The Application of Cloud Computing in E-government Systems

by

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In
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STATEMENT

I certify that this work has not been accepted in substance for any academic degree and is not being concurrently submitted in candidature for any other degree. Any portion of thesis for which I am indebted to other sources are mentioned and explicit references are given.

Student Name: Akram Ali Othman Nasr.
Signature:
First of all, I would like to thank ALLAH who support me and supplied me with power and faithful to comprehensive with this hot topic. I wish to express my deep gratitude and appreciation to Prof. Dr. Galal Hassan Galal-Edeen, for his guidance, advice, support throughout the entire thesis, and his teaching of the methodologies for good scientific research. I would like to present my thanks to my father for his advice and support. Second, I would also like to thank my family specially my mother, my wife, my sons, my brothers and my sisters. I thank the Ministry of High Studies and Scientific Research in Yemen, for the fellowship awarded to me. I present this work to the Yemeni Universities. I wish that I contribute some thing valuable to this community, if there is some thing wrong this is from my self and devil and if there are some thing right it is from ALLAH.
Publications arising from this research:


Web site:  www.ijric.org
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<td>ICTs</td>
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Abstract

E-government projects face much challenges that may lead to the failure of e-government. Most important of these challenges include the human resources are not qualified and the high cost of infrastructure and the traditional infrastructure cannot scale, scalability demands change over time. The solutions of these challenges in cloud computing will make cost saving, professional management of resources and applications, and the ability of scalability. However, the transition of e-government to cloud computing in the status quo will face many problems will make the cloud computing a problem not solution, such as: local governments are similar in some requirements that generate redundancy of services in cloud computing, and it is necessary to know the need degree to cloud computing. The current environment of e-government applications will fit cloud computing environment or not. The need to partial transition of e-government to cloud computing according to security, trust, and privacy considerations. Thoughtful and orderly transition will be needed. In this research, the researcher proposes a new development model of e-government called "Before Cloud E-government Model BCE-government model" that satisfies the cloud computing and attempts to avoid the previous problems.

Keywords: E-government, Cloud computing, E-government development Models, BCE-government Model, Development stages of e-government.
CHAPTER 1

INTRODUCTION

In this chapter, the researcher will present a visualizing about the thesis for each part. First section 1.1 will discuss the background and motivation of selecting the topic of the application of cloud computing in e-government systems. Second Section 1.2 will determine the problem statements. Third section 1.3 will discuss the objectives and aims of this thesis. Fourth section 1.4 will discuss the methodology that will be followed in the research. Then, section 1.5 will list the outline and action plan of the thesis. Afterwards, section 1.6 will determine the contribution of this thesis. Finally, section 1.7 will be about the structure of the thesis.

1.1 Background and Motivation.

E-government (electronic government) in short term means the operation of providing governmental services to the citizens electronically by using Information Communication Technologies (ICTs) specially the Internet [5]. That means the governmental services will be turned into electronic services (E-services). E-government started emerging in nineties of the last century as project to provide e-services to the citizens in order to save cost, time and effort. With this progress of technology, the development models of E-government began in the appearance to put the scientific steps to adopting and development e-government from zero point or to
develop another existent e-government. These development models developed according to different standards that change from one country to another. These development models developed to become maturity models to assess the progress of any e-government projects.

With this evolving, The Cloud Computing began to appear in the horizon as a revolution in the world of information technology at this century. Cloud Computing sparked widespread controversy nowadays about the future of information technology fields including E-government.

Cloud computing means providing the computer resources as services via the internet by providers to customers. These computer resources include the power of CPU processor, storage space, bandwidth and also the required applications to manage any operations [7]. Cloud computing services also include the operation of maintenance and update and manage the applications. That means the computer resources will be turned from products to services and the payment to cloud computing services provider according to the using as an electricity bills. There are three fields of services at cloud computing:

A. Software as a Service (SaaS): includes the providing original software to the end users as service via internet to manage their operations and requirements.
B. Platform as a Service (PaaS): includes the providing applications to the developers as tools to built and develop their applications
C. Infrastructure as a Service (IaaS): includes the providing of infrastructure, hardware and network equipments to the organizations to built their projects [1]. For cloud computing services and its customers, see figure 1:
Cloud computing is very useful for E-government projects. The cost of infrastructure of E-government and the inefficiency of human resources and staff. These are two main factors for the failure E-government projects. Cost Saving and professional management and use of all resources and applications will occur at cloud computing. This motive prompted the researcher to think about application of cloud computing in E-government.

However there are many problems will be occurred from the unorganized transition of e-government to cloud computing, such as redundancy of services, which generate additional costs in cloud computing and the privacy of some governmental transactions. It is necessary to propose new development framework model to organize the transition of e-government to cloud computing and application of cloud computing in e-government. This model is to satisfy the cloud computing.

1.2 Problems Statements

The solutions which cloud computing can offer for e-government challenges include: (scalability, cost saving, professional management of applications and resources), but the transition of e-government to cloud computing in the status quo and without organizational model can generate the following problems:
1- Studying the degree of need of cloud computing for e-government. What is the reality of e-government which leads to cloud computing to avoid the failure. Cloud computing should not be a luxury. It is necessary to know the status of e-government.

2- The environment of e-government applications should be suitable for cloud computing environment. E-government appeared before cloud computing. There are some legacy systems in e-government environment do not fit with the modern environment of cloud computing. It is necessary to make tuning of environment or appropriateness of the applications.

3- The partial transition of e-government to cloud computing according to security considerations. Some services will move to cloud computing, and some services still in the local infrastructure. It is necessary to know the modality to separate the services in the application to facilitate the controlling for services without effect on function of the application.

4- Local governments usually are similar in functional applications. The transition of e-government to cloud computing in presence that similar applications will make redundancy of services that generate additional cost in cloud computing. Reducing the redundancy of services is needed.

5- Security, privacy and trust are critical issues between e-government and cloud computing provider. Building strong Service Level Agreement SLA (legal contract), and determining security model to access the data in cloud computing are needed.

These problems that the research tries to get relatively satisfactory solutions by proposing new development model consists of five stages to solve the previous five problems.

1.3 Objectives

The application of cloud computing in e-government systems needs to propose new development framework model (because the transition of e-government to cloud computing is a developmental process, and the new environment of cloud computing needs to a new style of e-government) to solve the five problems. This thesis aims at developing and proposing new development model as a framework to the correct
transition of e-government to cloud computing to get the useful and organized application of cloud computing in e-government to avoid the five problems. The proposed model consists of five stages (every stage tries to solve one problem). This model is called *Before Cloud E-government Model* (BCE-Government Model). The correct transition of e-government to cloud computing, See figure 2.

In addition, the thesis objectives and aims include surveying the previous models of cloud computing for e-government, determine and analysis the weaknesses of the previous models. In addition to the analysis of the environment of cloud computing benefits and collecting the concerns of transition the e-government to cloud computing from the reality of e-government. Accordingly, the researcher will build a proposed model. Finally, the researcher aims at publishing a research adopted this thesis in an international scientific journal.

![Figure 2: The Correct Transition of E-government to Cloud Computing.](image-url)
1.4 Methodology

The proposed BCE-government model will be designed according to the analysis of previous models of cloud computing for e-government, then the analysis the problems of transition of e-government to cloud computing which collected from the theoretical context, afterwards the analysis of requirements of cloud computing environment, next the collection of more problems from the reality life, next the interviews are the mechanism which will be used to collect the more problems from the reality life. Finally, contract the proposed model.

The model will be tested as validation to determine its results in e-government of Egypt at Ministry of Administrative Development.

In this methodology, the researcher will collect data from the reality-life context twice. The first time before submitting the proposed model is to collect problems. The second time after submitting the proposed model is to test as validation. This will make a strong contribution of the work. The researcher can determine the main procedures of the methodology as follows:

1.4.1 Theoretical analysis for previous models

The operation of the analysis for the previous work in cloud computing and e-government. Determining the shortcoming of the related work. Determining the start points of the proposed model depending on the weaknesses of the previous work.

1.4.2 Interviews

The operation of data gathering and problems gathering needs to make interviews. The interviews will be semi-structured interviews. The participants in these interviews should be from experts that have great experience. The experts should answer the questions that relate to the e-government development model and the future of cloud computing in e-government. The results will be the concerns and problems of cloud computing and e-government models obstacles. In addition to the initial conception of some stages of new model to solve these challenges.
1.4.3 Validation

Validations are good techniques to test any proposed solutions to address certain challenges. The validation will add strength for any work. This proposed development model will be presented as validation test in e-government of Egypt at the Ministry of Administrative Development. The researcher will put two sides of this validation:

A- Data gathering

The data gathering by building a comprehensive questionnaire includes all stages of the proposed model. The questionnaire will collect all data about the proposed model. The participants in the questionnaires will answer the gradual intelligent (easy, direct) questions in order to get all comprehensive data of the proposed model for each stage.

B- Data analysis

The researcher will analysis the collected data by using statistical equations that read the meaning of the collected data and derive the percentage of success for every stage. The statistical equations will explain the meaning of collected data, and make the results.

1.5 Project Outline and Action Plan

A Project includes five main parts distributed into five chapters as follows: 1. Introduction and background part, 2. The related work part, 3. The proposed solution part, 4. Test part, and 5. Conclusion and results part. See figure 3: