

Cloud Technology Adoption Model: A Case of Iraqi SMES

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Abstract: In the present technological age, cloud computing represents a paradigm shift in computing with the potential of causing a change in the whole perspective in which contemporary computing is viewed. In the SMEs context, cloud computing adoption and usage decisions are influenced by many factors. Despite the extensive literature, there is still limited research related to the factors which impact on SMEs, adoption of this new innovation in the developing countries. This study is designed to analyze and propose a conceptual adoption model for SMEs in Iraq. The research will be carried out using an exploratory and descriptive research design. Findings have practical implications for assisting the business sector of Iraq to be able to respond effectively and strategically to the global technological wind of change in such a way that there would be an efficient and smooth transition from the conventional systems to the cloud based technological solutions.

Key words: Cloud computing, SMEs, adoption, TOS model, Iran, Malaysia

INTRODUCTION

Today's world is more complex, dynamic and increasingly uncertain. Globalization, a process fostered and spurred by rapid advancements in information and communication technology is making the world economy more interdependent and with this comes a huge influence in many aspects of modern society (Aigbogun *et al.*, 2014). The evolution of faster internet connectivity and the availability of powerful information systems and technology tools has transformed the landscape of doing business and resulted in a new commerce arena. This has facilitated many advantages to companies that seek to expand globally and geographically by gaining new customers. Information Technology is strategic in assuming roles in strategic business operations and corporate information systems and information technology strategy. This consists of the analysis, decisions and actions that an organization undertakes in order to create and sustain competitive advantage.

The small and medium scale enterprises to a large extent contributes to the robustness and vibrancy of the business sector of every economy. However, there are different sectors in SMEs; the main four sectors are agriculture, manufacturing, construction, trade and retail and other services. Innovations in products, services and procedures associated with the SMEs go a long way in improving the ease in doing business as well as adding value to end products and services which in turn increases customer delight. The importance of SMEs cannot be over emphasized especially in the developing

economies. In the light of this (Ogunleye, 2004), posits that SMEs are of immense national benefit in the following ways-supply potential entrepreneurs, create employment opportunities, mobilize local resources and mitigate rural-urban migration.

Iraqi SMEs definition: The term SME covers a wide range of definitions and measures, varying from country to country and between the sources reporting SME statistics due to differences in economic and social conditions among countries of the world. However, there is no universally agreed definition of SMEs.

The nature of company in Iraq can be categorized as: sole proprietorship, partnership business, family owned Business and Public Limited Company. There are three main criteria used to define when a company is considered a small or medium enterprise, the number of employees, total net assets, sales and an annual turnover. However, the most common definitional basis used is employment. The Iraqi SMEs definition based on the guidelines provided by Iraqi Government's Central Organization for Statistics and Information Technology (COSIT) (Table 1).

According to a Central Statistical Organization Ministry of Planning in Iraq 2013, the number of Iraqi SME's registered with the companies registration department reach to (130434) from various activities in different Iraqi regions as Table 2. Figure 1 provides a snapshot of the Office for the Coordination of Humanitarian Affairs (OCHA) field presence throughout the 18 governorates of Iraq within the Regional Hubs as Fig. 1. As the Table 1, the four Iraqi regions are Central, North, West and South which have different numbers

Table 1: Definition of Iraqi SMEs

Defined by	Country	Small enterprises	Values	Medium-sized enterprises	Values
White (2012)	Iraq	Number of employees:	4-10	Number of employees:	11-50
Synergy (2011)		Loan size: USD	5,001-250,000	Loan size: over USD	250,000

Table 2: Population number and percentage of SME's in Iraq

Regions	SMEs	%
Central	45364	35
West	37794	29
North	16953	13
South	30323	23
Total	130434	100

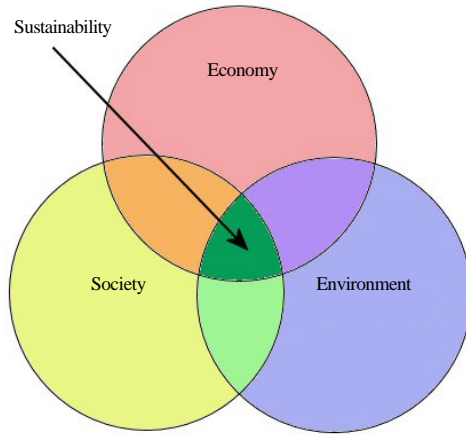


Fig. 1: Governorates of Iraq within the regional hubs

of registered SME's. Central has the largest number that reached to 45364 (35%) in the west of Iraq is 37794 (29%) while North and South have 16953 (13%) and 30323 (23%), respectively.

Background of study: Due to the constant and severe threats from competitors and competitive products and in order to stay in competition, firms need to improve their business operations and mitigate varying vulnerabilities in their organizational, internal and environmental operations (Aigbogun *et al.*, 2014). In doing this, businesses are having to adopt various state-of-the-art innovative information technologies to improve their business operations (Pan and Jang, 2008; Sultan, 2010). cloud computing which in recent years has been a very critical component in the world of information technology and a very important area for IT innovation in business (Goscinski and Brock, 2010).

Misra and Mondal (2011) defined cloud computing as a collection of disembodied services accessible from anywhere using any mobile device with an internet connection, provided by a type of parallel and distributed system of virtualized computers that are interconnected and that can be dynamically provisioned and one or more unified computing resources based Service-Level

Agreements (SLAs) established between the service provider and the user.

Over the years, cloud technology has drawn the attention of academicians, institutions and enterprises across the world as a new economic model that can be strategically and competitively utilized. Cloud computing is viewed as an economical model that can be used by enterprises to outsource some of their Information Technology (IT) resources to cloud services providers (Harmon and Auseklis, 2009).

The revolutionary development in cloud computing is one that has brought about significant progress in the way in which business is conducted and grown in terms of very important variables that borders around agility in business, affordability and cost savings as well as high capability of a system, network or process to handle a growing amount of work with the ability to be enlarged to

accommodate that growth. However this ability, cloud computing being a new technology has witnessed apprehensiveness on the part of firms in migrating their information systems to the cloud technology for implementation and this sensitivity warrants careful consideration with a view for strategy development this because the success of this relatively new technology is hinged on the successful strategic adoption by all and sundry for the benefits to be exposed on an industry basis.

The cloud technological services are usually offered by cloud service providers to their clients and the deployment models employed are usually either of three service types in which the clients can select from as determined by the intended role of cloud computing in the enterprise that intend to migrate their information systems into the cloud based technology system. The following are the three service models as proscribed by Mell and Grance (2011).

Cloud Software as a Service (SaaS): A service extended to customer that provided them with an ability to use the provider's applications running on cloud infrastructure.

Cloud Platform as a Service (PaaS): A service provided to a consumer as a platform where customer is allowed to deploy customer created applications using programming language and tools that are compatible or supported to the cloud service providers programming language and tools unto the cloud infrastructure.

Cloud Infrastructure as a Service (IaaS): A service provided to a customer as infrastructure that allows consumer to deploy unsystematic software's such as the operating system and applications.

The future of computing lies in cloud computing, with the focus of reducing the cost of IT services while increasing productivity, enhancing reliability, utilizing the availability and flexibility and decreasing processing time (Alsanea, 2015). Successful implementation of cloud computing in an enterprise requires proper planning and understanding of emerging risks, threats, vulnerabilities, and possible countermeasures. However, the rate of adopting this technology is not growing as fast as expected (Buyya *et al.*, 2009; Goscinski and Brock, 2010).

Several studies report the challenges and benefits of cloud computing and the risks associated with adopting cloud infrastructure (Nirschl, 2011), provides a background for the process and methodological guidance on migrating existing software systems to cloud computing, however, there is still insufficient literature as regards cloud Migration Management.

The growth and awareness of cloud technology in recent times has been astronomical and there are a number of advantages which are accrued to its application which is well known in business circles, however the reluctance of many SMEs to adopt this technology stems from a number of factors of which the strategy to migrate their technologies into the cloud is chief (Aljabre, 2012).

Putting the dynamics of the small and medium scale enterprises in Iraq which makes up the business sector, this research, proposes a strategic model to aid the smooth transmission of enterprises to the cloud based technology with a technological perspective in view. In achieving this aim, the following objectives would be explored in this ongoing research:

- To identify and explore the current state and level of cloud computing adoption and implementation amongst the small and medium scale enterprises in Iraq
- To identify the barriers and constraints faced by the SMEs in Iraq in migrating their systems and businesses to the cloud computing model
- To develop and propose a workable model that would serve as a strategy to enable a smooth and successful migration of SMEs to the cloud computing

Literature and conceptual model: The IT industry and the academic world have been enveloped in recent times with the various studies that borders around the perceived risks and potential benefits associated with cloud

computing adoption. Nevertheless it is widely known that these potential benefits associated with the adoption of cloud computing are numerous and of huge consequence to budding companies and the industries as a whole. This definitely impacts the economy of any nation, however, it is apparent from previous research that it is not yet mentioned since as much as its adoption comes with great benefits, the implementation of this concept can have dire consequences which can lead to economical loses, loss of reputation in cases of interruption of service or data loss/theft. With this in mind, a careful understanding and processing of the migration strategy into the cloud technology needs to be thoroughly investigated for adequate decision making.

With the review of related works at this stage it is hoped that a qualitative insight into the studies previously conducted will give knowledge of the vital variables needed to strategize a workable model. A number of studies have been conducted in the area of cloud computing suitability, adoption and implementation in different industries (Ghani and Jaber, 2015).

There are a number of factors that are taken into consideration while setting up an enterprise for adoption into the cloud technology. According to a perception study on "cloud computing in SMEs Baghdad, Iraq" conducted by Dhurgham and Marini, the entire process of cloud adoption goes through a number of steps which is termed as phases and each phase has its own requirements and once the organization shows its willingness to adopt cloud then the various resources of the organization are analyzed and the suitable migration plan for the company is developing. In their study, Dhurgham and Marini implicated four independent factors representing each phase of their migration model and these factors are organizational, technology, environment and future plan. According to Schadler (2009), the present state of information technology resources in the enterprise is one of these factors and the determinants of the size of the IT resources of a company includes; the number of servers the company maintains in its data centers; the size of the customer base of the company; the annual revenue from IT and the number of countries across which the company is spread over.

Management information systems are an essential part of modern businesses and firms are constantly in the lookout for ways to integrate their business processes into their existing information system applications in a way to create synergistic operations, building internet based technologies for transacting their businesses with their trading partners (Ercan, 2010).

Due to the competitive edge presented by adoption and implementation by SMEs and the subsequent

customer delight that this advantage translates into migrating to cloud computing technology is an important step in the life cycle of any conventional business.

Developing cloud computing capability is an important undertaking because it is not only rapidly changing the way that enterprises buy, sell and deal with customers but it is also becoming a more integral part of enterprises' business tactics. A study on "cloud deployment model selection assessment for SMEs" conducted by Keung and Kwok (2012) developed a model in which factors leading to difficulties in cloud computing adoption by SMEs were identified.

The issue of outsourcing and other variables are very important factors which have to be considered when migrating to the cloud technologies and a plus for this case as regards cloud technology was supported in the case study findings by Khajeh-Hosseini *et al.* (2010) in their research "a case study of migrating an enterprise IT System to IaaS" the findings revealed that cloud computing can be a significantly cheaper alternative to purchasing and maintaining system infrastructure in-house. Furthermore, the study showed that cloud computing could potentially eliminate many support-related issues since there would be no physical infrastructure to maintain. On the other hand, this study also showed that there are some other important socio-technical issues that need to be considered before organisations could migrate their IT systems to the cloud.

Today, moving applications to the cloud is more complex. After these said it is important to note that precautionary activities have to be undertaken before the migration into the cloud and the evaluation of the success after the migration is also a very important step (Azeemi *et al.*, 2013) proposes a holistic view in the visual display to measure information system success by combining key dimensions of information system context and information system characteristics in a model created which shows that an information system works with in a work system. Measuring success of migrating an information system to cloud depends on understanding context of an information system, i.e., stakeholder, observers, service boundary, scope of service and its relationship with in an overarching work system as seen by stakeholders. This deployment and delivery neutral model provides a mechanism to explore system complexity at multiple levels, i.e., business, work system, information system and technology levels while providing a single view of a whole system. As a result a single model provides multiple views for different stakeholders to have a shared vision to inform migration decisions (Azeemi *et al.*, 2013).

MATERIALS AND METHODS

The research process would start with an exploratory study. The intention is that the outcome of the study would form a more precise problem definition. Subsequently, the descriptive study would involve the collection of primary data through the questionnaire survey method which would be used in testing of hypotheses to answer the research questions.

A deductive research approach will be used in the case of this research in which a theory would be developed from the review of literature and statistical tests would be carried out on the variables that make up the theory. A positivism paradigm is also applied in this research. The paths that lead to finding answers to the research questions constitute the research methodology.

An interview qualitative study will be conducted. The purpose of the interview qualitative study would be: To dig deeper in the problem with the participants who concern in the target study. The interview is further adopted to find out if there is any latent factor that can affect the adoption of cloud computing in the Iraqi SMEs as well as to strengthen the research conceptual model. Adding to this, the goal of this interview is to know the opinion on IT environments, services and limitations of IT departments by the IT experts of the interviewed organizations. It can be also found the pros and cons of existing IT system from the organizations that are using other architectures. Moreover, the factors inhibiting or supporting adoption of cloud computing have obtained to be used in this study. The participants of the interview study would be recruited by means of the following criteria: experience in the field of information systems and cloud computing, academic background and current position. The content of this study would be centered on these 7 structured areas:

- In what ways can the business process of companies, most especially SMEs be improved in the 21st century?
- Enumerate on the difficulties and sophistication associated with understanding and implementing a new information system in a business?
- What are the organizational structures and the strategic planning issues to be considered by the SMEs in regards to the emerging cloud technology?
- What significant core technological issues strategic to cloud computing delivery are important for migration consideration?
- There can be several issues to be noted regarding cloud technology adoption and implementation in an enterprise. As regards this which issues do you perceive as vital regarding cloud technology and its adoption by SMEs in their information systems?

- In your opinion, what are the immediate factors external to the business environment that influence the migration decisions to the cloud technology?
- What organizational characteristics do you think have the capability of influencing decisions for migration current information systems into cloud computing?

From the data collected, the researcher used thematic analysis to analyze the qualitative data that were collected from the interviews. According to Braun and Clarke (2006) thematic analysis is flexible and simple technique used to create new ideas by identifying, analyzing and preparing patterns, these patterns or themes extracted from the data by organizing and describing these data to make sense of the data. The main stages of a thematic analysis are: read the data several times to become familiar to the reader, generating initial codes by observing the occurrence of patterns, combining codes in themes that depict the data accurately, reviewing the themes to ensure that these themes support the study and defining and naming the themes and the constructs. Researcher follow these stages in this study where the researcher started by reading the texts of interviews several times to become familiar with these answers, then generating the codes, then collecting the similar codes into issues, then combining the similar issues in themes and finally defining the constructs.

Based on literature review and the interview, the research conceptual model would be strengthened and the survey questionnaire developed. The developed questionnaire would be subjected to face validity and content validity. Face validity would be carried out by means of academicians in the field of information technology and cloud technology. While content validity would be carried out by means of Industry experts.

After making necessary modifications, a pilot study will be conducted and the analysis would be subjected to reliability testing and confirmatory factor analysis. After the pilot analysis and modifications, the research survey would be conducted.

The unit of analysis for this study is individual IT managers in Iraqi SMEs. The sampling population size would be obtained from a Central Statistical Organization Ministry of Planning in Iraq 2014. According to Krejcie and Morgan (1970) for a population size of 130,434 (confidence level is 95%, precision level is $\pm 5\%$ and variability is 50%), the required sample size is approximately 383 firms will be selected using stratified random sampling. The data collection for this study will be gathered through structured questionnaire. Target

populations are firm's managers/supervisors because they are perceived as the knowledgeable and important person in the firms, therefore they will be likely to have valid perception of IT and cloud technology adoption.

RESULTS AND DISCUSSION

Theoretical bases: This study examines the theories and literature that are used to examine SME's adoption of cloud computing in order to identify potential factors that may affect adoption of cloud computing. This section outlines the following theories: Diffusion of Innovation (DOI) Theory and Technology-Organization-Environment (TOE) framework.

Diffusion of innovation theory: The famous diffusion theory that has been widely used in the studies of technology adoption is DOI by Rogers (1962). Diffusion of Innovation Theory (DOI) is mainly known as a theory developed by Everett Rogers, a professor of rural sociology who wrote a book on this theory in 1962. However, Rogers is not the first person who introduced the concept of diffusion. One of the first studies regarding diffusion of innovation is the research conducted by Ratzel who studied the trans-cultural diffusion. Another influential study is conducted by Lazarsfeld *et al.* (1994) who interrogated the voting behavior of individuals. This study illustrated the importance of opinion makers' attitude in changing voters' mind. Later, Ryan and Gross (1943) studied the factors influencing the diffusion of seed corns in two Iowa communities.

The current version of DOI tries to discover the factors that influence the spread of a new idea or technology in a society (Rogers, 2003). The objective of this theory is to define why one innovation successfully diffuses in an organization while another does not. Innovation adoption is a part of the innovation diffusion process (Rogers, 1995) defines adoption as the decision of an individual or organization to make use of an innovation. DOI is used to study innovation adoption issues such as how, why and at what rate innovations are adopted by individuals or other adopting units (Rogers, 2003).

Technology-Organization-Environment (TOE)

Framework: TOE framework which is developed by Tornatzky *et al.* (1990) is originally an organizational psychology theory. However it has extensively been used by IS researchers. According to TOE framework, three aspects of enterprises' context influence the decision to adopt an innovation at firm level. Figure 2 show the TOE

framework and its elements. As it shows the decision to adopt a technological innovation is influenced by technological, organizational and environmental aspects of the enterprise.

According to Tornatzky and Fleischer (2000), technology adoption within an organization is influenced by factors pertaining to the technological context, the organizational context and the external environment. The TOE framework is a comprehensive framework that has been used in many studies (Cho *et al.*, 2006) to investigate user perception and adoption of new technology.

Seeing that the business environment is a vital component of any organization, sustainability and sustainable development is therefore very important a variable to consider. Sustainable development was defined by Brundtland (1987) as “meeting the needs of the present without compromising the ability of future

generations to meet their own needs”. While the need to promote sustainable development was made clear through this definition the approach to translate into practice for product and service providers was not that obvious. Elkington (1998) helped operationalize the application of this concept by presenting it as the three bottom lines (economic, environmental and societal) the business community should work on to achieve the goals set by the Brundtland commission. The theoretical model for this research therefore draws on the modification of the TOE framework by Tornatzky and Fleischer (2000) by incorporating the concept of sustainability. Figure 3 shows the conceptual model for this research.

The visual display (Fig. 3) is a representation of the research conceptual model, comprising of three independent variables each having three dimensions: technology (relative advantage, complexity, compatibility); organization (top management commitment, company’s size, technology readiness) and sustainability (environmental, societal and economic). There is one dependent variable and that is “cloud computing adoption”.

Individual services or organization are not regarded as sustainable in isolation. The achievement of sustainability in information systems and technology requires the involvement of the government, the organizations and public interest groups (Soni and Jain, 2011) to ensure not only sustainable production systems but also sustainable consumption patterns on the part of individuals and institutions.

Operationalizing information systems for computing in the banking industry requires a wider consideration

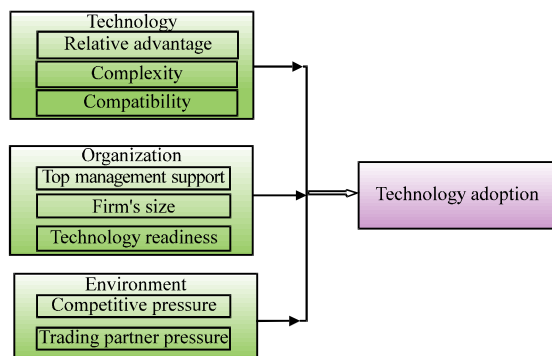


Fig. 2: Tornatzky and Fleischer (1990) (TOE) framework model adapted by Low *et al.* (2011)

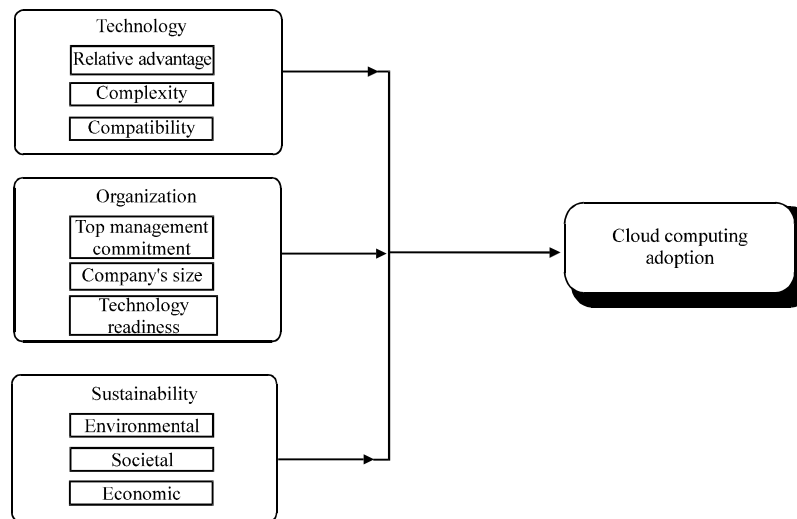
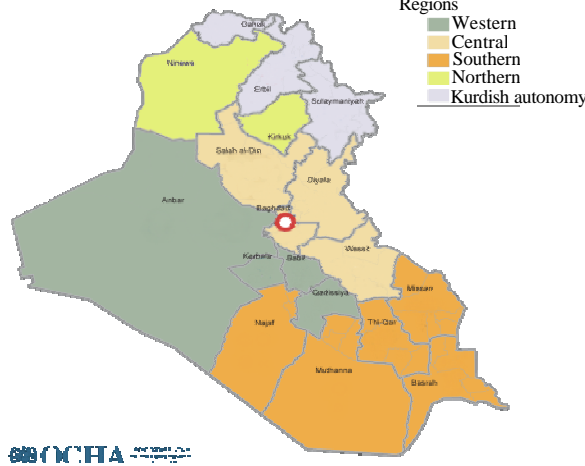


Fig. 3: Conceptual model source: adapted and modified from to Rnatzky and Fleischer (2000)



that involves the Triple Bottom Line (TBL) (economic, environmental and societal aspects) and is inclusive of not just the activities in pre-usage of the information systems but also the post-usage (Elkington, 1998). The theoretical model for this research therefore draws on the modification of the TOE framework by Tornatzky and Fleischer (1990) by incorporating the concept of sustainability. The research conceptual framework, comprises of three independent variables each having three dimensions: technology, organization and sustainability (Fig. 4).

Environmental sustainability: In an ecological context, IT services must be able deliver customer and business value while ensuring that the Earth's resources are being used at a rate that ensures replenishment. In essence, the goal for environmental sustainability is for IT services to be able to meet the needs of the present without compromising the ability of future generations to meet their needs (Harmon *et al.*, 2009; Senge *et al.*, 2008).

Compliance with these need to be monitored and managed. Social responsibility needs to be managed throughout the whole life cycle in order to assure a green

CONCLUSION

This research would provide an intellectual challenge and contributes to the knowledge in the area of users' perceptions of migration decisions and implementation to the cloud technology paradigm.

This research proposes the modification of the TOE model by incorporating the sustainability concept into the organizations internal and external environment. It is therefore recommended that this modified model is deployed empirically.

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