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SOME ASPECTS OF DIGITALIZATION AND SUSTAINABILITY IN THE EUROPEAN UNION

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Annotation
Nowadays knowledge has become a strategic resource, and plays a crucial role in education, innovation, different development processes, thus, in economic growth. Considering the rapidly and continuously changing business environment, the impacts of globalisation and digitalization, staying competitive is a great challenge for companies both in public and private sectors in the 21st century. Through the information society or knowledge-based society came to the fore, the use of diverse information technology tools and methods has become a significant influence factor in the daily life of both individuals and organisations. In this new economy the appearance of Information and Communications Technology (ICT), the different online applications – especially social media – represent a completely different and new structure in communication and education. Although the relationship between education and sustainable development is complex, there is no doubt that education is an essential tool for achieving sustainability. Also United Nations highlighted the importance of sustainability and the role of education and digitalization in it – in 2015 UN General Assembly emphasized the cross-cutting contribution of ICT to the newly defined Sustainable Development Goals as ICT can accelerate the progress of sustainability.
The current paper is intended to summarize the most important related literature and provide a better understanding of knowledge-based economy, digitalization and education for sustainability. Furthermore, the study offers a brief introspection into the current situation of Europe – compared with Hungary – in terms of digital competence and use of ICT. The research methods are the analysis of different related articles and reports, a comparative analysis of digital skills and competences between Hungary and European Union based on the reports published by the European Commission: Measuring Digital Skills across the EU: EU wide indicators of Digital Competence (2014); Survey of Schools: ICT in Education (2013) and Europe‘s Digital Progress Report 2017. Moreover, Authors mapped the current situation of ICT usage habits in secondary education in Hungary based on their own empirical research.
The main findings of the study show that Hungary has a better position in terms of digital skills in comparison with the average of the European Union. Although it is obvious that usage of different ICT tools is essential in education in order to make knowledge transfer easier, the inconvenience of the older generation can reduce the efficiency of the new technology in education. Summarizing the results it can be clearly seen that confidence of digital skills are higher in Generation Y and Generation Z, as they have the basic need to use different ICT tools, mobile and online technologies in their everyday life.
KEY WORDS: digitalization, sustainability, ICT, education, knowledge management, new economy

Introduction

According to the well-known Solow model economic growth and therefore growth of GDP are determined by the following three factors of production: labour (L), capital (K) and knowledge / innovation / entrepreneurial attitudes / technological developments (A) which can influence the efficiency of previous two also (Pongrácz and Nick 2017). Although Solow has already recognized and emphasised the importance of knowledge and innovation, researchers started to deal with information as a new factor of production only in the last few decades. The appearance of new information technologies, digital devices and the Internet has brought new challenges to the researchers as well as the different actors of the economy – on one hand the development of these new technological solutions leads to a complete restructuring of the economy, and on the other hand, the Internet and diverse online applications (especially social media) represent a completely different communication structure which also changes the behaviours of economic actors and the mode of operation of the economy itself.

Considering the rapidly changing business environment, staying competitive is a key issue and challenge for companies in the 21st century. The criteria of a company's or a country's success and competitiveness is the changing behaviour of the different economic actors and its influence. Through the information society came to the fore, the use of diverse information technology tools and methods has become a significant influence factor in terms of the entrepreneurs or company management. "Society is entering into an era where the future essentially will be determined by people's ability to wisely use knowledge, a precious global resource that is the embodiment of human intellectual capital and technology" (Mupa, Chabaya and Chiome 2011). In this new knowledge-based economy education has a continuously increasing role in knowledge transfer – with use of the different types of Information and Communications Technologies (ICT) knowledge can be more easily identified, captured, organised, created, learnt and disseminated. Digital solutions play an important role also in sustainable development. As the UN General Assembly highlighted in 2015, Information and Communications Technology have a cross-cutting contribution to the reformulated Sustainable Development Goals (SDGs) an can accelerate progress across SDGs (Figure 1) (Global e-Sustainability Initiative 2017).

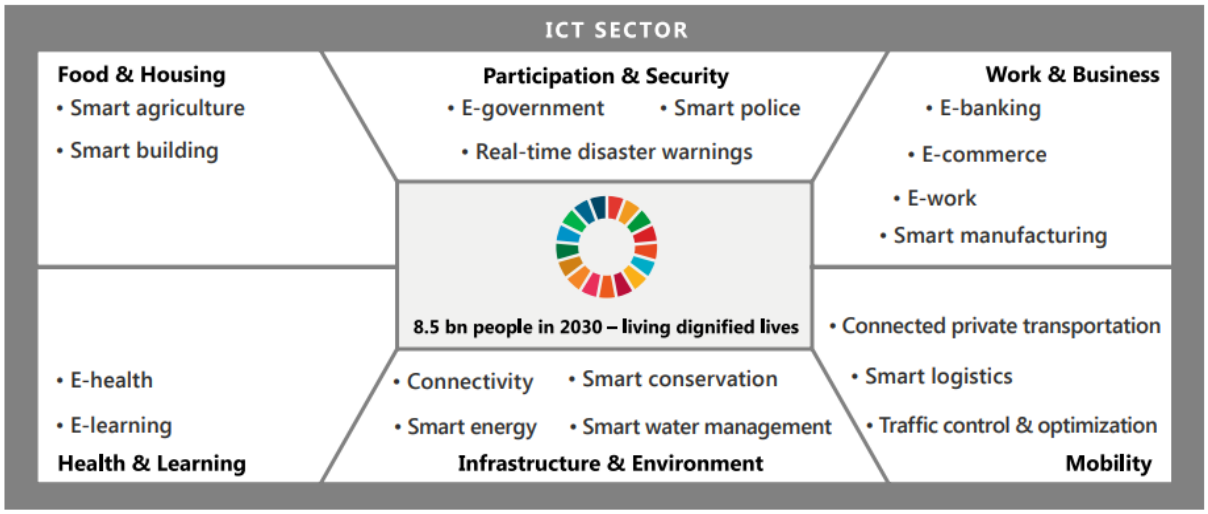

Fig. 1. Overview of digital solutioons across all areas of life contributing to SDGs
Source: adapted from Global e-Sustainability Initiative (2017)

It is also obvious that in this environment the demand for the education and training using new digital solutions and technologies will increase day by day, as ICT can increase the efficiency of knowledge transfer in education as well as the education level of the population. “Education is an essential tool also for achieving sustainability. People around the world have already recognized that current economic development trends are not sustainable and that public awareness, education, and training are key to moving society toward sustainability” (UNESCO 2006). Although importance of the sustainable development was recognized, a lot of time will be essential in order to change the behaviours and habits of people.

The current paper is intended to summarize the most important literature in terms of knowledge-based economy, digitalization and education for sustainability. The main objective is to find the role of digitalization or development of digital competences in the sustainable development – how education and knowledge society can contribute to the sustainability. Moreover, the study also offers a brief introspection into the situation of Hungary and Europe in terms of ICT usage habits in education.

Theoretical background

Role of digitalization – ICT, digital competence

The new technology revolution in 70’s – mentioned as industry 4.0 –, the appearance of various Information and Communications Technologies, automation and digitalization enabled us to talk about “new economy”, a knowledge-based economy today (Kovács 2017). The importance of digital competence was recognised also by the European Parliament and the European Council in 2006. Digital competence was identified and defined as one of eight key competences which are equally important and also essential for all individuals in a knowledge-based society. "Digital competence involves the confident and critical use of information society technology (IST) for work, leisure, learning and communication. It is underpinned by basic skills in ICT: the use of computers to retrieve, access, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet" (European Parliament and European Council 2006). Total list of the competences is the following:

1. communication in the mother tongue;
2. communication in foreign languages;
3. mathematical competence and basic competences in science and technology;
4. digital competence;
5. learning to learn;
6. social and civic competences;
7. sense of initiative and entrepreneurship; and
8. cultural awareness and expression.

In 2011 the European Commission elaborated a Digital Competence Framework in DIGCOMP project called. Aim of the project was to describe competences needed by individuals to be digitally competent. The framework defines the following 5 main competence areas, and 21 competences within them:

1. Information
   - browsing, searching and filtering information;
   - evaluating information;
   - storing and retrieving information.
2. Communication
   - interacting through technologies;
   - sharing information and content;
   - engaging in online citizenship;
   - collaborating through digital channels;
   - netiquette;
   - managing digital identity.

3. Content creation
   - developing content;
   - integrating and re-elaborating;
   - copyright and licences;
   - programming.
4. Safety
   - protecting devices;
   - protecting personal data;
   - protecting health;
   - protecting the environment.
5. Problem solving
   - solving technical problems;
   - identifying needs and technological responses;
   - innovating and creatively using technology;
   - identifying digital competence gaps.

(European Commission 2013a)

According to the European Commission (2015) 90% of jobs will require some level of digital skills and competences in the future. In order to support and accelerate the progress of digitalization, there are different types of funding sources are available both at European and national level – such as European Structural and Investment Funds (ESIF 2014-2020) recommended by the European Council in 2013 (European Commission 2015).

Education for sustainable development (ESD)

Directly after the new technology revolution the issue and concept of sustainability has also been given more attention. Based on the related literature, there is no generally accepted definition for sustainable development, and it is also continuously evolving which makes it more difficult to define. One of the original definitions derives from the Brundtland Report of 1987 which stated that "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987). However, recently more practical and detailed approaches have come to fore. Daly (1996) defined sustainable development as "development without growth beyond environmental limits." Others said that sustainability is simply the ability to continue a well-defined behaviour indefinitely. According to Magda (2013) sustainable development "involves maximising the net benefits of economic development, subject to maintaining the services and the quality of natural resources over time." It "ensures the well-being of humans by integrating social development, economic development, and environmental conservation and protection" (Magda 2013). Despite of many different definitions it is clear that sustainability is universally thought to have the following three components as pillars: environment, society and economy. In the last few decades, attention to sustainability or sustainable development is increasing – more and more researchers started to deal with this area. Recently researchers have not been talking about only three main categories, but also the following sub-dimensions can be evaluated: socio-economic (as the common section of social and economic dimensions), socio-environmental (as the common section of social and environmental dimensions), and eco-efficiency (as the common section of economic and environmental dimensions). Furthermore, national governments and international institutions try to influence the behaviours and habits of people towards sustainability through the education also. Due to the unsustainable behaviour, Sustainable Development Goals (SDGs) were reformulated by the United Nations in 2015 (Global e-Sustainability Initiative 2017).

The relationship between education and sustainable development is complex. Generally, researchers stated that basic education is the key to a nation's ability to develop and achieve sustainability targets (UNESCO 2005). The concept of Education for Sustainable Development (ESD) was mentioned and firstly discussed at the World Summit on Sustainable Development held in 2002. According to UNESCO (2005) ESD consists of the following five elements:

1. education that allows learners to acquire the skills, capacities, values and knowledge required to ensure sustainable development;
2. education dispensed at all levels and in all social contexts (family, school, workplace, community);
3. education that fosters responsible citizens and promotes democracy by allowing individuals and communities to enjoy their rights and fulfil their responsibilities;
4. education based on the principle of lifelong learning; and
5. education that fosters the individual's balanced development.

Importance of knowledge management

Nowadays knowledge management has become one of the key success factors in the business sector as well as in the field of education. Moreover, knowledge became the most strategic resource. The ability of a knowledge manager to recognize links between disparate information from various sources and make them available in a single location is essential for individuals and organisations to make key decisions. As rightly described by Stewart T. (2002) the essence of knowledge management is connection, not collection. According to Quintas et al. (1997), knowledge management is described as the process of critically managing knowledge to meet existing needs, to identify and exploit existing and acquired knowledge assets and to develop new opportunities.

Other authors also determined knowledge management as a process – Liebowitz (2000) presented the following 9 step-approach:

1. transform information into knowledge;
2. identify and verify knowledge;
3. capture and secure knowledge;
4. organise knowledge;
5. retrieve and apply knowledge;
6. combine knowledge;
7. create knowledge;
8. learn knowledge.

According to the Knowledge Management Cycle Model built by Evans, Dalkir and Bidian (2014) knowledge management consists of 7 phases: identify, store, share, use, learn, improve and create as presented in Figure 2.

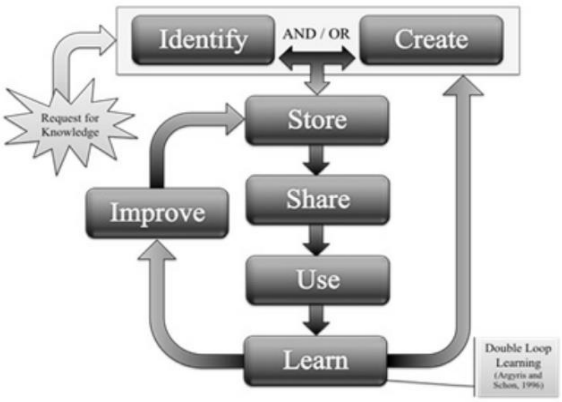

Fig. 2. Knowledge Management Cycle KMC) Model
Source: adapted from Evans, Dalkir and Bidian (2014)

Similarly, Rodriguez and Al-Ashaab (2007) described it as a process and created a Knowledge Life Cycle (KLC) including the following steps:

1. identify and gather knowledge from different sources;
2. capture and standardize the knowledge and constraints in the form of rules (because of different formats);
3. represent the knowledge formally using knowledge management tools;
4. implement the knowledge into a knowledge based system;
5. use of the knowledge to support decision making process;
6. create – new knowledge creating through experiments, capturing lesson learnt from previous projects, etc.;
7. maintain and upgrade.

It can be clearly seen that definitions and process steps determined by different authors and sources are very similar, therefore, we can declare that knowledge management is not about "what", but about "how". Knowledge management is about acting to build and leverage knowledge through an understanding of how it is created, acquired, processed, distributed, used, harnessed, controlled, etc. (Wiig 1993).

Due to the globalisation and developments of information technology the importance of knowledge is growing, knowledge has become a critical source of competitive advantage and value creation what encouraged all sectors – such as business or education – to pay attention to the knowledge-based solutions and different knowledge management tools. A knowledge society has been defined by Afgan and Carvalho (2010) as "a human structured organization that is based on contemporary developed knowledge and representing new quality of life support system". Knowledge is obviously the central pillar of a knowledge society that has access to wide range of information and the ability to process that information and transform it into useful knowledge. The rapid growth of ICT, including the increasing number of mobile and online applications, has further changed the characteristics of the knowledge society, which is composed of different dimensions (social, cultural, economic, political and institutional) that are specific to its own culture and environment (Liaqut and Advic 2015). Today, a knowledge society is a source of human and sustainable development (UN 2010); thus, it is beginning to play a fundamental role in building sustainable societies.

If we talk about knowledge or knowledge society it is essential to understand the following terms: absorption and diffusion. Absorption means the ability of an individual or company to absorb and apply specific knowledge in unchanged form. Skills development have an essential role in this progress, as quality of human resources can be improved through education which can enable organisations to adapt. By comparison, diffusion means the spread of knowledge that is adapted / improved / upgraded to the local circumstances (therefore not the same form). One of the most important issues in relation to knowledge diffusion is the analysis of Internet usage habits and impacts of ICTs (Kovács 2017).

Aim and objectives

The main objective of the paper is to provide a better understanding of the relationships among digitalization as a tool of knowledge management, education and sustainable development. The other objectives are the followings:

- to determine the role of digital competences in education;
- to provide an overview about the importance of education for sustainability;
- to offer a brief introspection into the situation of Hungary also in comparison with the European Union in usage of ICT.

Research methodology

The research methods consists of the analysis of different related research articles and reports, a comparative analysis of digital skills and competency between Hungary and European Union.

In order to exploit the different available funds and projects effectively, it is essential to know the current situation. The purpose of this research work is to map the European situation based on the reports published by the European Commission: Measuring Digital Skills across the EU: EU wide indicators of Digital Competence (2014); Survey of Schools: ICT in Education (2013) and Europe‘s Digital Progress Report 2017. Therefore, our study can contribute to the identification of digital gap in member countries. Essentially, school education should be analyzed, after the overview of total European population the results of students will be summarized.

In the second part of results Hungarian situation will be analyzed in terms of digital skills. Since the greatest evolution can be observed in the newly grown generations, our own research employed in Hungarian secondary schools in 2016. The study was empirical, the quantitative research is based on the Authors' own questionnaire survey. The study was conducted by a random selection of 127 participants overall – 91 teachers worked in Hungarian secondary schools and 36 secondary school students. The sample collecting method was the referral (snowball) sampling. This is a non-probability sampling technique where existing study subjects recruit future subjects from among their acquaintances. Thus, the sample group is said to grow like a rolling snowball. As the sample builds up, enough data are gathered to be useful for research. One and multivariable processes were used as analyzing methods. This survey is supported by an online survey later, with 82 further participants.

Results

European situation

According to the reports published by the European Commission (2017), in 2016, 44% of the European population had an insufficient level of digital skills. 19% had none at all, as they did not use the internet – there is a little improvement in comparison with 2012, when this rate was 23%.

There are large disparities across countries, with the share of people without digital skills ranging from 3% in Luxembourg to 41% in Bulgaria and Romania. In 2012, the lowest rate (6%) belonged to Sweden and the highest (50%) was in Romania. In 10 countries (Portugal, Poland, Slovenia, Croatia, Lithuania, Italy, Greece, Cyprus, Bulgaria and Romania), at least one-quarter of the population had no digital skills in 2016. Moreover, in Bulgaria and Romania, nearly three-quarters of the adult population can be considered as lacking basic digital skills. It is very interesting fact that Italy, with its large population, is also in this category which means that almost 18 million people live there with insufficient digital skills.

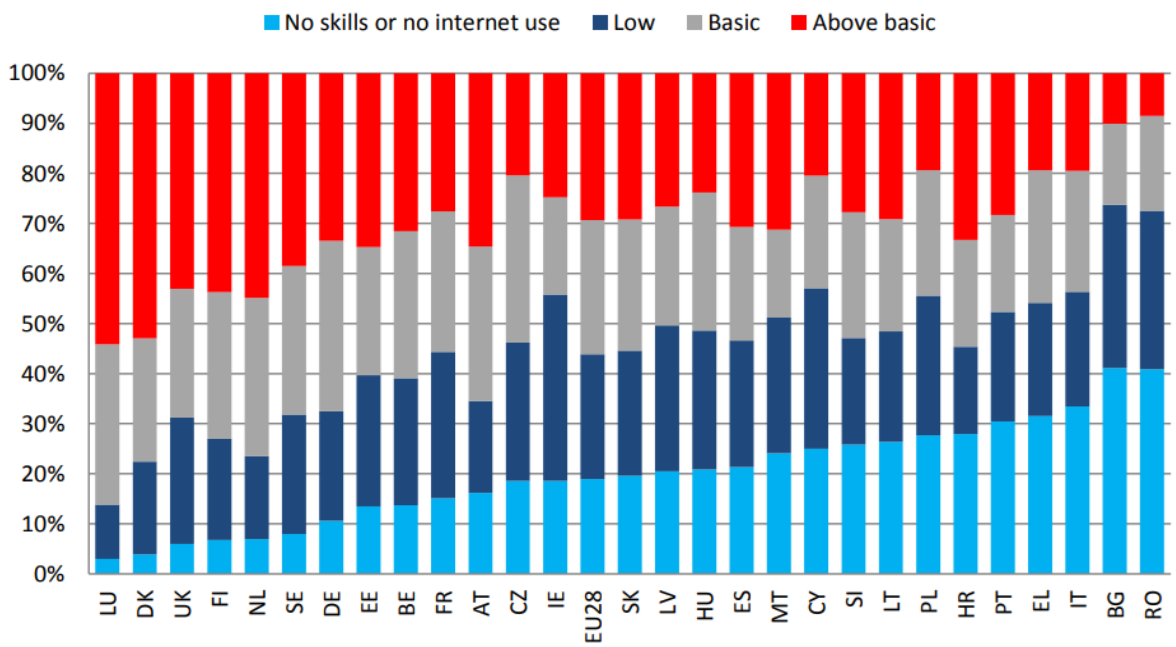

Fig. 3. Digital skills of the EU population, 2016
Source: adapted from European Commission (2017)

After reviewing the situation of total European population it is essential to map the digital skills of younger generations. Since latest report of the European Commission (Europe‘s Digital Progress Report 2017) does not include the results of students, the Survey of Schools: ICT in Education (data was collected in 2011) published by the European Commission in 2013 was used to analyze their digital competences. In this particular case, results were identified following 4 skills which are corresponding the competence areas of the DIGCOMP project: operational skills, social media skills, responsible internet use and safe internet use. The most relevant information for this paper can be exploited from the results of operational skills and social media skills of the students (Likert scale ranging from 1 to 4 was used). As Figure 4 represents the most confident students in their operational use of ICT live in Poland (3.01) followed by Portugal (2.81), France (2.80), Norway (2.77) and Lithuania (2.74). Examined students were least confident in Luxemburg (2.26), Turkey (2.40), Belgium (2.42), Ireland (2.45) and Greece (2.45). In comparison with the average of European Union (2.63) Hungary (2.70) is in a better position than average, directly after the above-mentioned Lithuania.

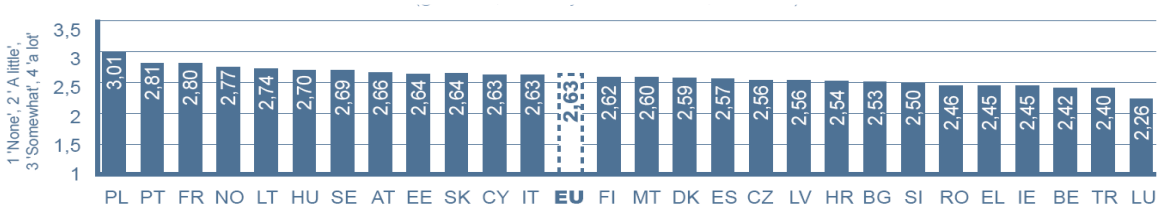

Fig. 4. Students‘ confidence in their operational use of ICT
Source: adapted from European Commission (2013b)

Nowadays use of social media applications has become one of the most important factors in the daily life of both individuals and organizations. For newly grown generations this type of communication channels is essential in order to share information with each other also in case of education. In the international comparison it can be clearly seen in Figure 5 that the highest level of confidence was again in Poland (2.82) followed by Estonia (2.72), Sweden (2.66), Portugal (2.65) and Finland (2.64). The least confident students surprisingly live in Luxemburg (2.08). Hungary has also the sixth position (2.63) in this case with higher confidence than EU average (2.41).

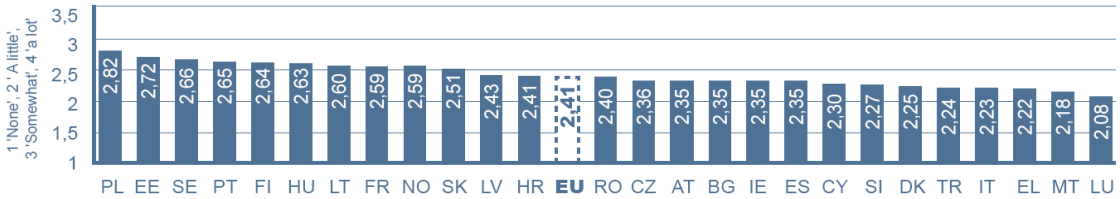

Fig. 5. Students‘ confidence in using social media
Source: adapted from European Commission (2013b)

Summarizing all areas, Figure 6 shows the overall confidence of students in their ICT skills by countries. Poland is on the top of the list which is very interesting if we compare the results of the total population (not only students) which shows that almost 60% of total population had "No skills" or "Low skills" in Poland. Compared with the average of the European Union, Hungary can preserve its better position. If we take a look to the positions of Visegrad countries, it is obvious that Hungary has the second position after Poland and followed by Slovakia and Czech Republic.

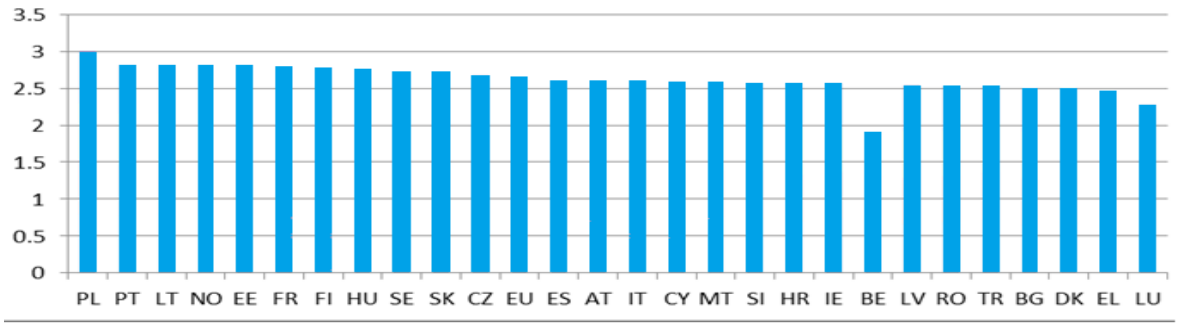

Fig. 6. Students' confidence in their ICT skills
(average score based on 4 competence areas; based on 4-point Likert scale)
Source: adapted from European Commission (2013b)

Hungarian situation

Nowadays social media plays a crucial role in online communication, especially in life of the Generation Y's or Digital Natives (born after 1981) (Bolton et al., 2013). Results of the online questionnaire performed by the Authors also support the previously mentioned statement. As Figure 6 represents, almost everybody (79 respondents from 82: 96.3%) from the respondents use social media applications and different community sites regularly. Different news sites are also very popular (68.3%) in order to capture all necessary information in the daily life of participants. The least popular answer was the torrent sites with 17.1%. Figure 8 demonstrates the purpose of the usage of ICT tools. It can be clearly seen, that most of the participants used these ICT tools for communication (97.6%) and for achieving and capturing information (92.7%).

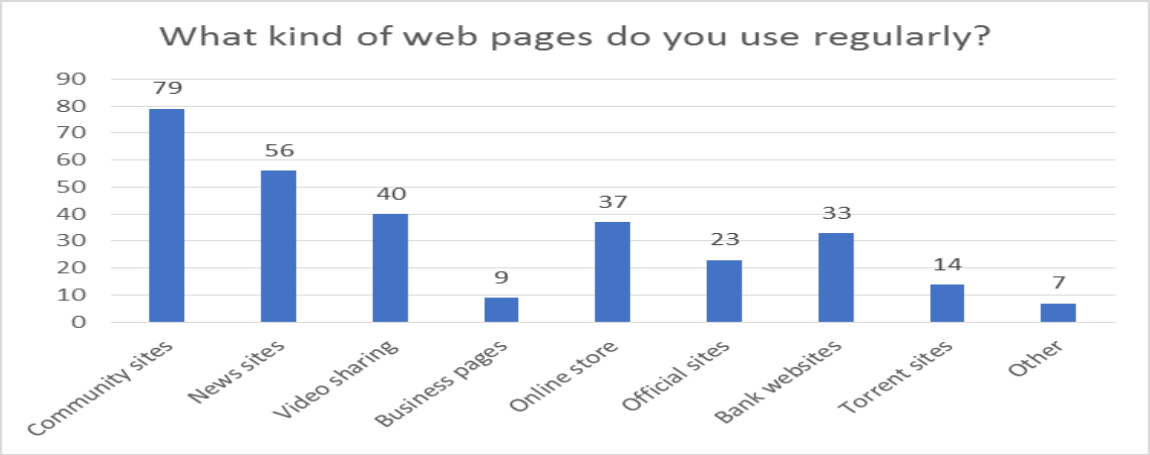

Fig. 7. Types of regularly used websites (number of valid responses, n=82)
Source: Authors' own edition based on survey data

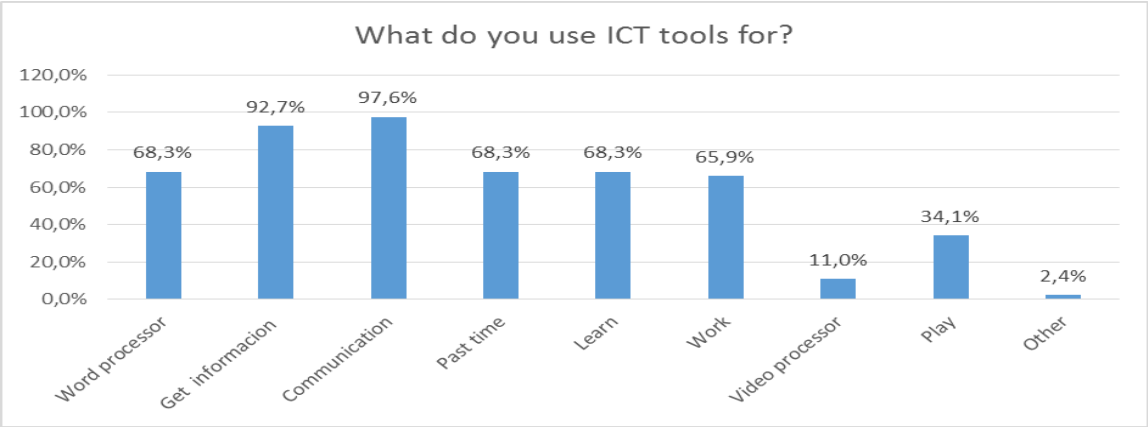

Fig. 8. Purpose of the usage of ICT tools (in % of valid responses)
Source: Authors' own edition based on survey data

Two-thirds of the surveyed teachers use computer and different ICT tools every day, both at school and at home. These ICT tools helps them in their everyday work – such as in preparing for lessons, exploring and learning different literature, operating the network of other colleagues or students. Using different web-based interfaces, they can share their experiences, receive or provide feedbacks in relation to their teaching activity, get or give information about the successes and failures of applying some teaching methods from or to their colleagues, which will also provide them the opportunity for self-improvement and knowledge transfer. Figure 9 shows the accurate results:

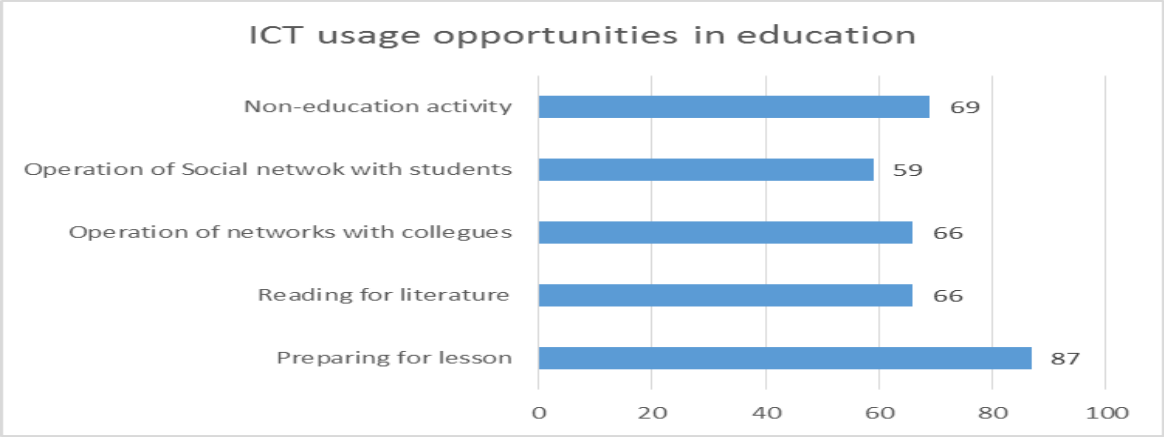

Fig. 9. ICT usage opportunities in education (number of valid responses, n=91)
Source: Authors' own edition based on survey data

Conclusions

Based on the literature the relationships can be easily determined among the knowledge-based economy or knowledge society, the role of digital competences in education and sustainable development. Recently two development processes were observed related to the topic: on one hand the new technology revolution in the 70's that enabled us to talk about "new economy" and knowledge society; on the other hand the concept of sustainability has also been given more attention. Use of different ICT tools can develop and increase the digital competence of the population, therefore, knowledge transfer can become quicker and population can become more conscious – people can easily reach information regardless time and location, they can identify, acquire and share their knowledge which is the base of a knowledge society. In the "new economy", in a knowledge society these tools also could be effectively used in education since basic education is the key to a nation's ability to develop and achieve the reformulated Sustainable Development Goals.

In the present research work results also supported the importance of digital competence as the confident and critical use of different information and communication technology tools. The main findings of the study demonstrated that Hungary has a better position in terms of digital skills (in all competence areas: operational use of ICT, use of social media, responsible use of ICT, safe use of ICT) in comparison with the average of the European Union. Although the Hungarian education system were improved in this area, further developments will be necessary in order to improve the population's digital competence. Although it is obvious that usage of different ICT tools is essential in education in order to make knowledge transfer easier, the inconvenience of the older generation can reduce the efficiency of the new technology in education. Summarizing the results it can be clearly seen that confidence of digital skills are higher in Generation Y and Generation Z, as they have the basic need to use different ICT tools, mobile and online technologies in their everyday life. Teachers are responsible for development of digital literacy, digital competence, responsible and safe Internet usage and also for acquisition of the virtual space capabilities at the highest level in education. For further research it is planned to do a comparative analysis of digital skills published by European Commission in 2014 and 2017 – how the results were changed by the new regulations and funding sources.

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