There is a growing need for a highly skilled workforce and, according to the Slovak government documents [6] already 90% of all job positions require at least a minimum level of digital skills, 45% of the EU population and 37% of the EU workforce lack digital skills. 40% of European employers say, they cannot find people with the required skills. In addition to technical knowledge and creative thinking, digital skills are now needed to get young people into the construction industry. Digitalisation is in fact a skills reform

The implementation of digital technologies is needed in learning activities at all education levels. At universities in Slovakia and abroad, learning activities are carried out in the interaction of teachers, students, and practitioners. By changing the established methods of teaching, wider use of ICT and available student licenses for software products, as well as moving towards a better use of tools of the TUKEmoodle environment (LMS used within the e-leaning portal of TUKE), it is possible to create appropriate conditions for the development of key competencies of both students and teachers involved in the pedagogical process at the Faculty of Civil Engineering of the Technical University of Kosice [16], [17].

The specified competencies can be developed while studying at university - within individual subjects, in cooperation with the practice, but also as the student's own initiative.

Fig.1: The implementation process and its benefits

Ability to integrate and apply the gained vocational theoretical and methodological knowledge within work performance was defined at the first place from among the desired soft key transferable competencies of a graduate.

The detailed analysis performed by the innovation team brought the following recommendations for innovation forms of education and development of key competencies:

- teaching and lecturing done by experts from business,
- excursions to companies,
- scholarships for students provided by businesses,
- cooperation with companies in supervising student, bachelor's, master's, and doctoral thesis,
- learning by searching solutions to real problems and through experiences,
- participating in real projects with businesses.

The main goal of the KEGA project is to support the attractiveness of education at Svf TUKE with an orientation on the introduction of digital technologies into the teaching process, which is shown in Fig.1.

Assuming the completion of all three planned phases, it will be possible to summarize the project results as follows:

• Contribution to the content of teaching subjects that create professional competencies of graduates of the Faculty of Civil Engineering usable in planning and managing the implementation of construction work. As the Faculty of Civil Engineering profiles its graduates in a wide range of construction professions to which digital technologies are directly related its graduates can work in the position of a client (government employee, investor, developer, property manager, building operations manager, ...), designer (architect, project team manager, technologist, technician, ...) or construction contractor (main contractor, subcontractor, preparer, budgeter, construction manager, manager and coordinator of construction projects, quality, safety and environmental protection manager, ...).

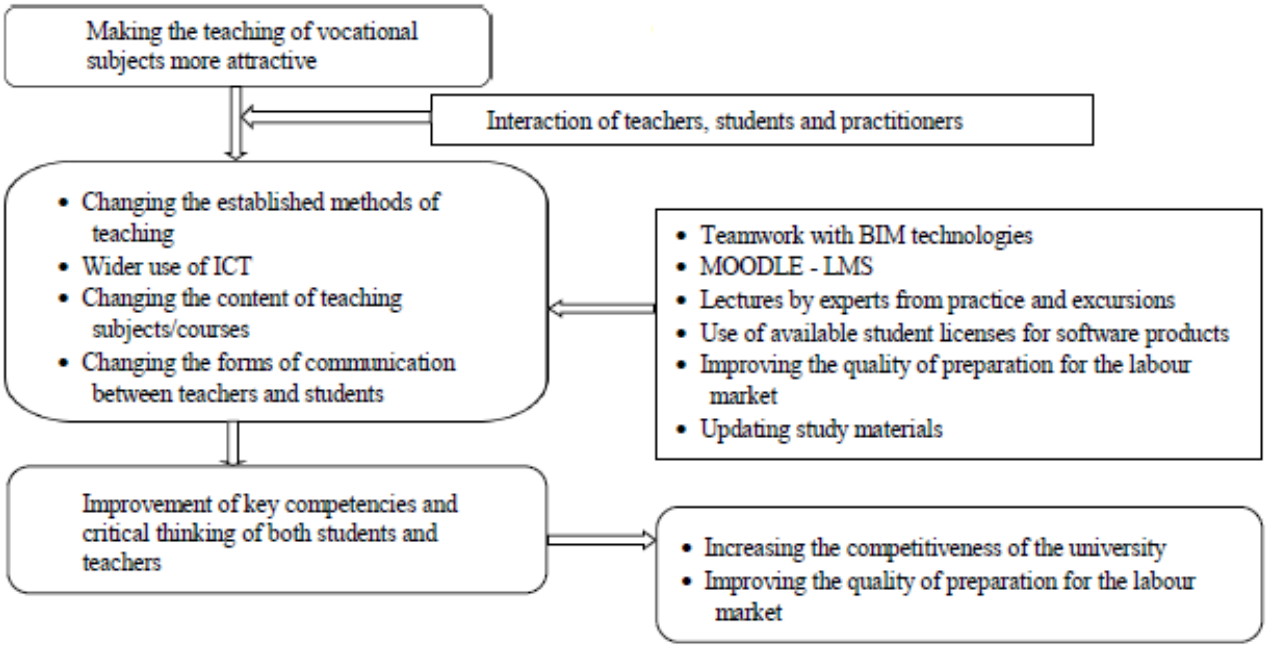

Fig. 1 The implementation process and its benefits

Based on the proposed composition of the research team, the activities will be focused on the use of digital technologies for the process of planning and implementation of the construction work and the promotion of graduates' skills in teamwork with BIM technologies.

• Supporting the efforts of the BIM Association Slovakia to implement BIM in Slovakia. It can be expected, also in Slovakia, that many large clients in the construction industry will direct engineering and construction organizations to use BIM more and more often.

• Involving students in solving partial tasks with the use of digital technologies and information modelling of buildings as part of teaching in the first and second levels of university study and creating space for increasing the interest of young people in the development of their digital skills; thus improving the quality of preparation for entering the labour market, which already today requires knowledge and digital and information and communication skills across the entire spectrum of professions in the construction industry.

• Making the teaching of professional subjects more attractive by using the potential of virtual reality and augmented reality tools to support the design, implementation management and control of building structures, as well as practical examples of the use of sensors for the control of structures and the management of construction processes.

• The attractiveness of the topic will increase the motivation of students to actively engage in the solution of university professional activities.

• Improvement of communication skills of educational process participants when solving team projects in the studio courses.

The project has set both, intangible and tangible goals. The goals fulfilment will create a technical and program background that will allow students to gain theoretical and some practical experience with the application of digital technologies.

Intangible objectives of the project:

• To transfer of knowledge in the field of construction digitalization and BIM modelling into the curricula of selected subjects of university studies at the Faculty of Civil Engineering.

• To innovate and digitalize teaching methods (e-leaning portal. LMS TUKEmoodle),

• To increase the digital skills of the teaching process participants.

• To innovate the form and content of teaching in selected subjects at the 1st and 2nd levels university study at the Faculty of Civil Engineering by the information base of the Construction 4.0 platform.

• To support the knowledge and competences of the teaching participants by active use of digital technologies.

• To support students' management and communication skills and their teamwork competencies.

• To specify requirements for digital technology software tools and devices for selected processes within the construction life cycle.

Tangible objectives of the project:

• To complete a virtual library of 3D models of building structural elements, objects, and site equipment.

• To create a repository of student projects solved in BIM platform software, intended for use in the educational process.

• To activate a repository of case studies on the use of digital technologies in different phases of the construction life cycle.

• To make information about the Construction 4.0 platform available to full-time and part-time students (TUKEmoodle portal).

• To equip classrooms with hardware and software resources for solving virtual reality problems in the field of design and implementation of construction projects (PC stations, touch screens, virtual reality goggles...) and equipment for presentations of BIM projects, semester, and final theses.

• The aim of the educational activities is to increase the competences of graduates of selected study programmes for the performance of their future professions in jobs where the use of digital technologies, including the technologies of the BIM platform, is desirable.

IV. Discussion

In line with industry trends, the education sector is moving towards a revolution that can be described as Education 4.0 [18]. The essence of the process is the "fusion" of industry and education sectors [19]. One of the most significant changes in Education 4.0 is the fusion of digital technologies and teaching methods [20]. The educational process should be greatly supported by digital materials and tools that support students in self-study. The students who are most affected by the 4th revolution in education are mostly from Generation Z who are fond of using online learning tools, which certainly helps the process [21].

Addressing the knowledge deficit of civil engineers in the field of digitalisation of production, design and all the processes which are radically changed by digitalization, is an issue that has been successfully addressed in Sweden. To meet the needs of Swedish industry, the PRODUKTION 2030 platform was created within the INGENJÖR 4.0 national programme in cooperation with Swedish technical universities [22]. This is an educational initiative for support of the competences of technical engineers, especially civil engineers. The project is presented as a strategic tool to maintain the competitiveness of Swedish industry under conditions of enormous price pressure (especially from Asian countries) through the digitalization of the industry. The project involves 13 technical universities, which have jointly developed specially focused modules. These are offered to university students in Sweden, as a retraining programme for practicing engineers, but also for those with a technical background around the world. The INGENJÖR 4.0 programme is the result of national interest and strategic consensus between industry

and academia and can serve as the example of good practice for our country.

The KEGA project presents efforts to innovate educational methods, the use of virtual reality in education, the solution of practically oriented tasks, as well as efforts to open the university to companies, as presented in the recommendations for the field of education in the material prepared by the Slovak Business Agency [23].

V. CONCLUSION

Currently, the construction industry in Slovakia, as well as in the EU, functions in an environment of digital transformation of all sectors of the economy and public administration, where the online world is becoming part of the everyday life of people and businesses. It can be assumed that businesses, including the ones from the construction sector, are more likely to succeed only if they are able to innovate and digitise their processes, but above all offer services and products with high added value.

The Faculty of Civil Engineering of the Technical University in Kosice provides education for the whole spectrum of positions of civil engineers who are involved in the design, planning, preparation, and implementation of the construction projects, as well as in the management of buildings. It trains bachelors, engineers, and doctoral students in the field of civil engineering as well as civil engineering structures. The contribution of the presented project is:

- The use of the competency profile based on key competences in the creation of innovations in the educational process.
- Supporting students' skills by targeted work with software and tools of the BIM platform.
- Contribution to quality improvement and optimal decision making by solving real examples of construction practice.
- Digitalization and accessibility of educational materials in virtual space that supports not only full-time but also distance learning of full-time and part-time students.
- The processed educational materials represent a source of information for practitioners in the framework of lifelong learning.

The successful implementation of the presented KEGA project will increase the level of knowledge, skills, critical thinking, and key competences of the graduates of the selected study programmes.

Even though there are now many computer-sensitive jobs, the human factor will be always needed for the jobs where creativity and social intelligence is crucial.

ACKNOWLEDGMENT

This work was supported by the Scientific Grant Agency of the Ministry of Education of the Slovak Republic and the Slovak Academy of Sciences under Projects KEGA 038TUKE-4/2020 and VEGA 1/0374/19.

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