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Enhancements in E-government using New Technologies and Approaches

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Abstract

E-Government aims to provide required services to required users at the required time. E-government uses Information and Communication technologies (ICT) to provide essential government services and information exchange with the citizens and other stakeholders through the internet. Existing e-government faces many challenges, from development to implementation. The objective of this paper is to give insights about cloud computing, agile principles and how to use them for E-government. This paper reviews different cloud computing and agile development methodologies with new technologies that have come with new approaches.

Keywords: E-government, Cloud Computing, Agile Approaches.

1- Introduction

Currently, most businesses run on the internet and related technologies. However, the traditional approaches for developing E-governmental projects are useful, only, in fixed requirements and resources. Agile methodologies provide approaches for rapid responses in a dynamic environment. Frameworks for E-government projects must be adjustable for rapid changes in both requirements and resources. The traditional E-government solutions are incapable to fulfill the current need because of its increasing demand, application complexity, infrastructure management, cost overhead and other technical challenges (see fig (1)).

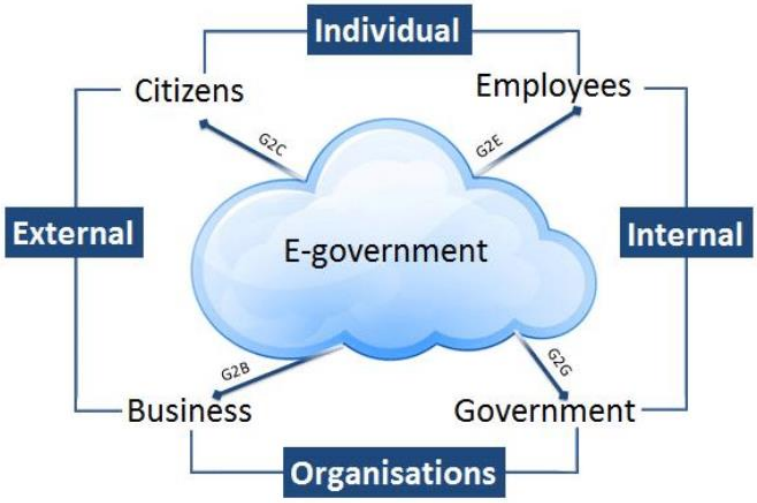

Figure (1): Types of e-government

Cloud computing is the future generation of computing. It is a very new concept in the field of computing characterized by three main entities - Software, Hardware and Network.

Governments all around the world are facing digitalization and cost-efficiency challenges, and to meet them they are transforming their policies and structures, public service, delivery process, and organize the two-way communication and interaction between public organizations and citizens. This transformation is regarded as e-government [1]. The concept of e-government has initially stood for just “use of ICT or other digital means to deliver public services to people,” but this has evolved to include also the development of these services and also transform public policies and organizations to enhance effectiveness and cost-efficiency of public sector as a whole [2].

E-Government aims to provide required services to required users on the required time. According to Richard Heeks [3], more than 80% projects are in the failure category. Existing technologies is not enough to address all challenges. With the

emergence of cloud computing, there are good basis to hope that some of the traditional challenges can be addressed.

An e-government system should be able to be selecting the services and provide the services in an efficient and effective way. An effective e-government system should be reliable, cost effective, ease to maintenance, satisfying other nonfunctional properties as well. Unfortunately, despite many available resources and technologies, many challenges have been encountered in developing and implementing e-government systems.

Agile is a group of software development processes that are iterative, incremental, self-organizing and emergent [4]. Agile software development process encourages modularity on development process level, provides iterative approach with short cycles, supports adaptive processes, guarantees risk minimization, enforces people collaboration and, minimizes development cost. The Agile Manifesto was introduced in 2001 [5]. Since then, several agile software developments methodologies have introduced into practice [6]. Examples of such methodologies are Extreme Programming (XP), SCRUM, Feature Driven Development (FDD), and Dynamic Systems Development Method (DSDM).

The techniques of agile software development have become popular during the last few years. For traditional Project Management, the agile methodology is widely used in software development to increase the quality of a project as well as to enhance customer satisfaction. Agile methods are light-weight software schemes [16]. The old traditional techniques (Waterfall, Unified Process, prototyping Model and Spiral Model) are not capable for software development nowadays because new requirements are taking place in the market. The new software development techniques include XP, Scrum, Crystal, FDD, DSD, and ASD [7].

2- Cloud Computing

The main goal of cloud computing is to provide ICT services with shared infrastructure and the collection of many systems. In cloud computing every facility is provided in terms of service [8][11]. Cloud computing is upcoming area and have different models can be categorized as follows:

- Public Cloud: it is a type of cloud where third party will provide services to client via internet. Each user will have its access mechanism provided by the third party. Public cloud is a cost-effective method to provide services.
- Private Cloud: private cloud has many benefits over public cloud depending upon the service required. In addition, in private cloud data and processes are managed by organization itself. It provides better and controlled infrastructure for security.
- Community Cloud: Community cloud provides services to a community within organization. Members of community can access data on community cloud. Communities are formed by grouping of people with shared interest.
- Hybrid Cloud: it is a combination of private, public and community cloud. It has maximum functionalities as compared to all cloud and non-critical information is handled by public cloud while critical information and processing is done on organization controlled private cloud [9]

2-1 Cloud Computing Service Models

It provides infrastructure as a service, software as a service, platform as a service, network as a service, and data storage as a service (as in fig (2)).

- **Infrastructure as a Service (IaaS)** is one of the three fundamental service models of cloud computing. In this model the users are allocated with computing resources in order to run their applications. The computing services

are provided in a virtualized environment i.e. in cloud by using a communication network. It can be implemented by utilizing the concepts like Enterprise infrastructure, Cloud hosting, and Virtual Data Centers (VDC). Network as a service (Naas) is a category of cloud infrastructure services where the user can use the network connectivity as a service.

- **Platform as a Service** is a category of cloud computing service model that provides the developers a platform to build and use applications and services by using a communication network. PaaS services are available in the cloud and accessed by users by using web browsers. In the PaaS model, cloud providers provide a platform which includes operating system, programming language execution environment, database, and web server. In PaaS services the user must pay for a subscription basis and charged just for what they use. PaaS includes Operating system, Server-side scripting environment, Database management system, Server Software, Network access, Tools for design and development and web hosting.[17]
- The third model is **Software as a Service** which provides a platform in which the users access the software from the cloud. The users of SaaS will not have to worried about managing the cloud infrastructure and platform on which the application is running [18].

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Figure (2): Cloud Computing Service Models

2-2 Modalities of E-government Facilities

The e-governance requirements are divided into three parts for proper investigation:

- **Government to Government**: Governments depend on other levels of government within the state to effectively deliver services and allocate responsibilities the need of government to government functionality is fully related to administration, inter government control and monitor on the government. It focuses on the inter communication between two governments and other aspects of the government to government communication.
- **Government to Business**: It consists of e-interactions between government and the private sector. Business organizations are important for any country and contributing substantially for the development. Government also keep an eye on these organization for enforcing the policies, standards and accountability. here it essentially required to automate government to business interaction such as tender management, contract management, tax payments etc.

- **Government to Citizen**: It deals with the relationship between government and citizens. Government to citizens interface is required to facilitate them basic emanates, proper education, health care and a quality life. A single window government solution could help to achieve citizens satisfaction required in E-Governance [9].

2-3 E-Government and Cloud Computing

Electronic Governance has become very common terminology now days. There are so many different views in e-government. Whatever the differences in views from different people but it is the approach in converting every government activity in digital form and providing these activities in terms of services to the citizen or stakeholders. There are some challenges are face every country in the world has tried to use or develop the e-government system. The challenges are as follows:[10]

- **Cost**: Cost is one of the prime challenges in e-government system. In many countries service comes after the cost. Especially when the entire world is facing economic crisis, the cost is the big factor. We must try to get maximum services in minimum cost. Cloud computing can do this.
- **Expertise**: Various experts are required in e-government system. The role of experts is not only limited during development phase. It is required throughout the life cycle of e-government system. It is not possible for developing countries to provide these experts all the time and even for developed countries it is not easy.
- **Maintenance**: In e-government system there are huge involvements of software, hardware, networking, security etc. As per the cyclic nature of government life cycle, the replacement and updating of all these software and hardware are very much required and moreover maintaining data center in every

city is very big challenges. In order to meet these challenges, cloud computing can help.

3- Agile Methodology

Agile Management Office (AMO) represents a way to transform the traditional program management office (PMO) to better support programs executing (or experimenting with) Agile. Four key features distinguish an AMO from a traditional PMO:

- **Tracking**: An AMO tracks team productivity and product delivery by applying hard assessment techniques, emphasizing the delivery of working software.
- **Coordination**: An AMO enhance collaboration between teams, ensuring that efforts are coordinated and aligned.
- **Governance**: An AMO provides a lightweight form of governance that focuses squarely on the project's strategic vision while allowing flexibility at the task level.
- **Prioritization**: An AMO ensures that teams focus on the important things first—features that will drive working software that delivers business value.

Table (1): Waterfall and Agile Methodologies: Pros and Cons

	Pros	**Cons**
Waterfall	• Budget expected is possible • Reduce demands on client staff • Suitable for traditional systems	• Have a rejection risk during user acceptance testing if the system is not what was expected. • Massive written specification is hard to understanding • The gap exists between the documenter intended and how the reader understand it
Agile	User input from design until implementation reduce the risk of explore errors in the critical moments	• Require change in culture • Client personnel suffer from demands.

Agile development methodology offers several ways to evaluate the trend of the project throughout the advancement of the lifecycle. If we want any type of achievement, it requires regular work, such as sprints. In an agile model each aspect is for this purpose, and it is frequently revisited throughout the lifecycle [12][13].

4- E-Government and Agile

Government is increasingly looking to use Agile to quickly deliver technology that meets users 'needs. To build Successful software through Agile you should depend on some elements. First, a clearly defined set of business problems and a vision of what's needed to solve those problems are important. Second, because business leaders and technologists had different perspectives and working styles so, steps should be taken to ensure their viewpoints are integrated. Third, the creation of the solution should be an evolving journey between the business side and the technology side who collaborate to redefine the best available outcome as quickly as possible.

Agile involves changing in mind-set for procurement officials from the most important Changing rules:

1. You are creating a relationship You aren't just buying software.
   Here the contract becomes a guide for structuring the relationship between the government agency and the vendor. The agency is no longer looking to buy a "thing"—in this case a new software system. Instead, the agency is entering a relationship to design and build a new software system.
2. From "lump sum, fixed price" to incremental pricing.
   Agile doesn't provide precise specifications up front, it's somewhere between difficult and impossible to calculate an accurate fixed price in advance. This means there will likely need to be some form of incremental pricing, which could

entail a time and materials approach, or breaking the project into smaller chunks, or paying for "development points."

3. From contract management to performance monitoring
   One Agile principle states: "Working software is the primary measure of progress" After every Agile "sprint, "hands-on review of the software is critical. One project manager told us, "Paper reviews are mostly worthless".
4. The vendor doesn't run the project; the agency does for Agile to succeed there must be a leader at the agency with a vision for what the application is going to do: Whom does the software support? How will data enter and leave the system? The Agile process change this vision into working software.
5. From contract-centered to project-centered
   Where Agile projects have a higher success rate than linear waterfall projects, and waterfall is not just to go over budget, but to fail in delivering software that works for users.

For procurement officials looking to use Agile, the contract has always been a cornerstone of public software procurement, the document defines the relationship between a government agency and a vendor. In the old contract-centric world, the contracting agency spends long time for documenting user requirements. The contract-centric approach too often leads to disappointment and disagreement.

While a growing number of government organizations are looking to take advantage of the benefits of Agile development, not all of them may be fully prepared for the level of commitment needed from their own people and stakeholders to enable success. An agile innovation management framework needs to consider a series of agile innovation principles that have the potential to change how government acquires or creates IT innovation itself. The main principle is open by default: software is developed and delivered once either with the help of contractors who agree to use agile development methods or built inhouse. The source code is then

shared on social coding sites such as GitHub so that other government agencies don't need to replicate the efforts and a continuous improvement process contributes to the other parts of government [19].

The second principle is the need for an agile leadership approach. While scholars and practitioners might be rejecting the importance of leadership and management in the design implementation of innovation, in risk averse government environments no action is taken without explicit top-down confirmation. An agile leadership approach [14] helps to change deep seated attitudes, values, and habits of the hierarchical bureaucracy. Leadership works toward cultural changes that allow for open collaboration between contractors and internal development teams and changes the perception that the only safe approach to deliver is a complete plan. Agile leaders are responsible for guiding a team to success even in situations where they are in experienced in agile methods and introduces the culture of prototyping and experimentation using shortened timelines that help to deliver results faster. Also, they combined the possibilities to explore alternatives and allow their teams to succeed. This procedural innovation creates a cultural change from contract management to participatory and collaborative culture.

The third design principle includes alternative contracting and outsourcing approaches [15].

The benefits of a comprehensive agile innovation management approach are that clients, end users, contract managers, and contractors are included in the contract specification phase and leave enough room for adjustments as they go through the implementation and delivery phases. With continuous iterations, small failures are quickly corrected and will lead to successful outcomes earlier [20]. The result is that government can create teams of intrapreneurs or entrepreneurs who see government as a startup opportunity by stepping away from the standard operating procedures of IT innovation and acquisition.

5- Cloud Computing and Agile

Cloud computing and agile, a great combination development processes improve (as much as possible) the opportunity given by computers that do work for you, but that are stored somewhere else and maintained by other companies as a

result of releasing software repeatedly. The client's point is to assist the organizations and to check and observe each fragment for upgrading standards [21][22].

Combining agile development and cloud computing brings the best of both worlds. Different organizations are using different methods for computing. It makes software faster than before. The cloud has provided quality. There are different advantages when we combine both agile and the cloud [23][24].

6- Conclusion and Future Work

This paper gives an overview of agile methodologies with cloud computing. In this review, we try to describe why agile software development practices and cloud computing should be used in traditional development organizations. Agile Software Development and cloud computing have brought us lots of high-quality stuff in software development. Cloud computing is an emerging technology in which every service is available in the cloud. Cloud is the collection of distributed computing devices. Cloud provides service through public and private clouds with the help of required technology like, system approach, distributed system, service-oriented architecture, grid computing and virtualization. The domain of cloud application is very big. E-Government system requires entities like, software, hardware, service, management, network, business, policy, security etc. to survive and function properly.

We suffer from current approaches or technology is insufficient to manage all these entities. Cloud computing which treats all these entities as a service can be used in

e-government system. Cloud computing can handle the abovementioned challenges and finally address global challenges of e-government system.

Cloud computing can play the vital role in making ICT the main insight is the enhanced excellence equality of products, improved efficiency of developers and less errors. The agile process ensures frequent interfacing between developers and customers, as well as contributes significantly to its investment.

No matter what cloud implementation is chosen (public, private, hybrid), application of agile methodologies may be managed through specific open-source software. There are a lot of available such software, among some are based on cloud computing, like Onetime from AxoSoft (www.axosoft.com), which implements Scrum under Windows, MacOS, Linux and ensures functional web in IE7, FireFox2, Safari3 and Chrome.

Another solution that implements Scrum and XP agile project management is provided by www.sprintometer.com as freeware (developed by practitioners in agile projects); it is simple, fast and user friendly. The features of this software make it easy to maintain an updated Sprint Backlog (features to be achieved in the current sprint/iteration/step), while providing a better vision on the team progress [28].

Cloud computing combined with agile development will become very useful for the world. It is efficient to consider the delivery of cloud computing software applications.

Due to advancement in technology, there is an increasing range of dealing with systems and need to increase the storing of networking.

Studying threat factors in using Cloud Development and discover serious achievement factors of the Adaptive Cloud, including improvements as well to discover a variety of hazard factors for introducing reusability in agile cloud expansion.

In Agile cloud development, reusability is capable of automatically using an automated apparatus. The automated form resolves or decreases the development expenditure while lifting the reusability and client fulfilment to a huge degree [27].

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