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The use of Cloud Computing by Students from Technical University – the Current State and Perspectives

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Abstract

Cloud computing is usually associated with a set of applications and tools, used by companies to conduct their businesses. However, the possibilities offered by the cloud, and its versatility, causes that its tools and applications can also be used in education. There are several articles and papers presenting the advantages offered by the implementation and use of the cloud by the universities, but none of these studies have raised the issue of using the cloud by students, who are the backbone of any university. Therefore, the aim of this article is to present, not only the possibilities offered by the cloud in education, but also how cloud computing is perceived by students, and whether they consider introducing cloud computer at universities. The first part of the article includes a theoretical part of cloud computing, explaining the main issues and most common definitions of the cloud, the second part presents the results of studies concerned on using the cloud by individual users (not the company). And, the third part of the article presents the results of research, that have been conducted among the students of the Technical University of Czestochowa.

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1. Introduction

Cloud computing has evolved from the earlier technology called grid computing, but has reached the stage of commercialization recently. Cloud computing has raised from a large growth of the Internet and the increasing number of e-commerce transactions, carried out all around the world. This caused, that large technology companies

have created huge data centers, to handle with the growing movement taking place all over the Internet. Cloud computing has enabled companies to provide Internet service without the need to purchase additional hardware, also helped to reduce costs, including incurred in connection with the work, they had done at the customer service staff. This causes that cloud computing is being seen as: *"cloud computing is rapidly emerging as a technology trend almost every industry that provides or consumes software, hardware and infrastructure can leverage"*¹. The main task of cloud service providers is the ability to data mass management, and the ability to acquire data at the point whenever user demands it. Also Cloud computing presents a model that provides on demand access to software and hardware resources with minimal management efforts².

The essence of cloud computing is moving data and information far beyond the computer (PC, laptop or netbook) to large data centers³. A simple example of the cloud are services that allow for storing data or obtaining information in the form of images, from sites such as Flickr, YouTube or Snapfish. The advantage of the cloud is the ability to access these images from any device connected to the Internet - computer, laptop, tablet or phone. Due to the fact that the functionality of the cloud based largely on access to the Internet, its absence causes her utter uselessness.

In the literature on Cloud computing, many definitions can be found, but the interpretation of most of them, does not cover a part of the options or tools, offered by cloud computing. According to M. Armbrust et al, Cloud computing refers to both, the applications delivered and offered as services over the Internet, as well as hardware and software, concentrated in centers, providing these services⁴. Jaeger, Lin and Grimes define Cloud computing as: *"computing platform that is able to dynamically provide, configure and reconfigure servers to address a wide range of needs, ranging from scientific research to ecommerce"*⁵. Other definitions concentrate on the determination of cloud computing as a service, platform or infrastructure. As a platform, Cloud computing is defined as the primary computer system, which includes the hardware, operating systems, and, in some cases, applications, and tools together with user interfaces, through which applications can be run.

And considering Cloud computing as an infrastructure, it refers to the physical components, that are required by the system in order to provide the full functionality. These components are the processors, databases, network hardware or operating system. These definitions are the extension of concepts such as SaaS (Software as a System), PaaS (Platform as a system) and IaaS (Infrastructure as a system)⁶. These concepts are also treated as a cloud layers, where each of them fulfills a different role or provides services to individual users. In addition to these layers, there is another dSaaS (Data Storage as a Service), which provides a place to store files⁹. However, in the simplest terms, cloud computing is a solution, that allows users to access information via the Internet from anywhere in the world. The most known and accepted definition of cloud is definition formulated by National Institute of Standards and Technology INIST): *Cloud computing is 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. This cloud model is composed of five essential characteristics, three service models, and four deployment models*⁷. Based on this definition we can assume that cloud computing is set of some characteristics features, deployment models, service pool, types of services and users.

2. The use of Cloud computing by individuals

Despite the cloud's growing popularity and its presence for a few years, issues related to cloud computing were overlooked in studies, which aim was to present basic information how Polish households and companies use ICT. Finally, in 2014 in the report "Information Society in Poland in 2014", a module on the use of cloud services was added. On the basis of the test results, the image of students using the cloud can be obtained. In this module issues related to the processing of data in the cloud, or the use of virtual space, have been raised. These issues are mainly concerned on:

- The use of transformation services in Cloud,
- The purpose of using the Cloud,
- The reasons of using the Cloud,
- The reasons of non-using the Cloud,

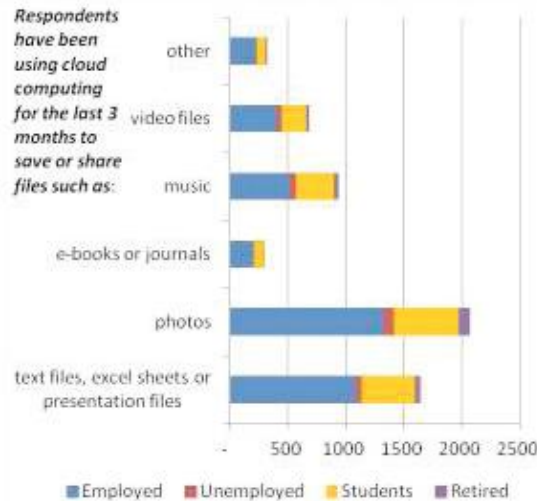


Fig. 1. Number of people using the Cloud according to their working status.

The highest percentage of people using the cloud are working people (employed under a contract, entrepreneurs and farmers), in second place are pensioners, students are just behind them, and at the end are the unemployed. The largest number of users clouds among workers, should not be surprising, because those who are active professional, usually do their work using a computer and the Internet. This automatically makes this group of people a group of the most common uses of the cloud, whether for professional or private purposes. Pensioners located on the second place, on the one hand can argue with the common image of a pensioner, who does not know, and not using the computer and the more the Internet. On the other hand, these values show, that today's pensioners are familiar with computers, are active Internet users and thus, tools and applications offered by the cloud. In the third place, are students, as young people and being up to date with current trends and solutions, many use the clouds. At the end there is a group of unemployed - only 2.2 million of these people use the cloud. The reason for the small size of this group, may be a lack of ability to use computers and the Internet as much as other groups, if only because of the lack of contact with information and communication technologies in the context of a professional activity.

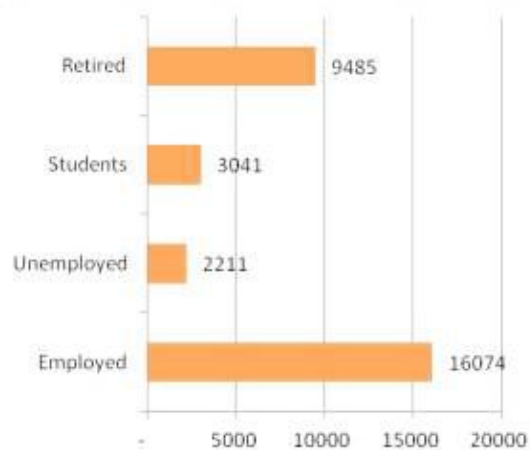


Fig. 2. The most common file formats being the subject of use of the cloud.

The most common file formats, which are the subject of actions in the cloud, are text files, spreadsheets, presentations, music, pictures, video files and digital editions of books or magazines. Among the working population, the most common subject of their actions, were photos and files generated, most likely, by Microsoft Office. These are in fact the most common file formats in employment, which also connects with computers or the Internet. Also among the students, such files are usually subject to write in space, or to share with other users, in addition they also use the music files. Pensioners frequently write and share their photos, as well as the unemployed. In all groups, the last place were e-books and electronic magazines. We can assume that this is due to the fact too little popularity of this type of files. Still paper books and newspapers are more popular than their digital versions.

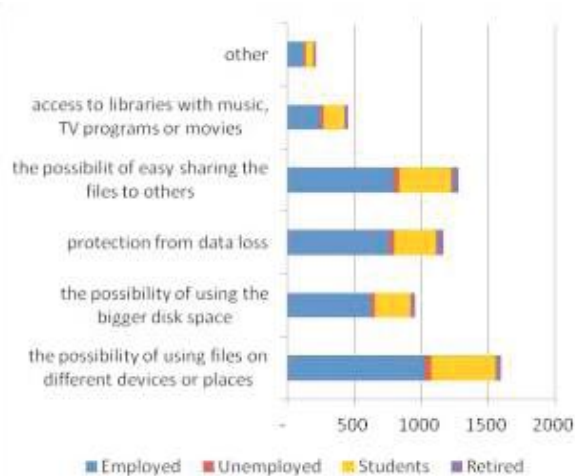


Fig. 3. Main purposes of using the Cloud by the people according to their working status.

The main reasons for the use of the cloud is the ability to use the files for various devices, eg. from home computer, work computer or Smartphone, as well as the ability to access them from any place where it is possible to connect to the Internet. In second place was the ability to share files with others, to have access to the cloud. In third place, the reason for using the cloud, was the ability to protect against data loss caused by eg. hard drive failure or computer failure. On the other hand, concerns about the safety of the use of clouds, cause that a significant number of people do use it. In contrast, few people use the cloud as a provider of access to music and film, one can only assume, that this number will increase with the spread of such services, such as Spotify and Netflix, which are still new services in Poland.

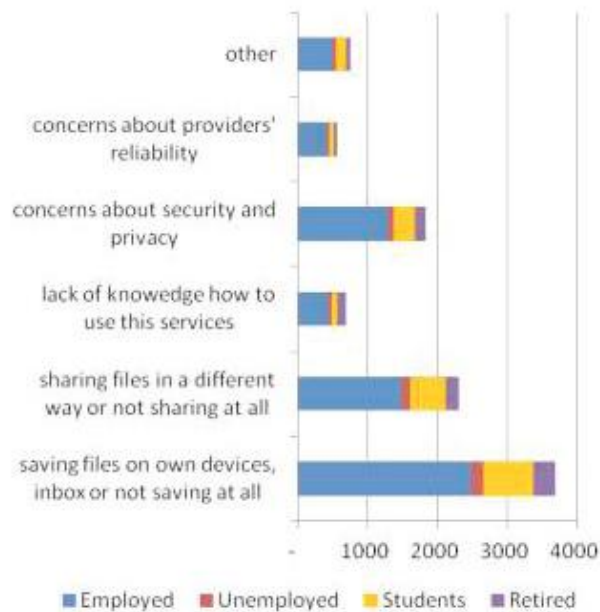


Fig. 4. The main purposes of non-using the Cloud.

The main reason for not using the cloud is storing files on other devices, hard drives, computers or USB sticks. Or there is no need to store any files. In second place are just security concerns - those who do not use it, most often fear that a third party will have access to their resources, which can be spread, change, or delete. However, these security concerns are likely to arise from ignorance concerning the operation of the clouds. Also, the lack of knowledge about the cloud, makes that less than a million people do not use it.

3. Cloud computing in education

While in the literature on the cloud it can be met a lot of research related to the use of it, the benefits it brings, or concerns related to its use, the most common objectives of these studies are large companies, companies operating within the SME sector, public administration or universities. In the case of universities, studies have focused mainly on the reasons for the implementation of cloud and identify potential benefits, that cloud can bring the university as the general public (ie, students, faculty and administrative units).

In contrast, this article focuses on the perception of the clouds by the students, of which more than 3 million benefit from the cloud (64%). In order to answer the questions with which to determine the suitability of the cloud for educational purposes, additional studies were conducted among the students of the Technical University of Czestochowa. For research purposes students who know and use the cloud were chosen, in total 285 people.

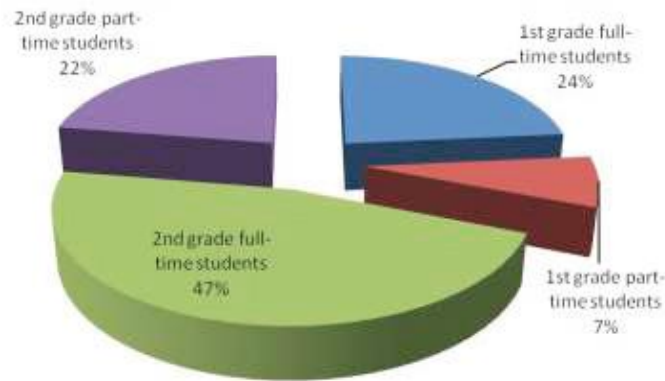


Fig. 5. The structure of students taking part in research according to their studies and grade.

The largest group of students participating in the study were students of second-degree full-time, they accounted for almost half of the group, in second place were students of first degree full-time studies, then also the second-degree students in college but part-time. The smallest group of students were the first degree part-time studies.

For the purposes of the research, a questionnaire has been created, containing issues related to the length of use of the cloud, the most frequently used applications, opportunities that cloud offers in educational dimension and the reasons, why universities should implement this solution.

Based on the survey, the results show as follows:

1. The length of the use of the Cloud

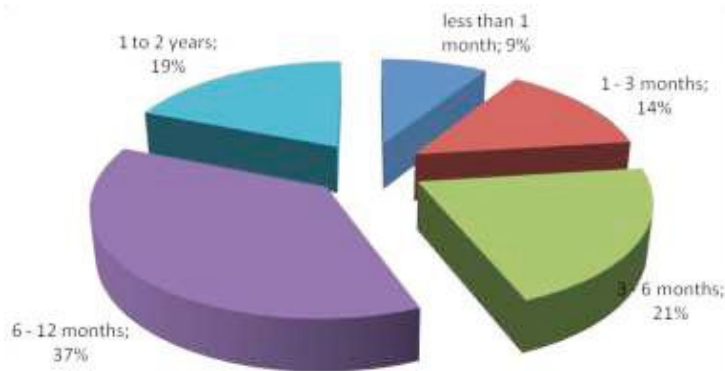


Fig. 6. The length of the use of the Cloud.

The largest percentage of respondents use the cloud less than a year, but more than six months, another group uses more than 3 months but less than half a year. Quite a large group of students have been the cloud for over a year, and the smallest number of subjects, has only just begun to use the cloud - less than a month. Generally, the cloud is not a new thing for the test group, and a tool that is used by them in their daily activities.

2. The most common used application offered by the Cloud.

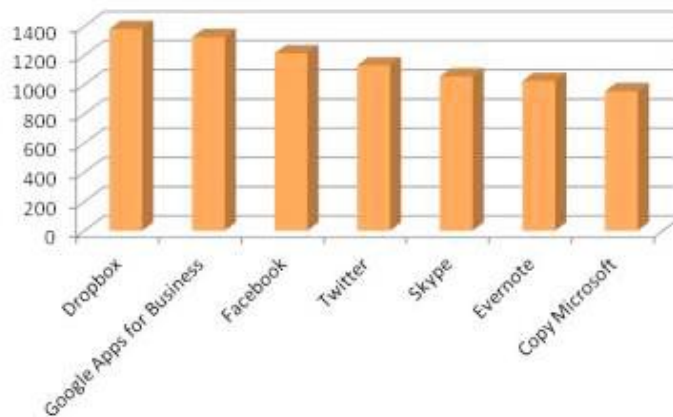


Fig. 7. The most applications.

common used Cloud

The most commonly used Cloud application is Dropbox, a tool offered by Apple. It is mainly used for storing and sharing files. Its great popularity determines the available space and ease of use. In second place are the tools offered by Google, called Google Apps for Business – it is a package, that includes word processing, spreadsheets, presentation software, e-mail programs, calendar or disk space. It can be said that this package is able to fully satisfy all the needs of the average user of computers and the Internet. Also, quite popular is Facebook and Twitter, mainly due to its social dimension and the role, they play in modern society. At the far end was a Copy application offered by Microsoft, is an application acting similar to Drive, offered by Google, but much less popular.

3. Do you agree with the statement that Cloud offering some possibilities, might be useful in educational dimension:

- (1) Easy and unlimited Access to knowledge in the form of books, lectures, presentation or notes,
- (2) Resources (books, lectures, presentation or notes) sharing possibility,
- (3) Cooperation possibility between students and teachers as also between students only,
- (4) Access to software owned by university,
- (5) Possibility of work at any time and in any location,
- (6) Time saving resulting from the above reasons,

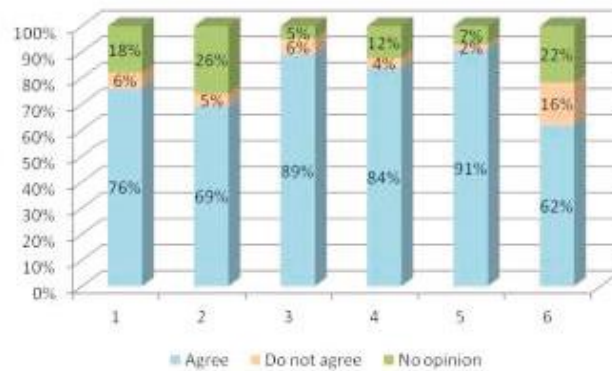


Fig. 8. Possibilities offered by the Cloud.

As much as possible, students agree with this, that the cloud offers the opportunity to work from anywhere and at any time, agree as strongly on issues related to the availability of the software and the possibilities of cooperation between individuals using the same cloud. The highest percentage of students who disagree concerned the possibility of saving time, resulting from the application of the clouds and the opportunities it offers. Quite a large percentage of students, did not have their own opinion on the possibility of sharing resources and saving time. As for the sharing of resources, the respondents stated that, it is not about the possibility of sharing the same individual user but a decision whether he will share their resources with others. While the teacher shares her resources with all the students, the students themselves impose limits and offer access to their resource to a few people only.

4. Do you agree with the statement that the following reasons are enough to introduce Cloud into University:

- (1) No need to carry around additional mobile devices, eg. CD / DVD, or pendrives
- (2) Data stability and security,
- (3) The traceability of the changes, the ability to return to a previously saved file
- (4) Less amount of printed papers,
- (5) Reduction of space requirements for storage of documents in physical form,
- (6) Time savings resulting from not having to print, stacking and storage of documents,
- (7) Cost savings from reduced use of printers, toner and paper,
- (8) Better employment effects resulting from the easy access to documents without using a third party,
- (9) Ease use of clouds
- (10) Impact on the environment due to reduced paper consumption, energy, computer hardware,

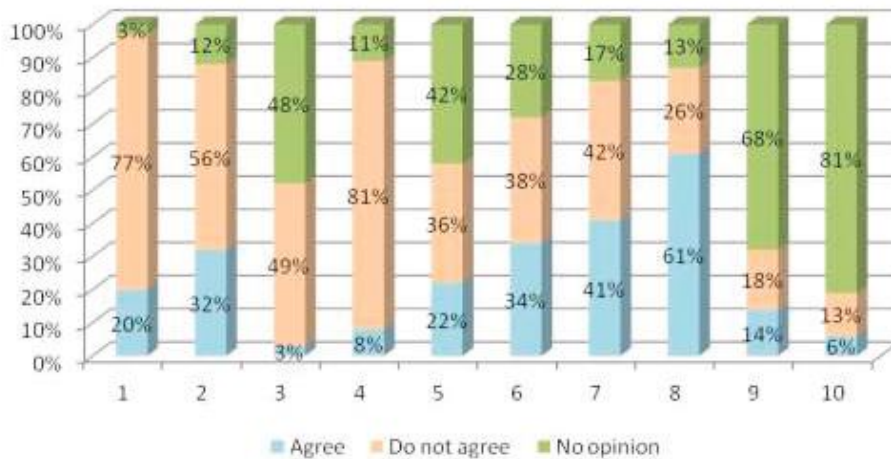


Fig. 9. The reason of cloud implementation by universities.

The highest percentage of students agree with the statement that the use of the cloud may contribute to the decreased consumption of printers, toners and papers, as well as the fact, that the cloud would improve productivity and efficiency. The lowest percentage of students agree on issues related to the possibility of tracking the changes applied to the documents and the positive impact of the use of the cloud on the environment. The highest percentage of students do not agree with the statement, that the use of the cloud will not need to carry other traditional storage media. Citing examples of the so-called. Real life, said that even though they are users of the cloud, they still carry the physical storage media. A large percentage also disagrees that cloud ensures the data stability and security. Most of it is treated as an additional cloud storage options, but almost no one takes the clouds as the only such place. Quite a large proportion of the respondents had no opinion on the ease of use the cloud and its positive impact on the environment. The latter is mainly due to ignorance and lack of interest in this topic. A lot of people do not agree well with the fact that the use of the cloud can reduce the amount of paper printed, although the use of the cloud is the number of documents printed by them has not diminished - but mostly due to the fact that they use for private clouds, but most of the teacher still require paper form of their works.

5. Would you use the Cloud as a solution offered by the University?



Fig. 10. The willingness to use the cloud for education purposes.

The vast majority of students responded positively to the question - a lot of people already using the cloud. Only 2% said that it would not use this solution and 9% had no opinion on the subject. Some people, who use the cloud for private purposes, have recognized its potential for use in education, and now they hope that the university will implement a solution soon.

4. Conclusion

As is apparent from the presented studies, we may indicate that the cloud can be a very useful solution in education. Its use in this dimension, can affect the fact, that more than half of the Polish student knows and uses the cloud, they also have some idea about the benefits it can bring them to the cloud not only as individual users, but also the university as a whole. A wide range of benefits and positive impact on the level and quality of education, should be a cause for the implementation of this solution by universities. On the other hand, do not forget the continuous technological development and progress, which is being made in the area of IT. On the basis of the past, it can be concluded, that the introduction of the cloud to education is only a matter of time, as a matter of time was the introduction of computers and the Internet for education units. Bearing this in mind, has the same economic issues, it can be assumed that over the years universities, of their own volition, will implement the solution, because the cloud may substantially reduce the costs incurred for the purchase of computer equipment, maintenance and servicing of IT infrastructure and the need to employ people in IT departments. At the moment, the university has already benefiting from the cloud, has been seen as an innovative unit, that complies with the modern solutions. In contrast, the students themselves, which is currently the "grassroots" movement cloud users, can also contribute to its spread in the education sector.

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