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# THE USE OF CLOUD COMPUTING IN HIGHER EDUCATION IN REPUBLIC OF NORTH MACEDONIA

**Abstract:** The development of information technologies has enabled higher education institutions to improve their teaching and learning methods through the use of modern IT platforms and tools and thus completely change the environment for the implementation of the teaching and learning process. Cloud computing as a model of offering information resources has enabled universities to use IT resources efficiently. Through the implementation of Cloud computing model in teaching process, every university can afford the use of relatively large amounts of information resources with relatively low costs for their use. It is especially important for developing countries such as the Republic of North Macedonia, which are not able to allocate large financial resources for the purchase of the latest expensive information technologies. Today, Cloud computing platforms for education (Google Suite for education, Microsoft education, Amazon cloud computing for education, Coursera, Blackboard, Evernote etc.) through the benefits they offer such as the availability of applications, cost effectiveness, flexibility, ease of use and security, enable universities to transform traditional learning processes and thereby advance the overall higher education process.

The main goal of this paper will be to present the level of use of Cloud computing platforms and tools in higher education institutions in the Republic of North Macedonia. For this purpose, a questionnaire was created in which the largest number of universities in the Republic of North Macedonia were included. This paper will present a qualitative and quantitative analysis of the results obtained from the survey. The questionnaire was created using Google forms and was delivered to the academic staff from the most of universities in Republic of North Macedonia. Also, through this paper, most of the challenges and benefits of using Cloud computing platforms/tools will be presented.

Key words: cloud computing, information technology, education, benefits, challenges, teaching

## 1. INTRODUCTION

Information and communication technologies have completely changed the way of life and exponentially helped the progress of the entire human civilization in the last few decades. These technologies have gradually penetrated into all segments of society, enabling the automation and digitalization of large number of processes. Like other areas in society, higher education has not remained immune to the changes that are happening today and are the result of the explosive development of information technologies.

Higher education is one of the most important segments in the functioning of any society. At the same time, the main goal of every higher education institution is the realization of a quality teaching and learning process for its students, who would be competitive on the labor market after graduation. Quality improvement of teaching and learning process in recent years is possible by the emergence of new technologies that provide unlimited opportunities to students and professors. The development of new information technologies enables the transformation of higher education and the improvement and advancement of teaching and learning methods. One of the models based on advanced information technologies is the Cloud computing model. The formal definition of cloud computing comes from the National Institute of Standards and Technology (NIST): "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 (K. Chandrasekaran, 2015). The three basic service models are Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS), while the four deployment models are Public Cloud Computing, Private Cloud Computing, Hybrid Cloud Computing and Community Cloud Computing. The Cloud computing sees no borders and thus has made the world a much smaller place (Rittinghouse J.W., Ransome J.F., 2010). Today, with the application of the Cloud computing model, especially universities from developing countries can have access to a large amount of information resources. This is particularly significant for these countries because they face a number of limitations, primarily financial constraints, because the purchase of new information technologies is relatively expensive. Using Cloud Computing model, universities can have access to large amounts of information resources for relatively low prices. By using some Public Cloud services (e.g., Gmail) some of these informational resources can be obtained completely free of charge. Cloud Computing is the third revolution after PC and Internet in IT. Specifically, Cloud Computing is the improvement of Distributed Computing, Parallel Computing, Grid Computing and Distributed Databases (Khadiga M. and all 2018). With its five essential characteristics such as On-demand Self-service, Resource pooling, Measured services, Flexibility and Rapid elasticity, Cloud computing provides Higher education institutions numerous benefits.

## 2. CLOUD COMPUTING AND HIGHER EDUCATION

Today, the most of universities are beginning to use the benefits of new information technologies. Many universities in the world recognize the potential and efficiency offered by the Cloud computing concept, so they strive to implement this concept in the teaching process. The benefits offered by the application of cloud computing can be numerous, such as: access to a large number of applications without geographical and time barriers, new and modern ways of implementing curricula, easy communication and interaction between participants in the teaching process, low costs for using the software, greater availability of learning resources etc. Already, Cloud service providers have established platforms such as Google Suite for education, Microsoft education, Amazon Cloud for education, etc. which enable support of the teaching and learning process. Cloud computing providers such as Google and Microsoft through their learning platforms provide educational institutions with a whole range of services for the realization of their teaching and learning process. These services include the use of e-mail, calendars, document storage, contact lists, on-line lectures and meetings, creation of quizzes and tests, classrooms for each group of students, etc.

In that context, the universities in the Republic of North Macedonia must adapt to the modern trends in the world. The importance of new information technologies and models came to the fore especially during the pandemic, when the conditions and ways of implementing the teaching process completely changed. In that period, Cloud platforms and tools were the basic ways of implementing the teaching process and proved to be a successful form for the implementation of curricula. After the end of the pandemic, some universities continued to use a Cloud platforms and tools as primary or additional tools of teaching.

In this paper, we explore the use of Cloud platforms/tools in higher education, as well as the challenges and benefits of using these tools. In addition, the emphasis will be on several issues related to: application of Cloud tools in each cycle of studies, dynamics of application using, the ways of teaching, the future of Cloud computing in Higher Education, etc. This paper will be a pioneering step in researching the application of Cloud computing platforms/tools in higher education in the Republic of North Macedonia, because so far there are no data in this area at all. We hope that this paper will be a good basis for further research on the application of Cloud Computing not only in higher education but also in primary and secondary education.

## 3. USE OF CLOUD COMPUTING IN HIGHER EDUCATION INSTITUTION IN REPUBLIC OF NORTH MACEDONIA-EMPIRICAL RESEARCH

To explore use of Cloud computing in higher education institution in Republic of North Macedonia was used the method of representative sample and were used combined questions of different types. The data obtained through an on-line questionnaire contained closed-ended questions and was used Likert scale for certain specific questions. The questionnaire created with Google Forms was sent via e-mail to the academic staff of Macedonian universities. In addition, 115 respondents answered questionnaire, which is an appropriate and representative sample based on which relevant conclusions can be drawn. In this paper will explore use of Cloud computing in higher education institutions in Republic of North Macedonia in realization of the curricula.

The questionnaire was sent to academic staff from 19 universities in the Republic of North Macedonia, from which answers were collected from 12 universities that are best ranked on several lists such as Webometrics and Edurank. At the same time, the largest part of the respondents were from the two oldest and the biggest universities, the University "St. Cyril and Methodius"- Skopje and University "St. Kliment Ohridski"- Bitola, which can be seen from the following Figure.
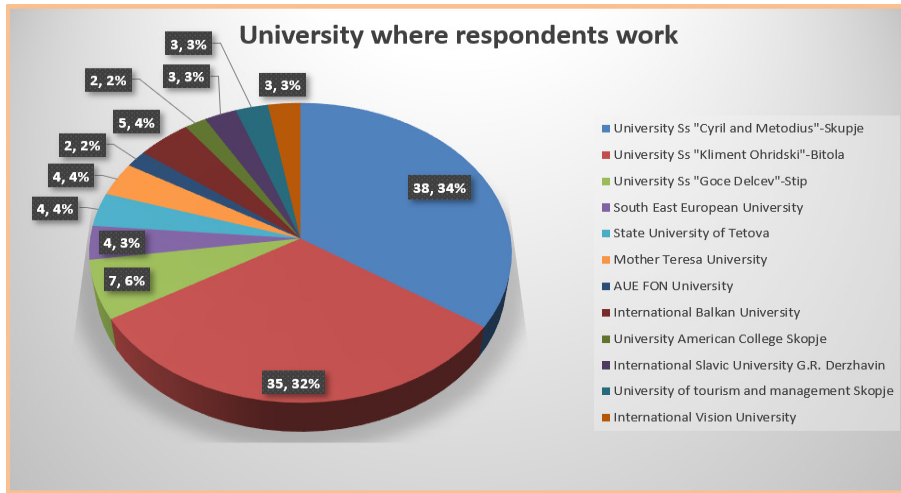
Figure 1. University where respondents work

The first group of questions refers to the personal characteristics of the respondents such as age, gender, work experience, academic title, etc. All those parameters can be viewed in the following Figure.
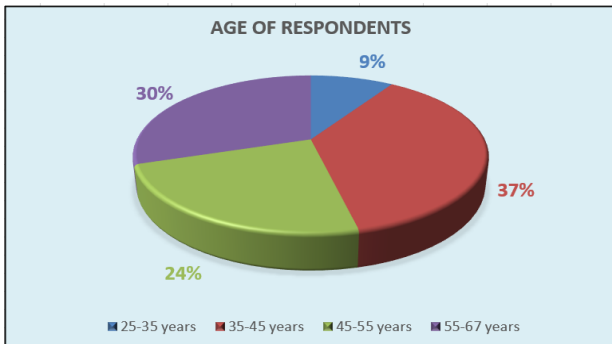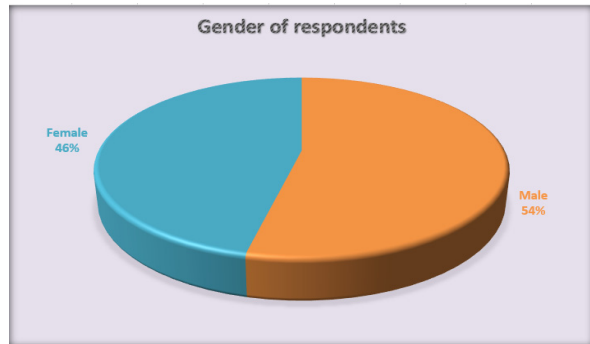


Figure 2. Age of respondents
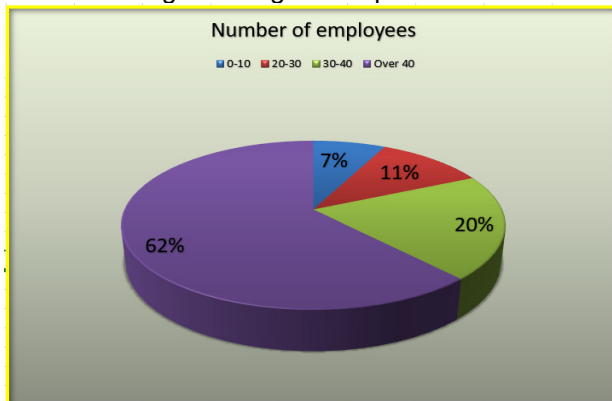


Figure 3. Gender of respondents



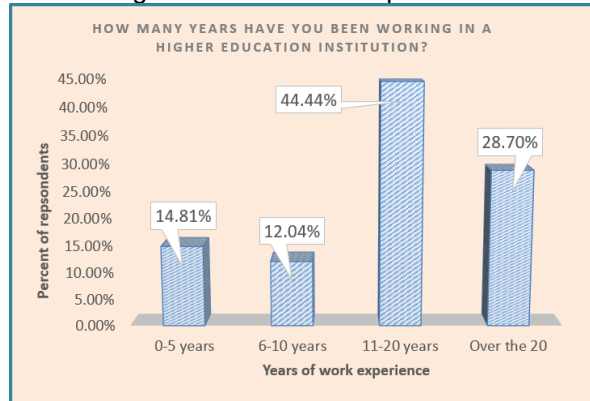Figure 4. Number of employees in institution



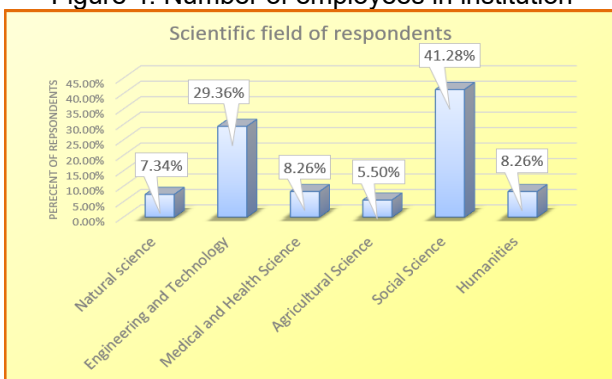Figure 5. Working experience of respondents



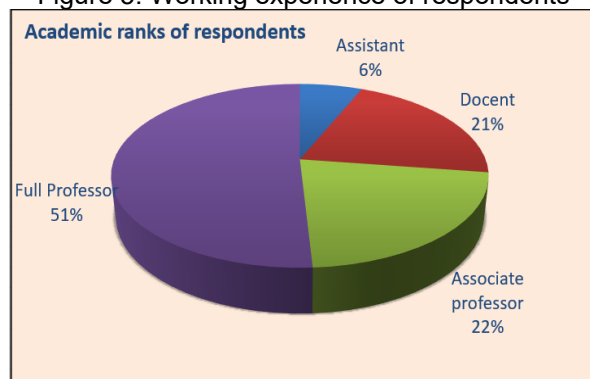Figure 6. Scientific field of respondents



Figure 7 Academic rank of respondents

As can be seen from the Figure 2, academic staff from all age groups are relatively equally represented, and the least number of them are in the age of 25-35 years, or only 9%. It is one of the biggest problems in higher education in the Republic of North Macedonia, and that is the lack of young academic staff. The reasons for this are various, starting from the insufficient investment of the state in higher education to the low interest of young people for academic career due to the low salaries in higher education. Also, in this context the results from Figure 7 corresponds with this issue and according to these results about academic rank of the respondents, the largest part of them are full professors (51%), then associate professors (22%), assistant professors (21%) and only 6% are assistants.

Most of the respondents are from institutions with over 40 employees or 62%, while most of the respondents have work experience of 11-20 years or 44.44%.

When it comes to the scientific field in which the respondents work, academic staff from all scientific fields are represented, of which the majority of respondents are from social sciences or 41.28% and Engineering and technology with 29.36%.

Today, it is almost unbelievable to realize a large number of processes without the application of new advanced technologies. It is same situation in the processes of education. The development of information technologies contributed to their increasing application in the educational process, which led to the modernization of the teaching and learning process. That fact is confirmed by the results obtained with this research. A very small or insignificant part of the respondents, i.e. only 2%, apply a traditional way of teaching without the use of information technology. The largest part of the academic staff applies a form of teaching with the support of information technology (57% of respondents), while a part of the respondents (11% of respondents) implement the curriculum exclusively based on information technologies. All this confirms the fact of the increasing implementation of information technologies in the teaching and learning process.
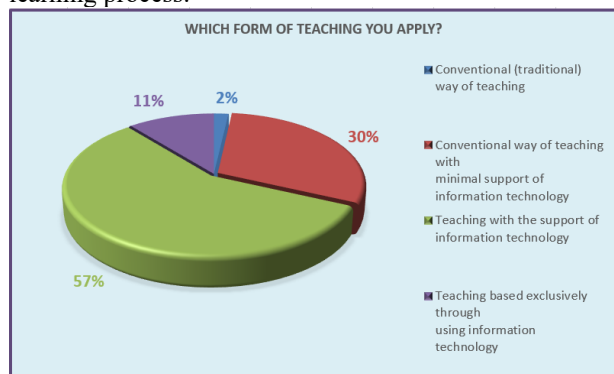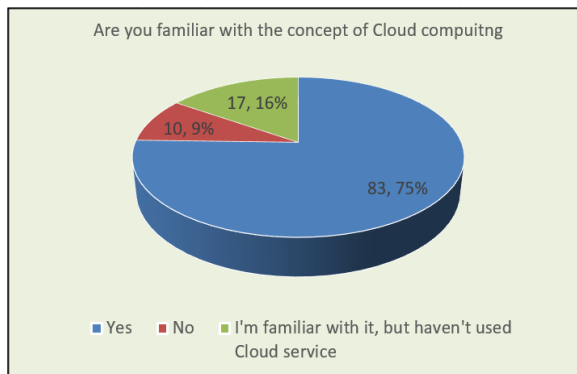


Figure 8. Form of teaching



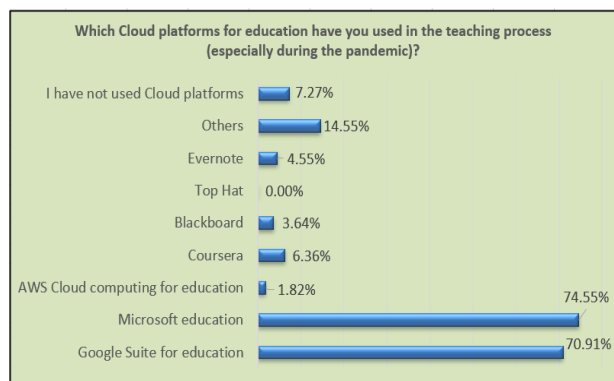Figure 9. Familiarity of respondents with Cloud computing



Figure 10. Cloud platform that respondents have used (especially during pandemic)
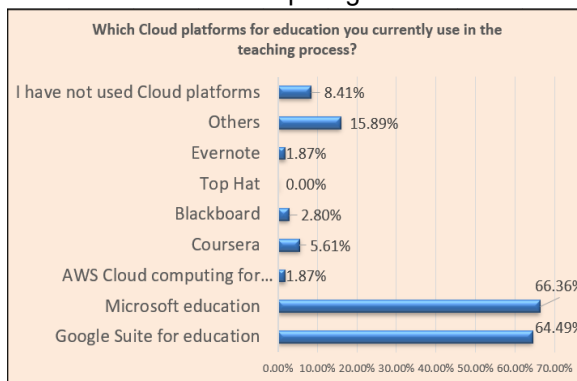


Figure 11. Cloud platform that respondents currently use

Cloud computing is a model of delivery of information resources based on new advanced technologies. The advantages of Cloud computing make it applicable in many areas, including in education, especially in developing countries such as Republic of North Macedonia. By applying of this model, universities in developing countries can have access to the latest advanced tools for on-line teaching and learning without investing large financial resources. According to the results of the research in this paper, most of the respondents are familiar with the concept of Cloud Computing, or even 83%, which can be seen from Figure 9. But not only are they familiar with the concept of Cloud computing, also a large part of them have already used or currently use some Cloud platforms/tools in teaching and learning process. Due to the pandemic, educational institutions had to adapt to the changed conditions and most of the teaching and learning process took place on-line. Also, in the Republic of North Macedonia, universities completely switched to distance learning. During that period, as can be seen from Figure 10, most of the respondents used learning platforms from the largest providers in this area, Google (70.91%) and Microsoft (74.55%). Academic staff in the Republic of North Macedonia in the past period, and especially during the pandemic, also used other Cloud platforms/tools for teaching and learning,

such as Coursera, Evernote, Blackboard, etc. The use of Cloud platforms/tools has relatively decreased in the period after the pandemic, but still today a significant number of academic staff use Cloud applications for teaching and learning. Again, the most used platforms are Google Suites for Education (64,49%) and Microsoft Education (66,36%) and their tools. After all, as the largest providers of Cloud services, Google and Microsoft have the largest share of the market and have the widest range of tools. Although Cloud platforms/tools are currently used less than during the pandemic, there is a satisfactory level of use of Cloud platforms/tools in higher education.

According to the obtained results of the research, the respondents use these Cloud platforms in all three cycles of study. Namely, 38% of the respondents constantly use Cloud services in the first cycle of studies, 40% in the second cycle of studies and 30% constantly Use Cloud services in the third cycle of studies. On the other hand, the number of academic staff who do not use Cloud services at all is very small, or 10% on the first cycle of studies and 17% on the second cycle of studies. The fact that 30% of respondents do not use Cloud services at all in the third cycle of studies is interesting, which is a really large percentage. The reasons for this can be various and require a more detailed analysis.

Cloud computing offers great advantages and benefits for universities in the Republic of North Macedonia. According to the results obtained with the research, where a Likert scale was used to examine the opinion of the academic staff, most of the respondents strongly agree with the benefits offered by Cloud Computing. The benefits of using Cloud computing it can be seen from the Figure 12 where the benefits are listed and they are: Improved cooperation between students and professors, More flexible education process, More efficient education process, Greater availability of learning resources, Improved learning facilities, Modern learning environment attractive to students, Easier monitoring of students in the learning process, Scalability (possibility of constant upgrade of the system) and Access to a number of learning tools.
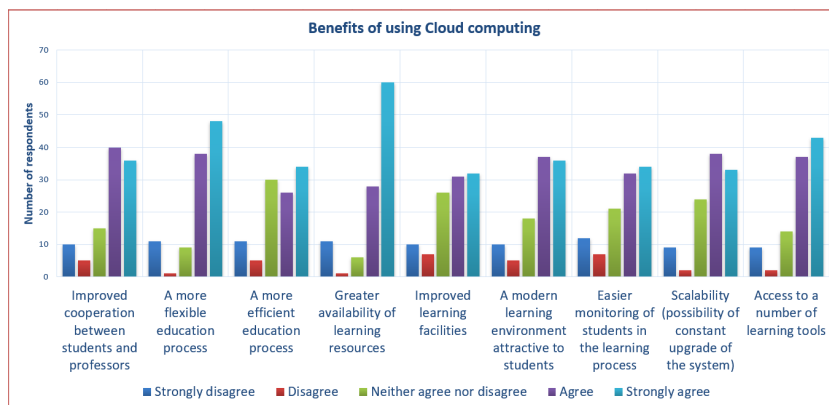


Figure 12. Benefits of using Cloud computing

Beside the advantages and benefits, the Cloud computing concept also faces certain challenges and problems. The results of the research indicate that the biggest problems faced by the respondents are: Poor social interaction between the participants, Poor internet connection and High digital knowledge is required. This can be seen in Figure 13.
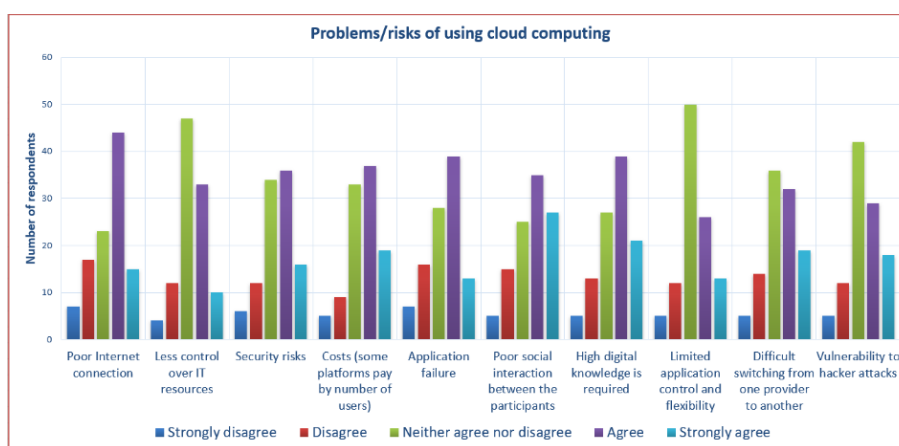


Figure 13. Problems/risks of using Cloud computing

However, when a comparison is made between the benefits and problems faced by Cloud Computing, the future trends will be in favor of Cloud Computing. The reason for that is because the benefits of using the Cloud Computing concept are far greater than the problems and challenges faced by this concept. That fact is confirmed by the results of the question about the future of Cloud computing, which can be seen in Figure 14. According to the results, most of the respondents believe that cloud computing will have a bright future, especially in Higher Education in the Republic of North Macedonia.
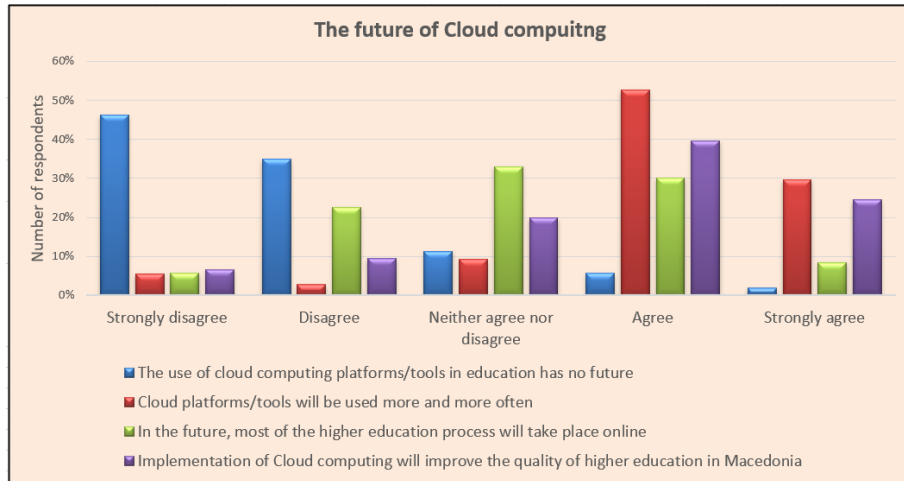
Figure 14. The future of Cloud computing in higher education

In this research, the results about which model of teaching and learning is most preferred by the respondents are quite interesting. As can be seen from Figure 15, according to these results, most of the academic staff prefer combination of online teaching and physical presence (hybrid model), or 73% of them prefer this model of curriculum implementation. Probably, in the future, this model of hybrid teaching and learning will be applied more often in order to meet the needs of students, but also to take advantage of the benefits offered by new technologies and models.



Figure 15. Preferred form of teaching

After the detailed analysis of the obtained results through cross-tabulations, interesting results were obtained. Due to the limited size of this paper, several cross-tabulations that are interesting for analysis will be presented. This analysis i.e., cross-tabulations were made with pivot tables in Excel and the obtained results are shown in the tables below.
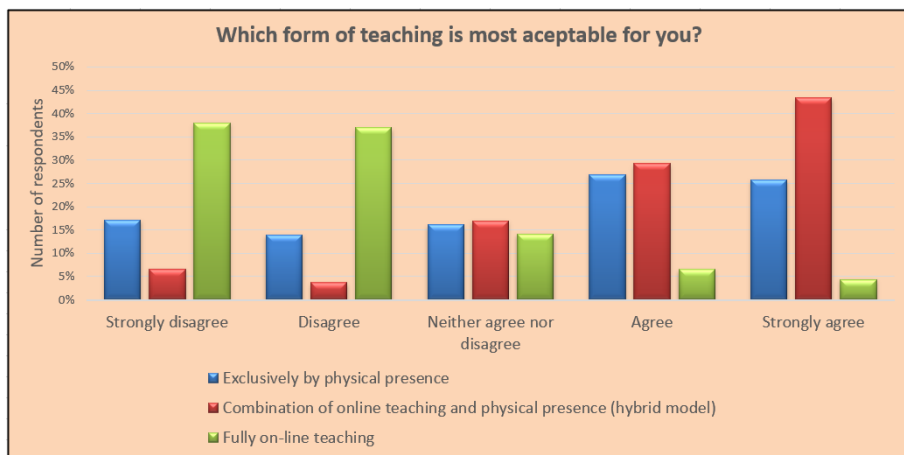
According to the results in Table 1, most of the respondents who are familiar with Cloud Computing are aged 35-45 (84%), while most of such respondents are in the scientific fields of Engineering and Technology (87.5%) and Humanities (88, 88%). When it comes to the size of the institution where they work, most of the academic staff who are familiar with Cloud Computing work in institutions with 30-40 employees (81,82%), while most of the associate professors (86.96%) are familiar with this concept.

Table 1. Cross-tabulation, Are you familiar with Cloud computing - Age of respondents

| Are you familiar with the concept of Cloud Computing? | Age of respondents | | | |
|---|---|---|---|---|
| | 25-35 years | 35-45 years | 45-55 years | 55-67 years |
| Yes | 60.00% | 75.61% | 84.00% | 72.73% |
| I'm familiar with it, but haven't used Cloud service | 10.00% | 14.63% | 4.00% | 6.06% |
| No | 30.00% | 9.76% | 12.00% | 21.21% |

Table 2. Cross-tabulation, Are you familiar with Cloud computing – Scientific field

| Are you familiar with the concept of Cloud Computing? | Scientific field in which you work? | | | | | |
|---|---|---|---|---|---|---|
| | Agricultural Science | Medical and Health Science | Social Science | Natural science | Engineering and Technology | Humanities |
| Yes | 83.33% | 55.56% | 68.89% | 62.50% | 87.50% | 88.89% |
| I'm familiar with it, but haven't used Cloud service | 0.00% | 11.11% | 13.33% | 25.00% | 3.13% | 0.00% |
| No | 16.67% | 33.33% | 17.78% | 12.50% | 9.38% | 11.11% |

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Table 3. Cross-tabulation, Are you familiar with Cloud computing – Number of employees

| you familiar with the concept of Cloud Computing? | Number of employees in Higher education institution (faculty, institute, school)? | | | |
|---|---|---|---|---|
| | 10-20 employees | 20-30 employees | 30-40 employees | Over 40 employees |
| Yes | 62.50% | 72.73% | 81.82% | 75.00% |
| I'm familiar with it, but haven't used Cloud service | 25.00% | 18.18% | 4.55% | 7.35% |
| No | 12.50% | 9.09% | 13.64% | 17.65% |

Table 4. Cross-tabulation, Are you familiar with Cloud computing – Academic Ranks

| Are you familiar with the concept of Cloud Computing? | Academic ranks of respondents | | | |
|---|---|---|---|---|
| | Assistant | Associate professor | Docent | Full Professor |
| Yes | 42.86% | 86.96% | 65.22% | 78.57% |
| I'm familiar with it, but haven't used Cloud service | 14.29% | 4.35% | 21.74% | 5.36% |
| No | 42.86% | 8.70% | 13.04% | 16.07% |

The following cross tabulation refers to the Form of teaching and learning in relation to certain characteristics of the respondents. As can be seen from Table 5, in institutions with 20-30 employees, teaching and learning methods with the support of information technology are most often used (63,64%), while in the scientific fields of Humanities (77,78%) and Medical and health sciences (66,67%), this method of teaching is most often used. When a comparison is made with Table 2, out of all scientific fields, the majority of Medical and Health Sciences are not familiar with Cloud Computing, and on the other hand, they usually apply teaching methods with the support of information technology. Also, teaching with the support of information technology is usually used by assistants who belong to the youngest category of employees, which can be seen from Table 7 and Table 8. However, even though the assistants use the teaching with the support of information technology (85,71%), a large part of them or 42,86% are not familiar with the Cloud Computing model (Comparison of Table 4 and Table 8). The reasons for such distortions in the obtained results can be very different from the lack of knowledge of the essence of Cloud Computing (lack of adequate training) to the nature of the teaching process, depending on the scientific field in which they work. There are often cases when a user applies some kind of Cloud service, but he does not know that it is a Cloud platform/tool.

Table 5. Cross-tabulation, of Form of teaching – Number of employees of respondents

| Which form of teaching do you most often apply? | Number of employees in Higher education institution (faculty, institute, school)? | | | |
|---|---|---|---|---|
| | 10-20 employees | 20-30 employees | 30-40 employees | Over 40 employees |
| Conventional (traditional) way of teaching | 0.00% | 9.09% | 0.00% | 1.47% |
| Conventional way of teaching with minimal support of information technology | 25.00% | 18.18% | 31.82% | 32.35% |
| Teaching based exclusively through using information technology | 12.50% | 9.09% | 13.64% | 10.29% |
| Teaching with the support of information technology | 62.50% | 63.64% | 54.55% | 55.88% |

Table 6. Cross-tabulation, Form of teaching - Scientific field

| Which form of teaching do you most often apply? | Scientific field in which you work? | | | | | |
|---|---|---|---|---|---|---|
| | Agricultural Science | Medical and Health Science | Social Science | Natural science | Engineering and Technology | Humanities |
| Conventional (traditional) way of teaching | 0.00% | 0.00% | 2.22% | 12.50% | 0.00% | 0.00% |
| Conventional way of teaching with minimal support of information technology | 16.67% | 11.11% | 42.22% | 25.00% | 25.00% | 22.22% |
| Teaching based exclusively through using information technology | 16.67% | 22.22% | 8.89% | 12.50% | 12.50% | 0.00% |
| Teaching with the support of information technology | 66.67% | 66.67% | 46.67% | 50.00% | 62.50% | 77.78% |

Table 7. Cross-tabulation, Form of teaching - Age of respondents

| Which form of teaching do you most often apply? | Age of respondents | | | |
|---|---|---|---|---|
| | 25-35 years | 35-45 years | 45-55 years | 55-67 years |
| Conventional (traditional) way of teaching | 10.00% | 2.44% | 0.00% | 0.00% |
| Conventional way of teaching with minimal support of information technology | 10.00% | 39.02% | 32.00% | 24.24% |
| Teaching based exclusively through using information technology | 10.00% | 9.76% | 20.00% | 6.06% |
| Teaching with the support of information technology | 70.00% | 48.78% | 48.00% | 69.70% |

Table 8. Cross-tabulation, Form of teaching - Academic Ranks

| ich form of teaching do you most often apply? | Academic ranks of respondents | | | |
|---|---|---|---|---|
| | Assistant | Associate professor | Docent | Full Professor |
| Conventional (traditional) way of teaching | 14.29% | 0.00% | 4.35% | 0.00% |
| Conventional way of teaching with minimal support of information technology | 0.00% | 30.43% | 39.13% | 30.36% |
| Teaching based exclusively through using information technology | 0.00% | 8.70% | 21.74% | 8.93% |
| Teaching with the support of information technology | 85.71% | 60.87% | 34.78% | 60.71% |

When it comes to the dynamics of using Cloud platforms/tools in teaching process, the obtained results are shown in the following tables. In addition, cloud computing is most often used in institutions with more than 40 employees (55.22%), while the scientific field where respondents often use Cloud applications are in the Humanities (66.67%). According to the results of Table 11, Cloud platforms/tools are often used by the academic staff aged 45-55 (52%), and according to Table 12, Cloud computing is often used by Full professors (57.14%).

Table 9. Cross-tabulation, of Dynamics of use Cloud computing – Number of employees of respondents

| What are the dynamics when using a Cloud tool/application during the implementation of the curriculum? | Number of employees in Higher education institution (faculty, institute, school)? | | | |
|---|---|---|---|---|
| | 10-20 employees | 20-30 employees | 30-40 employees | Over 40 employees |
| I don't use any Cloud tool/app at all | 12.50% | 27.27% | 13.64% | 7.46% |
| I use it in every class during the realization of the curriculum | 50.00% | 9.09% | 22.73% | 13.43% |
| I use it only a few times during the implementation of the curriculum | 12.50% | 27.27% | 22.73% | 23.88% |
| I use it often when implementing the curriculum | 25.00% | 36.36% | 40.91% | 55.22% |

Table 10. Cross-tabulation, Dynamics of use Cloud computing - Scientific field

| What are the dynamics when using a Cloud tool/application during the implementation of the curriculum? | Scientific field in which you work? | | | | | |
|---|---|---|---|---|---|---|
| | Agricultural Science | Medical and Health Science | Social Science | Natural science | Engineering and Technology | Humanities |
| I don't use any Cloud tool/app at all | 33.33% | 11.11% | 11.11% | 12.50% | 6.45% | 11.11% |
| I use it in every class during the realization of the curriculum | 16.67% | 11.11% | 17.78% | 37.50% | 19.35% | 0.00% |
| I use it only a few times during the implementation of the curriculum | 16.67% | 55.56% | 17.78% | 12.50% | 25.81% | 22.22% |
| I use it often when implementing the curriculum | 33.33% | 22.22% | 53.33% | 37.50% | 48.39% | 66.67% |

Table 11 Cross-tabulation, Dynamics of use Cloud computing - Age of respondents

| What are the dynamics when using a Cloud tool/application during the implementation of the curriculum? | Age of respondents | | | |
|---|---|---|---|---|
| | 25-35 years | 35-45 years | 45-55 years | 55-67 years |
| I don't use any Cloud tool/app at all | 30.00% | 12.50% | 4.00% | 9.09% |
| I use it in every class during the realization of the curriculum | 50.00% | 17.50% | 12.00% | 12.12% |
| I use it only a few times during the implementation of the curriculum | 0.00% | 20.00% | 32.00% | 27.27% |
| I use it often when implementing the curriculum | 20.00% | 50.00% | 52.00% | 51.52% |

Table 12. Cross-tabulation, Dynamics of use Cloud computing - Academic Ranks

| What are the dynamics when using a Cloud tool/application during the implementation of the curriculum? | Academic ranks of respondents | | | |
|---|---|---|---|---|
| | Assistant | Associate professor | Docent | Full Professor |
| I don't use any Cloud tool/app at all | 42.86% | 13.04% | 13.64% | 5.36% |
| I use it in every class during the realization of the curriculum | 42.86% | 26.09% | 18.18% | 10.71% |
| I use it only a few times during the implementation of the curriculum | 0.00% | 21.74% | 22.73% | 26.79% |
| I use it often when implementing the curriculum | 14.29% | 39.13% | 45.45% | 57.14% |

The results obtained with these analyzes are quite interesting and a number of conclusions can be drawn. Due to the limited size of the paper, we are not able to present additional analyses, but this scientific paper can be a good basis for further research.


# CONCLUSION

The new conditions created by the development of advanced information technologies enabled the application of new teaching and learning methods. Modern educational systems must adapt to these changes caused by the development of new technologies. The cloud computing concept in general, as well as cloud computing platforms and tools for teaching and learning, are already a reality and a need for universities in the implementation of their curricula. The transition from the traditional, conventional way of teaching to teaching using Cloud platforms/tools will allow students greater access to educational materials, but also improved collaboration between students and professors. After all, the expectations of the students are getting higher in terms of what the universities offer them, so the Higher education institutions have to meet such increased demands. The application of new teaching and learning methods will enable students to come out more prepared and more competitive in the labor market.

Through this research paper, we tried to present the real situation in the use of Cloud platforms/tools in higher education in the Republic of North Macedonia, as well as the benefits, expectation and challenges faced by the users of these applications. The results of this survey provide answers to many interesting issues. It is encouraging that most of the respondents are familiar with the concept of Cloud Computing and often use such platforms/tools in the implementation of curricula. According to the results of the research, most of the respondents use the platforms that are the most famous on the market (Google Suite for education and Microsoft education) and that also have the largest number of users worldwide. But in addition to these platforms, users also use a number of other distance learning tools (Coursera, Evernote, Blackboard ant many others), although the use of these applications is on a smaller scale. According to these results, universities were forced to transfer their entire work on-line during the pandemic, but very positive trend is that, even after the end of the pandemic, a large number of universities continued to use these platforms for distance learning. It is probably due to the fact that most of the academic staff is already aware of the benefits of these platforms, which was shown by this research. In the part of the research that refers to the benefits offered by cloud computing, most of the respondents answered affirmatively. All this points to the fact that the cloud computing model, as one of the ways to modernize teaching and learning methods, has a bright future. This was also confirmed by the survey, where most of the academic staff agree that Cloud Computing will be an increasingly used tool for the realization of curricula in the future, as support for the teaching process. For increasing the use of Cloud platforms in the Republic of North Macedonia, probably one of the biggest problems is the lack of adequate training and education for the academic staff

to use these tools. Perhaps that is why certain contradictory results were obtained during the cross-tabulations, because some of the respondents probably use Cloud platforms/tools, but are not aware of it. The problems faced by the application of the Cloud computing model such as Poor Internet connection, Application failure, Costs, Difficult switch from one to another provider will be overcome with the further development of technology, so this concept will be an integral part of the higher education process in the future, both in the world and in the Republic of North Macedonia.

# REFERENCES

Alzahrani I., (2015). The use of Cloud computing in Higher education: Reality, Expectation and Challenges, The 2015 WEI International Academic Conference Proceedings, Harvard, USA

Duan Y., (2016). Cloud Computing in higher education sector for sustainable development, Proceedings of International conference ITS, ICEduTech and STE, Melbourne, Australia

Elgelany A., Alghabban W.G. (2017). Cloud computing: Empirical studies in Higher education-A literature review, International Journal of Advanced Computer Science and application, England UK

Helaimia R. (2023). Cloud computing in Higher Education Institution: Pros and Cons, International Journal of SAdvanced Natural Science and Engineering Research, Konya, Tukey, 2023

J. Rittinghouse, J. Ransome (2010). Cloud Computing-Implementation, management and security, CRC Press Taylor & Francis Group, USA,

K. Chandrasekaran (2015). Essentials of cloud computing, CRC Press Taylor & Francis Group, Boca Raton, USA

Khadiga M. Elnajar, Eiman M. Sahly, Hend M. Farkash, Abdul Ghafar Faraj (2018). Cloud Computing in Education: A survey on the Adoption and the Challenges for the Faculty of IT at the Benghazi University-Libya, 5-th International Conference on Automation Control Engineering & Computer Science (ACECS'18), Hammamet-Tunisia

Marinescu D. C. (2018), Cloud computing: Theory and Practice, Elsevier

Mousavi S., and all. (2016), Assess the readiness of e-learning in the students of Zanjan University of Medical Sciences", Journal of Medical Education Development

Ramboll Management (2005), The use of ICT for learning and teaching in initial vocational education and training, Final Report to the EU Commission Brussels: DG Education and Culture.

Zivanovic R. and all. (2010), Use of Computers and Internet in The Educational System of The Republic of Macedonia, Foundation Open Society Institute – Macedonia and Metamorphosis Foundation Skopje, Macedonia

Yadav K., (2014), Role of Cloud computing in education, International Journal of Innovative Research in Computer and Communication Engineering, India