



Digital Competence Survey in Hungary and Austria

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Abstract: Nowadays, Information Technology (IT) is developing at a rapid pace. Existing techniques are being upgraded, and new ones are emerging. Big data, Artificial Intelligence (AI), Cloud Computing, etc., are becoming part of our lives. This makes it essential to develop digital knowledge and skills, as well as to foster a positive attitude towards innovation. In our cross-border research “DIGAP” “Intergenerational accessibility in digitalization among women”, digital competences were measured in 3 target areas: in Zala County, Graz, and in the East Styria region among women aged 15 and over. The target sample size was 250-250, stratified by age group, education, and place of residence. Our research questions asked whether there were differences in educational attainment between the two regions regarding digital competencies. Data collection took the form of an online questionnaire and a small-scale survey administered by a survey administrator. The questionnaire questions were developed by our research team based on the recommendations of the DigComp 2.2 framework, which was identified as the preferred framework in the literature review. The data were processed using SPSS statistical software. Our questions also included an assessment of the areas in which the women surveyed felt the need to develop their digital competences... The analysis also included the exploration of correlations and the description of cluster group behavior. In this paper, we present our partial results with a focus on educational attainment. In the future, we also plan to conduct focus group interviews among the target group.

Keywords: digital competence, digital literacy, education, cross-border research

1. Introduction

The aim of the research is to assess the digital competences of women in Zala County and in the Austrian regions of Graz and Eastern Styria, based on the European DigComp 2.2 framework, with a particular focus on the role of education.

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Digital competence is a key element of today's knowledge-based economy and a fundamental prerequisite for success in the labor market and social integration. The ever-growing importance of the digital economy and labor market, the widespread use of ICT tools, and the demand for digital skills in the labor market make it increasingly urgent to map individual competencies. European and national policy objectives, such as the Lisbon Strategy and the Digital Welfare Program, also emphasize the importance of developing digital knowledge. The research, therefore, aims to explore the extent to which women with different levels of education have elements of digital competence and what factors influence their presence or absence, which may contribute to the development of targeted education and employment policy interventions. Interreg is one of the European Union's oldest and most successful initiatives, designed to promote cross-border cooperation between European regions. The aim of the Interreg program is to support the management of common challenges, promote knowledge sharing between regions, and strengthen social and economic cohesion. The program provides funding in various areas, such as innovation, environmental protection, transport, or, as in this case, digital social cohesion. The DIGAP project is being implemented under the Interreg AT-HU (Austria-Hungary) cooperation program, which aims to promote the sustainable development and social integration of border regions.

The subject of this paper is to show the results so far of the Digital Competence Survey, which is part of the DIGAP project called "Intergenerational Accessibility in Digitalization among Women" (code: ATHU-0200079), funded by Interreg AT-HU. Three partner organizations are participating in the research; the lead partner is the University of Pannonia, Faculty of Business and Economics, in Zalaegerszeg, and its partners are the Local Government of Zala County and the Graz-based Nowa Verein. The aim of the DIGAP project is to establish digital competence development and digital self-defense training for women in Eastern Styria and Zala County through cross-border scientific research, analyzing women's digital competencies and digital self-defense skills by age group.

Both in Hungary and Austria, women face many challenges in using digital tools and acquiring the necessary digital skills. Women are still underrepresented in the field of technology and digitalization, and gender-specific gaps in digital skills are present.

The project will provide new insights to understand women's current digital habits, attitudes, and competencies through questionnaire research and focus group interviews in Zala County (Hungary), Graz, and Eastern Styria (Austria). A unique feature of the project is that the two research areas can be compared through a joint questionnaire and subsequent focus group interviews. In order to show which country and which generation lead the way in terms of women's digital competencies, it will be possible to analyze how they have achieved this. The two regions can learn from each other. Secondly, in order to reduce the digital divide, the project offers good opportunities for cooperation and development for both parties through joint design and implementation of the programs developed. Through the project, we can support women's digital

development, as a result of synergies and a proactive approach, and help them to benefit from the rapid development of digitalization and keep pace with the rapid evolution of the information society.

Developing women's digital competencies will also improve their access to education (e.g., they can more easily join online courses and acquire lifelong learning skills).

The project study builds on existing findings in Austria and Hungary and analyzes quantitatively and qualitatively the factors that inhibit and promote digital participation, focusing on women of different age groups. In both countries, the promotion of equal digital participation stems from regional and national strategies and action plans.

The questionnaire also addresses the distraction of social media and digital tools and the issue of cyberbullying. This part of the research could be the first element of an online threat warning system, as some online social media and online bullying trends are spreading from country to country. The comparison of the two regions will be carried out through quantitative research with a total of 500 questionnaires on both sides of the border. The questionnaire will be developed jointly by the three partners, highlighting differences or similarities in the problems and good practices available in the two regions. The target group is women aged 15 and over living in the two regions, with a representative analysis by age group.

The qualitative research has the same aim as the quantitative one, but provides a much deeper understanding of the problem: The focus group interview questions will also address the distraction of social media and digital tools and the problem of online attacks, cyberbullying. A comparison of the two regions will be made in qualitative research with 10–20 participants per country (depending on the element needed to achieve representativeness) on both sides of the border. The focus group interview questions will be developed jointly by the three partners, highlighting differences or similarities in the problems and good practices available in the two regions. The target group is women aged 15 and over living in the two regions, with a representative analysis by age group. In addition to age groups, we also differentiated the target group according to educational background and place of residence. The categories based on educational background are interpreted differently in the two regions.

Based on the results of the research, further cooperation is planned. Cross-border training programs, digital self-defense training, and workshops are planned for the target group on both sides of the border with the participation of the project partners.

The innovation of the project lies in the fact that, in line with the EU guidelines, but specifically for the program area, a unique, gap-filling primary research is being carried out, broken down by age group. The research will also identify digital challenges or attacks that are constantly changing, even on a daily basis, and will be addressed through the research in the university's subsequent training programs. (Interreg Austria-Hungary, 2024.)

2. Review of Literature

2.1 Europe's Digital Decade

The Europe's Digital Decade program is a policy program that aims to make the European Union's digital transformation a success by 2030. This includes improving connectivity, digital skills, digital businesses, and digital public services. In the framework of the program, member states work together to achieve the set goals, about which they report annually to the European Commission.

To reach the digital targets and objectives, the European Commission will accelerate and facilitate the launch of multi-country projects, large-scale projects that no single Member State could develop on its own.

These projects could:

- combine investments from the EU budget, including from the Recovery and Resilience Facility, from Member States, and the private sector
- address gaps in the identified critical capacities of the EU
- support an interconnected, interoperable, and secure Digital Single Market

The Commission has identified an initial list of multi-country projects. This list includes areas for investment such as data infrastructure, low-power processors, 5G communication, high-performance computing, secure quantum communication, public administration, blockchain, digital innovation hubs, digital skills, and cybersecurity. (European Commission, 2025)

2.2 Digital economy

According to the European Commission, the continent's digital economy has the potential to generate significant revenues in all sectors. However, in order to translate this potential into sustainable growth and new jobs, governments need to provide direction by adopting coordinated policies that can break down existing barriers to new services.

We need to seize the opportunities offered by the new generation, which will soon become an unavoidable factor in the European market. To achieve this, however, the economic potential inherent in the "digital generation" must be realized by enabling easy access to digital content. (European Commission, 2009.)

The digital economy depends on the macroeconomic conditions that characterize a particular economic structure. A key part of the digital economy is digital marketing, which refers to the form of marketing activity related to interactive business work that communicates with individuals and masses in a specific way in network information systems and electronic media, supporting global sales with online and offline tools.

"Nowadays, a country's comparative advantage depends largely on the level of development of its information technology. It is increasingly evident that information technologies are being integrated into manufacturing processes and products, replacing labor with robots and computers. However, the remaining labor demand requires a specially trained workforce." (Eszes, 2013.)

According to the Association of IT, Telecommunications and Electronics Companies, the spread of electronic systems and IT applications has been accelerating exponentially for years, as the availability of high-volume broadband infrastructure and continuous innovation in the market for information and communication tools and services have led more and more sectors to decide to digitize their production and commercial processes. This process is unstoppable and irreversible, as it is no longer innovative or experimental in nature, but economic: businesses that consciously and systematically use IT solutions are more efficient and competitive than their competitors using traditional solutions in all areas of industry and the economy. (IVSZ, 2016.)

The digital economy accounts for 20% of Hungary's total gross domestic product and provides jobs for nearly 15% of the workforce (European Commission, 2022). The narrowly defined information and communications technology (ICT) sector accounted for 8.3% of national exports in 2014 and represented more than 10% of Hungarian R&D expenditure in 2013. Large companies dominate the sector, especially in ICT manufacturing, but domestic small and medium-sized enterprises are playing an increasingly important role in the ICT services segment, which includes software and application development companies. (Digital Welfare Program, 2016)

In March 2000, the Lisbon European Council set a new strategic goal for the European Union. According to this, the European Union should strive to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable growth with more and better jobs and greater social cohesion. To achieve this goal, education and training systems that meet the requirements of a knowledge-based society and are capable of satisfying the demand for higher-level and higher-quality employment are needed.

One of the main components of this is encouraging the acquisition of new basic skills. The Lisbon European Council called on Member States, the Council, and the Commission to develop a "European reference framework for new basic skills" to be acquired throughout lifelong learning, which should include the skills needed in the areas of information and communication technologies, technological culture, foreign languages, entrepreneurship, and social relations. (European Council, 2001.)

According to the European reference framework for key competences for lifelong learning, key competences are transferable, multifunctional units of knowledge, skills, and attitudes that everyone should have in order to fulfill and develop their personality, integrate into society, and be employable. Key competences should be acquired during compulsory education and training. Later on, these competences form the basis for all types of learning throughout lifelong learning.

Of these eight key competencies, digital competence refers to the confident and critical use of electronic media at work, in leisure time, and in communication. This competence is linked to logical and critical thinking, high-level information management skills, and advanced communication skills.

At the most basic level, skills related to the use of information and communication technologies include searching for, evaluating, storing, creating, presenting, and transferring multimedia information, as well as the ability to communicate online and participate in networks. (Borbély–Pecze, 2011.)

2.3 Interpretations of digital competence

In its recommendation published in 2006, the European Council defined the key competences for lifelong learning that are necessary for individuals to learn, work, participate in society, develop, and achieve self-fulfillment. These include digital competence, which, according to their interpretation, encompasses the confident, critical, and responsible use of digital technologies and a commitment to them (Union, 2010). At the same time, there are several different approaches to the concept. In his study, Bak–Kővári (2019, p 56) summarized a group of interpretations of digital competence (see Table 1).

Table 1. Definitions of digital competence

Authors	Definitions
Martzoukou et al. 2020	Interpretations of digital competence go beyond digital literacy, technological tools, or media use. It also involves developing a mindset. Digital competence develops throughout our entire lives.
Bawden 2001	The ability to decode images, sounds, etc., as well as texts.
Hargittai 2005	The user's ability to search for Internet content efficiently and effectively.
Baird-Henninger 2011	The ability to create and understand multimedia, multimodal texts using digital technologies.
Ferrari 2012	The set of knowledge, skills, and attitudes necessary for the confident, critical, and creative use of ICT.

Gastelú et al. 2015	Skills and knowledge used in the application of information and communication systems.
Siddiq et al. 2016	The confidential, critical, and creative use of ICT to achieve goals related to work, employability, learning, leisure, social inclusion, and/or social participation.
DQ Institute 2017	The skills needed to meet the demands and challenges of the digital world include digital citizenship and literacy skills.

Van Deursen (2010) concluded from his research that digital competence is more than just the ability to use digital platforms in practice. It is also necessary to critically understand the content found.

Based on the research presented, it can be stated that the interpretation of the concept of digital competence is so diverse that there is no uniform or globally accepted definition (Ferrari – Punie –Redecker, 2012); (Ala – Mutka, 2011). At the same time, what these approaches have in common is that they are not only about access to and use of technology, but also about its meaningful use in life, work, and learning (Skov, 2016).

Digital competence is a combination of knowledge, skills, and attitudes; in other words, the acquisition of information, the ability to apply knowledge, solve tasks and problems, and the mindset and motivation behind actions.

2.4 Digital Competence Framework

The new European framework developed by the European Commission in 2013, DigComp, enables a uniform interpretation of digital competence (Chira, 2020).

The framework has undergone continuous development:

- DigComp (2013)
- DigComp 2.0 (2016)
- DigComp 2.1 (2017)
- DigComp 2.2 (2022)

According to DigComp 2.2, digital competence includes:

- proficiency in information and data management;
- communication and collaboration, media literacy;
- digital content creation (including programming);
- safety (including digital well-being and cybersecurity competencies);
- and problem-solving and critical thinking.

A more detailed description of each area is provided in Fig. 1 (Vuorikari – Kluzer – Punie, 2022, p 4).

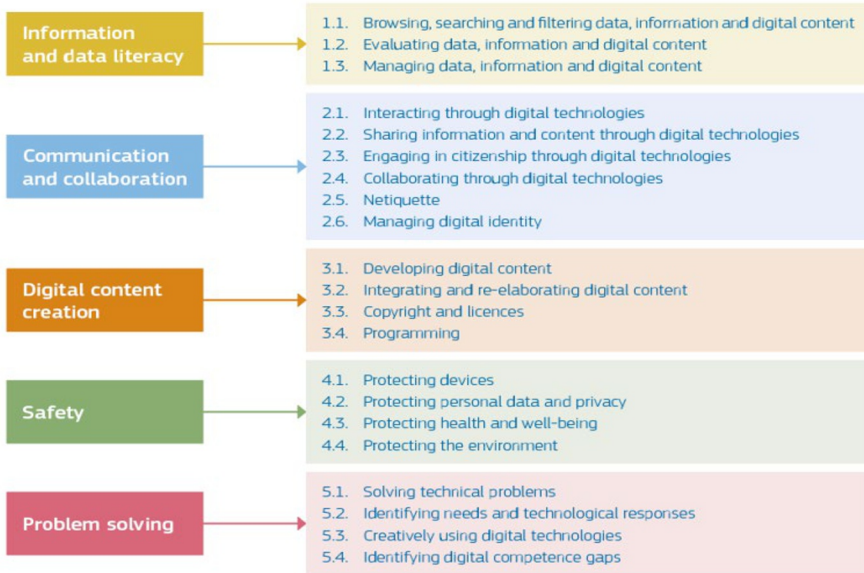


Fig. 1. The DigComp model

The DigComp 2.2 framework (Vuorikari – Kluzer – Punie, 2022, p 9) includes 8 levels of digital competence proficiency (see Fig. 2).

FOUNDATION	1	At basic level and with guidance
	2	At basic level and with autonomy and appropriate guidance where needed
INTERMEDIATE	3	On my own and solving straightforward problems
	4	Independently, according to my own needs, and solving well-defined and non-routine problems
ADVANCED	5	As well as guiding others
	6	At advanced level, according to my own needs and those of others, and in complex contexts
HIGHLY SPECIALISED	7	At highly specialised level
	8	At the most advanced and specialised level

Fig. 2. Digcomp2.2 Proficiency Level

2.5 Comparing the educational systems of Austria and Hungary

The educational systems of Austria and Hungary exhibit distinct structures and characteristics reflective of their national policies and historical contexts, while both align broadly with European educational frameworks.

Compulsory education in Austria is constitutionally mandated, requiring children to attend school for nine years, generally beginning at age six (Bildungssystem, 2025). This compulsory schooling is divided into three main phases: primary education, lower secondary education, and a ninth year focused on vocational or other school types.

Primary education, provided in Volksschule (elementary school), covers grades 1 to 4 for children approximately aged 6 to 10. Subsequent lower secondary education (grades 5 to 8) offers differentiated pathways: students may attend Mittelschule (middle school), Neue Mittelschule in regions such as Vienna, or the lower levels of Allgemeinbildende Höhere Schule (AHS or Gymnasium), a general secondary school that often extends to grade 12 and culminates in the Matura, a school-leaving exam qualifying for university studies. The ninth compulsory school year, typically for children aged 14 to 15, can take place at a polytechnic school emphasizing vocational preparation or at other specialized institutions.

Higher education entry in Austria requires passing the Matura or alternative exams like the Berufsreifeprüfung (vocational matriculation) or Studienberechtigungsprüfung (university entrance qualification). Austria offers diverse higher education pathways, including universities, universities of applied sciences, technical colleges, and teacher training colleges, focusing on various disciplines and professional fields (Austrian Federal Ministry of Education website).

In Hungary, compulsory education begins at age six and extends until students complete the school year, or they turn sixteen, with possible extensions to age twenty-three for students with special educational needs (KOL, 2025). Hungarian secondary education is offered through distinct grammar schools that vary in length (four, six, or eight years), preparing students for university entrance. Professional technical schools provide a school-leaving exam after four years and a technical qualification after five years. Both state and certain church-affiliated institutions provide secondary education.

The Hungarian Educational and Qualification System is organized into eight progressive levels aligned with the European Qualifications Framework (EQF) (Cedefop, 2020; European Commission, 2015). Levels range from foundational skills at primary completion (EQF Level 1) to doctoral qualifications (EQF Level 8). Completion of the 8th grade marks the end of compulsory education (Level 2), with subsequent levels representing progressively advanced vocational and academic competencies, culminating in tertiary education degrees and doctoral research qualifications (Eurydice, 2023).

Szoták (2021) outlines terminological divergences, noting that the Austrian Neue Mittelschule corresponds to grades 5–8 of the Hungarian elementary school, highlighting the necessity for linguistic and systemic awareness when comparing the two countries' educational data. Both systems provide for special education provisions and allow for alternative or private schooling to fulfill compulsory requirements.

Both Austria and Hungary maintain compulsory education beginning at similar ages, with Austria's compulsory schooling set at 9 years and Hungary's at 16 years, extended as needed for students with special needs. Austria's system emphasizes early vocational orientation and offers a direct vocational pathway in the ninth year, while Hungary

structures education within an eight-level framework matched to the EQF, encompassing vocational and academic progression culminating in higher education (European Commission, 2008). Both countries facilitate diverse secondary education options and maintain pathways for adult and vocational education, reflecting integration with broader European educational standards.

3. DIGITAL COMPETENCE RESEARCH USING QUANTITATIVE METHODS

Objective: to assess and analyze the digital competences and digital self-defense skills of women over the age of 15 in Eastern Styria, Graz, and Zala County.

Research questions:

1. Does the level of education of women over the age of 15 in the two investigated regions influence their digital competence?
2. Are there any differences in the data of the two regions in digital competences and the use of digital devices?

Comprehensive data on the target population are not available, so quota sampling was used based on data from the Hungarian Central Statistical Office for 2022 and the Austrian Statistical Office for 2023. The sample was determined using proportional stratification based on the demographic characteristics of the population, age, education, and type of residence (city, town/rural area).

According to the plan, a sample of 250 people was selected in each country.

Data collection was carried out using an online self-completion questionnaire (computer-assisted self-interviewing – CASI). Based on accepted professional consensus, the online data collection method can be considered representative of Internet users (Pintér-Kátay, 2010). At the same time, web surveys can face serious coverage problems because the target population is broader than the Internet population (Jelke, 2010). Taking this into account, we sought to contact people who were presumably not internet users in person (sampled persons face-to-face – CAPI).

We chose questionnaire-based data collection as a quantitative research tool.

However, research by Sillat-Tammets-Laanpere (2021) highlights the problem with quantitative studies using self-assessment tools, namely that they do not allow for deeper analysis or evaluation of the reliability and validity of responses. Therefore, they recommend supplementing them with qualitative research, which allows for the assessment and observation of specific skills. In this way, credible assessments can be carried out in addition to self-assessment of digital competence. In our research, we also used qualitative data collection through focus group interviews to enable deeper analysis.

The questionnaire was compiled as a result of secondary research, and its questions and answers were based on the Digital Competence Framework for EU citizens, known as DigCom 2.2. We chose this framework because it provides a comprehensive interpretation of the concept and areas of digital competence and allows for its measurement. For this reason, it has been used as a basis in several studies (Al-Khateeb, 2017; Molnár et al., 2019). When compiling the questions and answers, we drew on previous research. Such is the research by Tzafilkou-Perifanou-Economides (2022 p. 7), in which six areas of digital competence were identified and questions were formulated for each: (1) Search-Find-Access (SFA); (2) Development, Application, Modification (DAM); (3) Communication, Collaboration, Sharing (CCS); (4) Storage, Management, Deletion (SMD); (5) Evaluation (EV); and (6) Protection (PR). We also analyzed the content of the Europass questionnaire. Based on these, the questionnaire assessed the respondents' proficiency in five areas of digital competence: information and data management; communication; digital content creation; security; and problem solving. Based on the answers, the levels could be categorized as basic, intermediate, advanced, and master. The questionnaire was prepared in both digital and paper form, in Hungarian and German, based on the requirements of hybrid data collection.

The questionnaire-based data collection took place between November 2024 and May 2025. After filtering out incomplete and incorrect responses, we used 384 correctly completed questionnaires from Hungary and 489 from Austria in the sample. According to the quota sampling, we planned a proportionally stratified sample of 250 250 people. As a result of the actual completion, some categories were overrepresented, which is why we applied weighting. The Austrian and Hungarian databases are built from the same variables for comparability. These are mainly nominal and ordinal measurement levels, but there are also ratio scale variables. The data was analyzed using SPSS 27, Excel 2010, and R. The statistical methods used were descriptive statistics, cross-tabulation analysis, ANOVA, cluster analysis, and principal component analysis.

This study focuses on educational attainment. Educational attainment is ordinal, and the variables related to digital competence are also ordinal and nominal, so we performed a cross-tabulation analysis, using a chi-square test to examine the association between the variables and their strength. The minimum condition for the analysis was met, as the expected frequency was less than 5 in less than 20% of all cells. We present some partial results in this regard, because the number of cells in which the expected frequency was less than 5 did not exceed 20%, with the exception of one competency in Zala County.

4. RESULTS AND CONCLUSION

The relationship between educational attainment and digital competence in Eastern Styria, Graz, and Zala County (see Table 2).

Table 2. Partial results for the two regions regarding the relationship between the **Highest level of education (HEDU)** and variables measuring digital competence

Notion	Zala County	East Styria and Graz
<p>Highest level of education and Proficiency in information and data management</p> <p>- Pearson's chi-square significance level</p> <p>- Kendall's tau-b value</p>	<p>< 0,001</p> <p>0,374</p>	<p>< 0,001</p> <p>0,260</p>
<p>The highest level of education, communication, and collaboration</p> <p>- Pearson's chi-square significance level</p> <p>- Kendall's tau-b value</p>	<p>< 0,001</p> <p>0,391</p>	<p>< 0,001</p> <p>0,245</p>
<p>The highest level of education and digital content creation</p> <p>- Pearson's chi-square significance level</p> <p>- Kendall's tau-b value</p>	<p>-</p>	<p>< 0,001</p> <p>0,267</p>
<p>The highest level of education and safety</p> <p>- Pearson's chi-square significance level</p> <p>- Kendall's tau-b value</p>	<p>< 0,001</p> <p>0,304</p>	<p>0,010</p> <p>0,225</p>
<p>The highest level of education and problem-solving</p>		

- Pearson's chi-square significance level	< 0,001	0,004
- Kendall's tau-b value	0,350	0,248

Table 2 shows that in both regions there is typically a significant relationship between the highest level of education and the variables representing digital competence, as indicated by Person's significance level < 0.05 (5%). The strength of the relationship is expressed by Kendall's tau-b index, which shows a mostly weak association (below 0.3 (30%)) or a weaker than moderate association (between 0.3 and 0.4 (30–40%)).

Digital devices are determined by purpose in the two target regions (see Figures 3 and 4).

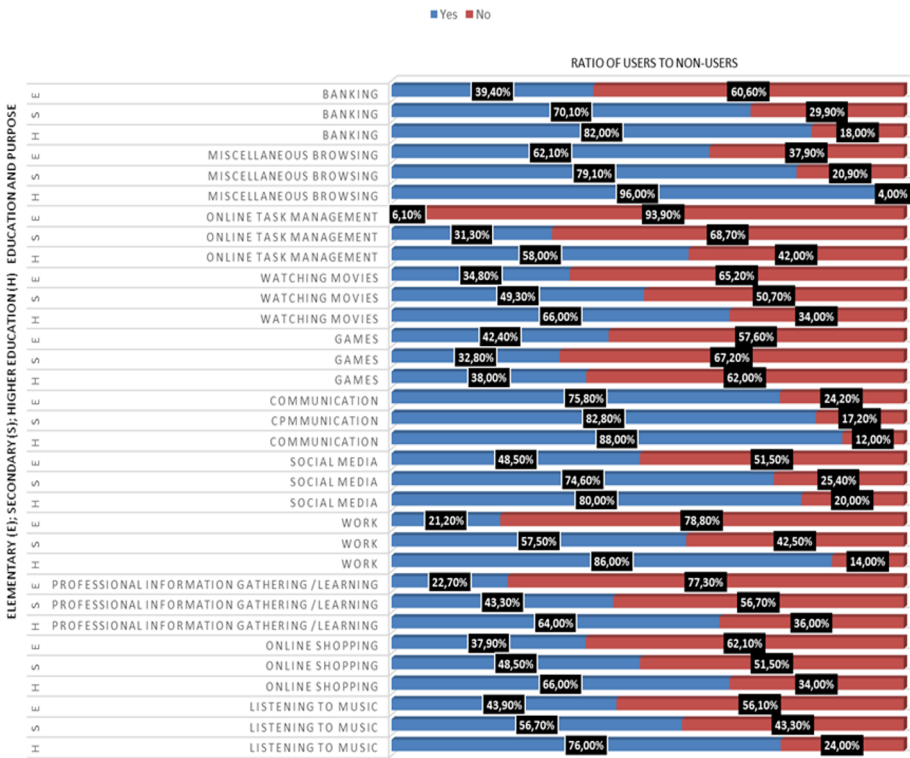


Fig. 3. Purpose of digital device use. Eastern Styria and Graz data.

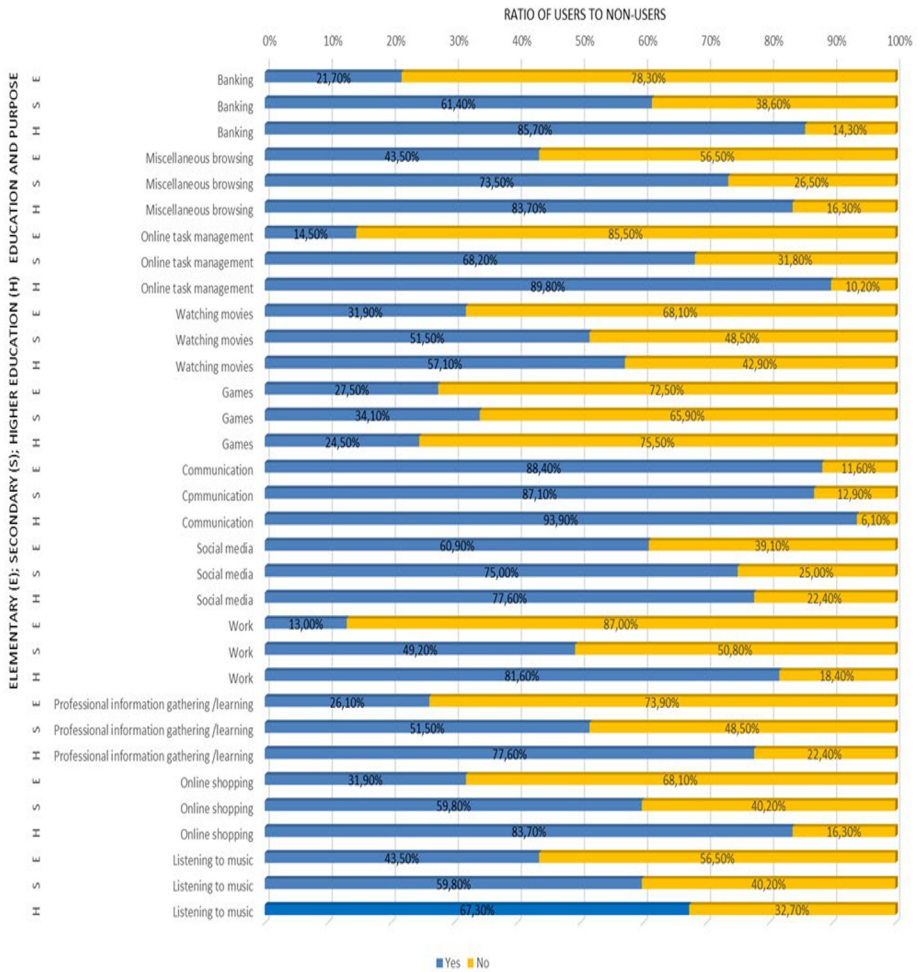


Fig. 4. Purpose of digital device use. Zala County data.

Figures 3 and 4 show that respondents in Graz and Easter Styria typically use their digital devices for banking, gathering information, watching films, playing games, and working to a greater extent than women in Zala County. At the same time, Hungarian sample members use digital devices to a greater extent for electronic administration, keeping in touch, using social media, gathering professional knowledge/learning, shopping, and listening to music.

In both samples, there is a weakly significant relationship between educational attainment and the purpose of digital device use in almost all categories, as indicated by Person's significance level < 0.05 (5%) and Cramer's value, except for the categories of communication and games.

We can also examine how women in the sample rated their digital skills by area of competence according to their educational attainment (see Figures 5 and 6).

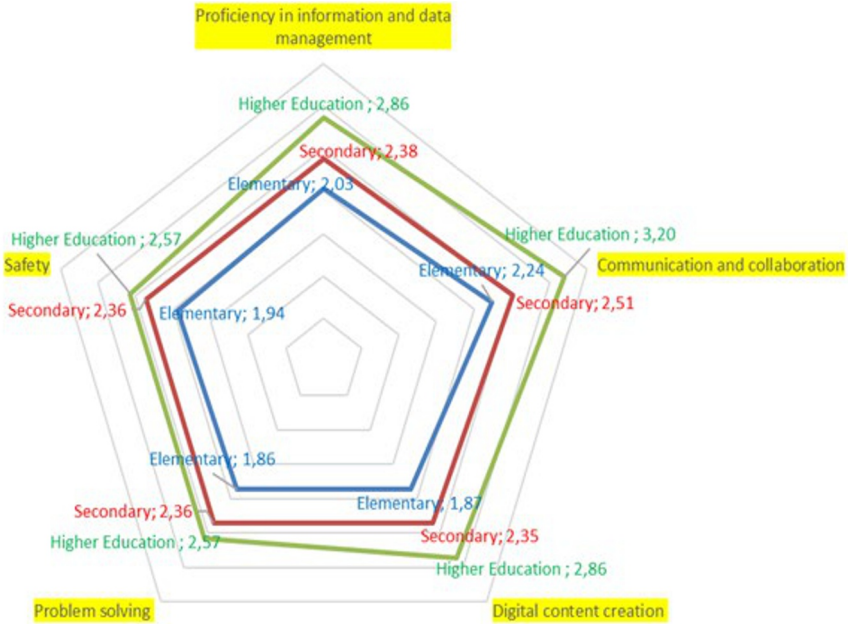


Fig. 5. Self-evaluation of women in Eastern Styria and Graz.

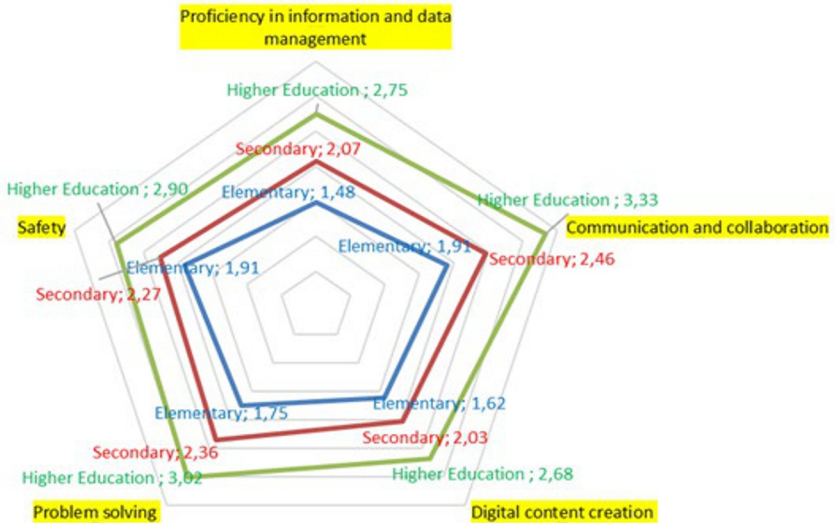


Fig. 6. Self-evaluation of women in Zala county.

We can read from the figures that women with elementary and secondary education in Eastern Styria and Graz evaluate their digital competence higher than their counterparts in Zala County. However, this is not the case with women with higher education. The differences observed in the self-assessment of competence among women surveyed in the two regions could not be explained by questions concerning the availability and use of digital devices or skills. Exploring the reasons for this is a task for qualitative research.

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