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# Average Matching Levels for Two DigComp Competence Areas of the Female Entrepreneurs in Serbia

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**A B S T R A C T**

*This paper aims to analyze the average level of matching the self-assessment and real-life scenario digital competences questions of Serbian female entrepreneurs using an online survey. The authors focused on the questions which belong to the first two areas of the Digital Competence Framework (DigComp). The online survey consisted of four general, and 71 self-assessment and life-scenario combined questions. The survey was distributed and used from the 5th February until the 5th March 2021. Results showed that the average matching levels of both areas were higher than 50% (medium). On the other side, according to the authors, they were not on a satisfactory level. The females' best performances in matching (above 80%) were in the "Browsing, searching, and filtering data, information and digital content" (segment of the first area) and "Interacting through digital technologies" (segment of the second area). Opposite, respondents' lowest matching level performances were in the "Managing data,*

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*information and digital content" (part of the first area) and "Sharing through digital technologies", and "Engaging in citizenship through digital technologies" (part of the second area).*

*The results of the conducted research show that female entrepreneurs should pay more attention to required competences for organizing data in digital environments and on competences directed to digital society services.*

**KEY WORDS:** *DigComp, framework, digital competences, female entrepreneurs, matching levels, Serbia*

## Introduction

Digital skills are among the eight key competences for lifelong learning (European Parliament & Council, 2006). According to UNESCO (2021), digital skills are defined as "a range of abilities to use digital devices, communication applications, and networks to access and manage information. They enable people to create and share digital content, communicate and collaborate, and solve problems for effective and creative self-fulfilment in life, learning, work, and social activities at large". Digital skills such as digital literacy belong to the group of essential skills in the 21st century, according to Eshet - Alkalai (2004). This is the consequence of enormous changes in all industries, especially in the information technology (IT) industry (Domazet & Lazić, 2017).

There are always significant gaps between market-required digital competences and their actual levels (Simović & Domazet, 2021). The study conducted on workforce age 16-64 by Bradić & Banović (2018) indicated a low level of digital skills in most respondents, and 62.6% of them were female (female respondents who do not have any digital skills or have low skills). This is in line with the results of Eurostat's Digital Skills indicator quoted in the same paper of Bradić-Martinović & Banović (2018), which shows that almost half of the respondents have low digital skills or do not have any skills at all. That information is vital because it can be used as a benchmark since this research investigates the levels of digital skills of females, with the particular emphasis on the first two areas of the DigComp 2.0: The Digital Competence Framework for citizens (in further text DigComp).

Three reasons were the motive for conducting this research. The first motive is based on the fact that digital skills are crucial for harmonization with European Union regulations. The key leaders of the Republic of Serbia

have been trying since 2012 to harmonize with the EU regulation by introducing the new strategic documents in education (Domazet, Lazić & Simović, 2014). The primary goal of moving forward is to improve the educational system using more interactive information and communication technology in the education process (Ivanović & Antonijević, 2020). The second motive was that the entrepreneurial industry in Serbia has grown in all quarters of 2020, despite the contemporary crisis caused by COVID-19. Comparing the total percentages in 2020 and 2019 has increased by 2% y-o-y (Statistical Office of Serbia, 2021). The third motive was that similar research had not been yet conducted in the Republic of Serbia. This study provides valuable data about female entrepreneurs', which today belongs to the major factors of a country's prosperity (Achakpa & Radović-Marković, 2018) competences and represents a valuable basis for future research in this field.

## Literature Review

There is a few literature in the world on measuring female entrepreneurs' digital competences and none, as previously mentioned, in the Republic of Serbia. As noted by the author Rizza (2014): "Digital competences is the general term used to describe or explain the ability (of a citizen, a student, a teacher, etc.) in a specific context".

The primary source for creating the survey for this research was the project "Digital Competences Development System (DCDS)" and the "DigComp" framework implementation. The value of this framework implementation can be found in different case studies from Spain, Denmark, Italy, Hungary, Poland and others (Kluzer & Pujol, 2018). The framework consists of five areas and several segments in every area. The areas are as follows as per Kluzer and Pujol (2018):

1. Information and data literacy
   - Browsing, searching, and filtering data, information and digital content
   - Evaluating data, information and digital content
   - Managing data, information and digital content
2. Communication and collaboration
   - Interacting through digital technologies
   - Sharing through digital technologies

- Engaging in citizenship through digital technologies
- Collaborating through digital technologies
- Netiquette
- Managing digital identity

3. Digital content creation
   - Developing digital content
   - Integrating and re-elaborating digital content
   - Copyright and licenses
   - Programming
4. Safety
   - Protecting devices
   - Protecting personal data and privacy
   - Protecting health and well-being
   - Protecting the environment
5. Problem-solving
   - Solving technical problems
   - Identifying needs and technological responses
   - Creatively using digital technologies
   - Identifying digital competence gaps

In this research, the first two areas are used to measure the digital competences of female entrepreneurs. Since those areas are more comprehensive and broader than other areas and can be explained as the first step and a base for further digital improvement, they were selected to be measured and evaluated. The importance of choosing these areas can be explained by the fact that people should have basic skills (consisted of the first two DigComp areas) to upgrade their knowledge to higher levels (other areas).

Digital competences provide a high potential for economic growth in every country (Radović-Marković, 2016). To stay up to date with the skills required in job vacancies, people should know their competences' levels at the moment and try to improve them. According to European Commission (2017), 44% of the EU population had an insufficient level of digital competences, meaning they did not possess the minimum – basic digital competences to meet the needs in 2016.

According to the Digital Economy and Society Index (DESI) of the European Commission, women in the EU have a special digital scoreboard created to monitor women's participation in the digital economy and society. The monitor is named "The Women in Digital (WID)", and it measures the performance of the women based on twelve indicators.

The WID in 2020 stated the following (European Commission, 2020):

- Women are still less likely to have specialist digital skills and work in this field than men, as only 18% of ICT specialists in the EU are women.
- The gender gap is present in all twelve indicators measured
- The gap in basic digital skills has narrowed from 10.5% in 2015 to 7.7% in 2019.

Serbia has been trying actively to improve women position by adopting National Strategy for Gender Equality from 2009 (Pavlović & Ognjenović, 2020). The action plan for implementing the National Strategy for Gender Equality for 2019 and 2020 recognized the need for increasing the competences in the ICT sector (National Strategy citated by the Association of the Business Women in Serbia, 2019). The same organization noted that one of the growth measures required were skills for digital entrepreneurship (2019). Regarding this action plan, authors Anđelković, Jakovi and Kovač (2019), from the DEA-Center for Public Policy Research (as the part of the team project Awakening of Women's Digital Entrepreneurship project) did the research which aim was to empower and promote women's entrepreneurship development. In mentioned research, authors gave the suggestions for overcoming obstacles in starting digital entrepreneurship. Those authors quoted that developing gender-sensitive training for writing business plans, training in bookkeeping, development and business management, and training women-potential entrepreneurs are required for guiding traditional and digital entrepreneurship (2019). In a recent paper of the authors Shukla et al. (2021) noted that: *"future of women's entrepreneurship lies in the efficient and effective use of ICT".*

Following the mentioned, the year 2020 especially brought enormous demand for digital platforms and digital competence improvement. The reason for that demand was mitigation measures on the COVID-19 virus (social distancing, working from home, etc.). According to the authors Vučeković et al. (2021), women underestimated their skills regarding working on digital platforms. It can be only assumed that women do not have the necessary digital skills to work remotely (online) or do not have

enough confidence to show them. According to the above, this work aimed to measure the female entrepreneurs' digital competences in Serbia and compare them with literature results.

## Research Methodology

This paper aims to overview female entrepreneurs' average matching level (%) on self-assessment and their real-life scenario questions in the Republic of Serbia. The average matching levels show the correctly matched and answered self-assessment questions (Likert scale) and real-life scenario questions (example) in both areas. The reason for having beside self-assessment questions, real-life scenario questions can be commented by the fact that self-assessment tests get immediate feedback which helps students make changes to their understanding and adapting. On the other side, the real-life scenario tests can address the knowledge gaps in understanding (University of Connecticut, n/d). Another assumption of the different author, Fulks (2004), is that self-assessment tests must support conclusions. As a result of these conclusions, both tests need to be combined to get the valid level of competences'.

For that purpose, an online survey was created using Google Forms. It consisted of four general questions (1. Education level, 2. Place of residence, 3. Age, 4. Type of business) and 71 questions that represent the mixture of self-assessment and real-life scenario questions, associated with the first two DigComp framework areas (Information and data literacy and Communication and collaboration). One of the research goals was to compare the subjective opinion of the respondents (questions for self-assessment) with the actual levels of their competences (questions from real life). The survey was active from the 5th February until the 5th March 2021.

The structure of the survey questions is given in Table 1. The table shows areas and their segments and the number of questions in each segment and total.

*Table 1: The structure of the survey questions (areas, segments and the number of questions in the survey)*

| The area of the DigComp | Segments of area | No. of self-assessment questions | No. of real-life scenario questions | The total number of questions |
|---|---|---|---|---|
| Information and data literacy | Browsing, Searching and Filtering | 8 | 5 | 13 |
| | Evaluating data, information and digital content | 4 | 2 | 6 |
| | Managing data, information and digital content | 4 | 1 | 5 |
| Communication and collaboration | Interacting through digital technologies | 9 | 4 | 13 |
| | Sharing through digital technologies | 4 | 2 | 6 |
| | Engaging in citizenship through digital technologies | 8 | 2 | 10 |
| | Collaborating through digital technologies | 3 | 1 | 4 |
| | Netiquette | 6 | 2 | 8 |
| | Managing digital identity | 4 | 2 | 6 |
| **Total number of the questions** | | **50** | **21** | **71** |

*Source: Authors' calculation*

The first area Information and data literacy, had twenty-four questions, based on sixteen self-assessment and eight real-life scenario questions. The second area, named Communication and collaboration, consisted of forty-seven questions, conducted from thirty-four self-assessment and thirteen real-life scenario questions. Thus, the total number of questions was seventy-one (fifty self-assessment and twenty-one real-life scenario questions).

The online survey was shared through cooperative e-mail groups of the associations of female entrepreneurs. The associations were the Chamber of

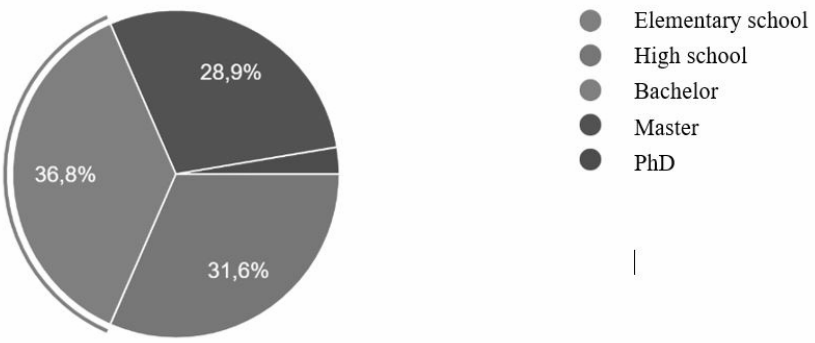
Commerce of Serbia and "Biznis na štiklama". The survey was shared with more than 800 e-mail addresses. The total number of a random sample (full-field and valid surveys) of the respondents for further analysis was 114.

## Results

The results were analyzed in two phases. In the first step, the authors have checked answers whether data is valid for further analysis and then, in the second stage, essential data was extracted for this research.

In the first chart, the education level of the respondents (female entrepreneurs) is shown.

*Chart 1: The education level of the female entrepreneurs*




*Source: Authors' calculation*

As we can see from the chart above, 36.8% of the female entrepreneurs finished Bachelor studies, 31.6% High school, 28.9% Master studies and 2.6% PhD studies. None of the respondents had finished only elementary school.

In the following table, the top 5 (in the total number of respondents places) residence places of the female entrepreneurs are shown.

*Table 2: The top 5 residence places of the female entrepreneurs*

| Place of residence | % of the respondents |
|---|---|
| Novi Sad | 28.9 |
| Kragujevac | 28.9 |
| Belgrade | 21.1 |
| Subotica | 10.5 |
| Užice | 2.6 |
| Other | 8 |
| **Total** | **100** |

*Source: Authors' calculation*

All city places (100%) are divided into five places with most respondents' shares. The 28.9% had both cities, Novi Sad and Kragujevac. In second place is Belgrade with 21.1% and in third and fourth place, Subotica and Užice. The other towns together had 8% in total.

The age structure is given in Table 3.

*Table 3: The age structure of the respondents*

| Age | % of the respondents |
|---|---|
| 18-24 | 44.7 |
| 25-34 | 13.2 |
| 35-44 | 21.1 |
| 45-54 | 18.4 |
| 55-64 | 2.6 |
| **Total** | **100** |

*Source: Authors' calculation*

Table 3 shows the respondents who mainly had 18-24 years (44.7%) and 35-44 years (21.1%).

In Table 4, the top three business types with the highest share of female entrepreneurs are shown.

*Table 4: The top three business types of female entrepreneurs*

| **Business type** | **% of the respondents** |
|---|---|
| Other service activities | 28.9 |
| Art, entertainment and recreation | 13.2 |
| Education | 10.5 |
| Accommodation and catering services | 10.5 |
| Other | 36.9 |
| **Total** | **100** |

*Source: Authors' calculation*

Based on age structure and the female entrepreneurs' business type, most female entrepreneurs from 18-24 are working in other service activities, in which Hairdressing and other beauty treatments are included.

Also, in the second business type, with the highest share of respondents (art, entertainment and recreation), is the increased potential for young entrepreneurs and the field of Education. The other business types have in total 36.9%, but individually do not have more than 3%.

The program used to analyze the obtained results was SPSS 25 software, and its option Crosstab with 95% probability to analyze the results based on matching the self-assessment questions to their real-life scenario questions. After matching through the Crosstab function, the authors present the results in percentages. To obtain an average matching level, all percentages were summed and divided by the total number of questions in that area.

Table 5 shows the average matching level between self-assessment results (Likert scale questions) and real-life scenario questions for the first area of DigComp (Information and data literacy).

*Table 5: The matching between answers on self-assessment questions and real-life scenario questions of the first area, "Information and data literacy"*

| Self-assessment questions | Real-life scenario questions | % of the respondents who answered with 4* on the Likert scale (self-assessment) and with the correct answer on its real-life scenario question |
|---|---|---|
| 1. My ability to use the toolbar buttons and the address bar of a web browser (Firefox, Chrome, Explorer, Edge, Safari) is: | You want to refresh the web page you are visiting. You click... | **78.95** |
| 2. My ability to use a search engine (Google, Bing, Yahoo) to find the information I need is: | You are looking for information about the quality of the railway service in Serbia. In order to find it you use... | **86.84** |
| 3. My ability to navigate inside a website using its internal menu is: | 1. Click on this link https://www.ien.bg.ac.rs/ then navigate into the website and answer to the following question: how do you find most information about the IES Researchers? | 1. **34.21** |
| | 2. Look at the picture below. The "About" link is an element of: | 2. **78.95** |
| 4. My ability to download and save files from the internet is: | What does it mean to download a file from the internet onto your local device? | **84.21** |
| 5. My ability to differentiate the official website of a service or product provider from other non-official websites is: | Please, click on the two links below and then answer: which one is the official website of Ryanair? | **57.89** |

| Self-assessment questions | Real-life scenario questions | % of the respondents who answered with 4* on the Likert scale (self-assessment) and with the correct answer on its real-life scenario question |
|---|---|---|
| 6. My ability to differentiate promoted/advertised digital content and non-advertised content on the Internet is: | Look at the images below, showing the results of a Google search for "solar panels": which of the highlighted items is advertised content? | **10.53** |
| 7. My ability to organize folders (create, copy, move, rename, delete) and manage files (create, locate, copy, move, rename, sort, delete,) on my digital device is: | You have to store the digital photos that you took in 2016, 2017, 2018 and you want to group them on a monthly basis for quicker retrieval. Which of the following folder organization solutions do you choose? | **47.37** |
| **Average matching level of the first area (%)** | | **59.87** |

*I have sufficient skills to operate on my own

*Source: Authors' calculation*

Based on the average matching level, it can be concluded that respondents' (female entrepreneurs) competences of the first DigComp area are in the medium level (a little higher than 50%). One reason for that conclusion is that responses on the first part of the question, "My ability to navigate inside a website using its internal menu are" and its real-life scenario question is below 50% (34.21%). Besides that, there is a low percentage (just 10.53%) of correct matching answers on the sixth question, "My ability to differentiate promoted/advertised digital content and non-advertised content on the Internet is". However, on the other side, the matching level on self-assessment questions "My ability to use a search engine (Google, Bing, Yahoo) to find the information I need" and "My ability to download and save files from the internet" and their real-life scenario questions is above 80%.

It can also be concluded that respondents have the highest matching level of the first area in "Browsing, Searching and Filtering" (above 80%), which is essential for retrieving and boosting new skills. On the other side, their weak point is Managing data, information and digital content. In other words, female entrepreneurs need to pay more attention to organizing data in digital environments.

In Table 6, the matching level between the results of self-assessment (Likert scale questions) and real-life scenario questions for the second area of DigComp (Communication and collaboration) is shown.

*Table 6: The matching level between answers on self-assessment questions and real-life scenario questions of the second area, "Communication and collaboration"*

| Self-assessment questions | Real-life scenario questions | % of the respondents who answered with 4* on the Likert scale (self-assessment question) and with the correct answer on its real-life scenario question |
|---|---|---|
| 1. My ability to create and save contacts in my digital devices is | You are creating a contact on your smartphone about a friend of yours. Which of the following sets of information would you include in the contact in order to communicate effectively with your friend? | **73.68** |
| 2. My ability to send and receive e-mails (send, reply, forward) and to manage them is | You have received an e-mail with a file attached from a colleague of yours. You want to send the file to your boss with some changes in the message's text. Which of the following steps do you choose? | **65.79** |
| 3. My ability to send text messages via instant messaging applications (WhatsApp, Messenger, Skype...) is | You want to send a short message to a friend of yours, you send it | **94.74** |

| | | | |
|---|---|---|---|
| 4. | My ability to create an account to access and use online digital services (e-mail, social media, other interactive public and private services) is | Look at the image below then answer to the following question: in order to create an account on Facebook, you need to | **68.42** |
| 5. | My ability to share files as attachments to an e-mail is | What kind of file is it possible to share as an attachment to an e-mail? | **86.84** |
| 6. | My ability to upload self-created content (e.g. a photo) to be shared on websites that request it and/or that give this possibility (social media) is | Can you share a photo by posting it on a website that you are visiting? | **28.95** |
| 7. | My ability to respond to authentication requests, if that is needed to access (public/private) services websites, is | What is an authentication request? | **52.63** |
| 8. | My ability to fill an online form (also using a dropdown list, check box, radio button, calendar and other functions) is | You just moved to Bologna and you would like to use the municipal civic digital network Iperbole. Look at the picture below of the service's online access page: what do you have to do in order to access the service? | **50** |
| 9. | My ability to send and receive e-mails with multiple recipients (and "answer to all" to support group communication) is | You received an invitation to a party through an e-mail which was sent to you and three other friends of yours. Unfortunately, you will not be able to go and you want to inform everybody about it. Which of the following e-mail commands would you use to send quickly your regrets message? | **81.58** |

| | | |
|---|---|---|
| 10. My ability to apply basic online writing rules (such as to avoid writing full words in capital letters, to take care of spelling, to refer to others through their nicks or nicknames....) is | You have just joined an online professional community and you want to introduce yourself in the general forum. Select the most appropriate way to do so among the three choices below | **81.58** |
| 11. My ability to recognize socially/ethically inappropriate online behavior and communication such as hate speech, flaming, trolling, cyber-bullying, online stalking etc. is | Look at the images below. Which one shows an inappropriate online behaviour/communication? | **71.05** |
| 12. My ability to recognize the footprints that I willingly leave online using different communication applications (e.g. posts in forums, blogs, "likes", published/shared photos and video etc.) and identify those that may damage my reputation is | Which of the following actions can damage your reputation? | **60.53** |
| 13. My ability to adjust my online profile depending on the potential audience (formal-informal, professional, official, thematic etc.) is | Look at the pictures below. Which one would you use as a profile picture in a professional social network? | **60.53** |
| **Average matching level of the second area (%)** | | **67.41** |

*I have sufficient skills to operate on my own

*Source: Authors' calculation*

Based on the second DigComp area results, the average matching level of self-assessment questions and their real-life scenario questions is 67.41%. That percent can be commented as higher than the medium level of 50%. The highest matching level is on the question "My ability to send text messages via instant messaging applications (WhatsApp, Messenger, Skype...)" with 94.74%, as well as on questions "My ability to share files as attachments to an e-mail" with 86.84% and "My ability to send and receive e-mails with multiple recipients..." and "My ability to apply basic online writing rules..." with the 81.58%.

To sum up, this sample of female entrepreneurs has the highest matching level of the second area in Interacting through digital technologies (above 80%), which is essential for establishing cooperation with other people and nurturing relationships. On the other side, the lowest matching level was in Sharing through digital technologies and Engaging in citizenship through digital technologies. Hence, the female entrepreneurs need to pay more attention to the competences directed to social services participation as a citizen.

## Conclusion

Even though this paper is not a national representative, it can be a reasonable basis for expanding this topic's research scope. Given the information above, it can be noticed that even though digital competences are necessary, there is a possibility of a competences gap that needs to be filled. Comparing results from the paper and other literature mentioned, it can be concluded that there is a 'lower level' matching of essential competences (both areas of the DigComp in the text) even though some of them are higher than average (above 50%). The results showed that more attention is needed for competences required for online involvement as a citizen, organizing in digital environments and recognizing appropriate digital technologies for sharing.

Further research will analyze the matching levels of their self-assessment and real-life scenario questions based on the other three DigComp areas implemented on female entrepreneurs.

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### Limitations of the Research

As this research is done on a small sample, it is required to do the research on a representative one. Also, the study should be done face-to-face by applying real-life scenario questions on the computer; to miss the independent variable of luck - that can happen when tests are done in form.

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