

Full Length Research Paper

Computer education and instructional technology teacher trainees' opinions about cloud computing technology

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This study aims to show the present conditions about the usage of cloud computing in the department of Computer Education and Instructional Technology (CEIT) amongst teacher trainees in School of Necatibey Education, Balikesir University, Turkey. In this study, a questionnaire with open-ended questions was used. 17 CEIT teacher trainees participated in the study. The aim of this qualitative study was to determine trends about cloud technology. The cloud technology under study included "Dropbox", "SpiderOak", "Google Drive", "iDrive", "pCloud", "OpenDrive", "Bitcasa", "OneDrive", "Tresorit", "Box" and "Yandex.Disk. The CEIT teacher trainees' opinions about cloud storage and its purposes; their opinions about types of cloud storage and the level of importance of cloud storage were investigated. The reliability and validity were taken. The advantages and disadvantages of cloud computing were examined. The study found that CEIT teacher trainees' had used cloud storages such as Dropbox and Google Drive previously and they continue to use primarily Dropbox, followed by Google Drive and OneDrive respectively.

Key words: Cloud computing technology, Dropbox, Google drive, choices of cloud storage, computer education and instructional technology (CEIT)

INTRODUCTION

The introduction to cloud computer

Cloud computing is described as using IT services through a computer network created by sharing hardware and software services on a data pool (Menken, 2008). As Internet infrastructure is being enriched day-by-day, Internet output speed increases rapidly as well.

Simultaneously, Internet access (especially mobile access) via various media like smart phones, tablets and personal computers becomes very important. Cloud computing has become a major point of interest in many fields, with its potential for providing enhanced service

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environments along with the advantages of scalability, flexibility, accessibility, reliability, and high performance while reducing IT-related operating costs (Armbrust et al., 2010; Jeong et al., 2013). The National Institute of Standards and Technology (NIST) described cloud computing as a model for enabling ubiquitous, 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 (Mell and Grance, 2011). A model for enabling convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction (National Institute of Standards and Technology-NIST, 2014).

Cloud computing is computing that involves a large number of computers connected through a communication network such as the Internet, similar to utility computing. It can be further defined as the use of computer technology that harnesses the processing power of many inter-networked computers while covering the structure that is behind it (Menken, 2008). Cloud computing involves accessing software applications, data storage and processing power over the Internet (Barnatt, 2010). A report from the University of California Berkeley summarized the key characteristics of cloud computing as (Armbrust et al., 2009) the illusion of infinite computing resources; the elimination of an up-front commitment by cloud users; and the ability to pay for use as needed. According to Buyya et al. (2010) it is inclusive of pay-per-use flexible capacity and the illusion of endless resources; self-service interface; and resources that are abstracted or virtualized.

The concept of cloud computing was first stated in 1950s. In universities or in companies connected to the main computer terminal client computers to serve as many people sharing the CPU in terms of providing both today's cloud computing technology has been the basis of John McCarthy's lecture in the 1961 that "computation may someday be organized as public service like electricity and water services". John McCarthy, who was the first to form the concept of artificial intelligence and wrote the Lisp programming language has been acknowledged by the IT industry because of his contribution and was awarded the Turing Award in 1971 (Wikipedia, 2014). Cloud computing was first proposed by Christophe Bisciglia at Google in 2006, though more attention was paid to it after Google launched "Google Apps" in 2007, and it became more popular still after Apple launched iCloud in 2011 (Jeong et al, 2013). The Internet has been represented on network diagrams by a cloud symbol for many years. When, around 2008, a variety of new services started to emerge that permitted computing resources to be accessed over the Internet, the label 'cloud computing' started to be used as an

umbrella term. As the cloud technologies are largely studied and mobile technologies are evolving, new directions for development of mobile learning tools deployed on cloud are proposed (Butoi et al., 2013).

The term 'cloud computing' is also useful because it classifies the kinds of things we have been undertaking online for a couple of decades from a totally new age of online software and processing power (Barnatt, 2010; Chung et al., 2012).

LITERATURE REVIEW

Gupta (2013) states the advantages of cloud computing are;

1. Economical: as the customers need not invest in infrastructure or equipment. IT resources are only provided depending on demand, so 'Pay-as-you-go' or subscription based payment method saves customers' money in the long run.
2. Efficient: as resources are utilized to optimum capacity.
3. Scalable and elastic: as resources and bandwidth allocation can be increased or decreased depending upon demand.
4. Green, environment-friendly: resource efficiency facilitates energy efficiency, leading to lesser carbon percentage.
5. Encourages innovation: as virtual machines encourage automated testing, new innovative applications can be developed and tested quickly.

The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications.

Cloud computing has also attracted a great deal of attention in the field of education with its potential for delivering economical, secure, reliable, and sharable education services (Masud and Huang, 2012). More recently, the concept of cloud computing evolved from delivering, sharing, accessing, and storing applications to providing access to a variety of files, such as text documents, photos, videos, and music (Jeong et al., 2013).

With the introduction of cloud storage and cloud servers, it has become easier than ever to backup all important computer files online. Everyone has the flexibility of retrieving all files from anywhere in the world, with the benefit that all important pictures, videos, music, files, documents, as well as other programs and data are securely collected and available 24 hours a day 7 days a week. When choosing a cloud storage service, it should be given free trial offers; access files from anywhere; 100% automated online backup; secure and encrypted storage; unlimited online storage; synchronisation with

various computers. Cloud storage service provides advantages in terms of price, storage space, speed, and support parameters to users.

According to related literature review, there are no other studies in this field. Therefore, it is hoped that this study will inspire future research. The concept of cloud computing is also explored in this study alongside the concept of cloud storage.

METHOD

This study is a qualitative study and a questionnaire with open-ended questions was used (Miles and Huberman, 2002).

Study group

The research was conducted in Balikesir University with the participation of Computer Education and Instructional Technology of Necatibey Faculty of Education in Balikesir University-Turkey who took part in 2014-2015 fall semesters. The Delphi group size does not depend on statistical power, but rather on group dynamics for arriving at consensus among experts. Thus, the literature recommends 10 to 18 experts on a Delphi panel (Pawlowski; 2004). For this reason, in this present study, there were 17 participants. All 17 participants were fourth grade teacher trainees of Computer Education and Instructional Technology. Teacher trainees' ages ranged from 21-23 years. All of them were able to use the Internet and computer. Respondents are always anonymous to each other, but never anonymous to the researcher. This gives the researchers more opportunity to follow up for clarifications and further qualitative data.

Data collection tool

In this stage, an open-ended questionnaire was developed to determine CEIT teacher trainees' opinions about the application of "Dropbox", "SpiderOak", "Google Drive", "IDrive", "pCloud", "OpenDrive", "Bitcasa", "OneDrive", "Tresorit", "Box" and "Yandex.Disk".

Research questions

In this study, the following research questions were investigated (it considered The Delphi study process):

1. "What are the Computer Education and Instructional Technology (CEIT) teacher trainees' opinions about cloud storage and its usage purposes?"
2. "What are the Computer Education and Instructional Technology (CEIT) teacher trainees' opinions about types of cloud storage?"
3. "What types of cloud storage are used by the Computer Education and Instructional Technology (CEIT) teacher trainees?"
4. "What are the Computer Education and Instructional Technology (CEIT) teacher trainees' opinions about the level of importance of cloud storage?"

All participants wrote down their answer of the first and the second research questions. A table was constructed for third research question in Table 1. The table includes a) "have you got any knowledge or usage history about "Dropbox", "SpiderOak", "Google Drive", "IDrive", "pCloud", "OpenDrive", "Bitcasa", "OneDrive", "Tresorit", "Box"; and "Yandex.Disk", b) which one do they use, c)

Please grade which is better than the other. The importance level of cloud computing was coded from 1 to 11.

After piloting the questions in the questionnaire, some questions were revised by experts and the researchers.

Data analysis

All the questionnaire design issues of a survey also apply to a Delphi study. After the researchers design the questionnaire, they select an appropriate group of experts who are qualified to answer the questions. The researchers then administer the survey and analyse the responses. Next, they design another survey based on the responses to the first one and read ministers it, asking respondents to revise their original responses and/or answer other questions based on group feedback from the first survey. The researchers reiterate this process until the respondents reach a satisfactory degree of consensus. The respondents are kept anonymous to each other (though not to the researcher) throughout the process. Participants' responses to the open-ended questionnaire were carefully examined and then coded (Boyatzis, 1998; Patton, 2002). The reliability of the obtained data was analysed via an expert debriefing, colleague checks and inter-coder reliability (Boyatzis, 1998; Lincoln and Guba, 1985). Inter-coder reliability is a critical component in the content analysis of open-ended survey responses, without which the interpretation of the content cannot be considered objective and valid, although high inter-coder reliability is not the only criteria necessary to argue that coding is valid. This below formula was used for Inter-coder reliability and it was found to be .89.

$$\alpha = 1 - (D_o - D_e)$$

(D_o: measuring the observed disagreement; D_e: measuring the expected disagreement)

A peer person who is outside the context of the study, is not interested in the issue of the study but is knowledgeable about research methods and can also discuss the problems related to the study process (Lincoln & Guba, 1985). 10 interviewers and 7 peers repeated the new questionnaire. The researcher can discuss the data collection process, findings, and so on. The participants' responses were studied and productive discussions were held regarding potential coding frameworks and themes. The researcher and the second coder separately examined the written answers, coded the responses and then categorized the data through coding. Examining the written responses of each category of data created the codes. These codes and the expressions of the participants were repeated at different times. Table 2 shows themes, sub-themes and definitions derived from open ended responses of the questionnaire. Examples have been presented to student number in the text S1 to S17. In short, internal validity and external validity were taken into consideration. The researcher and expert opinions were considered. The researcher and expert agreement percentage was 85%.

FINDING AND DISCUSSION

All open responses were categorized into sub-themes and themes (Table 2).

The first and second research questions of findings

The first two research questions were related to "whether they have information about cloud computing or not" and "whether they use any type of cloud computing or not".

Figure 1 shows teacher trainees' views about "whether

Table 1. Questionnaire of Cloud Computing.

Have you heard the concept of cloud computing? Yes No

What is the purpose of usage of Cloud computing?

.....

.....

.....

Which of the following did you hear and use?

Types of cloud computing	Do you have any information about cloud computing?	Do you use it?	Put in order to importance of cloud computing
Dropbox			
SpiderOak			
Google Drive			
IDrive			
pCloud			
OpenDrive			
Bitcasa			
OneDrive			
Tresorit			
Box			
Yandex.Disk			

Table 1. Themes, sub-themes and definitions derived from open ended responses.

Themes	Sub-themes	Definitions
Positive views	Collaboration-interactive	Online collaboration Group work Shareable Workable online
	Accessible	Easy to changes on files Changes made at any time Access via internet
	Store	Request accessible Stored on the web Stored Can backup Safe storage Information can be added
	Venue	Timeless Independent venue
Negative views	Independent venue (+, -)	Independent venue
	Accessed via internet (+, -)	Internet connection required
	Safe storages (+, -)	Stored on the web Can backup

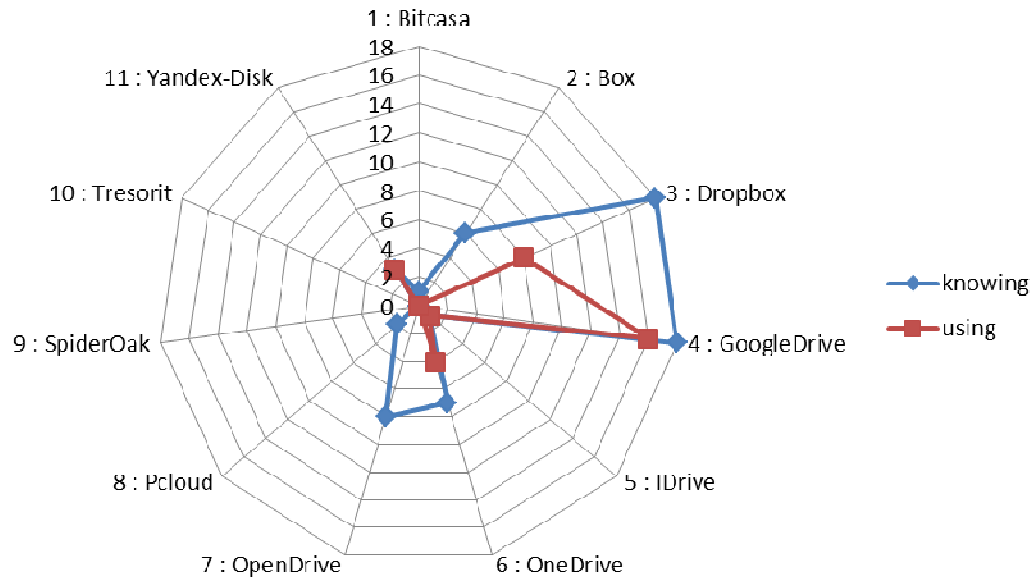


Figure 1. Radar Graphics of Hearing and Using Cloud Storage.

they have information about cloud computing or not” and “whether they use any type of cloud computing or not.

As seen in Figure 1, the most well-known cloud storages are Dropbox, Google Drive and the most used cloud storages are Dropbox, Google Drive and OneDrive. The least well known cloud storages are SpiderOak, Tresorit, IDrive and Bitcasa. The least used cloud storages are Bitcasa, Box, open Drive, pCloud, SpiderOak and Tresorit.

The third research questions of findings

The third research question was related to importance levels of cloud storages (“Dropbox”, “SpiderOak”, “Google Drive”, “IDrive”, “pCloud”, “OpenDrive”, “Bitcasa”, “OneDrive”, “Tresorit”, “Box”; and “Yandex.Disk”) (Figure 2).

As seen in Figure 2, Google Drive, Dropbox, Yandex.Disk, one Drive and IDrive were compared. The most preferred first choices were Google Drive, Yandex.Disk. The second most popular choices were Dropbox, Google Drive and One Drive.

The fourth research questions of findings

Result and findings of open responses of questions of “Do you have any information about cloud storage?”;

“The cloud storage is used for what purposes?”; “Do you have any information or have you heard about them?”.

As mentioned above, the most well-known cloud storages are Dropbox, Google Drive and the most used cloud

storages are Dropbox, Google Drive and OneDrive (Cassery, 2015). The least preferences of using Bitcasa, Box, open Drive, pCloud, SpiderOak and Tresorit. Google Drive, Dropbox, Yandex.Disk, one Drive and IDrive were compared. The most preferred first choice Google Drive, Yandex.Disk. The second choice was Dropbox, Google Drive. One Drive is the same level. The positive four categories were Collaboration-interactive, Accessible, Store and Venue. The negative three categories were found as Independent venue, Accessed via Internet and Safe storages. Following data analysis, the obtained findings were collected under the themes of process and outputs. Themes were grouped as positive and negative opinions. The theme of positive opinions included four categories; *Collaboration-interactive, Accessible, Store and Venue*. The theme of negative opinions was three categories; *Independent venue, Accessed via Internet and Safe storages*. The participant responses were given above.

The key advantages of cloud computing

The theme of **positive opinions** was four categories; *Collaboration-interactive, Accessible, Store and Venue*.

Collaboration-interactive

The Cloud allows multiple users to work on and edit documents at the same time; it enables effortless sharing and transmission of ideas. With this feature, group projects and or collaborative lesson plans can be optimized for both teachers and students (Weaver, 2013).

Choices

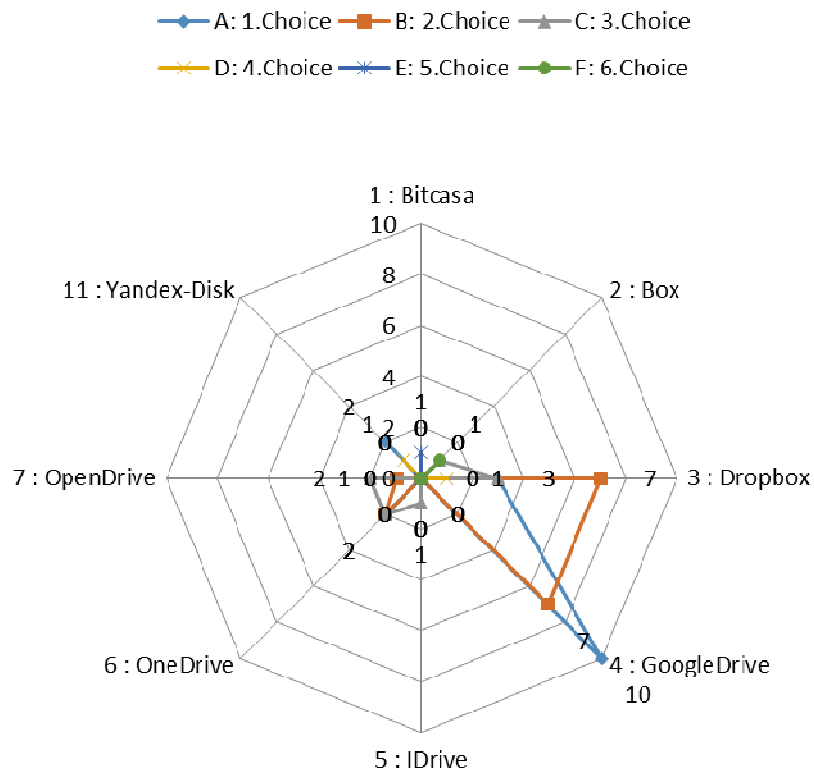


Figure 2. Radar Graphic of Choices of Cloud Storage.

“It allows me to work with my friends” (S5)
 “It provides interactive study among my friends and sometimes tutor.” (S1)
 Cloud-based materials are easy to update in real time so that students always have access to the most current learning resources.
 “It is so up-to dated learning materials.”(S6)

Accessible:

Any data stored in the Cloud can easily be accessed from almost any device including mobile devices such as phones or tablets. - See more at (Weaver, 2013):
 “I reach from anywhere” (S4)
 “I don’t need to carry books and flash drive or hard disk.” (S3)
 “I can carry information without the need for tools” (S5)
 “I can work on the internet” (S16)

Learners can access services rapidly, conveniently, and with flexibility (Bates, 2000; Osika, 2004; Moore and Kearsley, 2005;Khan, 2001;Thammametha, 2009). Cloud computing improves accessibility. An individual has access anytime, anywhere, making life so much easier i.e. Google Docs is an application of cloud

computing that provide the best way to others without cost (Mansuri et al., 2014).

Store and Venue

Cloud-based materials are easy to update in real time so that students always have access to the most current learning resources.
 “I store my information.” (S14)
 “I store my pictures.” (S1)
 “I keep my personal files.” (S16)
 “I can store on my computer.” (S14)
 “I make changes on my document and save.” (S13)
 “It is independent of the location; office, cafe, home, car...” (S12)

The theme of negative opinions were three categories; *Independent venue, Accessed via Internet and Safe storages.*

Independent venue,

“It is independent of the location; office, cafe, home, car...but it needs electricity and Internet connection.” (S4)
Accessed via Internet
 “If there is no Internet connection, it is unnecessary.” (S16)

Safe storages

"It is not always reliable." (S1)

"A security problem can occur." (S14)

Knowing how to use a technology was the most important factor in determining faculty adoption. Two other, similar factors were also rated as important in terms of adoption: difficulty in using the technology and difficulty in learning to use the technology. A never-ending issue will always be security in cloud computing related to multi-tenancy, concurrency, scale and distribution (Schubert et al., 2010). Moreover, in the study, respondents identified lack of time to learn as the most critical factor in adoption of Web-based instructional technology (Chizmar and Williams, 2001).

Conclusion

Technology is very important in our life. This paper proposed compared and scrutinized results according to their sharing and storing utilities of cloud computing (Butoi et al., 2013). Cloud computing has been increasingly and widely used in the field of education (Chung et al., 2012). Additionally, to find out which service tools are more effective to use in education system.

Comparison between products features the free storage space taken into account, yet it was observed that the teachers chose the free products. This paper established a number of features for the deployment of cloud-based educational content services. However, we have not yet fully implemented and evaluated the proposed system. We need to develop secure access for users. We demand to criticize our educational system. Important concept in education with cloud computing gives opportunity for sharing, collaborating, any time, any device and anywhere. This study asserted to use Dropbox for personal and academic affairs.

Regarding the outcomes of the development of a cloud computing benchmark model for higher education institutes based on opinions of the experts, it was found that there were 3 main indicators: Independent venue, Accessed via Internet and Safe storages.

This study asserted that educational cloud computing and how the universities and institutions are already taking advantage of it, not only in terms of cost but also efficiency, security, reliability and portability. Several general examples of cloud computing in education such as Microsoft, Google App, IBM, Amazon and others were provided and a case study of the applications was presented and explored in more details (Indrasiri, 2010). Cloud computing has remarkable potential to benefit businesses, industries, and entire economies, but substantial challenges stand in the way. This study has taken the first step: defining potential actions for education in order to accelerate cloud adoption and generate benefits for all stakeholders – individuals, businesses, govern-

ments, and society as a whole. In education specially, Dropbox, SpiderOak, GoogleDrive, IDrive, pCloud, OpenDrive, Bitcasa, OneDrive, Tresorit and Box might be effectively used. Our slogan is any device, anytime, anywhere, from every type of device such as PC, Tablet, Smart Phone, web site and any kind of operating system e.g. Windows, IOS, Android.

The cloud computing in education will resolve not only from an academic point of view, but also particularly on a reduction of cost, effective communication, security, privacy, providing flexibility and accessibility.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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