Using Cloud Computing for E-Government: Challenges and Benefits

Sajjad Hashemi, Khalil Monfaredi, Mohammad Masdari

Abstract—Cloud computing is a style of computing which is formed from the aggregation and development of technologies such as grid computing distributed computing, parallel computing and service-oriented architecture. And its aim is to provide computing, communication and storage resources in a safe environment based on service, as fast as possible, which is virtually provided via Internet platform. Considering that the provided Services in e-government are available via the Internet, thus cloud computing can be used in the implementation of e-government architecture and provide better service with the lowest economic cost using its benefits. In this paper, the Methods of using cloud computing in e-government has been studied and it's been attempted to identify the challenges and benefits of the cloud to get used in the e-government and proposals have been offered to overcome its shortcomings, encourage and partnership of governments and people to use this economical and new technology.

Keywords—Benefits, Cloud computing, Committee, Challenges, E-Government, Participation.

I. INTRODUCTION

OVER the past 10 years Internet and Web-based services have grown rapidly and has been used by many companies. However, the cost of data storage and the power consumption by the hardware is increased. At the same time major companies started extensive studies to reduce costs, better utilizing of existing resources and also to support their own business. In these studies, they found a new solution to answer their challenges, to use and to get maximum benefit from the resources and it was nothing but cloud computing [1]. Yes, this new technology is what which can answer thousands of their hardware and software needs. Today, the unique characteristics of cloud computing, has turned it to a valuable technology. Such that is considered the hottest topic in Research centers and universities related to the field of information technology [2].

Every day the expansion and complexity of the e-governments is being observed, So that the Size of their computational data is increasing daily. Thus, a suitable model for implementing e-government is required to include System

Sajjad Hashemi is with the Department of Computer Engineering, Science and Research Branch, Islamic Azad University, West Azarbayjan, Iran (e-mail: Iau.hashemi@gmail.com).

Khalil Monfaredi is with the Engineering Faculty, Department of Electrical and Electronic Engineering, Azarbaijan Shahid Madani University, Tabriz 5375171379, Islamic Republic of Iran (e-mail: khmonfaredi@azaruniv.ac.ir).

Mohammad Masdari is with the Department of Computer Engineering, Urmia Branch, Islamic Azad University, Urmia, Iran (e-mail: m.masdari@iaurmia.ac.ir).

efficiency and user satisfaction. As it mentioned before, Cloud Computing was introduced in other styles, such as Grid computing and service-oriented architecture which goal of these styles is processing large quantities of data using clusters of computers. Such high-volume computational problems can be solved easily and in an appropriate manner with the expansion and evolution of cloud computing. The other benefits of cloud computing in e-government should not be ignored of course. Which cost Reduction, integration and reusability of services can be noted. Due to the cloud computing's novelty, in order to identify cloud computing's benefits and weaknesses, it is necessary that this technology get completely identified for the development and use of it in e-government architecture, and its different domains should be considered much as possible to be used in the e-government and should've tried to overcome its shortcomings.

II. CLOUD COMPUTING

Cloud computing have various definitions which some have been brought here. The definition of the national institute of standard and technology of America is as follows [2], [3]: "Cloud computing is 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." On other common & acceptable definition is of Mater et al. [2]-[4] "A very exact scalable instrument, capable of technology-enabled service, which is available easily on the internet when needed."

Following the definition of cloud computing, we should comprehend their important features, developed models, the way of using services and also the way of protecting it, in order to know well and accept it [5]. Here are the five key features of cloud computing [2]-[6]:

- **Service demand on self.** Using this feature when needed the customer can easily and automatically access to computing facilities like server, net, storage and soon from any provider.
- **Ubiquitous network access.** It implies that the facilities are accessible on the net and they can be used following standard methods. The methods which support weak and strong clients like laptop and mobile phones.
- **Location-independent resource pooling.** This features pools different customers needed resources in the same place dynamically by the providers. These resources can

World Academy of Science, Engineering and Technology
International Journal of Computer and Information Engineering
Vol:7, No:9, 2013

include the storage, memory, the bandwidth of net and virtual machines.

- **Rapid elasticity.** Using this feature, the facilities can be provided rapidly and with high elasticity and can be expanded or release fast. In other words the services can always be updated and improved and accessible for the users.
- **Measured service.** This feature enables monitoring, control and reporting of the resources, and can apparently control and report the amount and quantity of resource using for both customer and the provider of the infrastructure. In other words all these features cover the coherence and appearance of the clouds.

Development models include the aim and identity of cloud and the way they are settled. NIST definition of the development models are of the following four types [2], [3]:

- **Public cloud:** The substructure of public cloud is for the public use and accessible to all in which the resources, applications and web-services are provided through internet and public organizations help to provide and supply the substructures [7]. Indeed a cloud service provider organization owns the public cloud.
- **Private cloud:** Private cloud is for the exclusive use and only for an organization, so everyone in the organization can access data, services and applications but others out of organization can't [7].
- **Community cloud:** Community cloud are provisioned and prepared to make some common facilities and resources available. Its substructure can be shared between one or some organizations but the main point here is that the requested work of them is the same and the demanders follow somehow the same mission, policy, security and soon. In Community cloud a certain group support tasks like security needs. Of course this king of sharing will have consequences for the organization at work [8].
- **Hybrid cloud:** The last models are Hybrid ones which are combination of two or more (public, private and community) clouds. It is in fact an environment which uses some internal and external cloud providers [7].

Various services of cloud are presented into three models which are [2], [3]: software as a service (SaaS), platform as a service (PaaS) and infrastructure as a service (IaaS)

- **SaaS,** in this section the customer doesn't manage the infra-structure of cloud including the net, servers, operational systems, and saving area, except the functional software to limited degree of adjustment at the level of user [8]. Consequently the companies are not interested in SaaS because of the security concerns of companies as the main hindrance in accepting them [2]-[9].
- **PaaS,** in this kind of service, the client has the option of putting the purchased functional programs on the infra-structure of cloud [9]. Here also the client dose not mange or control infrastructure of the cloud such as the net, servers, storage. He just has control over the functional

program installed or Settled by him [8]. In fact the PaaS is similar to SaaS the difference is that PaaS includes exclusive program environment and computing platform, developing and solution strategies [10].

- **IaaS,** The client dose not manage or control in infra-structure but has control over the operational system, saving area, and the established programs. In this service an artificial server is completely available for the client [9].

In this section the definitions of cloud computing, cloud models and types of services provided by it have been described. In the next section the concept of e-government will be introduced to give the opportunity to discuss the challenges facing the implementation of e-government with cloud computing with a proper understanding.

III. E-GOVERNMENT

Governments throughout the world are promoting services in the best possible way to perform daily activities, especially in government's offices that have direct interaction with citizens. The use of the latest technologies is critical to reduce required time for the processing processes and in order to improve interaction with citizens through providing efficient and effective services [11]. E-government can change the provided services to citizens, Provide access to information for citizens, and enable them to participate in the economic and social opportunities So that they can make a better life for themselves and future generations [12]-[13]. Today, the use of ICT in order to improve efficiency and effectiveness, transparency and comparability of financial and information exchanges within the government, between the government and its subordinate organizations, between government and citizens, and between government and the private sector, is called "E-government" [13]-[14]. E-government provides the government processes such as digitization of government records, automation of tax collection, receive community feedback, information dissemination collection of data / information, conducting elections management, etc. with the use of modern information and communications technologies such as the Internet, local and global network, Mobile, etc. 24 hours a day [15], [16].

Realization of E-government projects is done aimed at achieving different goals and these goals are meant to observe the following principles [15]:

- improve and increase providing governmental services
- empower citizens through access to information and the government's ability to interact and collaborate
- achieving greater transparency and accountability of government
- Improvement of internal relationship between the government and the citizens' electronic delivery

Many countries have attempted to implement e-government to realize their goals with the principles mentioned above. Some of these countries have achieved remarkable successes in this area. Based on the Waseda University Institute ranking

World Academy of Science, Engineering and Technology
International Journal of Computer and Information Engineering
Vol:7, No:9, 2013

which is presented in March 25, 2013 Singapore is at the forefront of the most successful countries in implementation of e-government. The top 15 countries in implementation of e-government ranked by the Waseda University Institute are listed in Table I.

TABLE I
THE TOP 15 COUNTRIES IN IMPLEMENTATION OF E-GOVERNMENT [17]

No	Final Ranking	Score
1	Singapore	94.00
2	Finland	93.18
3	USA	93.12
4	Korea	92.29
5	UK	88.76
6	Japan	88.30
7	Sweden	87.80
8	Denmark	83.52
9	Taiwan	83.52
10	Netherlands	82.54
11	Australia	82.10
12	Canada	81.78
13	Switzerland	81.33
14	Germany	80.08
15	Italy	79.11

There are seven main indicators used to rank the e-Government development of countries in the world. These indicators are Network Preparedness, Required Interface-functioning applications, Management Optimization, National portal, CIO in Government, e-Government Promotion, and e-Participation (Digital Inclusion) [17].

It shows that governments provide more advanced e-service delivery, better access to information, more efficient management and improved interactions with peoples, primarily as a result of increasing use by the public sector of information and communications technology[12].

In the previous two sections the concept of cloud computing and e-government have been discussed, now with the understanding achieved from cloud computing the implementation of e-government challenges and benefits of this technology will be examined.

IV. CHALLENGES IN E-GOVERNMENT AND CLOUD COMPUTING

An effective e-government system should be Reliable, economical and easy maintenance [12]. The government can use the powers and abilities of cloud to cover some communication gaps, especially relation to those of the citizens who reside in remote areas. Cloud can also be used to increase collaboration between different organizations within the government, reduce data redundancy and track and monitor the effectiveness of government plans. Sharing the computational resources between the central government and the states will lead to a reduction in infrastructure costs. Transparency in government can quickly be achieved through the adoption of cloud. Cloud has a lot of potential in this section and its benefits will come not only to themselves but

also to the millions of people [12].

E-government automatically provides an integrated management with cloud computing by solving resolution problems and helps to reduce the budget based on the actual use of the data. The cloud architecture can help the government to reduce repetitive operations and increase the effective use of resources, in the global arena. These matters in their turn have an effective aid to create a green government, reduce pollution and waste management. Currently companies and small businesses are using the benefits of cloud based on pay-as-you-use service model which is available in a wide scale [12]. Effective challenges in e-government are classified into three groups that include social, economic and political barriers [14]. These barriers limit the scope of policymakers' activity for effective use of new technologies. There are number of technical challenges such as data scaling, auditing and logging, replication and migration, disaster recovery, management policies, system integration, legacy software, Obsoleted technologies and migration to new technologies [18]. Cloud computing is appropriate to respond to these challenges. Cloud Database provides on-demand and high scalability. Which holds a large number of records that is the basic need in government. Cloud provides the ability to audit event, Login and report information about the tenant and based on program which recognizes fraud and corruption in government agencies. This can help in creating mechanisms for security increasement. There for reliable and accessible applications can be created [18]. Facilitate proliferation and migration of applications is possible with virtualization technologies in the cloud which is useful in disaster recovery and reduction of time to establishment new softwares. Cloud provides tools and technology which simples and Eases the disaster recovery [12].

V. THE BENEFITS OF USING CLOUD COMPUTING FOR E-GOVERNMENT

Cloud computing technologies have many benefits in different parts of e-government. These benefits are not limited to the contents discussed in this section.

A. Rapid Elasticity

Cloud computing is designed to provide services with unlimited scalability which is regarded as one of its basic features [19]. Customers have access to a huge pool of virtual resources which allows them to respond to unpredictable periods of peak load with an efficient, flexible and cost-effective method [20]. Therefore, performance and economic stability is balanced. In addition, cloud computing resources can be purchased automatically in any quantity at any time [21].

B. Protection, Care and Technical Support

Cloud computing service providers are hosts to applications and purchased servers. They are also responsible for updating software and provide technical support. The beauty of Cloud is appearing here to solve problems of e-government especially

World Academy of Science, Engineering and Technology
International Journal of Computer and Information Engineering
Vol:7, No:9, 2013

for small government department's outskirts of cities because employment of trained troops is not economical and also Professionals preferring not to work in such remote areas [22]. Moreover, in the cloud technology it is not necessary to update the software applications over a single computer [19]-[23]. This work will lead to save cost and time, and requires less trained personnel for developing countries and will increase system efficiency (by preventing maintenance errors) and its effectiveness.

C. Cost and Efficiency

The service models of cloud computing have focused to provide economical services to companies and Government agencies. It creates an opportunity to change from costs of investment to operating costs by reducing the cost of purchasing very expensive systems and employ professional employees to manage and maintain [21]. Hence one of the major barriers of having a huge and expensive technology infrastructure will be reduced and new opportunities for investment in developing countries will increase further.

D. Auditing and Logging

Traceability any change to contains of information is necessary in e-government services. Corruption in government agencies can be controlled with using information technology services and by responsibilities of service providers. Auditing process, security audits should be performed periodically to ensure system security. Cloud can help in analyzing huge volumes of data and detecting any fraud. This can help to build defense mechanisms to enhance the security, therefore applications are made available and reliable [24].

E. Disaster Recovery

This is really a critical issue for the survival of many organizations to ensure whether have the ability to survive at events Caused by their IT infrastructure or not. Disaster recovery programs in clouds provide more options than traditional disaster recovery model for organizations to restore information very quickly and effectively [19]. At this type of disaster recovery costs and recovery time are reduced [23]. Governments can store a backup of the server using the cloud as a backup for disaster recovery, daily basis and also can store it off-site using a third party storage service provider that has the ability to save in a different location.

F. Reporting and intelligently

Data Center (CPU, storage, network, etc.), the peak load, Consumption level, Use of energy along with time, are some factors That monitoring and reporting are necessary for better resource utilization. This minimizes costs and scheduling [24]. Profiling data makes various services provided by the government visible. Cloud provides the Best Smart Infrastructure Business in comparison with previous methods because it has its extent and functionality. Applications can extract large amounts of real time and reliable data to make the best decisions for providing better services [24].

G. Policies Management

E-government applications have to implement Policies raised by the government facing citizens [25]. These policies should be implemented Along with infrastructures and data centers to improve the daily performance. Cloud architecture is helping to implement this policy in a data center [24]. Security-related policies deploy applications, etc. Can be designed and implemented in the data center.

H. Systems Integration and Software LEGACY

Not only applications and offered services are transferred to the cloud, it also integrates with cloud-based applications [24]. Powers of IT are data correlation across applications and messages transmit in different systems to provide faster services to end users. Cloud is built based on the principles of SOA and can provide excellent solutions to integrate various applications. Also, applications can be seamlessly easily transferred into cloud [24].

I. Old technologies and Migrating to New Technologies

Transition from an old technology to a new one is always challenging. Using different versions of software, programs and security packages, is one of the nuances in the data center's security maintain in e-government [25]. E-government applications due to existence of Security and adaptability, Can manage the proposed policies using cloud. Different types of e-government applications are simply integrated [25]. Cloud architecture provides ability to run different versions of software at same time. After testing these applications they can enter the production phase [25].

J. Green technology

The use of ICT systems in the public sector has created a negative impact on the eco So that rate of carbon dioxide increases and requires more power consumption [23]-[26]. Cloud computing is relatively good in energy consumption and provides eco-systems through virtual services. Using Virtual Services, power consumption of an ordinary PC is reduced to 90% [26], [27]. Nowadays much attention has been paid to the effects of data centers. Power consumption and e-waste in the air can bring environmental hazards [25]. This could be one reason for the government's move towards cloud. Cloud rather than building new facilities, provides the possibility of centralizing the existing facilities.

K. Security

The cloud computing which is presented after technologies such as service oriented architecture brings not only the benefits of these technologies, but it is trying to fix their flaws as well. To implement e-government, One of the major challenges of governments, was security issue particularly data security which before cloud computing created many problems including disruption of servers or data centers, lack of access to certain services at certain times of year, such as voting and election days for governments and users but Implementation of cloud computing includes advanced security technologies. Having a pool of resources enables cloud providers to

World Academy of Science, Engineering and Technology
International Journal of Computer and Information Engineering
Vol:7, No:9, 2013

concentrate on all of the security resources in order to secure the environment. Also the automation within the cloud along with focused security resources creates advanced security features. Nevertheless no system can fully ensure the security.

VI. EVALUATING CLOUD COMPUTING RELATED TO E-GOVERNMENT

After introducing some of the benefits and challenges of cloud computing related with e-government, overall evaluation of using cloud computing in e-government' projects is shown in Table II.

TABLE II
EVALUATING CLOUD COMPUTING RELATED TO E-GOVERNMENT

Evaluation Criteria	Result
Performance	Improve the quality of services and applications availability of services and resources on-demand and Increased access
Efficiency	Reduce implementation costs Reduce the time and easy access to applications and data
Key Benefits	Integration and better interaction between organizations Create newer and better services along with lower cost Transparency and ongoing evaluation of services and monitoring of events in time Overcome geographical, hardware and software limitations Increased participation

VII. CLOUDY GOVERNMENT EXAMPLES

A. Singapore

The Singapore Government acknowledges that each model of cloud computing provides its own level of assurance and benefits. As such, strategy of the cloud for Singapore Government is to leverage the proper cloud for the proper need by adopting a multi-prong approach to cloud computing as follows [28], [29]:

- Leverage commercially-available public cloud offerings for proper needs so as to benefit from lower cost of computing resources.
- Implement a private government cloud (G-Cloud) for whole-of-government use where security and governance requirements cannot be met by public clouds.
- Enable interoperability between G-Cloud and agency Clouds through a set of internal G-Cloud standards.

The Singapore Government Cloud or G-Cloud is the next generation whole-of-government infrastructure. It will provide efficient, scalable and resilient resources for cloud computing and will be designed to meet different levels of security and governance requirements [29]:

- High Assurance Zone – a physically dedicated computing resource pool which will only be used by Government to serve its high assurance needs.

- Medium Assurance Zone – a computing resource pool which will be shared with non-government cloud users to lower cost of computing resources for Government.
- Basic Assurance Zone – a computing resource pool which is shared with public cloud users

To further aggregate the whole-of-government demand to minimize the cost of Government, the Government will identify and provide common services, such as business analytics, customer relationship management and web content management, software as a service and platform as a service offering on G-Cloud. New central services like government web service exchange and gateways to authentication and payment services will be added at the next phase of G-cloud. G-Cloud enables standardization, and sharing of computing resources and applications at the whole-of-government level, thereby generating cost savings to the Government.

B. USA

The official web portal of the United States government (www.usa.gov) is one of the busiest website portals in the world as it receives approximately 342,000 visits daily [30]. It is the best site to visit when U.S.A government services are required. It is designed to aid the citizens of U.S.A to interact with the government departments efficiently. However, users frequently suffered long delays and downtimes during high traffic periods, such as voting seasons, monthly unemployment statistics release days, and natural disasters. In order to overcome this problem, U.S.A government decided to develop new IT hardware devices, which stays Idle most of the time when there is no high demand to access the web portal [25]. It also uses more power and requires additional security features such as multifactor authentication and physical on-site security at the data center building. The time required to upgrade this site was up to nine months. The General Services Administration (GSA) was paying about two million American dollars for software licenses and hardware upgrades in addition to 350,000 US dollars for staff costs each year [25, 31].

Vivek Kundra has suggested a better approach; United States first federal Chief Information Officer (CIO) to migrate to the clouds was selected for the following considerations [25]:

- The cloud computing platform's flexibility: the benefit of paying for a baseline capacity for normal traffic periods, but it can accommodate large traffic when needed and save cost when it's not being used.
- Minimal time for migration: because of the provided services sensitivity, it needs the minimum time to complete the migration. The actual migration process took 10 days only, while the test validation occurred in one week.
- Additional security elements: all the security requirements for the website administration are met such as multifactor authentication (MFA) to access the portal, packet flow analysis, 128-bit encryption for traffic, and resource tracking. Furthermore, according to the Ministry of

World Academy of Science, Engineering and Technology
International Journal of Computer and Information Engineering
Vol:7, No:9, 2013

Defense standards; a special data center has been built to meet the security specifications of the physical building.

The outcome of migration to the cloud resulted in reducing cost (up to 90%), improved capabilities, system flexibility and complete process automation. Thus, customer requests are handled in real time and allowed users to access data to integrate with other websites [27]. Cloud-based solution made upgrades to the site takes only a single day, which previously took nine months to accomplish [32]. Thus, the availability of the website increased up to 99.99 % with almost zero downtime monthly. The allocated budget to www.usa.gov reduced to only 650.000 American dollars per year [31].

C. United Kingdom (UK)

The UK government has made the creation of the "G-cloud," which is to be a government-wide cloud computing network, a strategic priority [33]. The Digital Britain Report, issued jointly in June 2009 by the Department for Business Innovation & Skills and the Department for Culture, Media and Sport [32]-[34], calls for the UK government to take the lead in a wide-ranging digital strategy for the country. As Prime Minister Gordon Brown announced the issuance of the report: "Digital Britain is about giving the country the tools to succeed and lead the way in the economy of the future" [35]. An important aspect of the Digital Britain strategy is to improve IT use in government and allow for more services to online migration. To support this action, the UK's IT procurement efforts will be focused on enabling the government to become a leading force in the use of cloud computing. The report states that: "The Government's impact on the digital economy goes way beyond its role as policy maker. In delivering public services, as a large customer of ICT products and services and as the owner of data systems, the public sector has enormous influence on the market. In many areas, such as education, health and defense, Government can use its position as the leading procurer of services, to drive up standards (in some cases to set standards) and to provide an investment framework for research and development" [34]. The Digital Britain team from both cabinet offices has an official forum, where interested parties can learn more about the plan and comment on it, located at http://digitalbritainforum.org.uk/. [32]

D. Japan

In Japan, the national government is undertaking a major cloud computing initiative, dubbed the "Kasumigaseki Cloud" (named for the section of Tokyo where many Japanese government ministerial offices are located) [32]-[36]. The initiative seeks to develop a private cloud environment that would host all of the Japanese government's computing eventually. According to Japan's Ministry of Internal Affairs and Communications (MIC) [32], the Kasumigaseki Cloud will provide greater information and resource sharing and promote more standardization and consolidation in the IT resources of government. By consolidating all governmental IT under a single cloud infrastructure, the Japanese

government believes it will see not just reduced costs and operational benefits, but more "green," environmentally friendly IT operations [32]-[37]. The Kasumigaseki Cloud is part of the Digital Japan Creation Project. This represents a governmental effort aimed at using IT investments (valued at just under 100 trillion yen) to help spur economic recovery by creating several hundred thousand new IT jobs in the next few years and doubling the size of Japan's IT market by 2020 [38]. The MIC believes that "accelerating the use of ICT nationwide will require the government to take the initiative in implementing measures," and that the national government's promotion of cloud computing will not just help spur ICT development, but to help diminish the digital divide in that country [32].

E. Thailand

In Thailand, the Government Information Technology Service (GITS) is establishing a private cloud for use by Thai government agencies. The GITS has already established a cloud-based e-mail service, and it is planning to add SaaS offerings in the near future. GITS believes that such consolidation will improve service offerings for government agencies, while simultaneously cutting their overall IT costs "considerably" [32]-[39].

VIII. RECOMMENDATIONS

Considering the expressed subjects and benefits of cloud computing technology, this technology is currently the best option for e-government. Thus the best option for developing countries that have not yet fully implemented e-government is leading government towards cloud architecture. This will reduce costs and increase the efficiency and user satisfaction. Also the importance of benefits such as data integrity, acceleration of processes and the flexibility of cloud in government should not be ignored that these benefits can meet many challenges of governments to implement e-government. But significant challenge that perhaps governments are harassment to use cloud computing is laws and service level agreements because the countries laws are very different from each other. And in case government rent the service from cloud service provider in another country, it should accept not only the laws of the country of origin but also the laws of the country that is in the data transfer path if there is one. Thus the need to create new laws and regulations between countries is required in data transfer field, to use of services provided by service providers to be possible for governments all over the world. In this regard, and according to the developed countries and some developing countries are separately executing the e-government projects and have less participation in this field together. The developing countries with cooperating and using each other's experience to form a committee to investigate the cloud computing's depth and applications in e-government and laws related to data transfer is proposed. To be able to provide needs and necessary platforms to the development and implementation of e-government and e-services with the achievements of the committee in a short time and instead of

World Academy of Science, Engineering and Technology
International Journal of Computer and Information Engineering
Vol:7, No:9, 2013

using separate operating teams for each country, the creation of such a committee can reduce many of the costs of research including financial and time in this field. And this cooperation will lead to participation of other countries in the future and the result of this cooperation will be creation of more coherent and consistent e-government with the minimum technical and legal problems and therefore reception and participation of people will be followed for Extensive use of e-government services. It seems that participation is key to success, especially in this period of time to create the e-government based on cloud computing. However, special attention should be given to providing infrastructures, Telecommunications and communications equipment for increasing internet's bandwidth for realization of the e-government by using cloud computing.

IX. CONCLUSION

With the study was done in this paper the importance of using of technologies that are improving efficiency and reducing costs in government could be clearly understood. Countless benefits like flexibility, cost effectiveness, integration and proper security that cloud computing provides, has converted it to an appropriate option for use in e-government. From this paper it could be concluded that developing and even developed countries have critical need to create e-Government to reduce costs and also having Sustainable Development in this economic and critical situations and the best way to accomplish this matter is the use of green and cheap technology which is the cloud computing. Undoubtedly, the participation of countries with each other on technical and legal issues is code key for achieving e-government based on cloud computing as soon as possible. And it can fix and or minimize the existing problems and challenges on the way and therefore an E-government is created which interest and participation of people to use its services is huge.

REFERENCES

[1] Ghaffari, Amir Reza, "cloud computing systems: Sample, Applications, Challenges", M.Sc. Thesis, Shahid Beheshti University, Tehran, 2010.
[2] F. Soleimanian, S. Hashemi, "Security Challenges in Cloud Computing with More Emphasis on Trust and Privacy", International Journal of Scientific & Technology Research, Vol. 1, ISSUE 6, 2012, pp. 49-54.
[3] H. Takabi, J.B.D. Joshi, G.Ahn., "Security and Privacy Challenges in Cloud Computing Environments", IEEE Security Privacy Magazine, Vol 8, 2010, pp. 24-3.
[4] M. Monsef, N. Gidado, "Trust and privacy concern in the Cloud", 2011 European Cup, IT Security for the Next Generation, 2011, pp.1-15.
[5] M. Firdhous, O. Ghazali, and S. Hassan, Trust and Trust Manage-ment in Cloud Computing – A Survey, Inter Networks Research Group, University Utara Malaysia, Technical Report UUM/CAS/ InterNetWorks/TR2011-01, 2011.
[6] D. Jamil, H. Zaki, "Security Issues in Cloud Computing and Countermeasures", International Journal of Engineering Science and Technology, Vol. 3, No. 4, 2011, pp. 2672-2676.
[7] S. Qaisar, K.F. Khawaja, "Cloud Computing: Network/Security Threats and Countermeasures", Interdisciplinary journal of con-temporary research in business, Vol.3, No 9, 2012, pp. 1323-1329.
[8] J.R. Winkler, Securing the Cloud: Cloud Computer Security Techniques and Tactics, Technical EditorBill Meine, Elsevier Publishing, 2011.
[9] K, Sachdeva, Cloud Computing: Security Risk Analysis and Recommendations, Master Thesis, University of Texas, Austin, 2011.
[10] Siani Pearson, "Privacy, Security and Trust in Cloud Computing", HP Laboratories, appeared as a book chapter by Springer, UK, 2012.
[11] Layne, K. and Lee, J. "Developing fully functional e-government: a four stage model". Government Information Quarterly, vol.18, 2001, p. 122.
[12] Kuldeep Vats, Shravan Sharma, Amit Rathee, "A Review of Cloud Computing and E-Governance", International Journal of Advanced Research in Computer Science and Software Engineering, Vol2, Issue 2, 2012.
[13] Safari, H and Khosh Sima, Gh, Mohammadian, A, Tamizi, AR , Haki, k, Farazmand, E, Moslehi, A , "Iran's Ministry of Commerce E-Government Maturity Model", Quarterly Journal of Knowledge Management, No. 63, 2003, pp. 53-78.
[14] A. tripathi, B. Parihar, "E-governance challenges and cloud benefit", VSRD International Journal of CS & IT Vol. 1 (1), 2011, pp. 29-35.
[15] Gopala Krishna Behara, Vishnu Vardhan Varre and Madhusudhana Rao, "Service Oriented Architecture for E-Governance", 2009, www.bptrends.com.
[16] Thomas B. Riley and William Sheridan, "Electronic Government in Developing and Developed Countries: The Basics By Thomas B. Riley and William Sheridan," Commonwealth Centre for e-Governance, Ottawa, Canada, October 2006.
[17] Waseda University International e-Government Ranking 2013, http://www.waseda.jp/eng/news12/130326_egov.html [Accessed: August 2013]
[18] KPMG, "The Cloud Changing the Business Ecosystem", Survey report, (2011), http://www.kpmg.com/in/en/issuesandinsights/articlespublications/page s/thecloud-changingthebusinessecosystem.aspx [accessed: August 2013]
[19] Rajkumar Buyya, James Broberg, Andrzej M. Goscinski. Cloud Computing: Principles and Paradigms. Hoboken, New Jersey: John Wiley and Sons, 2011.
[20] Borko Furht, Armando Escalante. Handbook of Cloud Computing. New York: Springer, 2010.
[21] Eric A. Marks, Bob Lozano. Executive's Guide to Cloud Computing. Hoboken, New Jersey: John Wiley and Sons, 2010, PP. 40 – 102.
[22] Wojciech Cellary, Sergiusz Strykowski. "E-Government Based on Cloud Computing and Service-Oriented Architecture" International Conference on Theory and Practice of Electronic Governance, 2009, PP. 5-10.
[23] Staten, J.,"Case Study: USA.gov Achieves Cloud Bursting Efficiency Using Terre mark's Enterprise Cloud". http://www.terremark.com/ uploadedFiles/Industry_Solutions/Federal_Government/Case%20Study- %20USA.gov%20Achieves%20Cloud%20Bursting%20Efficiency%20 Using%20Terremark%27s%20Enterprise%20Cloud.pdf, [July 27, 2013]
[24] A. tripathi, B. Parihar, "E-governance challenges and cloud benefit", 2011 IEEE International Conference on Computer Science and Automation Engineering, 2011, Publisher: IEEE, pp.: 351-354
[25] Mahafuz Aziz Aveek, Md. Sakibur Rahman, "Implementing E-Governance in Bangladesh Using Cloud Computing Technology", BRAC University, Dhaka, Bangladesh, 2011.
[26] Ishaq, Qusay and Rana, Muhammad Ehsan, Towards Cloud-based e-Government Solutions for Developing Countries: Critical Success Factors and Expected Benefits. In: University of Malaya, 4th international conference on Informatics and technology, Kuala Lumpur, 10-11 November 2011. Available from [www.informatics.fsktm.um. edu.my/cameraready/Informatics_006.docx].
[27] Toby Velte, Anthony Velte, Toby J. Velte, Robert C. Elsenpeter. Cloud Computing: A Practical Approach. New York: McGraw Hill Professional, 2010, PP.274
[28] Cloud Computing for Singapore Government, http://www.egov.gov.sg/ egov-programmes/programmes-by-government/cloud-computing-for-government [accessed: august 2013]
[29] Malini Nathan, Cloud Computing for Singapore Government, IDA Singapore, https://www.ida.gov.sg/~/media/Files/Archive/ News%20and%20Events/News_and_Events_Level2/20120508123036/ CloudComputingFactsheet.pdf [accessed: august 2013]
[30] D.C. Wyld, Moving to the cloud: An introduction to cloud computing in government. Washington, DC: IBM Center for the Business of Government, November 2009.
[31] Kundra, V. (2010). State of public sector cloud computing. Federal Chief Information Officers Council.

World Academy of Science, Engineering and Technology
International Journal of Computer and Information Engineering
Vol:7, No:9, 2013

http://www.cio.gov/pages.cfm/page/ State-of-Public-Sector-Cloud-Computing, [accessed: August 2013].

[32] David C. Wyld, The Cloudy Future of Government IT: Cloud Computing and the Public Sector around the World, International Journal of Web & Semantic Technology (IJWesT), Vol 1, Num 1, January 2010, pp.1-20.

[33] B. Glick, "Digital Britain commits government to cloud computing," Computing, 2009. http://www.computing.co.uk/computing/news/ 2244229/digital-britain-commits [Accessed: July 28, 2013].

[34] Government of the United Kingdom, Department for Business Innovation & Skills and Department for Culture, Media and Sport, Digital Britain: The Final Report, 2009. http://www.culture.gov.uk/ images/publications/digitalbritain-finalreport-jun09.pdf [Accessed: June 25, 2013].

[35] Government of the United Kingdom, Department for Business Innovation & Skills and Department for Culture, Media and Sport, Press Release: Building Britain's Digital Future, June 16, 2009. http://www.culture.gov.uk/reference_library/media_releases/6220.aspx [Accessed: June 25, 2013].

[36] R. Hicks, "The future of government in the cloud," FutureGov, 6(3), pp. 58-62, May 2009.

[37] D. Rosenberg, "Supercloud looms for Japanese government," CNet News, May 14, 2009. http://news.cnet.com/8301-13846_3-10241081-62.html [Accessed: July 1, 2013].

[38] J.N. Hoover, "Japan hopes IT investment, private cloud will spur economic recovery: The Kasumigaseki Cloud is part of a larger government project that's expected to create 300,000 to 400,000 new jobs within three years," InformationWeek, May 15, 2009. http://www.informationweek.com/shared/printableArticle.jhtml?articleI D=217500403 [Accessed: June 3, 2013].

[39] R. Hicks, "Thailand hatches plan for private cloud," FutureGov, May 25, 2009 http://www.futuregov.net/articles/2009/may/25/thailand-plans-private-cloud-e-gov/ [Accessed: June 17, 2013].

Sajjad Hashemi is a M.Sc. student in Computer Engineering Department, Science and Research Branch, Islamic Azad University, West Azerbaijan, Iran. His interested research areas are in the cloud computing, e-government.

Dr. Khalil Monfaredi received the B.Sc., M.Sc., and PhD degrees from Tabriz University in 2001 and Iran University of Science and Technology in 2003 and 2011, respectively. He was with Electronic Research Center Group, during 2001 to 2011 and was also an academic staff with Islamic Azad University, Miyandoab Branch from 2006 to 2012. He served as the Research and Educational Assistant of Miyandoab Sama College from 2009 to 2011 and vice chancellor during 2011 to 2012. He is currently with Electrical and Electronics Engineering Faculty, Azarbaijan Shahid Madani University, Tabriz 5375171379, Islamic Republic of Iran. He is the author or coauthor of more than thirty national and international papers and also collaborated in several research projects. He is also the founder of electronic department in Islamic Azad University-Miyandoab Branch and was the chairman of 2010 electronic and computer scientific conference (ECSC2010) held in Islamic Azad University, Miyandoab Branch. His current research interests include current mode integrated circuit design, low voltage, low power circuit and systems and analog microelectronics and data converters.

Mohammad Masdari is Currently Head of the Department of Computer Engineering, Urmia Branch, Islamic Azad University, Iran. He Has a Currently PhD Candidate In Department Of Computer Engineering At Science And Research Branch, Islamic Azad University, Iran. His Interested Research Areas Are in the Cloud computing, e-government, wireless Sensor Networks.