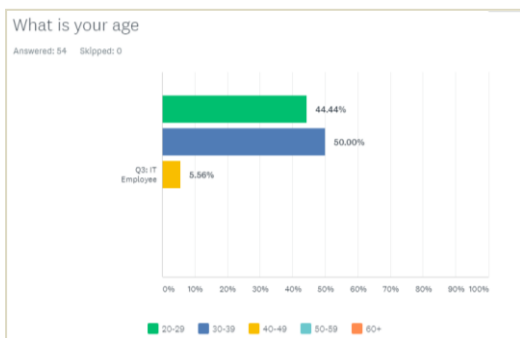


Figure 133: Student age responses

Figure 1414: IT employee age responses

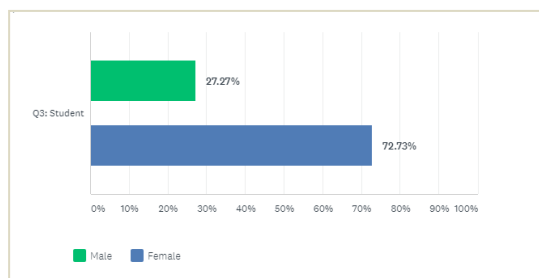


Figure 1716: Student gender responses

Gender and position:

In terms of respondents' gender and position, male students' responses were few (27%) comparing to female (72%) responses. IT employee respondents were average parallel between male (53%) and female (46%). On the other hand, IT manager responses majority were men (66%) comparing to female (33%).

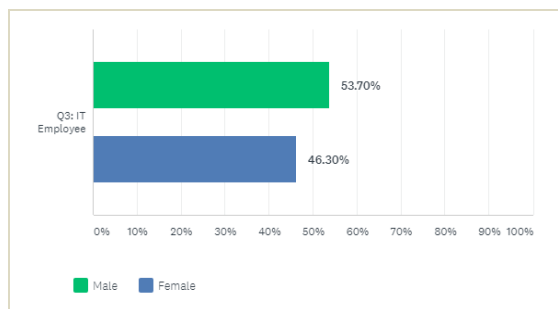


Figure 18: IT Employee gender responses

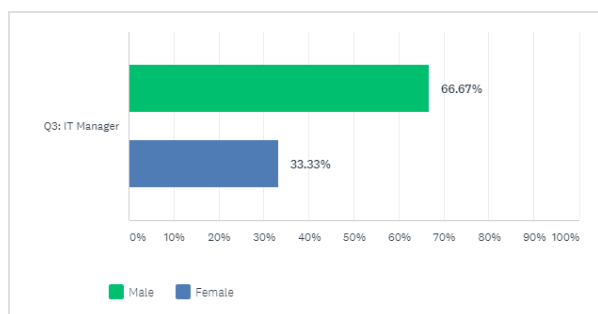


Figure 19: IT Manager gender responses

Position	Number of respondents	Percentage
Student	33	22%
IT employee	54	36%
IT manager	27	18%
Other	36	24%

The following (table 5) describe survey participants' position number of responses for both male and female gender respondents'. As shown below majority of students were female, IT employee were male, and IT manager were male.

Position	Age range	Number of respondents	Percentage
Student	male	9	27%
	Female	24	73%
IT Employee	male	29	54%
	Female	25	46%
IT Manager	male	18	67%
	Female	9	33%

Table 5: Total number of gender and position responses

Position:

In term of respondents' position, the majority were IT employee (36%). Collectively 18% of the respondents were IT managers and 22% were students. Other sample representatives participated in other positions in 24%. Other positions are presented in figure 28.

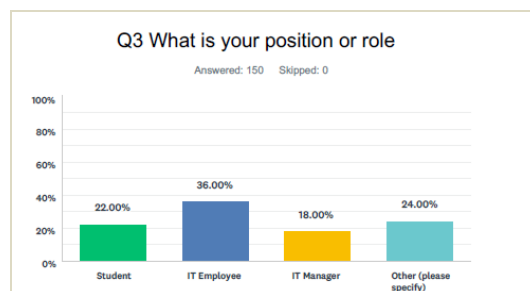


Figure 20: Participant position responses

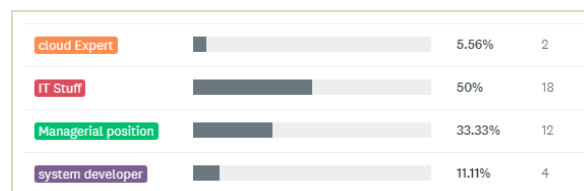


Figure 171: other participants' responses

The following define respondents' position number of responses and percentage. As shown below the highest number of respondents' is IT employee on which 54 IT employee participated in the survey. On the other hand, 33 students and 27 IT managers participated in the survey. Furthermore, 36 participants' participated (figure 28) in different positions.

Table 6: Total number of position responses

Company profile

This section will present the companies profile that took part of the survey. The majority of the companies have been in the business for 10 years and between 5 and 9 years (32%). (Figure 29)

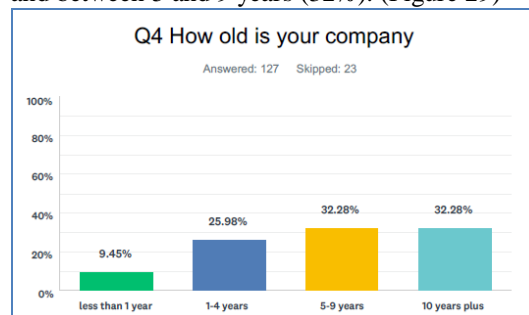


Figure 22: Number of years that the companies have been in business

Overall companies in the survey were from wide range of business sectors and are classified in figure 30. From data, it is shown that most of the companies were from technology business sector (41%).

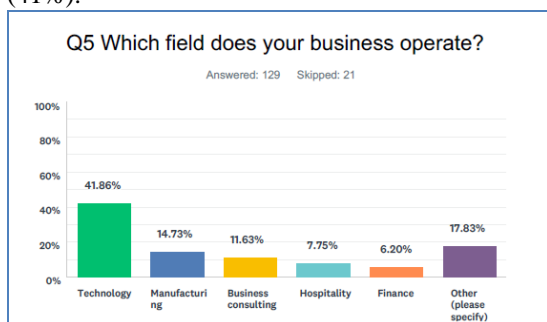


Figure 22: Business sectors represented in the study

Over 37% of the companies participated in the survey has more than 100 employee. This shows that companies participated most of them were large organizations that hold big number of employees. On the other hand, 32% of the companies participated were middle size and have between 50 to 100 employee. In comparison, small companies also participated in the survey by 28%.

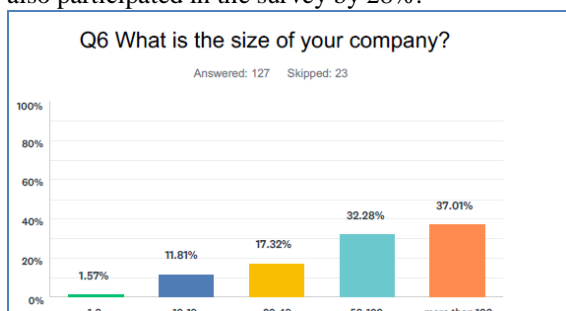


Figure 18: size of the companies represented in the study

The following (table 7) describe in details each business sector that participated in the study and number of years companies have been in the business. From data, highest rate in all sectors are technology sector companies operated for 10 year plus for 38%, and manufacturing sector companies operated for 1 – 9 years 38%. On the other hand, business consulting and hospitality sector companies' highest rate is for companies operated for 5-9 years 47% and 50%. Finally, finance sector companies highest rate is for companies operated between 1 to 9 years 38%.

Business sector	Number of years	Number of respondents	Percentage
Technology	Less than 1 year	5	9%
	1-4 years	14	27%
	5-9 years	13	25%
	10 years plus	20	38%

Manufacturing	Less than 1 year	3	16%
	1-4 years	7	37%
	5-9 years	7	37%
	10 years plus	2	10%
Business consulting	Less than 1 year	1	7%
	1-4 years	4	27%
	5-9 years	7	47%
	10 years plus	3	20%
Hospitality	Less than 1 year	2	20%
	1-4 years	1	10%
	5-9 years	5	50%
	10 years plus	2	20%
Finance	Less than 1 year	1	12%
	1-4 years	3	38%
	5-9 years	3	38%
	10 years plus	1	12%

Table 7: Total responses of the number of years that the companies have been in each business sector

The companies' size in the survey was different based on business sector. In table 15, business sectors and company size is presented to show different range of companies size participated in the study. Technology (36%), hospitality (40%), and finance (50%) companies' sizes majority were large companies that hold more than 100 employees. In contrast, manufacturing and business consulting companies' size majority were medium companies that hold between 20 to 100 employees.

Business sector	Size of company	Number of respondents	Percentage
Technology	1-9	2	4%
	10-19	6	12%

	20-49	8	15%
	50-100	17	33%
	More than 100	19	36%
Manufacturing	1-9	0	0
	10-19	1	5%
	20-49	8	42%
	50-100	8	42%
	More than 100	2	11%
Business consulting	1-9	0	0
	10-19	2	13%
	20-49	2	13%
	50-100	7	47%
	More than 100	4	27%
Hospitality	1-9	0	0
	10-19	1	10%
	20-49	2	20%
	50-100	3	30%
	More than 100	4	40%
Finance	1-9	0	0
	10-19	2	25%
	20-49	1	12.5%
	50-100	1	12.5%
	More than 100	4	50%

Table 8: Total responses of the size of the companies in each business sector

In terms of using cloud system, it was shown that 63% of companies participated used cloud system of any type. In comparison, 37% of companies participated didn't use cloud system before.

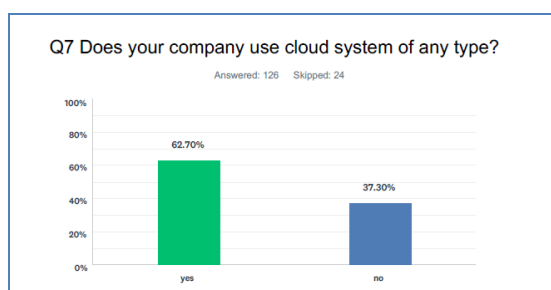


Figure 19: Using cloud system

Below table 9 describe each business sector participated in the study and using cloud system. From data it was shown that majority of technology, business consulting, and hospitality business sector companies' are using cloud systems. On other hand, manufacturing and finance business sector companies are not using cloud system.

Business sector	Using cloud system	Number of respondents	Percentage
Technology	Yes	36	71%

	No	15	29%
Manufacturing	Yes	7	37%
	No	12	63%
Business consulting	Yes	8	53%
	No	7	47%
Hospitality	Yes	7	70%
	No	3	30%
Finance	Yes	3	37.5%
	No	5	62.5%

Table 9: Business sectors using cloud system

Understanding of cloud system

This section is provided to describe respondents understanding to cloud system. It represent knowledge rate among survey respondents about cloud technology which affect the convention of cloud systems adoption. There were five questions in this section. The first two questions were used to evaluate how often respondents hear of cloud computing and the perception of their understanding of cloud computing. The third question was used to test respondents' use of cloud system. The fourth question was used to estimate respondents understanding to the need of cloud systems adoption in companies. The fifth question was used to signify cloud systems benefits. The questions evaluation is provided below.

In the survey respondents were asked in the first question to rate their knowledge in cloud computing in general whether they never heard of it, they have basic knowledge, or advance knowledge level. 18% responded that they never heard of it, 49% responded that they have basic knowledge, and 33% responded that they have advance level of knowledge.

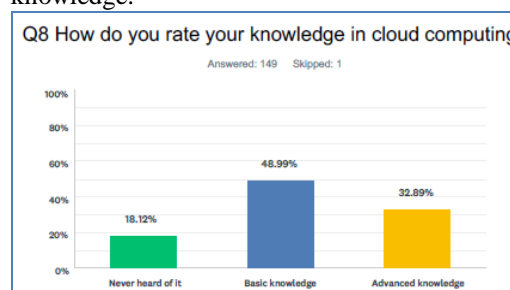


Figure 34: Cloud computing knowledge rate

Table 30: Total number of cloud knowledge responses

Knowledge in cloud computing	Number of respondents	Percentage
Never heard of it	27	18%
Basic knowledge	73	49%
Advance knowledge	49	33%

In order to get clear image of participants cloud computing concept understanding. Survey included the second question about cloud computing level of understanding excellent, good, average, poor, or very poor. Majority of respondents' answered that they have good level of understanding to cloud computing (40%). Secondary level of respondents' answered that they have excellent level of understanding to cloud computing (29%). Minority level of respondents varied in answers between average (15%), poor (13%), and very poor (3%) level of understanding to cloud computing.

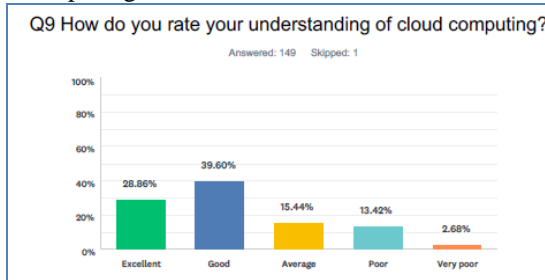


Figure 205: Cloud computing understanding rate

Cloud computing understanding	Number of respondents	Percentage
Excellent	43	29%
Good	59	40%
Average	23	15%
Poor	20	13%
Very poor	4	3%

Table 11: Total number of cloud understanding responses

In the third question of this section, participants were asked if they used cloud system before or not. 72% answered by yes and 28% answered by no.

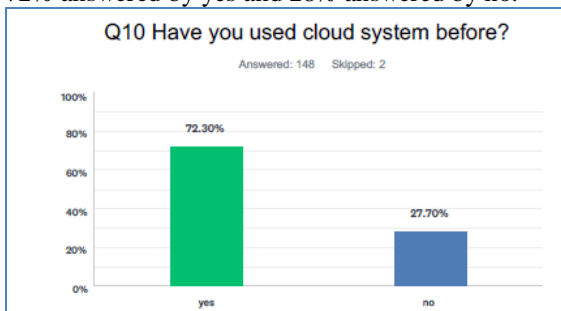


Figure 216: Using cloud system

Using cloud system	Number of respondents	Percentage
Yes	107	72%
No	41	28%

Table 12: Total number of using cloud system responses

In order to identify respondents' perception of cloud system adoption, question four focused on asking them about whether they agree or disagree to adopt cloud system in companies. 37.5% agree to adopt cloud computing systems in companies while 17% disagree. In comparison, 33.5% strongly agree and 2% strongly disagree. 9% were neutral respondents.

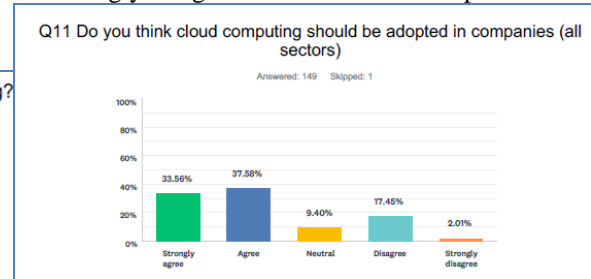


Figure 37: Cloud system adoption

Cloud system adoption	Number of respondents	Percentage
Strongly agree	50	33.5%
Agree	56	37.5%
Neutral	14	9%
Disagree	26	17%
Strongly disagree	3	2%

Table 13: Total number of cloud adoption responses

The last question was used to identify cloud computing system benefits. Respondents were given set of benefits that was identified during the study and they will choose based on their knowledge and understanding. 31% responded that cloud main benefit is more system flexibility. 23% responded that cloud improve system performance. Lower rates were in cost saving (19%), better scalability (20%), and higher system optimization (7%).

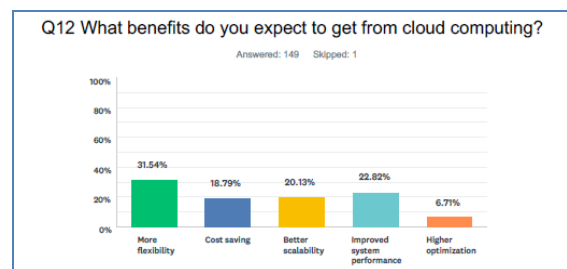


Figure 38: cloud system benefits

Understanding of cloud ERP system
This section was designed to examine respondents' understanding to cloud ERP system. There were four

questions in this section. The first two questions were designed to evaluate level of respondents' knowledge and understanding of cloud ERP system. The third question was used to test respondents' usage or adoption to cloud ERP system. The last question was used to test respondents' perception of cloud ERP system.

The first question that the respondents' were asked was (rate your knowledge is cloud ERP system). This question was measured by three points never heard of it, basic knowledge, and advanced knowledge. From 148 respondents, 40 (27%) never heard of it, 69 (47%) have basic knowledge, and 39 (26%) have advanced knowledge.

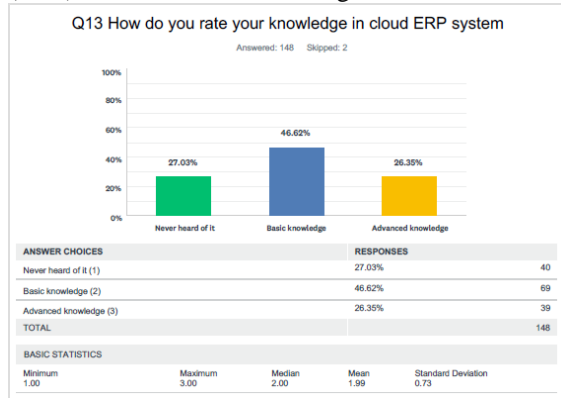


Figure 39: Cloud ERP system knowledge

The second question was (rate your understanding to cloud ERP system). In order to get clear response this question was measured by five measurement points excellent, good, average, poor, and very poor. The following descriptions were applied to the analysis of the responses to this question: negative (very poor to poor rating), neutral (average rating) and positive (good to excellent rating). From 149 respondents, the result show that 43 (29%) of the respondents have a negative understanding about cloud ERP system, 23 (15%) of the respondents have a neutral understanding about cloud ERP system, and 83 (55%) of the respondents have a positive understanding about cloud ERP system.

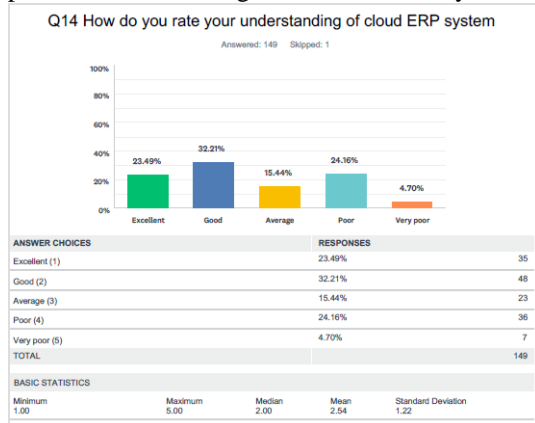


Figure 40: Cloud ERP system understanding

The third question was (have you used cloud ERP system before). The question has two analysis indicators which the user can choose yes or no. The question answer rate was close in negative and positive answers. From 145 responses, 68 (47%) answered by yes and 77 (53%) answered by no.

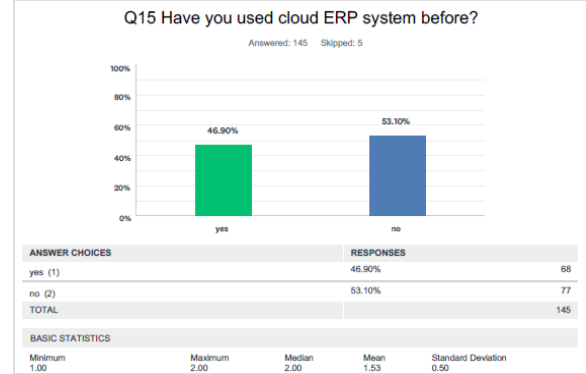


Figure 41: Using cloud ERP system

Based on, 68 responses of cloud ERP system users and 77 responses of non-cloud ERP system users from the third question. Respondents were asked what type of cloud ERP systems they used. Among the respondents that have adopted cloud ERP systems, 46 percent have cloud SaaS ERP systems while 27 percent have hybrid ERP systems. Furthermore, 15 percent have cloud PaaS ERP systems while 12 percent have IaaS ERP systems.

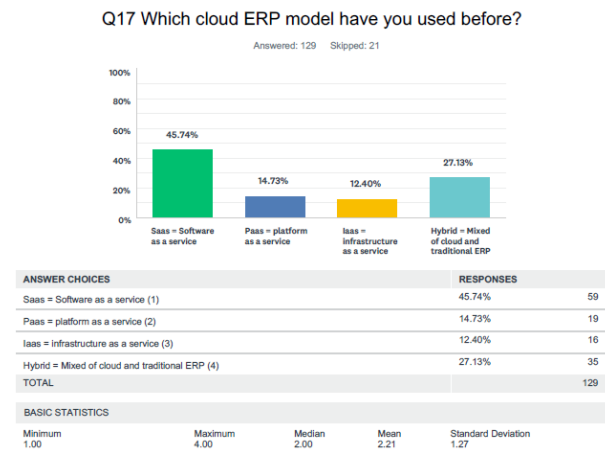


Figure 42: Type of cloud ERP system adopted

The last question was (indicate whether the following statements are true or false about cloud ERP). Respondents were given statements about cloud ERP system obtained from literature review that require a true or false response. The respondents had to specify if each of the statements was true or false. There were five declarations about cloud ERP systems, four of them were true, and one was false. All five declarations were answer by 145 respondents 80% of them answered correctly and 20% had incorrect responses. This shows that respondents have a good general understanding of cloud ERP systems.

Q16 Please indicate whether the following statements are true or false about cloud ERP



Figure 43: Statements about cloud ERP system

Further analysis was done on each respondent response to the question. This is done to relate between questions responses and make sure those respondents that had negative cloud ERP knowledge and understanding their score in true and false question will be very low. On the other hand, respondents that had positive cloud ERP knowledge and understanding their score in true and false question will be very high. Respondents that said they never heard of cloud ERP system (40) 5 of them answer all true and false statements correctly while the others didn't. In comparison, respondents that said they have basic (69) and advance level (39) of understanding to cloud ERP system most of them answered statements correctly.

Another further analysis was done to type of cloud ERP adopted by companies participated in the study. Large companies that used cloud ERP 20 (38%) used SaaS cloud type, 5 (26%) used PaaS cloud type, 5 (27%) used IaaS cloud type, and 11 (35%) used hybrid cloud type. Middle companies that used cloud ERP 20 (38%) used SaaS cloud type, 4 (21%) used PaaS cloud type, 6 (40%) used IaaS cloud type, and 10 (32%) used hybrid cloud type. Lastly, small companies used cloud ERP 12 (18%) used SaaS cloud type, 10 (15%) used PaaS cloud type, 5 (7.5%) used IaaS cloud type, and 10 (15%) used hybrid cloud type.

The following analysis is done for additional analysis to know what type of companies sectors used cloud ERP system. In the study it was shown that 26 (50%) technology companies, 7 (13%) manufacturing companies, 6 (11%) business consulting companies, 4 (8%) hospitality companies, and 3 (6%) finance companies used SaaS cloud ERP system. PaaS cloud ERP system mostly

were used by technology (47%) and manufacturing (21%). IaaS cloud ERP system was used for an equal number of companies 2 to 3 companies from each sector. Lastly, hybrid cloud ERP system was mostly used by technology companies (35%) and business consulting (16%) while other sectors had lower rate (19%).

Reason for adopting cloud ERP system (Influence factors)

In this section respondents were given statements that was identified from the literature review part and requested to indicate based on their knowledge why they adopted cloud ERP system. It is important to note that (based on question 15 results) 68 (47%) companies used cloud ERP system and 77 (33%) companies didn't use cloud ERP system, which mean that 68 companies that used cloud ERP system participated in this part of study. Therefore, the number of respondents answered this

question is enough to draw statistical conclusion. However, the measurement of this question was done based on six main statements. After the analysis the top reasons chosen by respondents were the following:

- To improve business performance (46 (33%))
- To implement new technology system (38 (27%))
- To integrate remote/mobile system (28 (20%))
- To decrease maintenance cost (17 (12%))
- To decrease number of IT staff (9(6%))

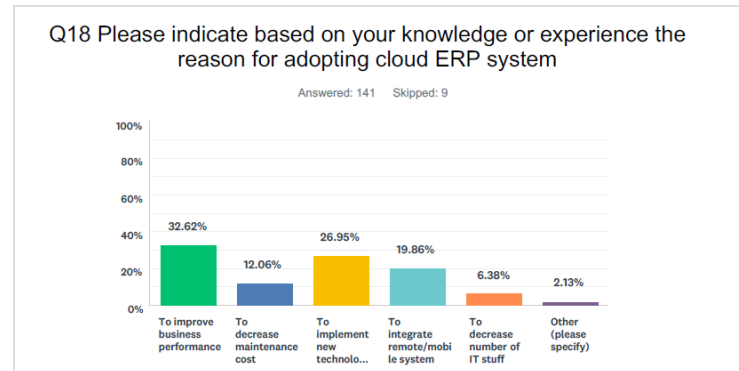


Figure 44: Reason for cloud ERP adoption

The result (Figure 44) shows that the top reasons for cloud ERP system adoption are to improve business performance, implement new technology, and integrate mobile/remote system. In addition, other significant reasons are to decrease maintenance cost and to decrease the number of IT staff.

Further analysis was done to this question to ensure that respondents that answered that they adopted cloud ERP system participated in this section. As shown in the table below all 68 companies that answered yes participated in these section responses.

Reason for not adopting cloud ERP system:

In this section respondents were given statements respondents were provided list of reasons for not adopting cloud ERP system which were identified in the literature review. The measurement of this question was done bases on three main statements. After the analysis the top reasons chosen by respondents were the following:
 Fear of security risk (58 (41%))
 Fear of data privacy and integrity (50 (35%))
 Fear of losing in-house IT resources (26 (18))

The result shows that top reasons for not adopting cloud ERP system are fear of security risk and fear of data privacy and integrity. Another significant reason for not adopting cloud ERP system is fear of losing in-house IT resources. Some other (5%) factors were added by the respondents such as satisfied with current in-house system, risk of network downtime, restricted customization, poor integration with other systems, and lack of knowledge about cloud offering.

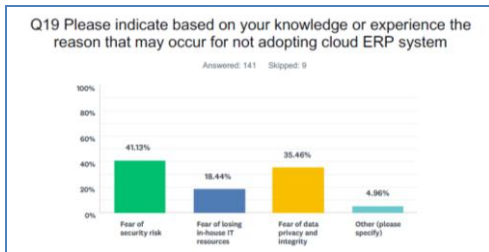


Figure 225: Reason for not adopting cloud ERP

Advantages and disadvantages of cloud ERP system
 In this section respondents were given a number of statements about cloud ERP system advantage and disadvantages (Figure 46 and Figure 47). The measurement was done based on three criteria which are positive (strongly agree and agree), neutral, and negative (disagree and strongly disagree). The majority of 144 respondents answered positively most of the advantages statements which are:

- Reduce IT resources (44%)
- System accessibility and flexibility (56%)
- Focus on core business activities (57%)
- Deliver best practices (57%)
- Improve business efficiency (66%)

	Reduce IT cost	System accessibility and flexibility	Focus on core business activities	Deliver best practices	Improve business efficiency
Positive (agree and strongly agree)	44% 63	56% 81	57% 82	57% 80	66% 94
Neutral	8% 11	11% 16	11% 16	16% 22	12% 18
Negative (disagree and strongly disagree)	48% 70	33% 47	32% 45	27% 39	22% 31
Mean	2.95	3.33	3.37	3.39	3.61
Median	3	4	4	4	4
Standard deviation	1.21	1.18	1.19	1.12	1.14

Table 13: Advantages of cloud ERP system analysis

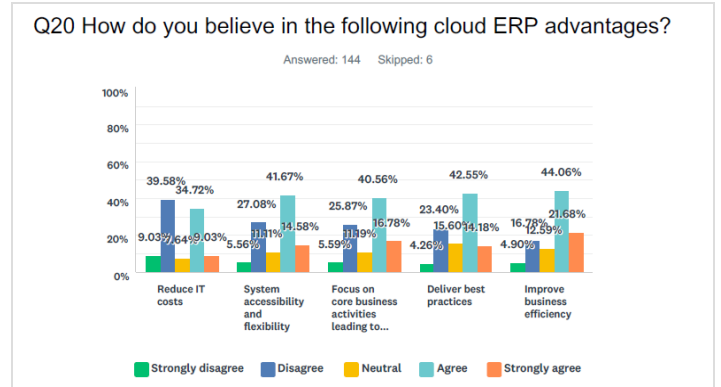


Figure 45: Advantages of cloud ERP system

The majority of 140 respondents answered positively most of the disadvantages statements which are:
 Create gap between old in-house system and new system (48%)
 Lead to strategic risks as a part of the IT department is outsourced (53%)
 Cause additional costs during implementation such as customization (51%)
 Increase waiting time in case of slow Internet speeds (57%)
 Cause security risk (61%)

	Create gap between old in-house system and new system	Lead to strategic risks as a part of the IT department is outsourced	Cause additional costs during implementation such as customization	Increase waiting time in case of slow Internet speeds	Cause security risk
Positive (agree and strongly agree)	48% 68	53% 75	51% 73	57% 81	61% 86
Neutral	15% 20	10% 13	14% 18	10% 13	14% 18
Negative (disagree and strongly disagree)	37% 52	37% 52	35% 49	33% 46	25% 36
Mean	3.20	3.26	3.27	3.36	3.49
Median	3	4	4	4	4
Standard deviation	1.12	1.17	1.15	1.17	1.06

Table 14: Disadvantages of cloud ERP system analysis

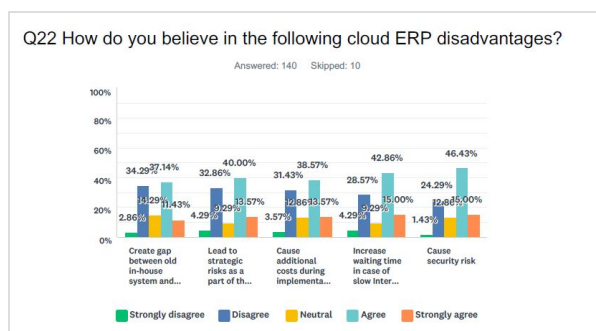


Figure 46: Disadvantages of cloud ERP system

vii. SUMMARY AND CONCLUSION:

Review of the first research question

What are the main factors that influence adopting cloud ERP system?

Data from the survey and interview shows that respondents provided the reason for adopting cloud ERP system and influence factors that can influence any company to adopt cloud ERP. The two top reasons were to improve system efficiency and performance and to integrate mobile system. To improve system efficiency it was overwhelmingly chosen by 4 interview participants and by 70 percent of survey respondents. To integrate mobile system was chosen also by 4 interview participants and by 60 percent of survey respondents. There are other reasons for adopting cloud ERP system such as it can lead to low maintenance cost and number of IT stuff. Furthermore, more reasons are improve overall business efficiency.

During the interview one of the participants highlighted an important note about cloud ERP

adoption influence factors which is "IT department is the only department that can define of their department is ready to move to cloud ERP system since many structure inside the department will be changed. So, structure of the company can affect the engagement with new system". This part was presented in the literature review under the factors that can affect adopting cloud ERP system.

Review of the second research question

What are the advantages and disadvantages of cloud ERP system?

Advantages:

- From the study it was shown that a good number of companies have a good understanding to the advantages of cloud ERP system. Result from the survey showed positive overall mean ($\mu= 1.99$) from participants responses which is crucial for adoption. This means that companies need to have a good understanding to cloud ERP system in order to adopt it which means that this can affect their decision. In this study it was shown that the top advantages are:
 - Using advanced technology (50%)
 - System accessibility and flexibility (56%)
 - Focus on core business activities (57%)
 - Deliver best practices (57%)
 - Improve business efficiency (66%)

Disadvantages:

- From the study it was shown that a good number of companies have a good understanding to the disadvantages of cloud ERP system. Result from the survey showed overall mean ($\mu= 1.32$) from participants responses was neutral. This can potentially be a barrier to adoption as companies will not understand the disadvantages cloud ERP systems which are important in order support adoption decision. The top two disadvantages from the study are:
 - Cause additional costs during implementation such as customization (69%)

Cause security risk (73%)

Therefore, it can be realized that the top disadvantage of cloud ERP system is security risk. Most of the respondents during interview said that as mostly people will be afraid to put their data outside their control. Studies have shown that cloud systems are more secure than in-house systems. The perception that cloud is not secured have to be managed from change management perspective. As one of the interview respondents said that cloud security can be managed to be in-site by using SLA agreement with cloud providers.

Contributions and recommendations

This study shows a valuable contribution to the ERP theory and particularly to the knowledge of cloud ERP systems. The theoretical knowledge of cloud ERP system understanding, advantages, and disadvantages can have a deep impact on cloud ERP system adoption. This theory was validated during the survey and interview with different companies and the result of the study can be important and useful to researchers and ERP vendors. Adopting cloud ERP system has many advantages and drawbacks' that need to be considered before adoption. Lack of cloud ERP understanding can lead to lower system adoption rate and this was shown in the research. For any company, in order to make a clear decision to move to cloud ERP system they should do the following: have a clear understanding to the advantages and disadvantages of the system and have a clear understanding to SLA agreement for security and privacy. Many other factors companies should consider such as IT department need and structure and company resources and in-house system data should be taken into consideration.

As each company has different requirement from the other. During the study, cloud ERP adoption was highest in technology and manufacturing sector. These are sectors that have technical understanding to cloud ERP system. Despite the low adoption rate, studies shows that cloud ERP system will continue to be adopted by different companies and sectors in the future.

During the interview, the study showed that many companies were looking to upgrade their IT department and use cloud ERP system. Furthermore, it was shown that good number of companies already adopted cloud ERP system. From the study it was shown that all cloud ERP models (Saas, IaaS, PaaS, and hybrid) were used in different business sectors.

Limitation of the study

As any research has some limitations, this research limitation was in interview participants' selection and survey disruption. During the interview participants' selection many companies refused to make an interview with them and some others gave

me appointment for the interview then refused to do it. This affected the solution due to the number of interviews that was done. Regarding the survey distribution, sending the survey to different companies in different sectors wasn't easy so some sectors weren't included in the study.

Future research

Future work for the research can be the following:

Aim at bigger sample, interview more companies from different sectors to check if they adopted cloud ERP system or willing to adopt.

Focus on specific sector to gain insight into their understanding to cloud ERP system.

Focus on impact of cloud ERP system adoption in companies.

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