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Results of Croatian National Higher Education Survey on Use of ICT and E-learning

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Abstract. *The use of ICT within higher education has grown rapidly over the last decades. The universities across the world are embracing new technologies hoping that they will improve the teaching and learning with these actions. However, the situation regarding the use of ICT within Croatian educational process still varies.*
Within this paper we will present some of the results of the Croatian national survey at higher education level regarding ICT and e-learning application in educational process. The primary focus of this paper is the situation regarding ICT and e-learning usage at the higher education institutions in Croatia and attitudes of management and teachers towards ICT and e-learning from the perspectives of vice-deans for academic affairs.

Keywords. higher education, e-learning, national survey, teachers' attitude

1 Introduction

For the past two decades there has been tremendous increase of information and communication technology (ICT) solutions that have been used to enhance the education process. Their implementation and use have become unavoidable in modern education, primarily because of the opportunities this technology brings to education as well as its role in achieving educational goals. Today's work market wants "knowledge workers" who possess new skills needed in the 21st century and are prepared to use life-long learning technologies in their work (A. W. Bates & Poole, 2003).

When changes in higher education teaching are discussed, the importance of teachers is stressed the most. They have a responsibility towards the students, academic community and society to transfer knowledge and foster students' creativeness and innovativeness while using new technologies and appropriate teaching methods. But how they cope with technology and what is their attitude towards ICT and e-learning has often been ignored. It cannot be presumed that all teachers will be positively inclined towards new technologies and eager to change the way they have been teaching for years. The majority of teachers do not have the ICT skills or knowledge necessary to implement new technologies in teaching and some do not even have access to infrastructure that would enable them to incorporate technology into their teaching. The real challenge at the policy level is finding an appropriate way to introduce and use technology in education and managing the process of change in teaching and learning (A. W. Bates & Sangra, 2011).

Within this paper we will present the results of the Croatian national survey regarding ICT and e-learning application at higher education institutions (HEI). The prime motivation of this paper is to identify the situation at the HEI regarding ICT and e-learning, reveal attitudes of management and teachers towards ICT and e-learning in educational process.

2 Literature review

2.1 E-learning overview

It is not easy to give an unambiguous definition of e-learning. One of the perhaps most applied definitions states that e-learning represents "all computer and Internet-based activities that support teaching and learning – both on-campus and at a distance." (T. Bates, 2008). According to Khan (B. H. Khan, 2005), e-learning encompasses web-based instructions, online learning, mobile learning and web-based learning. University of Rijeka's E-learning Strategy for 2006-2010 defines e-learning as the educational process enhanced with new information and communication technologies (ICT) (University of Rijeka, 2006). The generally accepted definition of e-learning at the University of Zagreb is defined in the University of Zagreb E-learning Strategy as the educational process (learning and teaching process) conducted by utilizing information and communication technology which improves the quality of the process itself as well as the quality of its results (University of Zagreb, 2007).

In general, e-learning includes all technology supported learning solutions, such as usage of Web 2.0

tools to support learning activities, implementation of learning management systems - LMS (Moodle, Claroline, Edmondo, Sakai etc.) or development of personalized online learning environments such as e-portfolios (Mahara, Elgg, Pebblepad etc.). There are several distinguishable forms of e-learning (Bates and Poole 2003): the application of elementary classroom tools (classroom aids) in the classic form of teaching (face-to-face), the mixed mode (blended/hybrid) which combines face-to-face teaching and e-learning, and finally fully online teaching conducted only by means of technology. Further, e-learning can be instructor-led and/or designed for self-paced individual study. It can be synchronous (usage of webinars, chats or collaborative Web 2.0 tools, etc.) or asynchronous (usage of discussion forums, wiki, multimedia files, instruction pages etc.). As opposed to the traditional classroom face-to face learning where teachers are in the centre of educational process, e-learning offers a learner-cantered, self-paced learning environment (Zhang, Zhao, Zhou, & Nunamaker, 2004).

Application of e-learning offers better access to information and learning resources, increases students' motivation, deepens understanding, helps students think and communicate creatively and promotes lifelong learning (M. S. H. Khan, Hasan, & Clement, 2012; Makhdoom, Khoshhal, Algaidi, Heissam, & Zolaly, 2013; Tarus, Gichoya, & Muumbo, 2015). Introducing e-learning into the educational process strengthens the role and importance of the teacher as a mentor, coordinator and motivator in the learning process. E-learning demands more interaction from students and more effort from teachers in order to get value from it.

2.2 E-learning implementation challenges

The e-learning implementation can significantly contribute to improvement of the quality of education and the results of the educational process. It brings numerous advantages in the organization of the educational process, such as: time and space flexibility in teaching and learning; flexible approach (in terms of time and space) to topical and current multimedia and interactive teaching materials; access to repositories of teaching materials and digital libraries. It also facilitates adjustment to individual styles of learning, easier and better communication between teachers and students and among students themselves, collaborative learning and development of skills for project and team work, and accessibility to a broader student population (disabled students, students at distant locations, foreign students, etc.). ICT supports the creation of the authentic learning environments due to the possibility of accessing an opulence of information by using multiple information resources and enables viewing information from multiple perspectives (Noor-Ul-Amin, 2013). It is expected that in ten years e-learning will become prerequisite for learning at all, and students will not know a time when they did not have access to the Internet for learning.

In a research study reported by OECD ten years ago (OECD, 2005), the increase of e-learning application at higher education was evidenced. However, the up-take progressed slowly due to certain barriers. Barriers towards e-learning up-take can be categorised into two categories, institutional and personal (Rolfe, Alcocer, Bentley, Milne, & Meyer-Sahling, 2008). Most reported institutional barriers are lack of adequate ICT infrastructure, lack of strategic planning and vision from the institution management, and lack of financial resources (Begičević, Divjak, & Hunjak, 2007; Rolfe et al., 2008; Kisanga & Ireson, 2014; MacKeogh & Fox, 2008; Newton, 2003; OECD, 2005; Oh & Park, 2009). Most mentioned personal barriers are lack of skills to use the technology, time (additional workload involved in preparing e-learning materials) and lack of awareness of the benefits that technology could bring (Kisanga & Ireson, 2014; MacKeogh & Fox, 2008; Newton, 2003; OECD, 2005; Oh & Park, 2009; Rolfe et al., 2008).

Some teachers are accustomed to traditional modes of instruction and therefore refuse to change. Further, some teachers assume that e-learning is just publishing the lecture notes online which then will affect learners' attention or even their class attendance. According to Rolfe et al. (Rolfe et al., 2008) some teachers felt that e-learning could disadvantage the quality of education and could encourage learners to plagiarism. However, adoption of e-learning into educational practice is becoming the necessity for dealing with the millennium learners (Pedró, 2006). There should be more initiatives to raise teachers' e-learning awareness and encourage them to adopt proper e-learning practice. These incentives should come from the higher management. According to Birch and Burnett, leadership and support from higher management are identified as critical for successful e-learning implementation (Birch & Burnett, 2009).

Situation regarding e-learning is much better today than ten years ago. E-learning is becoming a central part of many HEI strategies across the world (Allen & Seaman, 2016; A. W. Bates, 2015; MacKeogh & Fox, 2008; Rolfe et al., 2008). Some of the reported reasons why HEI adopt e-learning within their strategies are: to improve quality of teaching and learning, to enhance reputation, to foster the development of information skills/literacies, to increase flexibility, to support disabled students and to reduce costs i.e. improving the cost-effectiveness (MacKeogh & Fox, 2008). Allen and Seaman (Allen & Seaman, 2016) report that 69.3% of chief academic leaders of higher education in the United States say that online learning is critical to their long-term strategy. 71.4% of academic leaders rated the learning outcomes in online education as the same or superior to those in face-to-face instruction (Allen & Seaman, 2016).

When management of HEI institution decides to integrate e-learning into their long-term strategy, it is

necessary to investigate users' attitudes towards it. Studies show that successful implementation of educational technologies largely depends on the attitudes of educators and that their attitude is a major enabling/disabling factor in the adoption of technology (Albirini, 2006; Babić, 2012; Krishnakumar & Rajesh Kumar, 2011). If teachers' attitudes are not positive, e-learning implementation can result in teachers' frustration, confusion and it can further influence the reduction of learner interest. At their first encounter with e-learning, teachers are not sure what benefits it brings to their subject. Therefore, in order to remove the negative assumptions, teachers, as well as students should be educated and trained for e-learning.

2.3 Beginning of systematic implementation of e-learning at HEI in Croatia

Some e-learning technologies have already been in use at the HEI in Croatia for many years, but mostly as the teachers' individual activities. Important catalyst for this process was the European Tempus project *Education Quality Improvement by E-learning Technology – EQIBELT*. The University of Zagreb coordinated the project consortium of eight EU universities and three Croatian universities. The aim of the project was to introduce and implement e-learning at Croatian universities participating in project with well-defined and specified project outcomes. The most important expected outcomes were strategic and operational documents on e-learning and e-learning support centers. This project provided necessary inputs and knowledge regarding e-learning from European universities with tradition and respectable experience of e-learning implementation. Further, this project enabled participating Croatian universities to take most suitable and appropriate approaches and adopt them to their concrete circumstances. The best overview of lessons learned in the field of e-learning vision and strategy and on e-learning support to users (teaching staff, institutions and students) was given in the conclusions of the *EQIBELT* workshop (Bekić & Kučina Softć, 2006; Bekić & Kučina Softić, 2008).

Seven public universities with their constituents, and numerous polytechnics and schools of professional higher education in Croatia, are faced with new major challenges in the field of knowledge and education and have to respond to the new, modern and competitive global education market. The University of Zagreb, Rijeka and Dubrovnik were partners in the *EQIBELT* project and they had additional support in creation of the policy and strategy to officially implement e-learning at the university level.

3 Research and results

In order to identify the existing situation regarding ICT and e-learning application into the educational process of Croatian HEI and their future plans regarding e-learning implementation, the Ministry of Science, Education and Sport has conducted the survey in 2013. The University Computing Centre University of Zagreb (SRCE) as the partner of the Ministry has been in charge for carrying out the survey and providing the technical support to the HEI in filling in the survey. The aim of the survey was to get an overview of the present situation regarding the ICT and e-learning application at HEI in Croatia, and use these findings as the basis for further planning of strategic steps related to the improvement of education quality in Croatia. The survey results can also be of value to the HEI as information and referent data for reflection on their situation and for the comparison with others.

The survey was filled by vice-deans for teaching respectively as head of the departments in charge for teaching (depending of the institution) delegated by the HEI management in Croatia. In that sense the survey provides mainly vision and attitudes of institutions' managements on situation and perspective of the ICT usage and e-learning in educational process in higher education institutions in Croatia.

The invitation for participation was sent to 163 HEI, 119 of them responded which makes the response rate of 73.00% [28]. List of the institutions that have participated in the research are presented in the Appendix. Survey was conducted online in the period of March-May 2013. The questions in the survey were divided in three areas:

- estimation of present situation (status and existing condition, present level of ICT and e-learning use in education process),
- expectations on e-learning (ranking of possibilities and advantages which can ICT and e-learning bring to each HEI institution and exact conditions in which they work),
- plans for future on e-learning (short and long term plans on implementation of ICT and e-learning in HEI institution).

Within this paper, based on the results of the mentioned survey, we wanted to reveal following information: (1) what is the Croatian HEI institution management attitude towards the e-learning; (2) what is the situation regarding e-learning application at HEI in Croatia; (3) what is the teachers' attitude towards ICT and e-learning application within the education process; (4) how many Croatian HEI have available funds for the e-learning implementation and the development of e-learning materials; (5) how many Croatian HEI have some kind of learning management system (LMS) integrated within their institution; (6) is there a relationship between HEI attitude towards e-learning and situation for e-learning at the HEI in

Croatia; (7) is there a relationship between the situation at the HEI regarding the e-learning implementation and the teachers' attitude towards ICT and e-learning application within the educational process; (8) is there a relationship between HEI attitude towards e-learning and the teachers' attitude towards ICT and e-learning application within the educational process; (9) is there a relationship between available funds for e-learning and the teachers' attitude towards ICT and e-learning application within the educational process.

The results showed that majority of HEI have positive attitude towards e-learning (Figure 1), more precisely 76% of HEI consider e-learning crucial or important at their institution. Only one HEI does not consider e-learning important.

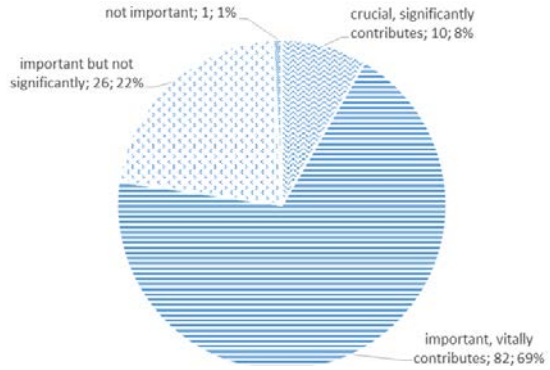


Figure 1. HEI managements' attitude towards the e-learning at their institution

74% HEI reported the situation regarding the e-learning application favourable or exceptionally favourable (Figure 2). 20% are neutral towards e-learning application and 6% of HEI see it as not favourable. For all constituent units of University of Zagreb and Juraj Dobrila University of Pula there was available data regarding the situation for e-learning application and after analysing this data it can be concluded that situation at these Universities is in general favourable. As there was missing data for some constituent units of other universities, more specific conclusions could not be made.

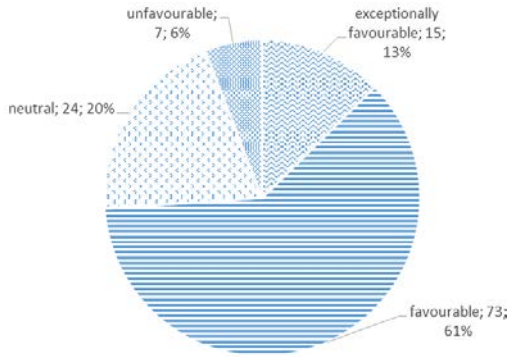


Figure 2. Situation at HEI for e-learning application

From the results presented in Figure 3, 64% of vice-deans for teaching consider that the teachers' attitude at their institution is favourable or exceptionally favourable. These teachers were open to implementation of ICT in their teaching. Best overall attitude towards ICT and e-learning in education was reported at University of Rijeka and University of Osijek.

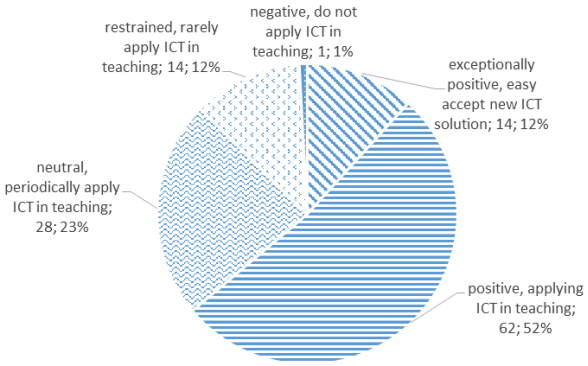


Figure 3. Teachers' attitude towards the ICT and e-learning in education

Results in Figure 4 show that only 16% of the Croatian HEI have special fund for e-learning and the development of e-learning materials (Figure 4). Only five constituents of University of Zagreb have such a fund, three constituents from University of Zadar, two from University of Osijek and several polytechnics and professional higher education.

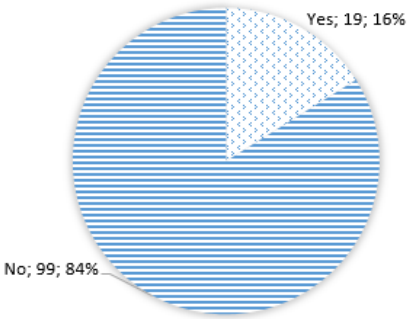


Figure 4. Percentage of HEI that have available funds for e-learning and the development of e-learning material

Majority of HEI are using some kind of learning management system (LMS), and only 24% of institutions are not using LMS (Figure 5). Moodle is dominantly used as the LMS. 37% of HEI are using LMS available at their own institution. 22% of HEI are using the LMS Merlin provided by SRCE, 11% of HEI are using the LMS provided by CARNet, and 6% of the HEI use LMS provided elsewhere.

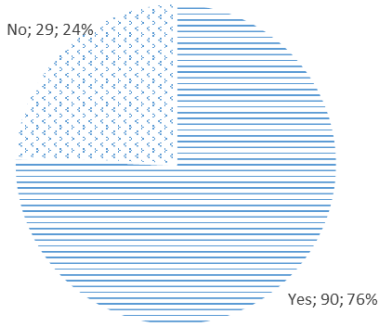


Figure 5. Situation at HEI regarding LMS usage

In order to find an answer to research questions 6-8, Spearman's correlation coefficient *r* was calculated. The results showed that there is a positive correlation between HEI attitude towards ICT and e-learning and situation for ICT and e-learning at the HEI (Spearman's r = 0.534, p<0,0001). As the HEI attitude towards ICT and e-learning increases, the situation for e-learning at the HEI increases as well. Further, the results showed that there is positive but weak linear correlation between situation at the HEI regarding the e-learning implementation and the teachers' attitude towards ICT and e-learning application in education process (Spearman's *r* =0.420, p<0,0001). So when the situation at the HEI regarding the ICT and e-learning implementation improves, teachers' attitude towards ICT and e-learning application in education process increases. And lastly, the results showed that there is a positive correlation between HEI attitude towards ICT and e-learning and the teachers' attitude towards ICT and e-learning application in education process (Spearman's *r*=0.511, p<0,0001). It can be concluded that teachers' attitude towards ICT and e-learning application in education process increase, as the HEI attitude towards e-learning increase.

Based on the exploratory data analysis, we have hypothesized that teachers' attitudes vary with respect to availability of funds for e-learning. Moreover, it is expected that the overall teachers' attitude towards e-learning would be greater if there are available funds for teachers regarding e-learning than if there is no such funds. A chi-square test of independence was calculated comparing teachers' attitude towards e-learning depending on the availability of the funds at HEI in Croatia. The results showed that availability of funds for e-learning and teachers' attitude towards e-learning are independent ($\chi^2(4) = 2.033$, p=0.7296). Even though teachers' attitudes towards e-learning are not depended on the availability of the funds they are still related to the situation at the institution regarding e-learning and on the institution attitude towards ICT and e-learning application in education process.

More detailed analysis for each university in Croatia will be reported in future papers.

4 Conclusion

E-learning is changing the process of teaching and learning. If implemented properly, e-learning can bring many benefits to educational process. Within this paper some of the results of the national survey regarding e-learning situation at HEI in Croatia have been presented. The results of this study can be useful for HEI management when planning their e-leaning initiatives. The analysis of the data showed that 74% of HEI have favourable or exceptionally favourable situation at their institution regarding e-learning application. Further, 76% of HEI consider the e-learning crucial or important at their institution. Results also showed that 76% of HEI uses some kind of LMS. Although the general situation regarding e-learning at HEI in Croatia is favourable, only 64% of teachers have positive or exceptionally positive attitude towards e-learning. Even though this is a high percentage, we have expected that this percentage will be closer or equal to the institution attitude (74%). Higher management has more favourable attitude towards e-learning than teachers do. The results further showed that there is a relationship between teachers' attitudes and the situation at the HEI and the HEI attitudes towards ICT and e-learning in Croatia. This means that when the situation at HEI regarding e-learning application increases, the teachers' attitudes towards ICT and e-learning increase. As well, when the HEI management attitude towards e-learning increases, the teachers' attitudes towards ICT and e-learning also increases.

Even though the results did not provide evidence for the relationship between teachers' attitude and the availability of funds for e-learning, the literature review suggests that institutions should provide teachers with support as they implement e-learning into their practice. If some HEI want to implement e-learning the first step is to recognize the benefits and possibilities of ICT for them and find ways how to incorporate it into their practice, and at the same time to retain the high quality of teaching and learning. Then, HEI management should consider including the e-learning into their long term strategy. Strategies are needed to increase awareness of e-learning benefits and to set guidelines for e-learning application. Next, it is necessary to investigate users' attitudes towards e-learning. Understanding user's attitudes towards e-learning is prerequisite for successful e-learning application. HEI should ensure teachers and students with support and adequate training in e-learning. The e-learning initiatives can only be successful if teachers have the motivation and skill to use it. However, there are few limitations that should be taken into the consideration when interpreting the results of this study. First, the survey was filled by the vice-deans for teaching of the HEI. Therefore their point of view my not correspond completely with actual teachers' attitude towards ICT and e-learning application so the results may be biased. Second, the available data is for

119 HEI from 163. Therefore the results should be generalized with caution.

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APPENDIX

List of Higher Education Institutions that have participated in the survey:

Sveučilište Josipa Jurja Strossmayera u Osijeku:

- Filozofski fakultet
- Građevinski fakultet
- Medicinski fakultet
- Odjel za fiziku
- Odjel za kemiju
- Odjel za matematiku
- Poljoprivredni fakultet
- Pravni fakultet
- Prehrambeno-tehnološki fakultet
- Strojarski fakultet
- Umjetnička akademija

Sveučilište Jurja Dobrile u Puli:

- Odjel za ekonomiju i turizam Dr. Mijo Mirković
- Odjel za glazbu
- Odjel za humanističke znanosti
- Odjel za odgojne i obrazovne znanosti
- Odjel za studij na talijanskom jeziku

Sveučilište u Dubrovniku:

- Odjel za akvakulturu
- Odjel za ekonomiju i poslovnu ekonomiju
- Pomorski odjel

Sveučilište u Rijeci:

- Filozofski fakultet
- Građevinski fakultet
- Medicinski fakultet
- Odjel za biotehnologiju
- Odjel za fiziku
- Odjel za informatiku
- Odjel za matematiku
- Pomorski fakultet
- Pravni fakultet
- Tehnički fakultet
- Učiteljski fakultet

Sveučilište u Splitu

- Ekonomski fakultet
- Filozofski fakultet
- Katoličko blagoslovni fakultet
- Kemijsko tehnološki fakultet
- Kineziološki fakultet
- Medicinski fakultet
- Odjel za forenzične znanosti
- Odjel za stručne studije
- Odjel za studije mora
- Odjel za zdravstvene studije
- Pomorski fakultet
- Prirodoslovno matematički fakultet

Sveučilište u Zadru:

- Odjel za ekonomiju

Odjel za francuske i iberoromanske studije
Odjel za geografiju
Odjel za germanistiku
Odjel za informacijske znanosti
Odjel za klasičnu filologiju
Odjel za lingvistiku
Odjel za nastavničke studije u Gospiću
Odjel za pedagogiju
Odjel za psihologiju
Odjel za sociologiju
Odjel za talijanistiku
Odjel za turizam i komunikacijske znanosti

Sveučilište u Zagrebu:

Agronomski fakultet
Akademija dramske umjetnosti
Akademija likovnih umjetnosti
Arhitektonski fakultet
Edukacijsko-rehabilitacijski fakultet
Ekonomski fakultet
Fakultet elektrotehnike i računarstva
Fakultet kemijskog inženjerstva i tehnologije
Fakultet organizacije i informatike
Fakultet političkih znanosti
Fakultet prometnih znanosti
Fakultet strojarstva i brodogradnje
Farmaceutsko-biokemijski fakultet
Filozofski fakultet
Filozofski fakultet Družbe Isusove
Geodetski fakultet
Geotehnički fakultet
Građevinski fakultet
Grafički fakultet
Hrvatski studiji
Katolički bogoslovni fakultet
Kineziološki fakultet
Medicinski fakultet
Metalurški fakultet
Muzička akademija
Pravni fakultet
Prehrambeno-biotehnološki fakultet
Prirodoslovno matematički fakultet
Rudarsko-geološko-naftni fakultet
Stomatološki fakultet
Šumarski fakultet
Tekstilno-tehnološki fakultet
Učiteljski fakultet
Veterinarski fakultet

Ostala sveučilišta:

Hrvatsko katoličko sveučilište
Medijsko sveučilište

Veleučilišta:

Međimursko veleučilište
Tehničko veleučilište
Veleučilište "Lavoslav Ružička" u Vukovaru
Veleučilište "Nikola Tesla", Gospić
Veleučilište u Karlovcu
Veleučilište u Požegi
Veleučilište u Rijeci
Veleučilište u Slavonskom Brodu
Veleučilište u Šibeniku
Veleučilište u Varaždinu
Veleučilište Velika Gorica
Veleučilište VERN

Visoke škole:

MUP Policijska akademija – Visoka policijska škola
RRIF Visoka škola za financijski menadžment
Visoka poslovna škola PAR, Rijeka
Visoka poslovna škola s pravom javnosti, Višnjan
Visoka poslovna škola Zagreb
Visoka škola tržišnih komunikacija "Agora", s pravom javnosti, Zagreb
Visoka škola za ekonomiju, poduzetništvo i upravljanje "N. Š. Zrinski", Zagreb
Visoka škola za informacijske tehnologije, Zagreb
Visoka škola za menadžment i dizajn Aspira
Visoka škola za menadžment u turizmu i informatici u Virovitici
Visoka škola za odnose s javnošću i studij medija "Kairos", Zagreb
Visoka škola za primijenjeno računarstvo, Zagreb (Algebra)
Visoka škola za sigurnost s pravom javnosti, Zagreb
Visoka tehnička škola, Bjelovar
Visoko gospodarsko učilište, Križevci
Visoko učilište EFFECTUS - visoka škola za financije i pravo, Zagreb