



## CLOUD TECHNOLOGIES FOR TRAINING UNIVERSITY STUDENTS OF SOCIO-HUMANITARIAN SPECIALTIES AND PUBLIC ADMINISTRATION

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**Abstract:** *The article discusses the current state of cloud technologies and examines their in training students on socio-humanitarian and public administration courses. The research deals with the essence, features and functions of «cloud», «cloud computing» and «cloud technologies». It outlines the structure of university cloud-oriented educational environment by defining its components, subjects and objects of architecture. Discussed are the specificity and ways in which to employ cloud technologies to improve the efficiency of training students on socio-humanitarian specialties and public administration. Relying on the analysis of their sociological research and secondary data, the present authors outline the most popular cloud services used in times of forced transition to distance learning mode. The article analyses the existing software products based on the cloud computing system, as well as the advantages and affordances of each of them when applied in the training of students of socio-humanitarian specialties and public administration at universities. The research pinpoints the challenges in university functioning which can be quickly overcome by virtue of cloud technologies.*

**Keywords:** cloud technologies, online services, teaching, distance learning, university, sociology, public administration.

## INTRODUCTION

2020 will go down in world history as a year dividing the lives of modern humanity into *before* and *after* the global pandemic, which has significantly changed all aspects of public life. In terms of education, this year saw professors and students fully, or even exclusively using information and communication technologies in organising and managing all classes remotely. In contrast to recent years, when a large number of teachers and students used the Internet only to find the necessary information to prepare for classes, the Internet has currently become a full-fledged communication tool. Distance learning systems in Ukrainian universities until 2020 were more an exception rather than the rule, because this form of education required full licensing and accreditation, and most universities focused more on traditional presence classes. But under the conditions of quarantine restrictions, the situation changed dramatically: some universities developed their own systems of remote data exchange between professors and students, while others have been using the specialised services of the world's leading IT companies, in particular Google and Microsoft, namely cloud technologies.

### 1. PREVIOUS RESEARCH ON THE USE OF CLOUD TECHNOLOGY IN THE EDUCATIONAL PROCESS AT UNIVERSITY

While characterising modern Ukrainian scientific discourse on the use of cloud technologies in the educational process, its fragmentary nature and certain one-sidedness should be noted, as most scientists focus on general issues of ICT implementation and distance learning at universities: there are only a few works on the use of cloud services at universities. Thus, Morze and Kuzminska (2011) singled out the pedagogical aspects of cloud computing in the functioning of universities; Husiev and Usherenko (2016) considered the aspect of managing the formation of competencies of higher education seekers through the use of cloud services, Shelestova (2018) explored online services as promising and alternative means of teaching students in Ukrainian universities. The authors of this article published a series of papers on various aspects of optimising the educational process in higher education based on the introduction of modern ICT and cloud technologies, namely social networks, the use of media, thematic websites, e-books, official websites of universities, electronic literature repositories, information portals, personal pages of teachers (Shelomovska et al., 2019; Shelomovska et al., 2018; Shelomovska et al., 2017; Shelomovska, Sorokina, & Romaniukha, 2017; Shelomovska, Sorokina, Romaniukha, & Bohomaz, 2017). However, these works do not reveal all the extremely diverse educational potential of cloud technologies. The scientific discourse lacks publications discussing opportunities of cloud technology in the training of students on socio-behavioral courses and public administration course at universities, hence the choice of topic for the present study.

#### 1.1. Research Methodology

The present research was possible with a number of methods. The method of theoretical literature review was employed with an objective to study the general trends in the use of cloud tools in education, their essence, structure and functions.

In order to study the experience of students and professors using cloud tools in education there was designed an anonymous questionnaire, which was carried out remotely via e-mail and messengers. The purpose of the study was to identify the scope of use of cloud tools by professors and students of socio-humanitarian specialties and public administration in conditions of forced transition to distance learning mode. The collection of primary sociological information among professors and students of DSTU coincided with the start of the global Covid-19 pandemic in April 2020. The main stages of the study included: the development of the questionnaire and accompanying tools, questioning, quality control of the work performed, input and verification of data for logical errors, and preparation of the final data set.

Elements of qualitative and quantitative methods of data processing were employed to discuss the results of sociological survey and deliver conclusions.

## 2. PRESENTATION OF RESEARCH RESULTS

Surprisingly, cloud technologies were known to the academic community, but it is only recently that they gained such popularity. Now in a global pandemic came the paradigm of so-called *cloud thinking*. Experts say that over the next few years, about 80% of all organisations and businesses will totally depend on cloud computing.

In modern scientific discourse, the term *cloud is understood* as the latest innovative way of organising information and telecommunications infrastructure, which consists in the deployment of hardware and software on remote (cloud) providers' sites. In fact, the cloud is one huge virtual server. In turn, *cloud (scattered) computing* or cloud, scattered data processing is a way of processing data in which computer resources and capacity are provided to the user as an Internet service (Rudenko, 2015; Nazarenko, 2016). Pihareiev, Lozhkovskiy, & Mamatova (2017) expressed the view that these are service models that provide consumers with universal and convenient network access to a common pool of computing resources, e.g. data networks, servers, repositories, applications, services, etc., which are configured and form a *cloud*. *The key function of cloud tools* is to provide users with remote data processing. Cloud technology involves a computer / web application hosted on remote servers through a user-friendly interface or application format. Cloud technologies in education *allow communication between an unlimited number of professors and students through messenger and e-mail; teamwork collaboration* to achieve common educational goals as well as the creation and maintenance of personal and shared file repositories; *cooperation* via collaboration, interconnectedness through their activities (Odainyk, 2016; Zhornytska & Ivasiuk, 2017).

Based on this, *three components* of the cloud-based learning environment can be identified: spatial-semantic, content-methodological and communication-organisational. *The subjects of the cloud-based learning environment* are professors, students, university management and administrators. Importantly, cloud technologies allow carrying out both individual educational activities on subjects, and group ones in teacher↔student format, which is the one-on-one mode of work, as well as in the teachers↔students format based on group interaction.

*The objects of architecture* behind cloud-based learning environment include: e-mail, planning system, e-notebook, address book, calendar, structured repository of teaching materials available to all users, online surveys and testing, software, website designer, video conferencing system, user management system and corporate network (Makarenko, 2015). In his professional activity, the teacher can use any of the types depending on the purpose of the service, and combining them into a single system allows you to build a *cloud over the university* that can replace the local network without the need for a server. *Cloud resources allow* storing educational information in a shared information environment of the educational community.

Morze and Kuzminska (2011) state that the use of cloud computing at universities makes sense for all the staff, in particular professors and students can benefit from the cloud's personal set of software depending on specialization, course, etc., it allows keeping personal data of significant volume. At the same time, cloud computing provides personal environment for the students throughout the study period, with access to it from anywhere at any time, allows mobility and session saving functionalities, as well as automatic distribution of software packages, according to curricula, scientific needs etc.

Significant *advantages of cloud computing* which indicate the possibility and necessity of their use in the training of students of socio-behavioral specialties and public administration at universities are the following:

**1. Accessibility and mobility** – clouds are available to everyone from any location where there is an Internet connection, from any device with a browser. The comfort and convenience of using cloud computing is provided by the appropriate customization or individualization and versatility of the connected devices. Given this, the teacher with the help of cloud technology can not only use traditional forms and teaching methods, but also create conditions for learning everywhere. Generally speaking, the interface is quite intelligible.

**2. Economy** – since cloud technologies do not require additional software and most of them are absolutely free, as they do not involve the university's financial costs necessary to develop custom-made software and hire a local IT-technician.

**3. High manufacturability and flexibility.** The user has a large computing power to use for storage, analysis and data processing. Unlimited computing resources, e.g. disk space, memory, processing power, are achieved through the use of virtualisation systems (Hladkova, 2017). All the necessary resources are supplied by the provider automatically, and all information in the cloud storage is always kept up to date.

**4. Reliability.** According to many experts, the reliability provided by modern cloud computing is much higher than the reliability of local resources, as only few universities are capable of acquiring and incorporating a full-fledged data center.

Cloud services provide the following *opportunities for the training of specialists in socio-humanitarian specialties and public administration*:

**1. A platform for cooperation and a forum for the exchange of ideas**, as they enable multiple users to work simultaneously, create group projects and optimize plans for cooperation of participants in the educational process. It develops students' critical thinking, promotes deeper study and awareness of educational material.

**2. Keeping unlimited amount of educational information** without external storage. The teacher gives all students access to the necessary study material. Discussion of materials and media reports helps not only to increase students' interest and motivation in learning, but also to keep abreast of current events in various spheres of public life, accumulate social and political material, get acquainted with innovations and form their own worldview and identity (Shelomovska, Sorokina, Romaniukha, Sorokina, & Machulina, 2019).

**3. Expanding the content of educational material**, which is extremely needed for sociologists, political scientists, public administration, whose work depends on their ability to navigate the surrounding events and provide a reasoned opinion. Cloud tools help the teacher to create and upload teaching materials in a variety of formats.

**4. Fast updatability.** Cloud technologies allow the professor to make adjustments to the material and take into account students' work, such as their presentations, audio and video in teaching future students of the same course. They can increase the quality of training due to dynamic update of curricula and allow joint access to educational materials.

**5. The openness of educational environment and student-centered approach.** Students see each other's work, comments and instructions of teachers, take into account their own and potential comments in their work. Consequently, student group work becomes more informed, and the teacher interactively manages the activities, leaving comments and showing students control points.

*The quality of learning with cloud technologies increases* due to the faster adaptation of students to the educational material, strong account of their capabilities and abilities, selection of a more appropriate method of mastering the subject; regulation of training intensity at different stages of the educational process; self-control, and figurative visual form of presentation of the studied material.

Among *the disadvantages* of using cloud technologies in the educational process one can often hear technical issues: the need for permanent Internet connection, the dependence of the educational process on the quality of the Internet channel (Shelestova, 2018), the inability to maintain intermediate stages of information processing, and security issues, such as the risk of transferring control over intellectual property products to third-party providers and servers, the vulnerability of clouds in terms of information security and the inability to transfer all data to the cloud environment due to a limited set of tools, as well as the emergence of huge amounts of uncontrolled information. Also, Viter and Zasadna (2014) assume that in the long run, the cloud model may become more expensive than hosting a local server.

The greatest success of applying cloud tools in Ukraine so far is the creation of *Unified state electronic database on education at the governmental level which is working on hybrid cloud technology*, encompassing *public cloud*, where the provider offers relevant IT resources for wide Internet audience and *community cloud*, shared by several universities with related computing resources and tasks. The Unified State Electronic Database on Education (USEDE) is an automated system for collecting, processing, storing and protecting information on students and subjects of educational activity. Its main purpose is to provide public authorities, local administration, in-

dividuals and legal entities with information in the field of education on educational institutions, documents on education and scientific degrees, the results of external independent evaluation, the course of the admission campaign to educational institutions, student ID sample, other information in the field of education (Pro YeDEBO). According to a survey among students and academic staff conducted by the State Education Quality Service of Ukraine in April–May 2020 universities demonstrate quite a systematic use of distance learning technologies. Thus, academic staff shows a fairly high degree of readiness for new working conditions, particularly among professors of the humanities (15%), pedagogy (11.5%), management and administration (10%), information technology (8%), social and behavioral sciences (6.5%) and law (6%) (Informatsiino-analitychna dovidka, 2020).

The survey on the share of respondents using distance learning technologies to provide feedback, transfer or obtain information found that asynchronous learning tools dominate in distance learning for students, namely, messengers: Viber, Messenger, Telegram, WhatsApp with a share of 69.7 %. At the same time, most teachers – 69.4% – showed that they manage distance learning and communicate with students through virtual educational environments like Moodle, Google Classroom, etc., and use messengers a little less – 67.7%. The share of students who were trained through virtual educational environments during quarantine was 56.6%. Among teachers, the third place in the use of ICT in the educational process during the pandemic was taken by communication technologies – Zoom, Skype, Meet, Hangouts – with a share of 59.5%, and among students they were used by only 43%. E-mail was used by every second respondent in both categories, and e-cabinets on the websites of institutions – every fifth respondent in both groups.

Only 48.3% of the surveyed professors assessed their experience with *virtual educational environments* as positive. At the same time, 80% believe that this distance learning technology is the most effective in organising remote education. However, among the respondents who have positive experience of working with virtual educational environments, one in four does not use them to develop their own educational content and only one in three provides advisory guidelines for laboratory, practical, seminar classes with their use. Simultaneously, when trying to determine the ranking of distance technology tools by efficiency, virtual educational environments are found the most effective – 70.1% of professors and 50.1% of students believe so. The effectiveness of video communication is stressed by 69.7% of professors and 46.8% of students; messengers – 41.3% of professors and 51.5% of students; e-mail – 33.4% of professors and 30.7% of students. Messengers remain the most effective distance learning tools for students.

The present authors believe that modern universities should rely on specific cloud technologies in the training of students of socio-humanitarian specialties and public administration, especially in periods of restrictions: web-applications, e-journals, online services for learning, tools for live communication, testing, distance learning systems, libraries, media collections, file repositories, shared access, collaboration resources, video conferencing tools, Google Apps and Microsoft cloud platforms, cloud file repositories, e.g. Dropbox, SkyDrive, GoogleDocs, etc.

Currently, in the Ukrainian segment of Internet there is a strong preference among educators and public administration students towards cloud computing services by Microsoft and Google, available in the public domain. In education, Google provides *Google Apps for Education* cloud applications for distance learning, and *Google Apps for Government* for public administration. Microsoft corporation offers to educational institutions cloud options of the package *Office 365 for education* (Windows Azure in education). Generally speaking, the educational services available today within the cloud can be divided into *three broad categories*: storage, data processing, and collaboration.

To study the aspects of use of cloud tools in the educational process in Dniprovsky State Technical University (DSTU) there was conducted a sociological survey involving 250 full-time students (80.2% undergraduate and 19.8% master students). Random sampling by the method of simple probabilistic selection, representative by the course of study and the educational program was used. The survey addressed 75 research and teaching staff as well. Random sampling by the method of simple probabilistic selection, representative by sex, age and profession was used.

Table 1.

**The experience of students and professors of DSTU using cloud services in education, in %. According to the authors' sociological survey**

Cloud services	Professors		Students	
	Familiar	Used	Familiar	Used
Google translate	93.4	78.9	92.3	84.9
E-mail	91.5	72.1	89.1	61.4
Google Disc (Drive)	81.2	47.8	59.4	32.1
Videoconferences (ZOOM, Skype, Google Talk)	75.4	57.2	83.4	52.4
Google Docs	75.1	52.3	48.3	24.8
Google Classroom	72.1	43.5	51.2	38.4
Google Forms	71.3	42.1	65.8	17.3
Cloud technologies for testing	68.2	51.3	72.4	35.3
Google Presentations	64.2	46.3	35.1	12.3
Google Tables	52.8	25.4	27.4	5.1
Cloud data storages Dropbox, SkyDrive	52.1	15.8	67.2	34.2
Google Calendar	42.1	14.3	42.6	7.8
Office 365 for education/ Windows Azure in education	36.5	4.5	25.8	12.3
Google Groups	34.5	15.7	24.3	2.6
Microsoft Live@Edu	31.2	5.7	11.4	0.5
Google Hangouts	27.0	5.2	14.5	1.2
Google Keep	8.1	1.8	5.2	–

Source: own work.

Table 1 represents the trends in the use of cloud tools. When it comes to implementing a number of educational tasks the largest proportion of students use such cloud services as e-mail and online translator. More than half of both professors and students employ cloud tools for collaboration, such as ZOOM, Skype, Google Talk. In con-

trast to that, when it comes to tools for knowledge management and assessment, for instance, such group of tools as Google Docs, Google Classroom and Google Forms, professors demonstrate stronger awareness of the environments than students, who were evidently receiving the tasks from professors in these formats. Interestingly, the survey revealed poor use of such time-management tool as Google Calendar by both professors and students.

Importantly, it is not only professors and full-time students who enjoyed the efficiency of cloud tools, but also part-time students. For them, cloud services can almost completely solve the problem of interaction with professors and access to learning environment in-between sessions.

*Microsoft Office 365* allows users to stay in touch with other people via instant messaging and video chat; store documents in the cloud and share them with other users via OneDrive; hold multi-user meetings through conferencing which includes enhanced sharing, notetaking and commenting. Microsoft Office Web Apps offers advantages of existing Microsoft Office functions through a web browser. *Office 365 Education* is a set of services that allow one to collaborate on teaching materials. The product contains: Office Online, Word, PowerPoint, Excel and OneNote, 1D OneDrive storage, Yammer and SharePoint sites, as well as e-mail, calendar, web conferencing; virtual board; designer of creating and maintaining websites, schedule of classes and activities, allows video files, online meetings, joint processing of documents, creating, editing, storing teaching materials and their use. For high school distance learning, Microsoft proposes to optimize distance learning with *Microsoft Teams*, which provides an online classroom with virtual one-on-one communication, tasks, files, and conversations as a single solution available on many devices (Perekhid na dystantsiine navchannia). *Google Apps* come with a free basic and a professional package. For educational purposes, there is Google Apps Education Edition – a free package for schools which includes all the features of the professional package. Google Apps Education Edition – Web-application based on cloud computing, providing students and teachers with tools necessary for effective communication and collaboration. *Google programs for education* are free, and for educational institutions with 24/7 support free of charge. The service allows you to create and share files in real time, automatically store information in the cloud, access it from any device. The service includes: Gmail e-mail; *Google Calendar* web conferences; virtual board; website builder and supporter. The service provides an opportunity to create, edit documents on *Google Drive*, where one has space for creating, editing and storing files and set access rights to them. Since 2012, GoogleDrive allows users to store data in the cloud, synchronize files across multiple devices and share files. GoogleDrive includes the Google Docs office suite, Google Spreadsheets, and Presentations, as well as document editing, spreadsheets, presentations, drawings, and forms. *Google Docs* is an online office for creating and storing text documents, spreadsheets, PDFs, and presentations, as well as collaborating on them. At each stage of designing assessment surveys or independent work of students one can use a special form within *Google Forms* which also allows you to create sociological questionnaires and get results in graphic mode. *Google Talk* enables professors to organise online-consultations with students, both in writing and as a video con-



ference. *Google Calendar* is a web tool for managing and planning the educational process, lets set tasks for a thesis project, offers to share calendars to create and view schedules of classes and consultations. *Google Hangouts* software is used for instant messaging and video conferencing. Chat histories are stored on Google servers, allowing you to sync them on a number of devices. Photos that participants share during the conference are automatically uploaded to private Google+ albums (*Google products for Education*).

*Google Classroom* environment enables professors to easily provide information to students: texts and/or presentations of lectures, literature for self-study, assignments for independent work, thematic online discussions, grades and announcements. One of the benefits of Google Class is its integration with other Google services. Thus, the teacher can upload information to Google Class in almost any format: text, PowerPoint presentations, images, videos, audio and other kinds. Naturally, these features of the Google Class will contribute to effective learning only if the teacher has a well-designed course, as well as texts and/or presentations of lectures, and a set of practical tasks that contribute to the assimilation of theoretical material. Tasks and work performed by students are stored, organised as structured folders and documents on Google Drive. It can be argued that the GoogleApps cloud services in distance learning will be best used to organise the practical work of students of socio-behavioral specialties, including sociologists when planning and conducting their own sociological research. According to the educational program for bachelors and masters in Sociology in most free educational institutions of Ukraine during their studies at the university, applicants must develop such competencies as the ability to use modern software and computer technology for processing sociological data; the ability to analyse data for the preparation of analytical decisions, expert opinions and recommendations; the ability to use basic theoretical knowledge, practical skills and abilities to participate in scientific and applied research, analytical and consulting activities; ability to analyse, present and interpret numerical and non-numerical social data. Google's cloud services can be used to form specific skills:

- planning and conducting surveys using Google Drive, Calendar, Group, Email, Google Hangouts, Google Keep, Google Talk. At this stage, it is also worth using online services, social networks, thematic forums, scientific communities and electronic libraries to identify research issues, determine their relevance and conduct pilot activities;
- gathering information – Google Drive, Forms and Email, Google Groups, Google Hangouts;
- analysing and processing of the necessary information – Forms and Google Drive, Google Keep;
- presenting information as text, presentations, electronic tables, etc. – Google Presentations, Google Spreadsheets, Google Docs, Google Talk.

Public administration students found cloud technologies more convenient and motivating for study, especially in a global pandemic. This doesn't come as a surprise, since distance learning relying on various cloud services increases the share of independent involvement with the material and this in turn gradually ensures the development

of such qualities as independence, responsibility, organisation and the ability to realistically assess one's strengths and make informed decisions, which is very important for a successful career as a public servant. In particular, in the training of public servants at the Dnipropetrovsk Regional Institute of Public Administration of the National Academy of Public Administration under the President of Ukraine web-applications from Google Apps are widely used as communication and educational technologies. The convenience and efficiency of using Google Apps tools was appreciated not only by teachers of the academy and full-time students, but also by those who study by correspondence. Google Apps allows part-time students to solve the problem of interaction with the teaching staff and learning environment almost completely. A flexible system of knowledge assessment in combination with individual and group work formats and tests enables students to acquire any amount of knowledge. The distance education of public servants, enhanced by cloud technologies, allows professors to implement all tasks and improve practical skills related to work processes, while simultaneously reducing the costs.

## CONCLUSION

Cloud technologies should become the key element of the educational process, especially in a global pandemic, which challenges the work of universities in the coming years. They help create shared communication environment, new forms of work in the classroom, free exchange of documents for classes, general contextual environment for creative tasks. Cloud technologies should be especially useful for professors when teaching students of socio-behavioral specialties and public administration with whom communication should not be limited to asynchronous tools such as e-mail and messengers, but must contain the tools to develop in them the skills of expressing their own opinion, analyzing the surrounding socio-political situation, reflecting on all latent phenomena. It is also necessary to engage students in extra work in order to expand their knowledge by providing them with access to educational materials that are allocated to independent work. The latter requires from students a great deal of self-discipline, since in most cases, the material submitted to students for self-study is neglected. Cloud technologies can fix this situation via the tools that manage and motivate independent student activity.

The use of cloud technologies in the training of students of socio-behavioral specialties and public administration, on the one hand, requires from professors of humanities cutting-edge ICT-skills, and on the other – promotes the solutions to one of the most pressing tasks of the country and society – digitalization and informatization of all spheres of public life, which can only be achieved by improving the ICT competence of both students and professors.

With cloud technologies it is possible to organise the process of interactive online communication between teachers and students, and is indispensable for distance education during global quarantine restrictions. However, even after their relaxing, cloud technologies should be incorporated in the universities' activities to prepare students of socio-behavioral specialties and public administration as a supplement to the clas-

sic forms of full-time education. However, cloud technology will never replace the process of direct *live* communication between professors and students, because it is here that you can move away from one-size-fits-all approach.

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