Multimedia Use in Higher Education: e-Universities project

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Abstract

The e-Universities project by CARNET (2022 – 2025) aims to enhance educational practices and digital competencies in Croatian higher education institutions. Within the project, a pilot study was conducted involving 21 institutions focused on using multimedia equipment and reflecting on educational processes. The study consisted of three main goals: assessing current use of digital technology, identifying user needs, and creating a learning community for knowledge and experiences exchange. Participants developed recommendations for digital technology implementation and informed further direction of HE equipment procurement within the project. Further on, the results of the pilot study are to contribute to the development of curricula and educational content for a modular education program, further strengthening the digital competencies of teaching and administrative staff in higher education institutions. The action research ran from April 2023 to October 2024, providing a foundation for further digital transformation of higher education in Croatia.

Keywords

Digitalisation of higher education, multimedia studios, life-long learning, community of practice in HE

1. Introduction

Higher education (HE) institutions worldwide are undergoing a profound digital transformation, spurred by the increasing integration of digital technologies in teaching and learning. This shift is motivated by the need to adapt to new educational paradigms and meet the expectations of digital-savvy students and the post-digital world in general. Digital transformation encompasses not only technological advancements but also a fundamental shift in teaching approaches and institutional strategies (Garrison & Kanuka, 2004). As stated in OECD report (2024) higher education systems function in an environment marked by rapid technological advancement, a growing focus on sustainability, and rising societal expectations. Policymakers and institutional leaders face the challenge of adapting to the increasingly diverse needs of learners by creating more flexible and responsive programs and learning paths.

The same report highlights that digitalisation has been promoted as a tool to improve inclusion and efficiency in evolving higher education systems. It offers the potential to make education more accessible to students who cannot attend traditional in-person classes, allows for more personalized teaching and learning approaches, enhances collaboration through virtual channels, and can help reduce educational costs. The success of digitalisation strategies hinges on a strong foundation of connectivity, equipment, and the skills required to use them effectively. Addressing gaps in connectivity and equipment is seen as essential to the success of digital transformation initiatives within education systems. Therefore, the state of digital infrastructure significantly impacts the digital readiness of higher education systems and is a key factor in the digital maturity of individual institutions, alongside digital leadership, competencies, and culture. As the report further states,

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Croatia's higher education system is undergoing a series of reforms as part of a broad modernisation program. In the OECD analysis Croatian higher education institutions have highlighted an urgent need to upgrade their on-campus audio-visual equipment. This need was underscored during site visits by the OECD team and in responses to the CARNET-OECD digital maturity survey. OECD reported on demand for audio-visual equipment capable of supporting digital resource integration in lectures, as well as tools for recording live sessions and facilitating hybrid teaching formats – the basis of e-University's equipment process.

1.1. Background

The role of multimedia in higher education has gained significant attention due to its potential to enhance student engagement and learning outcomes (Mayer, 2009). Multimedia, including video, audio, and interactive content, has been shown to improve student engagement and knowledge retention (Mayer & Moreno, 2002).

The adoption of multimedia in higher education also supports the blended learning model, which combines traditional face-to-face instruction with online components. This approach has been linked to improved student satisfaction and better academic performance (Means et al., 2010). However, successful integration of multimedia requires adequate infrastructure, training, and support for faculty. Research by Selwyn (2014) highlights the need for institutions to invest in multimedia tools and training programs to help faculty effectively incorporate digital content into their teaching practices. Additionally, Henderson et al. (2017) found that faculty often face challenges with multimedia technology due to a lack of technical support and limited experience, which can hinder its full potential in enhancing teaching and learning.

This article presents the findings of the e-University pilot research project, which explores the use of multimedia in higher education institutions in Croatia. The study presents the introductory phase of equipping HE institutions, the equipment provided during the pilot phase, challenges faced, and the types of support needed to foster digital transformation.

1.2. Context

The pilot research on the e-University project was conceptualized and conducted as qualitative research whose main purpose is to establish a learning community, share good practices and analyze the needs of employees of higher education institutions related to the application of digital technology in the educational process. The specificity of this research refers to the use of multimedia studies, which are part of the strengthening of infrastructural resources carried out as part of the e-University project.

The expected framework period for implementation of the pilot research was from January 2023 to December 2024, however, due to the international halt in supply chains, the pilot research continued in the academic year 2024/2025. The research was coordinated by Croatian Academic and Research Network - CARNET and Zagreb University Computing Centre - Srce.

The planned objectives of the pilot research were related to:

- identification of the current application of digital technologies in higher education (HE) institutions,
- specific needs of different groups of users at HE regarding the purposeful application of digital technologies to improve the learning and teaching process,
- building a learning community with the aim of connecting, exchanging knowledge and purposeful application digital technologies in learning and teaching at HE,
- making recommendations for purposeful practical application of digital technologies in higher education and recommendations for equipping HE with teaching equipment.

In addition to the above-mentioned goals, it was expected that the pilot research would additionally contribute to: the creation of the curriculum and, indirectly, the educational content of the modular education program for the development of digital competences of teaching and

management staff at higher education institutions and the next phase of equipping the HE institutions as part of the e-University project (the so-called main procurement).

Public invitation for participation in the pilot study was published in December 2023. Although it was originally intended that 15 higher education institutions would participate in it considering the demanding nature methodology of the action research, due to the exceptional interest and quality of the applications, 21 higher education institutions were included. In the application process, it was necessary to register teams (stakeholders) consisting of teaching staff, IT (mandatory participants) and library staff (optional) and attach an action plan for one course. The action plan was to contain a description of the context in which digital technology is applied and digital competences are developed. It was necessary to add elements related to the use of digital technologies and the development of one's own digital competences and the digital competences of students to the teaching plan for one elective course, taking into account the Framework for Digital Competences for Educators of the European Commission according to which the plan was evaluated. It was important to show that both or all three stakeholders are included in the plan, that is, in those parts where they can be included.

Based on the evaluation of the applications, the following 21 institutions with a total of 75 participants were included in the pilot research within the e-University project:

- J. J. Strossmayer University Osijek, Faculty of Electrical Engineering, Computing and Information Technologies
- J. J. Strossmayer University Osijek, Faculty of Educational Sciences
- J. J. Strossmayer University Osijek, Faculty of Philosophy Osijek
- Juraj Dobrila University in Pula
- University of Rijeka, Faculty of Mathematics
- University of Rijeka, Faculty of Medicine
- University of Rijeka, Faculty of Law
- University North
- University of Slavonski Brod
- University of Zagreb, Faculty of Economics
- University of Zagreb, Faculty of Electrical Engineering and Computing
- University of Zagreb, Faculty of Civil Engineering
- University of Zagreb, Faculty of Organization and Informatics
- University of Zagreb, Faculty of Medicine
- University of Zagreb, Faculty of Food Technology
- University of Zagreb, Faculty of Veterinary Medicine

1.3. Equipment description

Through the Pilot, one of the six models of equipment was delivered to each participating institution:

- Recording studio B
- Integrated recording studio
- Type A hybrid multimedia hall
- Type B hybrid multimedia hall
- Portable recording set
- Simultaneous translation system

Recording studio B is a smaller studio with a fixed setup, one camera, sound and lighting. The main purpose of the studio is to record educational content. Some of the elements that come with this type of equipment are sound insulation, PTZ camera, background wall canvas, desktop computer (encoder) and screen for desktop computer and presentations, card for receiving and processing audio/video records, lighting, headphones, wireless system with microphone, wireless laser presenter, speaker.

The integrated recording studio is the smallest studio housed in a soundproof box. An integrated recording studio independently record educational content or rooms for post-production of recorded content. Some of the elements that come with this type of equipment are a soundproof cabin, desktop computer and screen, camera with integrated microphone, desktop USB microphone, speakers, lighting, headphones.

Hybrid multimedia hall Type A is intended for conducting classroom, online or hybrid classes. The hall offers the possibility of transmitting lectures and recording lectures and is of a more advanced type, so it requires technical support before or during the start of work. This type of hall consists of a presentation screen min Type-1, a motorized stand for a presentation screen, a presentation screen min Type-2, a desktop computer (encoder) and a screen, a presentation computer, a card for receiving and processing audio/video signals, a PTZ camera, loudspeakers, wireless microphones, handheld (stick) microphones, studio headphones, audio mixers, video mixers, etc.

Hybrid multimedia hall Type B is intended for conducting online, classroom or hybrid classes, but of a simpler type with equipment that enables automation. This type of hall consists of a presentation screen min Type-1, a motorized stand for a presentation screen, a presentation computer, a presentation screen min Type-2, a camera with speaker tracking, a soundbar speaker, a ceiling microphone, a videoconference image and sound processor, a wireless microphone set.

The portable recording set that enables online transmission is a portable set packed in a compact box. It can be quickly assembled and start working at any location. This equipment enables online transmission or connection to a conference. The set consists of a camera and a

stand, a laptop, an adapter for connecting the computer and the camera, a wireless system with a lavalier microphone, a power strip with surge protection and a carrying case.

The simultaneous translation system consists of four cabins and enables the translation of eight languages. The system consists of a booth for translators, a translation desk with a microphone, headphones and monitors, an infrared digital radiator, a transmitter for 8 languages with a DANTE converter, an infrared digital receiver for listeners, an audio processor, a video conference camera, a server for implementing a software solution, a wardrobe for installation of equipment and software solution.

1.4. Support for the implementation of pilot research

The research itself began with an introductory meeting in the form of a workshop for the participants of the pilot research on March 31, 2023. An analysis of the needs of the project participants was carried out on the support that needs to be provided so that the participants can successfully use the equipment and create digital teaching materials. In addition to the general part of the workshop where the participants of the pilot were informed about the e-University project and the implementation of the pilot research methodology, a part of the workshop was intended for each of the individual groups of users - a workshop "ABC teaching design workshop" and technical support experts were informed about the technical features. Finally, National and university library representatives spoke about services for library staff as part of the e-University project.

At the workshop, the participants in groups shared their experiences with the use of technology and talked about the topics they considered important for the further application of technology in higher education. They spoke about the importance of strategic planning, the creation and use of open educational content (the difficulties of creating it), the impact of artificial intelligence on the development of science and education, they shared diverse experiences in the implementation of online classes and emphasized the need for constant and systematic support for the application of technology in education. Based on the introductory workshop and an insight into the needs of the participants, a plan of education and reflective workshops necessary for the application of the equipment and the implementation of the research was made.

Based on the input of research participants, numerous training sessions were organized aimed at developing their competencies for using digital tools and methods in education. An introductory workshop on pilot research was followed by workshops on planning and adapting curricula and creating digital educational content. Through group work and open discussions, participants shared experiences on using digital tools and analyzed their action plans.

A series of workshops covered the basic skills of creating multimedia audio-visual content and creating activities in the Moodle system. Also, innovative approaches such as the application of artificial intelligence in education, analysis of student behavior in the Moodle system and flipped classrooms as a pedagogical model were investigated. Some of the topics included the transformation of library services, information literacy and the adoption of new tools such as ChatGPT in the educational process.

Regional workshops were also held in Zagreb, Rijeka, Osijek and Split, with the aim of adapting action plans based on available equipment and developing a curriculum for online and hybrid classes. In addition, workshops were organized focusing on public speaking and presentation skills, as well as technical aspects such as pre-production, production and post-production of multimedia content. The participants went through practical workshops on the interactivity of students in an online environment and were further trained in the development of AV content.

Special attention was paid to copyright and intellectual property in the context of educational content, as well as the use of artificial intelligence in teaching course design and the difference between generated and recorded video lessons. At the end, reflective workshops were organized with a focus on the evaluation of the delivered equipment and the training that the participants received.

Furthermore, several online workshops and webinars were organized, which were key to providing flexible and accessible education to the participants. Online workshops included topics such as student interactivity in an online environment and monitoring their work, which educated participants on methods for engaging students and evaluating their progress in the digital educational space.

The webinars covered the technical aspects of creating multimedia content, including the basics of AV production in the pre-production phase and the application of video materials in education. The participants gained insight into the creation of video materials that support the teaching process and improve interaction with students. Additionally, a webinar was conducted to cover the creation of podcast content, providing participants with practical skills for this increasingly popular form of educational material.

2. Methodology

The e-University pilot research was primarily envisioned as action research, employing a mixed-methods approach, including reflective workshops, equipment surveys, and field visits. Data was collected to assess the use of multimedia equipment, digital teaching practices, and support needs. This paper categorizes and synthesizes the participants' feedback into actionable recommendations to enhance the digital education infrastructure and support systems within higher education institutions. Participant feedback from workshops was transcribed, coded using thematic analysis, and categorized into key themes such as: benefits of technology use (students / teaching /processes and communication), challenges of technology use (time-related, infrastructural, pedagogical, and structural) and further support. As stated, the study was primarily conceived as qualitative action research with the main purpose of establishing a learning community, sharing good practices and analyzing the needs of employees of higher education institutions related to the use of digital technology. Although the planned framework period for the implementation of the pilot study was from January to December 2023, due to the global supply chain disruption in 2023, the pilot study was moved to the academic year 2023/2024. The equipment was delivered during the summer semester of 2024.

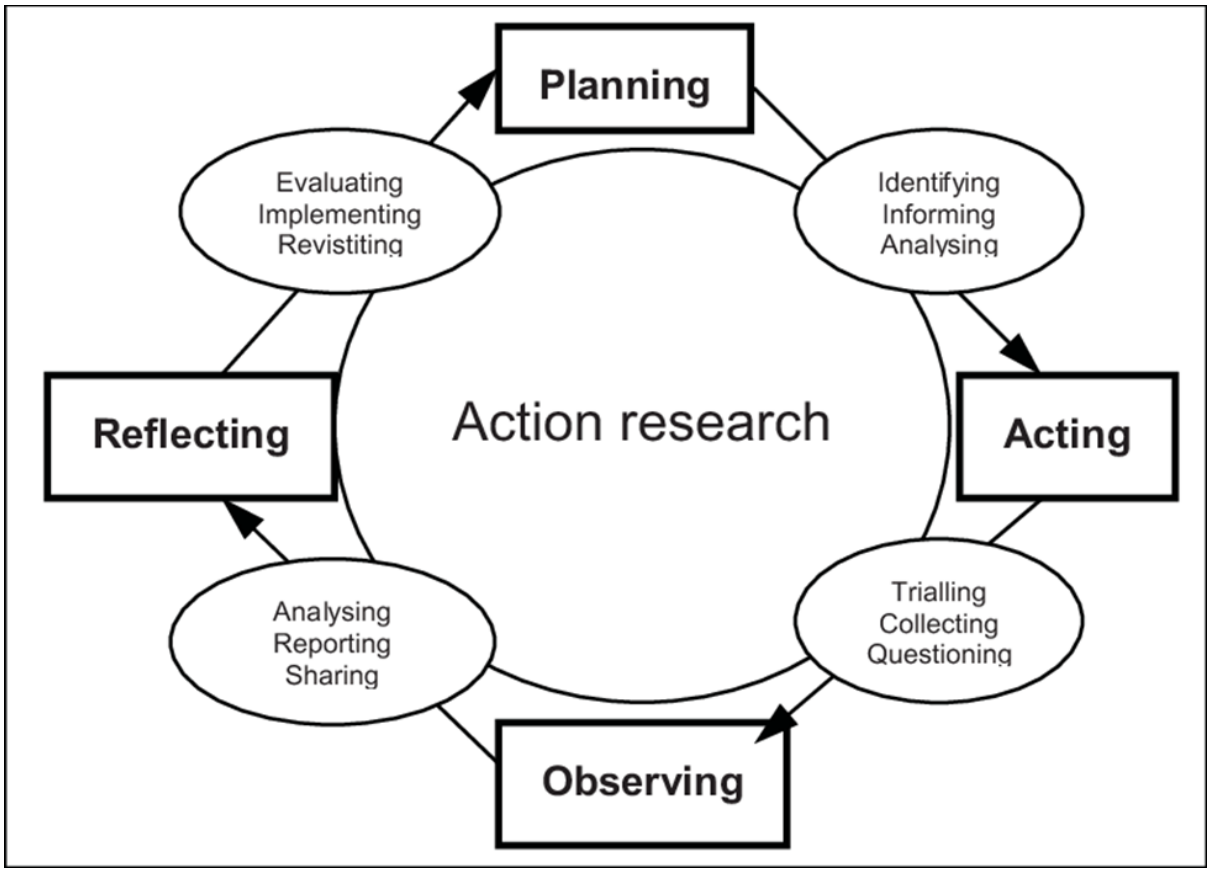

Figure 1: Action research cycle (Mavink.com)

The action research, which encompassed both action and study, was largely based on reflective workshops with pilot research participants through which their needs were analyzed and, in cooperation, further action was planned, that is, participatory and educational activities. However, due to the need to analyze the participants' satisfaction with the assigned equipment and the training held by the supplier, after delivery, questionnaires about the features of each type of equipment were also distributed to the participants. Six questionnaires with 34-40 questions were prepared, which were adapted to the examination of a specific type of equipment. In addition to the questionnaire, after the delivery of the equipment, a field survey was conducted in order to gain a more thorough insight into the practices of using the equipment. Field research was conducted at the Faculty of Medicine, Faculty of Organization and Informatics, and Faculty of Veterinary Medicine of the University of Zagreb and the University North.

3. Recommendations

In this report, we provide an overview of the positive aspects of technology highlighted by the participants of the regional workshops held in 2023 and 2024 as part of the pilot research on the e-University project, as well as the obstacles they encountered in the use of technology. Based on these answers and the input from the participants of the pilot research and the overall analysis, recommendations were made for the further implementation of the activities and the implementation of the action research until the end of the project.

3.1. Advantages of using technology

In Table 1. are shown the advantages of using technology stated by workshop participants at the introductory workshop, regional reflective workshop in Zagreb, Split and Rijeka, and the final reflective workshop.

Table 1
Advantages of using technology

Students	Preparation and organization classes	Processes and communication
Transfer of knowledge (visualization, repetition of videos of processed units that are more demanding)	Developing creativity and innovation	Efficiency of the process
Speed of knowledge transfer and learning at your own pace	Content personalization	Connecting with colleagues
The possibility of watching video lessons when it suits the students and as much as it suits them	More practical knowledge, less theory feedback on the lesson	Team development
Connecting students and learning together	Flexibility in the possibility of attending classes	
	Access and organization of materials	
	Availability of sources and materials	

3.2. Barriers to using technology

In the Table 2. are shown the obstacles in the use of technology mentioned by workshop participants.

Table 2
Obstacles of using technology

TIME	Time requirements of preparing online and hybrid classes
	Time requirements of creating digital educational content
	Constant availability (unstructured availability) and consequences (burnout)
INFRASTRUCTURE and TECHNOLOGY	Lack of infrastructure
	Insufficient quality of equipment and network
	Prices - software, storage
	Deep fake abuse possibilities
COMPETENCE	Time requirements of creating digital educational content
	Constant availability (unstructured availability) and consequences (burnout)
	Lack of infrastructure

	Insufficient quality of equipment and network prices - software, storage
	Deep fake abuse possibilities
	Insufficiently developed skills for using technology in education
	Lack of necessary education for the teaching profession (most universities)
	Motivating students in an online/hybrid environment
	Changing the role of the professor (knowledge management, not knowledge transfer)
	Lack of knowledge of regulations regarding intellectual property rights and the use of licenses for content sharing
	Insufficiently developed content sharing practice
	Ignorance of the principles of open science, open educational content
	Reduced interaction with students in online classes and lack of feedback from students, with a smaller number of highlighted conflicting examples
COMMUNICATION, PSYCHOLOGICAL and INTERPERSONAL	Uncertainty related to the use of technology (self-confidence)
	Fear of being exposed to the court of the public, of ill-intentioned colleagues and their criticisms
	Fear of misuse of materials (based on existing experiences, illegal recording and manipulation of videos)
	Development of responsibility towards one's own learning - professors and students (differences in earlier and senior years of study) - attitudes towards learning depending on age and context
	Lack of communication at institutions (closedness in individual departments)
	Lack of systematic support - technical and pedagogical
	Decreasing number of students, increasing number of study programmes
STRUCTURAL	Inadequate (and insufficient) value put on teacher competencies
	Lack of valorization of the creation of digital educational content

3.3. Recommendations for infrastructure

Based on the data collected from the pilot research participants through reflective workshops, equipment questionnaires and field trips, the need for additional support was identified, on the basis of which the following recommendations[2] are issued:

Integrated Studio: There is a need for a larger studio space to allow better camera angles and movement. The studio should have proper ventilation and doors without transparent glass, or with

[2] The recommendations are based on the data collected through the Questionnaire on the features of the portable set of equipment, where at the time of filling out the questionnaire, most of the respondents had not yet had the opportunity to use the obtained equipment.

the option of adding a screen.More comfortable chairs and appropriately sized tables are required to accommodate all necessary equipment. Instructions should be prepared for adjusting lighting and equipment. Better lighting solutions are needed for high-quality recordings. Microphones with sound-recording indicators would be beneficial to clarify which device is recording. The RAM should be upgraded to 128 GB for smoother operation of the software and equipment. Post-production software, like a mobile camera, should also be provided. More equipment such as table microphones, a sound mixer, teleprompter, and speakers should be available.

Recording Studio (Type B): Teachers require support for adjusting basic equipment, as well as rules and channels for reporting technical problems. A portable studio camera with a stand is preferred over PTZ cameras due to space limitations. Additional lighting fixtures and a lighting controller for wireless control are needed to reduce shadows and improve lighting. Directional microphones with noise cancelation for podcasts, better quality peripherals (mouse, keyboard), and speakers are requested. Full software versions (e.g., advanced DaVinci tools for ChromaKey) and improved computer speed are needed. There is demand for an additional moving camera, a tripod, and a sound mixer.

Portable Recording Set: The current transport box is cumbersome, and a more practical option is needed. Users request shoulder support for cameras, a wired microphone with cable, camera lighting, and additional lighting fixtures.

Translation System: Higher education institutions should provide adequate space for cabins, ensuring there is sufficient room around them. There is a need for a sound mixer, improved microphones, and overall better sound equipment. Users recommend adding a laser projector.

Hybrid Multimedia Classroom: Type A classrooms are satisfied with the equipment, while Type B users mention minor shortcomings. Some users believe a sound mixer is essential, while others find it unnecessary. Users request additional cameras, speakers, ceiling microphones, lighting fixtures, and an HDMI matrix with multiple inputs and outputs.

Despite the overall satisfaction with the equipment, users have highlighted some minor adjustments and upgrades that could enhance their experience further when working with multimedia equipment.

Based on the input gathered from users regarding different types of equipment setups, the need for larger and better-equipped spaces is highlighted, enhanced lighting, improved audio and video equipment, more user support, and more practical transport options across different studio types and equipment setups.

Overall, the need for better support, flexibility, and advanced technical features is evident across all types of setups, focusing on improving user experience and recording quality.

3.4. Pedagogical and educational activities

Although there were many pedagogical and educational workshops held, considering the needs and interests of the participants, the mentioned educations should be offered as part of regular support to higher education and support should be given in the use of the acquired multimedia equipment and the creation of the digital educational materials. Though mentioned educational and pedagogical activities refer to the following:

- creation of the podcast
- monitoring the activities of students in the online environment and encouraging interactivity of students in the online and hybrid environment
- student motivation in the online environment
- intellectual property and types of licenses
- on material regulation and ethical issues
- advanced education for working in programs - Audacity and DaVinci Resolve
- education and instructions for working on Medusa (CARNET's video repository)
- education on the use of mixers (eg with a hybrid multimedia classroom) works fully exploiting its possibilities

3.5. Education provided by equipment suppliers

Although training on the use of the equipment was provided by the supplier of the equipment, it proved to be insufficient, and in some cases inadequate for monitoring, and it is recommended that the training by the supplier be announced in detail in such a way as to define:

- the type of education (practical workshop) and the method of its implementation
- the duration of the education, the minimum and maximum number of participants
- the method of organization of the education, which includes timely scheduling of appointments with the institution and instructions for communication with the client and users
- specification of educational content that is created for education: • implementation scenario in which all parts of education, content and activities will be defined with
- attendees
- manual – the scope of the manual, the content it must cover and the way of presentation content in the manual and the format in which it is delivered
- dynamics of training preparation and creation of educational content with regard to dynamics
- equipping the institutions (defining the deadlines within which the education takes place and how far in advance the education must be announced to the educational institution)
- quality assurance – evaluation of participant satisfaction and the minimum evaluation of education and lecturers below which an intervention is made, which includes adjusting the content and activities of the education and/or changing the lecturer, monitoring education by the client recommended that instructions for using the equipment be provided on each computer that is obtained as part of a particular set of equipment. It is desirable that there is also a video instruction for using the equipment.

3.6. Further support

Most of the participants expressed the need for systematic support in the use of equipment, not only through the project, but in daily work and preparation of teaching materials. This form of support exists at European universities (KU Leuven, University of Wageningen, Aalto University, to name a few) where there are university departments in charge of multimedia with a solid number of employees whose function is to help and support the creation of multimedia educational materials. An additional recommendation is to strengthen CARNET's resources (mobile teams with the support of the multimedia team and the educational team) so that they can hold trainings/workshops on the equipment and be supportive in the continuation of the project, but also to connect and encourage faculties/departments to share the given equipment within respective universities.

4. Discussion

The e-University pilot research project has provided valuable insights into the digital transformation needs of higher education institutions. It has been shown that by addressing infrastructural and educational needs, through training and support, institutions can equip faculty to deliver engaging, technology-enhanced learning experiences. The findings underscore the importance of investing in digital infrastructure, fostering communities of practice, and aligning policy with institutional needs. Future research should explore the long-term impacts of these recommendations on teaching and learning outcomes and evaluate the scalability of this model in diverse educational contexts.

Considering the objectives of the pilot study, which were related to the following:

- identification of the current use of digital technologies in HE,
- specific needs of different groups of users at HE regarding the purposeful application of digital technologies to improve the learning and teaching process,

- building a learning community with the aim of connecting, exchanging knowledge and purposeful application digital technologies in learning and teaching at HE,
- providing recommendations for purposeful practical application of digital technologies in higher education and recommendations for equipping HE with teaching equipment

it was established that employees of higher education institutions encounter numerous obstacles regarding structural, infrastructural, competence and communication issues. Structural obstacles have the greatest importance and refer to the lacking regulation of evaluation of digital educational content and insufficient human resources for multimedia support at all institutions involved in the pilot research. These obstacles should be addressed by relevant authorities (Ministry of Science, Education and Youth, The Agency for Science and Higher Education). In the framework of CARNET's activities, apart from continuous pedagogical and methodological support and development of education programs (CN Academy), it is necessary to strategically connect repositories Edutorij[3] and Medusa[4] with the institutionalization of evaluation of digital educational content.

The multimedia equipment allocated through the pilot research of the e-University project significantly met the infrastructural needs. Quantitative and qualitative research showed that the participants were mostly satisfied with the assigned equipment and its quality. The research pointed to the specifics of higher education institutions and the need for minor upgrades and adjustments of the acquired equipment. The need for a more thorough approach to education by suppliers and further equipment was also pointed out.

The participants listed a number of competence-based needs for the use of multimedia equipment. For the aforementioned reasons, a series of training sessions were held through pilot research that addressed various issues such as online teaching methodology, podcasts, use of tools for video production and post-production, open educational content, interactivity in online teaching, etc.

5. Conclusion

The pilot research conducted within the e-Universities project was based on action research methodology and in addition to planning, acting, observing and reflecting, the main result of the study was the creation of community of practice. On several occasions, the participants of the pilot research highlighted the creation of a learning community as one of the biggest contributions of the implementation of the action research - connecting, exchanging knowledge and learning about the purposeful use of technology. A significant part of the action research was made up of reflective workshops where they themselves conveyed their insights, discussed existing practices, and provided training to each other. Apart from the The HE Carnet Users' Conference 2023, where institutions from the pilot research participated with their own workshops and presentations, the participants contributed with their knowledge at other events organized through the e-University project - round tables, workshops and presentations. Conclusions of the pilot research are presented in the form of policy recommendations of digital transformation of higher education and adress the needs for:

- the development of evaluation criteria and standards of digital educational content and digital competence of teachers for advancement,
- the additional investment in infrastructure and provision of infrastructural support,

[3] Edutorij is a repository of digital educational content that enables the publication, access, storage and exchange of digital educational content, created primarily by teachers and students of Croatian primary and secondary schools, but also by experts from other educational institutions. https://edutorij.carnet.hr/

[4] CARNET Meduza is a service for the distribution of multimedia content intended for educational and academic institutions and individual users of CARNET member institutions. https://meduza.carnet.hr/index.php/home

- additional investment in human resources - constantly available technical support and assistance to higher education teachers in the use of equipment and creation of digital educational content,
- additional investment in the development of education for higher education teachers that will help them stay up to date with the latest technologies and pedagogical approaches in
- order to continuously improve their skills,
- defining the necessary digital education for the teaching profession at universities that considers the change in the paradigm of the professor's role (knowledge management, not knowledge transfer),
- encouraging the practice of open education, open digital educational content and open science.

Overall, considering the participants' needs, CARNET will continue with the implementation of action research, educational activities included, providing support until the end of the e-Universities project which will further be continued through an overarching CARNET HUB service. Additionally, the Srce Center for e-Learning academy has already drawn on the pilot model roviding online courses covering many topics related to the digital competences of teachers.

Declaration on Generative AI

The author(s) have not employed any Generative AI tools.

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