JOURNAL OF MODERN SCIENCE

2/56/2024

www.jomswsge.com

DOI: doi.org/10.13166/jms/177634

Renata Szanter
Pomeranian University in Słupsk, Poland
ORCID iD: orcid.org/0000-0002-7864-9497

Ewa Matuska
Pomeranian University in Słupsk, Poland
ORCID iD: orcid.org/0000-0003-1334-3574

DEVELOPMENT AND CERTIFICATION OF DIGITAL COMPETENCES IN EUROPEAN UNION COUNTRIES IN PROJECT-BASED LEARNING INITIATIVES

Abstract

Objective: The study aims to highlight opportunities for educational and non-governmental institutions in European Union member states to undertake initiatives that enhance and certify the digital skills of citizens and workers.

Methods: The article is based on an exploratory research approach and presents mixed research methods and techniques. The first part presents a descriptive analysis of digital competencies in EU policy based on a review of literature and EU legislation. This was followed by a qualitative analysis based on data from Eurostat's online database to diagnose the current level of digital competencies in the EU and trends in this area in recent years. Finally, a case study of an international educational project aimed at contributing to the achievement of the Union's goals for improving the digital competencies of citizens and workers is presented.

Results: The results obtained and their analysis indicate an urgent need to intensify educational efforts to improve digital competence in Europe. The case study can be used to raise and certify the level of digital competence for different target groups.

Conclusions: From the point of view of the priorities set by the European Union, the digital competence of its citizens is unsatisfactory, and large discrepancies between countries in this area have been identified, which requires the implementation of more educational initiatives to develop digital resilience. Project-based learning initiatives generating open and free online tools for certifying existing and acquired digital skills in the EU are recommended. Developing a unified system of EU standards to prove the digital competence of citizens and workers can help on the way to achieving better competitiveness and sustainability of the European market.

Keywords: *digitalisation, digital society, digital competences, DigComp digital competences framework, project based learning initiatives*

Introduction

The strongly perceptible trend towards digitalisation, which is evident in almost every area of life, does not allow participants in socio-economic life to remain indifferent to the changes taking place. Citizens, businesses, public administration are constantly facing new challenges brought about by the ubiquitous information and communication technologies. Digitisation affects practically every sphere of life (Castells., M, 2010, p. 28), from personal

relationships enhanced by social media and related services, to other relationships such as, for example, citizens' interaction with e-government support services (Gray, J., Rumpe, B., 2015, pp. 1319-1320), the creation of a digital working environment, to businesses' engagement with potential or current customers in various communication channels (Deloitte, Digital Transformation, 2019, p.42). Being familiar with digital technologies and having the competence to navigate among them on a daily basis has even become essential. The digital transformation of the economy means that almost all occupations and participation in society require at least basic digital skills, which are now as important as literacy and mathematical reasoning (European Commission, 2018, p.1.) The digital skills started to be a key aspect of raising the standard of living of citizens (Stofkova, J.hh et al., 2022, p.15), but still exists many usage gaps in that area (Van Deursen, A., JAM, Van Dijk, J.AGM. 2014, pp. 509-512). Hovewer, due to the introduction of mandatory e-government in many European Union countries, citizens are obliged to use e-services, so the development of digital skills is becoming increasingly important (Rodríguez-Hevía, L. F., Navío-Marco, J., Ruíz-Gómez, L. M., 2020, p.13; Morte-Nadal, T., & Esteban-Navarro, M. A. 2022, p.7).

The aim of the study is to highlight the opportunities for educational and non-governmental institutions in EU member states to take action to contribute to the digital competences of their citizens and employees, by creating international initiatives that result in the creation of freely available digital tools to improve and certify these skills. The main hypotheses formulated for the article are:

- **H1.** Without constant development and improvement digital skills the citizens and employees of EU can't fully participate in the modern digital society and gain the profits flying from digitalization of economy and civic services. Digital competences are also the base of competitiveness and sustainability of EU in an era of digital economy.
- **H2.** The international partnerships and project based learning methods are recommended as the plausible plaforms for designing and implementing widely used digital tools by EU citizens and organizations oriented on implementing long life learning initiatives.

Digital competences as the base of EU policy aimed on competitiveness and sustainability in digital socio-economic era

One of the identifying designations of the information society presented by Professor Haber is digital competence, which plays an important role from the point of view of how citizens function in today's reality (Haber, 2001, p.44). Since information and communication technologies (ICT) are involved in the daily lives of citizens at home, work, school or at the university, in a wide range of activities: everyday communication, searching for current news, entertainment, interaction with public authorities or when paying current bills or shopping online, mastering digital skills is essential to use them effectively and safely. What are digital competences? The importance of digital competences was recognised by the European Parliament and the European Council already in 2006 in the Recommendation on Key Competences for Lifelong Learning, which have identified digital competences as one of the eight key competences necessary for all individuals in a knowledge-based society and defined them as *involving the confident and critical use of Information Society Technology (IST) for work, leisure and communication. They are based on basic ICT skills: using computers to retrieve, assess, store, create, present and exchange information, and communicating and participating in collaborative networks via the Internet, presenting and exchanging information, and communicating and participating in collaborative networks via the Internet* (Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning (2006/962/EC), 2006, p. 394/15). Already in this document it was emphasized that the current requirements regarding competences have changed due to the growing number of jobs subject to automation, the increasingly important role of technology in all areas of work and life (revolution 4.0). The key competences are transversal competencies – i.e. those that are used in various contexts and roles of social and professional life. Therefore, they should be the basic signpost in building educational programs of lifelong learning. Responsible education and development of key competences plays a strategic role in building resilience and the ability of citizens and employees of the Community to adapt to the constant changes in the socio-economic environment.

As things are moving fast in the digital sphere, and this is specifically true for new technologies such as: an artificial intelligence, virtual and augmented reality, robotisation, Internet of Things as well as the emergence of new phenomena such as disinformation, for example, there is a need to define new, increased digital literacy requirements for citizens. In the updated Council Recommendations of 22 May 2018 on key competences for lifelong learning (2018/C 189/01, p. C189/9), digital competences *include the confident, critical and responsible use of and interest in digital technologies for learning, work and participation in society. They include information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), security (including digital comfort and cyber-security competences), intellectual property issues, problem solving and critical thinking.* For many years the European Union has been taking a number of initiatives to raise the level of digital skills of citizens in Union countries, given that there are still existing the huge digital skills gaps. Digital competences are at the forefront of the European policy agenda and the Union's digital skills strategy aims to increase digital skills in connection with digital transformation. For the current programming period 2021-2027, the Commission for the first time set a specific target to increase the percentage of citizens with basic digital skills – from 56% in 2019 to 70% in 2025 (European Court of Auditors, 2021). In the Digital Compass and the European Pillar of Social Rights Action Plan, the EU adopted a target that a minimum of 80% of the population is to have basic digital skills by 2030 and the number of ICT professionals is to be 20 million. In line with the 2006 Council Recommendation, the process of operationalising digital competences has begun.

As the tool for the development of digital competences of EU citizens was developed the European Digital Competence Framework DigComp. The work on DigComp consisted of a multi-stakeholder consultation and is aimed at creating a common concept at European level, focusing on the individual components that are part of digital competences. DigComp can provide a meta-framework for already existing frameworks, curricula or certificates (DigComp, 2022, p. 8).

The first DigComp reference framework was released in 2013 and there the digital competences were defined as a combination of 21 competences grouped into five main areas. Given the rapid changes in the development

of new technologies and the emergence of new phenomena related to them, work on the framework has been carried out systematically and the framework itself continues to be updated. In 2016, there was a modification of DigComp 2.0: The Digital Competence Framework for Citizens, Update Phase 1: The Conceptual Reference Model, in 2017 an update of DigComp 2.1: The Digital Competence Framework for Citizens with eight proficiency levels and examples of use, and in 2022 a modification of DigComp 2.2: The Digital Competence Framework for Citizens with examples of knowledge, skills and attitudes applicable to each of 21 competences enumerated in the document.

The DigComp 2.2. framework consists of 5 dimensions, which define the underlying data model and collect all the elements showing how they are related to each other. The subsequent parts of DigComp are: dimension 1 – areas identified as part of the digital competences, dimension 2 – descriptions of the competences and titles related to each area, dimension 3 – levels of proficiency for each competence, dimension 4 – examples of knowledge, skills and attitudes applicable to each competence and dimension 5 – use cases on the application of the competences in different contexts (Dig Comp 2.2, 2022, p.5). In a DigComp 2.2. for each of the 21 competences, 10-15 statements are given that describe them and give contemporary examples of these competencies. By that way more than 250 examples of knowledge, skills and attitudes provided highlight new and only recently emerging topics related to digitization (R. Vuorikari, R., Kluzer S., Punie, Y., 2022, p.5). They are certainly useful for those responsible for planning and updating curricula and for developing digital training courses and their syllabuses. The range of 5 areas and 21 digital competences in DigComp 2.2 reference model is presented in Table 1.

Table 1. *DigComp 2.2 conceptual reference model*

INFORMATION AND DATA LITERACY	1.1 Browsing, searching and filtering data, information and digital content 1.2 Evaluating data, information and digital content 1.3 Managing data, information and digital content
COMMUNICATION AND COLLABORATION	2.1 Interacting through digital technologies 2.2 Sharing information and content through digital technologies 2.3 Engaging in citizenship through digital technologies 2.4 Collaboration through digital technologies 2.5 Netiquette 2.6 Managing digital identity
CREATION OF DIGITAL CONTENT	3.1 Developing digital content 3.2 Integration and re-elaborating digital content 3.3 Copyright and licences 3.4 Programming
SAFETY	4.1 Protecting devices 4.2 Protecting personal data and privacy 4.3 Protecting health and well-being 4.4 Protecting the environment
PROBLEM SOLVING	5.1 Solving technical problems 5.2 Identifying needs and technological responses 5.3 Creatively using digital technologies 5.4 Identifying digital competence gaps.

Source: own study based on the R. Vuorikari, S. Kluzer, Y. Punie, DigComp 2.2 – *The Digital Competence Framework for Citizens with new examples of knowledge, skills and attitudes*, Luxembourg: Publications Office of the European Union, 2022, p. 4

European Union policy on raising and measuring citizens' digital competences

DigComp as a kind of the theoretical framework was used to develop the kind of benchmarking tool – the Digital Skills Indicator (DSI), which is an important EU-wide indicator for monitoring the level of digital skills of EU citizens and is used to set policy targets (Dig Comp, 2022, p. 4). It was first introduced by the European Commission in the 2010 European Digital Agenda, which included 'EU-wide indicators of digital competences and media literacy'. Following a pilot project in 2014, DG CNECT (Directorate-General for Communication Networks, Content and Technology) and the Eurostat

Working Group on Information Society Statistics developed and published a 'Digital Skills Index' based on the Digital Competence Framework for Citizens, using data from the EU survey on ICT use by households and individuals. From 2021, the DSI is to be published every two years. It is worth mentioning that the DSI data is also used by the Commission as the element of another indicator, the Digital Economy and Society Index DESI (European Commission, 2022), which is a composite indicator that aggregates a number of related indicators on digitisation in Europe and allows monitoring the progress of Member States towards digital resilience. One dimension of the DESI index relates to human capital, which takes into account digital skills at basic and advanced levels (European Court of Auditors, 2021, p.11).

It is also worth mentioning the international I-DESI index, which slightly extends the application of the DESI index to 18 countries outside the EU, allowing wider comparisons of performance in the digital area. Also, the OECD has a programme to assess and analyse adult skills, the Programme for the International Study of Adult Competencies (PIAAC). The survey includes an adult skills survey, which measures the level of key information processing skills – literacy, mathematical reasoning and problem solving. The main aim of the survey is to analyse the cognitive aspects of problem solving, with the use of ICTs treated as a secondary objective. The survey is conducted every 10 years and has had two cycles so far. In the first cycle, three rounds of data collection took place between 2011 and 2018. In 2018, the second cycle of the survey began and the results will be published in 2024(OECD). The EU's policy for raising the digital competences of citizens is to support the actions taken by member states through the construction of guidelines, recommendations, support for networking and, of course, funding of activities related to the implementation of the adopted intentions. Starting in 2010, the European Union has launched various initiatives to improve the digital competences of citizens from different target groups. Through the development of the digital competences framework already mentioned, it has assisted countries in the development of national digital literacy strategies and helped create national coalitions for digital literacy and employment in the Member States (European Court of Auditors 2020, p. 24). The most important EU initiatives aimed to improvie digital competences shows chronologically Table 2.

Table 2. *Key European Union initiatives to improve digital competences*

Initiatives	Main objectives for enhancing digital competences of EU citizens
eEurope 2002 Communication – Impacts and Priorities, – 2001.	Priority areas: new framework for electronic communication services, high-speed infrastructure e-learning and e-employment skills e-commerce, e-inclusion, e-government (e-Europe Communication, 2001, p.11-15)
Council conclusions 12 May 2009	Establishing a strategic framework for European cooperation in education and training Strategic objectives: 1.Making lifelong learning and mobility a reality; 2.Improving the quality and efficiency of education and training; 3.Promoting equity, social cohesion and active citizenship; 4.Enhancing creativity and innovation, including entrepreneurship, at all levels of education and training(ET 2020, 2009, p.119/3; 119/4)
Commission Communication. *Europe 2020 – A strategy for smart, sustainable and inclusive growth* . *inclusive growth*. – 2010r.	*Europe 2020 presents three mutually reinforcing priorities: smart growth: developing an economy based on knowledge and innovation, sustainable growth: promoting a more resource efficient, greener and more competitive economy, inclusive growth: fostering a high-employment economy delivering social and territorial cohesion.*(Europe 2020, 2010, p.5) Addressing digital skills through the introduction of the ‚Digital Agenda for Europe' and the ‚Agenda for New Skills and Jobs'.
First Digital Competence Framework for Citizens – 2013 r.	Following the Council's recommendations, a team consisting of: Joint Research Center on behalf of the Directorate General (DG) for Education and Culture and the DG for Employment, Social Affairs and Inclusion of the European Commission. It developed the first framework of digital competencies for citizens, the so-called DigComp. It defined digital competencies as a combination of 21 competencies grouped into five main ones (European Commission, Measuring Digital Skills across the EU: Digital Skills Indicator 2.0, 2022, p. 4.
Digital Single Market Strategy – 2015.	The digital single market strategy is based on 3 pillars: better access for consumers and businesses to goods and services online across Europe, creating the right conditions for the development of digital networks and services, and maximizing the economic growth generated by the European digital economy and in it widening the circle of people using the digital economy and improving their skills.(Digital Single Market Strategy for Europe, 2015, p.4)

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Digitalization of European Industry. Taking full advantage of the digital single market – 2016.	One of the priorities adopted has been to prepare human capital for the digital transformation and equip it with the necessary skills (Communication Digitization of European Industry, 2016, p.16).
Council recommendation of December 19, 2016 on skills improvement pathways: new opportunities for adults – 2016.	One of the recommendations to member states is to achieve a minimum level of literacy and mathematical reasoning, as well as digital competence in adults with low skills, knowledge and competencies.(EU Council Recommendation, 2016, p.484/4).
Digital Skills and Employment Coalition – 2016.	All organizations that are taking action to increase digital skills in Europe can become members of the Coalition. The Digital Skills and Employment Coalition Governing Board provides strategic leadership for the Coalition. The Coalition addresses the digital skills needs of four broad groups: Digital Skills for All, for the Workforce, for ICT Professionals, and in Education.(European Commission, https://digital-strategy.ec.europa.eu/pl/policies/digital-skills-coalition)
Council recommendations on key competencies for lifelong learning – 2018.	Among other things, Recommendation 2.4 was issued – to promote and improve the level of digital competence at all stages of education and training, in all groups of the population;(Council Recommendation, p.189/4
Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – *A European Skills Agenda for Sustainable Competitiveness, Social Justice and Resilience* – 2020.	The Communiqué adopted quantified targets for skill improvement (raising the level of skills already possessed) and retraining (acquiring new skills) to be achieved over the next five years.
Proposal Regulation of the European Parliament and of the Council on the European Social Fund Plus (ESF+) – 2018.	Digital skills are included in the objectives: *ESF+ should provide support to improve the quality, efficiency and responsiveness of education and training systems to the needs of the labor market in order to facilitate the acquisition of key competencies, in particular digital skills, which all individuals need for personal fulfilment and development, employment, social inclusion and active citizenship.* (ESF+ Regulation of the European Parliament and of the Council, 2018, point. 14)

Proposal for a Regulation of the European Parliament and of the Council establishing *Erasmus*: the Union Programme for Education, Training, Youth and Sport and repealing Regulation (EU) No. 1288/2013. Erasmus for 2021-2027 – September 2020.	The new program is a continuation of an earlier program program and is intended to provide support for vocational training and education, digital skills and adult education. Digital skills are explicitly mentioned in the regulations, with a special focus on advanced skills.
Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, *Digital Education Action Plan 2021-2027. Bringing education and training back to the digital age.* – 2020r.	Priority areas and activities: Strategic Priority 1: Support the development of a high-performance digital education ecosystem. Strategic Priority 2: Strengthen digital skills and competencies for digital transformation. In addition: Strengthen cooperation and exchange in digital education at the EU level
Council Recommendation of October 30, 2020 on Bridge to Employment – Strengthening the Youth Guarantee and Replacing the Council Recommendation of April 22, 2013 on Establishing a Youth Guarantee – 2020.	*Targeted upskilling helps young people respond to the growing demand for digital skills and addresses the digital divide* (Council Recommendation on Bridging to Employment, 2020, p. 372/4
Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A European Skills Agenda for Sustainable Competitiveness, Social Justice and Resilience – 2020.	5 components of the program: „Call for concerted action to mobilize businesses, social partners and stakeholders to commit to working together, particularly within EU industrial ecosystems and across value chains Identify a clear strategy to ensure that skills lead to jobs Support citizens in building their skills throughout their lives in an environment where lifelong learning is the norm Identifying the financial resources that will be allocated to invest in skills Setting ambitious up-skilling and re-skilling targets for the next 5 years (European Skills Agenda for Sustainable Competitiveness, Social Justice and Resilience, 2020, p. 4.
Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Digital Compass for 2030: The European Way in the Digital Decade – 2021.	One of the 4 main directions of the Digital Compass for 2030 is a digitally qualified society and highly skilled digital professionals.

Source: own compilation based on the analysis of legal acts of the European Union listed in the table

The review of the actions taken by the European Union for more than 20 years shows the scale of the initiatives aimed at improving the digital skills of its citizens nad employees. The cited initiatives were and are often a part of broader activities involving different target groups and different levels of government, NGOs, educational institutions, businesses.

The gaps and disparities in digital competences across Eurpean Uninon countries

The European Union seeks to continuously improve the digital skills of its citizens, through guidelines and recommendations for member countries, the implementation of which it monitors, while supporting the formation of networks and funding individual activities. However, it is the responsibility of member states to take appropriate measures related to the organization of the vocational education and training system (European Court of Auditors, 2021, p. 5.). It is worth reading the basic indicators presented by the European Union to get an idea of the progress being made by individual member countries. Below (in Table 3) is presented the level of overall digital skills according to the Information Society Index from 2015 to 2019 and separately for 2021.

Table 3. *Level of general digital skills according to the Information Society Index (DSI) in 2015 – 2019*

	2015					2017					2019				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
European Union - 27 countries (from 2020)	23,18	27,05	26,69	53,74	0,87	25,83	26,21	29,04	55,25	0,94	28,89	25,00	31,05	56,06	1,03
European Union - 28 countries (2013-2020)	23,30	27,09	28,23	55,33	0,83	25,53	26,00	31,19	57,19	0,90	27,82	25,01	33,31	58,32	1,05
Belgium	24,40	29,16	31,13	60,29	0,37	26,92	29,57	30,99	60,56	0,20	29,23	26,65	34,18	60,83	0,21
Bulgaria	25,08	18,46	12,75	31,22	0,36	33,51	18,44	11,05	29,49	0,41	38,12	18,11	11,29	29,40	0,42
Czechia	23,17	33,97	22,93	56,89	1,23	23,94	35,78	24,06	59,85	0,85	24,36	36,30	25,79	62,10	0,58
Denmark	20,23	26,45	48,46	74,91	1,19	25,75	23,98	47,22	71,19	0,16	26,70	21,46	48,53	69,98	0,38

Germany (until 1990 former territory of the FRG)	20,65	31,42	35,30	66,71	0,22	21,73	31,46	36,71	68,18	0,34	22,49	31,32	38,84	70,16	0,33
Estonia	23,18	27,07	37,44	64,51	0,71	27,05	25,47	34,84	60,31	0,74	27,81	24,55	37,03	61,58	0,84
Ireland	34,86	19,37	25,01	44,38	0,88	32,95	19,90	27,74	47,64	0,64	35,77	19,24	34,14	53,38	1,19
Greece	22,15	27,91	16,11	44,01	0,67	23,15	24,49	21,66	46,16	0,59	24,19	27,20	23,32	50,52	0,96
Spain	22,83	23,87	30,02	53,90	1,96	27,81	23,16	31,61	54,77	2,03	31,49	21,11	36,09	57,20	2,03
France	27,64	29,93	26,85	56,78	0,27	28,89	27,89	29,24	57,13	0,54	31,58	26,38	30,92	57,30	0,51
Croatia	18,07	20,63	30,28	50,91	0,82	25,47	20,31	20,61	40,92	0,71	25,59	18,01	35,34	53,35	0,13
Italy	20,62	23,98	19,32	43,30	1,65	:	:	:	:	:	31,52	19,49	22,02	41,51	2,54
Cyprus	28,45	27,19	15,36	42,55	0,72	29,38	31,67	18,71	50,38	0,98	40,51	19,79	25,23	45,03	0,53
Latvia	29,48	23,66	25,54	49,20	0,53	32,88	21,27	26,80	48,07	0,37	42,28	18,51	24,45	42,96	0,89
Lithuania	19,50	20,95	30,29	51,24	0,64	21,99	22,85	31,94	54,78	0,85	24,79	23,85	32,30	56,15	0,65
Luxembourg	10,85	30,32	55,89	86,21	0,27	11,72	29,93	55,25	85,18	0,47	30,29	28,83	35,76	64,58	1,55
Hungary	23,24	27,10	22,42	49,52	0,07	27,02	23,84	25,75	49,59	0,13	31,33	23,32	25,36	48,68	0,36
Malta	23,27	18,14	34,54	52,68	0,82	23,02	17,90	38,70	56,59	1,14	29,41	17,56	38,25	55,82	0,55
Netherlands	20,24	29,91	42,52	72,43	0,43	15,66	31,65	47,85	79,49	0,18	16,43	29,81	49,56	79,37	0,25
Austria	18,96	31,21	32,79	64,00	0,97	19,19	31,23	36,22	67,45	1,29	20,93	26,33	39,22	65,55	1,28
Poland	26,81	24,98	15,07	40,04	1,15	28,46	25,25	21,13	46,38	1,15	34,94	23,16	21,29	44,45	1,04
Portugal	19,94	19,75	27,88	47,63	1,06	22,53	19,51	30,75	50,26	1,00	22,44	19,66	32,10	51,76	1,15
Romania	29,49	17,30	8,97	26,28	:	34,69	18,90	10,15	29,05	0,02	42,68	20,64	10,33	30,97	:
Slovenia	21,38	25,28	25,62	50,90	0,82	24,36	24,31	29,69	54,00	0,52	27,54	24,06	31,07	55,13	0,44
Slovakia	24,25	27,07	26,07	53,15	0,24	22,35	25,95	33,07	59,01	0,27	28,66	26,80	27,07	53,87	0,32
Finland	17,87	33,04	40,94	73,97	0,44	17,78	30,32	45,23	75,55	0,35	18,58	26,40	50,07	76,47	0,24
Sweden	17,36	36,35	35,24	71,58	1,67	18,19	30,83	46,38	77,20	0,80	23,65	26,38	46,04	72,42	1,48
Iceland	:	:	:	:	:	12,73	27,09	58,31	85,40	0,13	13,32	23,80	61,57	85,37	0,34
Norway	16,68	30,43	49,43	79,86	0,27	20,53	25,78	51,24	77,02	0	15,51	31,45	51,09	82,55	0,34

Switzerland	:	:	:	:	:	17,42	32,75	42,76	75,50	0,79	19,00	27,48	49,33	76,80	0,70
United Kingdom	24,20	27,41	39,86	67,27	0,54	23,47	24,53	46,02	70,55	0,60	20,50	25,04	48,85	73,89	1,19
Bosnia and Herzegovina	:	:	:	:	:	:	:	:	:	:	45,54	16,36	7,79	24,15	0,26
Montenegro	:	:	:	:	:	21,68	35,26	14,33	49,60	:	:	:	:	:	:
North Macedonia	33,11	23,24	13,84	37,08	0,19	41,92	20,28	12,21	32,49	0,23	49,66	16,48	15,07	31,55	0,13
Albania	:	:	:	:	:	:	:	:	:	:	46,71	14,15	7,33	21,48	0,37
Serbia	33,07	19,65	12,24	31,89	0,36	31,19	19,60	19,26	38,87	0,27	31,17	25,89	19,83	45,72	0,53
Türkiye	27,14	11,73	11,59	23,31	1,14	30,23	14,52	19,59	34,11	0,34	36,94	11,50	24,31	35,81	1,23
Kosovo (under United Nations Security Council Resolution 1244/99)	:	:	:	:	:	61,54	15,58	5,47	21,06	0,32	58,90	13,24	14,33	27,57	4,23

Source: own compilation based on database: Eurostat, Level of digital literacy of individuals (up to 2019) (online data code: ISOC_SK_DSKL_I)

Legend:
(1) Those with low general digital skills[I_DSK_L].
(2) Those who have basic general digital skills[I_DSK_B].
(3) Those who have above basic general digital skills[I_DSK_AB].
(4) Individuals who have basic or above basic general digital skills[I_DSK_BAB].
(5) Individuals who have no general digital skills[I_DSK_X].

Data analysis allows us to formulate several conclusions. There are large disparities in the level of general digital skills across the Union. When analyzing the percentage of people with basic or above basic general digital skills, the definite leaders are: Belgium, Denmark, Germany, Estonia, Luxembourg, the Netherlands, Austria, Finland, Sweden, Switzerland, Iceland, and Norway – with percentages above 60%. The countries with the lowest percentage of the people with such skills are: Turkey, Serbia, Macedonia, Romania, Poland and Bulgaria – 40 and below 40%. Analyzing the trend of change for the European Union average, for those with basic and secondary general digital skills, it is increasing, from 55.33% in 2015 to 58.32% in 2019, but the increase is not significant. Quite surprisingly, the percentage of people who have low

general digital skills increased between 2015 and 2019, from 23.30% in 2015 to 27.82% in 2019, and those who have no general digital skills from 0.83% in 2015 to 1.05% in 2019. The latest measurement of digital skills from 2021 defines basic digital skills relating to five areas: information and data literacy, communication and collaboration skills, digital content creation skills, cyber security knowledge, and IT problem-solving skills. Detailed data as of 2021 are presented in Table 4. The data show a still wide disparity in the level of digital skills possessed among EU countries. Ireland joined the leaders with a high percentage of people with basic or above basic general digital skills of 70.49%. It is also clear that countries have made little progress in basic digital skills. The leaders are already approaching the target set in the Digital Decade, which outlines the Union's vision for digital transformation, and are scoring close to the designated 80% of EU citizens aged 16-74 with at least basic digital skills. However, a large number of countries have this percentage at 30-40% and the European Union average is 59.92% – people with basic or above basic general digital skills (all five component indicators are at basic or above basic level). Details presents Table 4.

Table 4. *Digital literacy level of EU citizens from 2021 according to the Information Society Index (DSI)*

	1	2	3	4	5	6	7	8
European Union – 27 countries (as of 2020)	53,92	26,46	27,46	17,14	9,47	5,42	3,04	11,00
Belgium	54,23	26,34	27,89	18,59	11,71	5,24	3,01	7,21
Bulgaria	31,18	7,82	23,36	14,51	11,67	11,75	6,16	24,73
Czech Republic	59,69	24,06	35,63	17,36	8,42	2,42	0,96	11,15
Denmark	68,65	37,37	31,27	20,17	8,04	1,14	0,89	1,11
Germany (until 1990, former territory of the Federal Republic of Germany)	48,92	18,84	30,08	21,22	11,51	6,19	3,58	8,57
Estonia	56,37	27,68	28,69	19,13	9,82	3,37	2,28	9,02
Ireland	70,49	39,69	30,80	14,17	7,60	4,83	1,85	1,07
Greece	52,48	21,70	30,78	10,64	7,86	5,45	2,07	21,51
Spain	64,16	38,06	26,11	15,44	7,44	4,47	2,39	6,10

France	61,96	31,25	30,71	16,07	8,47	3,74	1,32	8,45
Croatia	63,37	31,18	32,19	11,57	4,73	1,49	0,10	18,75
Italy	45,60	22,52	23,08	16,34	9,84	6,12	3,69	18,41
Cyprus	50,21	20,95	29,26	20,58	10,07	6,98	2,92	9,24
Latvia	50,80	23,79	27,01	20,70	12,37	5,05	2,37	8,70
Lithuania	48,84	23,01	25,83	18,61	10,41	5,84	3,23	13,07
Luxembourg	63,79	31,81	31,98	20,41	8,32	4,70	1,44	1,34
Hungary	49,09	21,54	27,56	20,51	11,91	4,98	2,14	11,36
Malta	61,23	35,49	25,74	15,45	6,09	3,25	1,46	12,53
Netherlands	78,94	51,77	27,18	11,40	3,39	0,46	0,32	5,48
Austria	63,33	33,28	30,05	16,95	6,82	3,38	2,05	7,47
Poland	42,93	20,64	22,28	18,82	11,45	7,31	4,88	14,63
Portugal	55,31	28,54	26,76	12,64	6,99	4,76	2,60	17,69
Romania	27,82	8,73	19,09	16,53	14,23	14,88	10,13	16,41
Slovenia	49,67	19,72	29,95	20,48	11,21	4,80	2,84	11,00
Slovakia	55,18	20,83	34,36	18,15	8,93	4,40	2,26	11,07
Finland	79,18	48,13	31,04	12,58	3,59	1,02	0,33	3,29
Sweden	66,52	35,68	30,84	17,93	8,00	2,78	1,53	3,24
Iceland	80,99	44,77	36,23	12,10	4,93	0,74	0,68	0,56
Norway	78,71	42,59	36,12	15,03	4,33	0,86	0,49	0,58
Switzerland	77,79	40,26	37,53	12,22	4,60	2,17	1,36	1,86
Bosnia and Herzegovina	34,65	5,35	29,29	21,53	10,17	7,17	2,16	24,32
Montenegro	47,21	9,14	38,08	25,44	7,91	1,65	0	17,78
Northern Macedonia	34,62	8,15	26,48	18,28	15,93	11,71	5,85	13,60
Albania	23,80	4,01	19,79	16,80	17,39	14,42	6,96	20,63
Serbia	41,30	12,32	28,97	18,67	10,48	6,65	4,08	18,83
Turkey	30,12	9,87	20,25	19,64	14,34	10,00	7,32	18,59

Source: own compilation based on Eurostat data, level of digital skills of individuals (from 2021) Online data code:ISOC_SK_DSKL_I21

Legend:

(1) People with basic or above basic general digital skills (all five component indicators are at basic or above basic level)

(2) Individuals with above basic general digital skills (all five component indicators are at above basic level)

(3) People with basic general digital skills (all five component indicators are at or above basic level, but not all are above basic)
(4) People with low general digital skills (four of the five component indicators are at or above basic level)
(5) People with low overall digital skills (three of the five component indicators are at or above basic level)
(6) People with limited general digital skills (two of the five component indicators are at or above basic level)
(7) Individuals without general digital skills
(8) Digital skills could not be assessed because the person has not used the Internet in the past 3 months.

Murat Gümüş M. and Kukul W. cite studies of the concept of digital competence in education, including International Society for Technology in Education (ISTE) 2017, UNESCO ICT Competence Framework for Teachers 2018, Organisation for Economic Co-operation and Development (OECD) Report 2019 with guidelines and frameworks for digital competence skills directly in education, noting that the acquisition of digital competence also in education plays an important role in improving the knowledge and skills of teachers and students worldwide (Gümüş, MM, Kukul, V., 2023, p. 2749). Faced with the emergence of new phenomena such as disinformation, education should develop the skills to be critical, to filter and evaluate information and to deal with information overload (European Commission, 2018, p.2). While many studies highlight the need to develop citizens' digital competences in all age groups, few are devoted to teaching and learning methods. The European Commission states on its Erasms+ project results page indicates that at the end of 2019, Erasmus + had around 16 000 projects related to ICT, new technologies and digital competences and around 4 300 related to adult learning and education and vocational training.

International educational project ProDisk as an example of project learning based initiative aimed on development digital competences in EU countries

The PRODISK Erasmus + VET project initiative[1] is an example of the project learning based (PBL) approach (Barron et al, 1998 pp. 310-311**,** Helle et al 2006, pp. 288-289, Sturing, L.et al, 2011, pp. 192-194**)** via undertaking the international educational cooperation to achieve the objectives adopted by the European Union in terms of improving citizens' digital competences. The main advantage of PBL is the fit to educational needs especially adult people who are *learning by doing* and who are vitally interested to verify their competency requirements for demand of labour market (Pellegrino, J.W., Hilton, M.L., 2012). A review of the scientific literature on the PBL methodology (cf. Condliffe et al., 2017) shows that it is based on the development of transversal competences and on general *design principles*, opens up opportunities for the acquisition of new transversal and specialist competences. Today, Project based learning entered the new traction around the world as the growing number of educators recognize the need for new approaches to teaching and learning in the 21st century (Lamer et al, 2016, p.12). The uniqueness of learning in the PBL approach lies in the construction of the final product in the form of a *concrete artifact* (Helle et al., 2006, p. 312), which triggers a new way of understanding (insight) in the learner, updates his knowledge, shapes new attitudes towards the problem and a processed way of presenting its solution. Many authors recognize that modern information and communication technology (ICT) greatly supports the successful implementation of the PBL methodology and increases its effectiveness (Krajcik, J. S., Shin, N. 2014, p.297, Ravitz, J., Błażewski, J., 2014, p. 6578).

The PRODISK represents the example of PBL methodology adapted to educational needs of VET target groups. The project was designed and currenly is implemented (for years 2022-2023) by partners from three countries: Poland (Pomeranian University in Slupsk, Federation of Associations of Scientifical and Technical Councils of the West Pomeranian Region in Szczecin), Spain (Formacion y Educacion Integral in Madrid, Camara Oficial

de Comercio e Industria de Madrid, Knowledge Innovation Works S. L.) and Italy (Universita Degli Studi di Salerno, Conform-Consulenza Formazione e Management SRI). This partnership was sucessfuly confirmed in a previous project also funded by the Erasmus+ VET program, project LINCE[II] carried out from 2017 to 2019. The current project responds to a need detected during the implementation of the LINCE project implicating desiging next joint projects addressed to vocational students and adult people to promote their more effective employment. One of the findings of the previous project was that Vocational Education and Training (VET) teachers involved in subjects with a small number of technological components, do not have the resources and tools available to support the teaching and assessment of the digital competences required by students to face the labour market demands. The most specific deficiency identified by the participating teachers was a contextual practical framework to map students' activities with practiced and acquired digital skills. The teachers and VET centres involved in LINCE project indicated that without the additional support of the international project, the quality of student outcomes will not improve. The COVID-19 pandemic sudden experience only increased the need for the aforementioned resources with the requirement of partly distance learning methods.

The PRODISK project contrasted the detected need with the European Commission's diagnosis included in the Digital Education Plan 2021-2017 and delivered by other specialist researches. The discovered need occurred to be perfectly in line with the priority of the educational goals of digital transformation in Europe. All partners in the partnership bring a range of own specific experience in using digital skills for practical purposes in vocational and higher education. It was also recognised that a collaborative approach, characteristic pror theproject based learning approach would provide the results obtained with a broad international context for practicing and assessing digital competences, and enrich its quality and opportunities for use with greater impact than those expected from single local initiatives.

The specific objectives of the PRODISK project are: 1. to develop an e-course on Digital Skills Evaluation to help VET teachers to recognise and certify the digital competences acquired by students (from initial and continuing VET) in the development of their VET cycles. The course will be based on DigComp,

the digital competences framework developed by the European Commission. 2. to integrate the digital skills assessment course in a digital learning environment aimed at VET teachers and students. 3. to disseminate the learning environment in which the digital skills assessment course is integrated into VET centres in the three participating countries, with the support of official partnership partners and associated partners, as well as to extend the promotion of this resource internationally to all stakeholders for use online as an Open Educational Resource. 4 Achieve relevant sustainability indicators at the end of the project by using the selected learning environment for certification of practice and pilot activities for employment purposes.

In order to meet above objectives, a specific work plan was developed, i.e. a management, dissemination and quality plan to achieve the desired results and impact. The impact objectives were defined through qualitative and quantitative indicators, focusing on the target groups of teachers and students of VET centres and civil society institutions (chambers of commerce, professional and regional associations, educational authorities. The impact objectives were also defined at a wider international level through specific promotional activities, including participation in international events, publication of specific documents and making the results available on online learning platforms. The main intellectual outcome of the project is an e-learning course integrated in an open digital learning environment, facilitating the teaching of digital skills and their assessment at an initial and intermediate level of difficulty, according to DigComp framework, which will be introduced to VET schools with practical application of digital competences in different work-related geographical contexts. The course will help in the assessment of practical digital skills with a specific approach to certification for initial and continuing VET, socio-economic organisations (chambers of commerce and professional associations) via using certification of digital competences for employment purposes. PRODISK project develops educational pills and training resources developed by INTEF in Spain. aimed especially at teachers in secondary schools. In particular, it extends the theoretical content with a concrete, contextual exercises. In Italy and Poland, PRODISK is the first initiative bringing DIGCOMP closer to the specific context of VET for employment. PRODISK furthermore complements various international

initiatives: ELENE4WORK guide for job seekers, by extending soft skills to curricular and work-based skills, BILDUNG IN DER DIGITALEN WELT, using part of its methodology to help integrate PRODISK resources into the curricula of VET partners and associated partners, PATHWAYS4EMPLOY, using the different elements of the digital profiles included in the project to define specific practical exercises for the assessment and recognition of digital skills. PRODISK builds in particular on TUCERTICYL, an initiative of the Spanish regional administration of Castilla y Leon for certification purposes, by developing an assessment approach based on an e-learning course. The course will consist of interactive online learning resources to be developed as part of the PRODISK project, in which students will be required to acquire a range of digital competences, including but not limited to: information retrieval, sharing digital resources, digital interaction with resources and decision-making problem solving. Interactive practical resources for VET were not found in any of the studies of the Resource Guide of the European Commission's Joint Research Centre publishing DIGCOMP-related initiatives. The outcome of PRODISK is also expected to have an internal and external impact on the partnership. Internally, through the partners and associated partners, the result will be used as an educational resource in the VET centres and universities participating in the initiative (reaching tens of thousands of people in Spain, Italy and Poland). Externally, it intends to become one of the international initiatives gathered regularly by the European Commission to promote DigComp in the Member States, thus influencing new related initiatives in other countries. In an educational context, it is expected that the results of the project will be used as a tool to recognise and certify the digital competences acquired by students (from initial and continuing VET, including universities) and to develop their further, long-ligfe learning education. Through promotion and dissemination activities, it is assumed that the product will be made available to stakeholders also in other countries. The resource will be open for online use and available in the three languages of the partnership (Polish, Spanish, Italian) and in English.

Conclusions

In the light of presented data it can constated that both research hypotheses were confirmed.

Ad. Hypothesis 1: Without constant development and improvement digital skills the citizens and employees of EU can't fully participate in the modern digital society and gain the profits flying from digitalization of economy and civic services. Digital competences are also the base of competitiveness and sustainability of EU in an era of digital economy.

Although European Union have elaborated during last several years a scope of legal documents and operational programms, including Erasmus+ learning dimentions, oriented on achieving long term goals on the way to wide societal digitalization, the status quo of digital skills of Europen citizens and employees is fare away from satisfacionary. The digital competences gaps and disparities in a space of European Union still are significant and highlight the need for complex intervention. There is a visible disparity in digital competences across different member states and within different demographic groups within the European Union. Some, and mostly still same, regions and populations lag behind in acquiring and utilizing digital skills effectively. All of it signalizes the risks on the way to improve European Union market competitiveness and sustainability as the strategic goal of the "Digital Education Action Plan 2021-2027, or Digital Compass for 2030.

Ad Hypothesis 2: The international partnerships and project based learning methods are recommended as the plausible plaforms for designing and implementing widely used digital tools by EU citizens and organizations oriented on implementing long life learning initiatives. The presented data of gaps and disparities of digital competences in a space of EU indicate the urgent need to intensify long term learning activities of government and non-governmental and educational institutions to accelerate the wide societal digitalization. Especially welcomed are efforts directed on developing the unified system of EU standards for proving digital competences of citizens and employess should help to achieve better competitiviveness and sustainability of Europen market. For this purpose, existing computer literacy certification programmes can be used, e.g. the popular ECDL (European Computer

Driving Licence), called European Computer Skills Certificate in Poland, as an example of a certificate recognised by employers in Europe and worldwide (now ICDL – International Computer Driving Licence), which includes 177 learning outcomes assigned to the DigComp framework (Unesco, 2018, p.12). There are many examples of digital literacy frameworks and certification in Europe and internationally, e.g. British Columbia Digital Literacy Framework, IC3 Global Standard 5, Microsoft Digital Literacy Standard Curriculum Version 4.0, Costa Rica Student Performance Standards in Digital Technology-enhanced Learning (Unesco, 2018, p.12). Therefore, it seems appropriate to move towards standardisation of certification based on the frameworks developed by the European Union in order to make the validated skills as compatible with them as possible.

The case study of the project PRODISK illustrates how the European universal theoretical reference model of DiscComp can be used for dissemination of the long life learning initiatives and how to build effective international cooperation on the field of vocational education to help Europen citizens, employees, and organizations meet digital economy demands. The development of the open online learning platforms can be used to raise and certify the level of digital competence for different target groups: young people and adults and accompanying them intheir long life learning process.

There is still not sufficient amount of the research dedicated to the specificity of the learning processes of adult people in a fast accelerating digital era: their preferencies, barriers, and most adequate learning methods (Condliffe et al., 2017, Gümüş, MM, Kukul, V., 2023, p. 2749). While many studies highlight the need to develop citizens' digital competences in all age groups, still only few are devoted to teaching and learning methods and its standardization for the age of digital economy (Larmer et al. 2016). Especially today, in a time of emergence of new digital threats phenomena, education should develop the skills of data critical selection, carefully filtering and evaluating information and dealing with information overload and disinformation (European Commission, 2018, p.2).

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Endnotes

[I] PRODISK project's web: https://prodisk.eu/en/
[II] LINCE project's web http://proyecto-lince.com/en/