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# REVIEW ON USING AGILE METHODS IN CLOUD COMPUTING

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**ABSTRACT**

Today, many cloud computing companies use agile methods to deliver software. Agile development methods and cloud computing are able to collaborate with together. Agile methods are suitable for the cloud computing environment because of their iterative approach and flexibility. The main benefits of using agile software development in cloud applications results in the improved service delivery and lesser costs. There are many advantages to using agile development with cloud computing. By using agile methods in cloud computing can overcome delays and increase the development speed of projects. Moreover, by using agile methods the resources of cloud computing may increase the speed of the projects. This paper describes the relationship between the agile methods and cloud computing.

**Keywords:** agile development; cloud computing; agile in cloud computing; agile and cloud development;



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## 1. INTRODUCTION

The main goal of this paper is to use agile methods in cloud applications. Firstly, description Agile Software Development and Cloud Computing are given. Next section description about collaborate between Agile development methodologies and cloud computing. In the third section gives a short introduction of the advantages of Agile Development with using Cloud Computing. And in next sections description about Issues in adopting agile development for cloud applications and Speed up agile software development by using cloud computing. In next sections description about Issues in adopting agile development for cloud applications and also Speed up agile software development by using cloud computing is given.

## 2. THE AGILE SOFTWARE DEVELOPMENT

Agile software development is an Iterative and incremental method. The Agile Manifesto was introduced in 2001[1]. The agile manifesto includes four main values (see figure 1).


**Figure. 1** *Values* of *agile* software development

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In the agile approach, although the right-side values are important, the left side values are more important. Some features of agile methods include simple planning, short iterations, the earlier release, plan driven, frequent customer feedback, etc. Agile methods are used to develop and implement to quickly software to customer requirements. Also, the agile methodologies for Software Development contain twelve simple principles. It allows the development team to produce the quality products and rapidly.

## 3. CLOUD COMPUTING

Cloud computing is a model for accessing an online network to a repository of computing resources (e.g., infrastructure, servers, operation system, storage, platforms, applications, and different services). This type of cloud computing consists of five fundamental specifications, three service models [2]. Essential characteristics Includes the following.

### 3.1 Essential characteristics

#### a) On-demand self-service

On-demand self-service is a characteristic which is necessary for the suitable operation of cloud computing services. Also, it allows to cloud computing users to run their own works and manage its, without interplay with service providers or other sections. A client can provide computing capabilities, such as Server time and network storage.

#### b) Broad network access

It refers to resources provided in a private cloud network. The ability to accessible on the network with standard systems that use by different thin or thick client platforms.

#### c) Resource pooling

Resource pooling is an environment in cloud computing which provides a multi-tenant model with different physical and virtual resources.

#### d) Rapid elasticity

The ability can be elastically released to the client. The capabilities of available for providing can appropriate online. Users can automatically request the different services in cloud.

#### e) Measured service

This feature of the cloud service is monitored by the cloud provider. Cloud systems automatically manage the type of services (e.g., storage, processing, bandwidth and active user accounts).

### 3.2 Cloud services

Cloud services include a lot of IT resources that are provided on the Internet. The popular cloud computing is included software as a service , platform as a service and infrastructure as a service [2]. Figure 2 shows the cloud services.

#### a) Software as a Service (SaaS)

SaaS provided the applications running on a cloud infrastructure. The applications are available from different client platforms via either a client interface, such as a web browser.

#### b) Platform as a Service (PaaS)

PaaS offer a platform that let customers to develop, run, and manage applications without the complexity of building and maintaining the infrastructure.

#### c) Infrastructure as a Service (IaaS)

Infrastructure offer the essential computing resources that the client is able to run an arbitrary software, which includes the operating systems and applications.

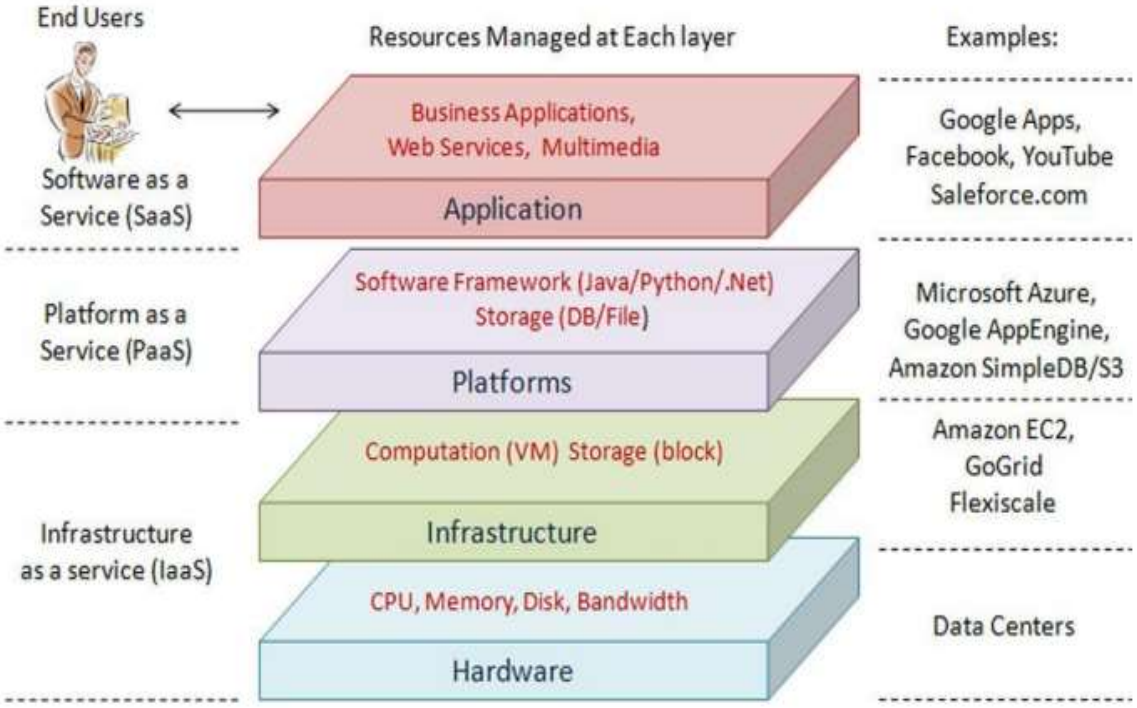


**Figure. 2** The cloud services

## 4. COLLABORATIVE AGILE DEVELOPMENT AND CLOUD COMPUTING

Virtualization and cloud computing concepts and combine it's in agile development teams can be used to increase the productivity [3]. Agile methods suite to the cloud computing environment because of their iterative approach and flexibility in their management strategy (see figure 3). Salesforce.com is a cloud company using agile methods to the delivery of software[4].

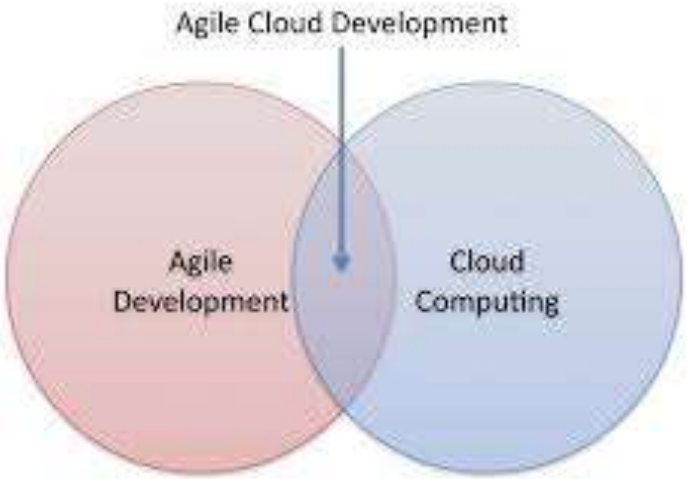


**Figure. 3** Agile cloud development

Agile development methodologies and cloud computing are able to collaborate with together. Using agile development with cloud computing provides a highly interactive and collaborative environment [5, 6].In this approach developers finalize a feature, they can deliver it as a cloud service; users can analysis it instantly and offer valuable feedback. This approach causing innovation, requirement discovery and increase validation in cloud computing. The key benefits of using agile software development in cloud applications causing to better service delivery and fewer costs. Cloud computing is the phenomenal environment for agile development. Rapid

development cycle, the one of an inherent benefit are in the cloud computing and agile method [7]. Agile development methods were lacking a development platform that supports the rapid development cycles [8]. Combine agile development and cloud computing brings the best of both worlds. It caused to develop software faster than before. Cloud computing services are responsible for fast fulfilment of user requirements. In Agile methods project requirements separate in smaller, achievable task. This approach responsibility user's feedback information on every task of the project. Tasks can be planned, developed and tested separately [9].

Also, the IaaS and PaaS services of cloud computing help to agile development teams to delivering of values with rapid provisioning of environments through virtualization and using cloud interfaces simplify the deployment of software and environments, directly with the developer's Integrated Development Environment (IDE) [10]. Although the enabling potential of PaaS for agile methods are not known but studies showed the potential of PaaS for agile methods are suitable from different aspects [11].

## 5. ADVANTAGES OF AGILE DEVELOPMENT WITH USING CLOUD COMPUTING

Cloud computing is the complete environment for agile development because feedback from the customer is collected quickly[12]. There are many benefits in during agile development with cloud computing. This advantage effective in different steps of agile development, so that developed application is built faster and the quality of the application is better [9, 13, 14]. These advantages are indicated in Table 1.

**Table. 1** Some of the advantages of agile development with cloud computing

| | |
|---|---|
| **Infrastructure** | Using agile methods without cloud computing having high capital expenses which consist (infrastructure, software, and platform). Combining agile methodologies with cloud computing, cause reduce the investment. In cloud computing, the resource allocation depending on demand can get bigger or smaller. |
| **Frequent communication and Model sharing** | One of the main reasons for project failure is lack of communication between the members of teams in projects. There are many software as a service solution in cloud computing to help collaboration between people when exchanging and sharing resources. |
| **Application development lifecycle** | When cloud computing is used, the tools for application development lifecycle management are needs for the cloud environment. |
| **Testing and integration** | By using cloud computing for application testing, changes can be created for further testing and incremental implementation can be done in the cloud environment. Also, customers can review the valuable feedback. Delivering software is the cloud service, for the end user. This access higher degree of innovation, the disclosure of requirements and validation in cloud computing. |
| **Prototyping and initial versions** | Create a prototype by the developers and implemented on the cloud platform, can be immediately available to customers to take faster feedback information. |

Also, use agile methods in cloud computing have very advantages which mentioned some of them in below [5, 12].

- ✓ Upper stability of work-loads.
- ✓ Higher quality by earlier feedback from the customers.
- ✓ Higher flexibility to change of project.
- ✓ Reduce the cost of moving information among people.
- ✓ Place people physically closer.
- ✓ Increased quality of applications
- ✓ Effective use of resources
- ✓ Lowered time to market
- ✓ Cost savings

## 6. ISSUES IN ADOPTING AGILE DEVELOPMENT FOR CLOUD APPLICATIONS

Adoption and migration to cloud computing must be coordinate with the development tools. No important what cloud implementation is chosen (public, private, hybrid), agile methodologies may be managed through specific open source software [5]. Agile development activities optimize the opportunity provided by cloud computing by doing software releases iteratively, receiving user opinion more facilitate the organizations to examine the quality section of the improvement [15]. Cloud computing increased the efficiency in agile software development, which summary of them shows in Table 2.

**Table. 2** Enhance the efficiency in agile software development with using cloud

| | |
|---|---|
| **Providing the required servers for the agile development with using Cloud Computing** | With the use of the cloud computing virtualization the software development teams in an agile environment, there is the unlimited number of servers available. Cloud computing services reduces the dependency on physical servers. Without the cloud's services the teams will be limited to only one server per development. |
| **parallel activity in Cloud computing and Agile development** | Purpose of the agile method is to eliminate the delays from the software development phases which it really ignores certain facts. But with cloud computing, it converts to parallel activity by leading it to a more effective utilization of the software development teams. |
| **innovation through investigation in Cloud Computing** | With combining agile software development and cloud computing the team can create quicker products with manual experimentation and produces models to innovation. |
| **iterative development with continuous integration in Cloud Computing** | In testing phase of the software development cycle is an iterative process that the team needs to subsequently repair the errors that occur on testing. There are many numbers of virtual machines in the agile team which cloud speed up time delivery. Thus, cloud's virtualization enhances integration over time. |
| **increase Delivery platforms in agile development with using Cloud Computing** | There are many services in the cloud as Software as a Service (SaaS) and the Agile development can make use of these services in combination with virtualization. |
| **facilitating code branching with Cloud computing** | In agile practices, development lasts longer than a release. Code refactoring is to be increased and used in production. With Cloud computing cost of renting servers for this sort of purposes can be avoided. |

## 7. SPEED UP AGILE SOFTWARE DEVELOPMENT USING CLOUD COMPUTING

Using release cycles are quickly in agile software development but there are delays in availability to platforms. With using agile methods and cloud can overcome delays and increase the speed up the continuous integration with release cycles because there are many numbers of resources in the cloud. Cloud computing increases the speed up in software agile development with using virtual machines, Cloud-based services and provides processes to software created with automated testing. There are many benefits and opportunities to maximize agility in the software development process with using the cloud computing, which summary of them indicated in Table 3.

**Table. 3** Speed up agile software development by using cloud computing

| | |
|---|---|
| **Reduces of times** | Agile development teams are limited to one physical server. But when using the cloud, actually an unlimited number of servers are available for development teams. This leads to reduction wait for the physical server. |
| **Accelerating release cycles** | Having many numbers of resources available in the cloud, the agile development team can overcome the delays, and speed up of the continuous integration and release cycles. |

| | |
|---|---|
| **Speed up efficiency and effectiveness** | Although the agile software development teams perform several activities in parallel, the parallel activities are delayed due to lack of enough services. Cloud computing is done the parallel activity by providing the required services to speed up efficient and effective agile software development. |
| **Encourage of innovations** | Cloud encourages the development teams to innovate and experiment new strategies because there is the wide range of available services in the cloud. |

Also, Cloud computing increases the speed up in software agile development with using virtual machines, Cloud-based services and provides processes to software created with automated testing.

## 8. CONCLUSION

This research is a study related to the cloud computing and agile development. Also, it examined the advantages of agile development and its use in cloud computing. Cloud computing increases the efficiency of agile software development. With using the resource of cloud computing and agile methods can be accelerated the software projects. In this research had been examined the advantages and opportunities to increase agility in the software development process with using the cloud computing.

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