DOI: 10.28934/jwee24.34.pp180-205
JEL: D83, J24, L83, Z31

ORIGINAL SCIENTIFIC PAPER

Exploring Gender Disparities in Digital Skills: Evidence from the Serbian Tourism Sector

Aleksandra Bradić-Martinović[1]
Institute of Economic Sciences, Innovation Economics Department, Belgrade, Serbia
Milena Lazić[2]
Institute of Economic Sciences, Digital Economics Department, Belgrade, Serbia
Jelena Banović[3]
Institute of Economic Sciences, Innovation Economics Department, Belgrade, Serbia

A B S T R A C T

The paper examines the digital skills of key stakeholders in the Serbian tourism industry (supply side) to identify potential gender gaps in digital proficiency. Employing a cross-sectional survey of 418 participants within the tourism industry, we utilized binomial logistic regression to parse out the effects of gender relative to other socio-demographic variables on digital skills. The descriptive results based on DigComp 2.0 methodology reveal notable gender differences, with women showing higher levels of information and communication skills but lagging men in problem-solving and content manipulation skills. However, the binomial logistic regression analysis indicates that gender does not significantly predict digital skill levels in the Serbian tourism sector. Instead, age and education are significant factors, with older individuals less likely to possess advanced digital skills and higher education levels correlating with greater digital

[1] Corresponding author, e-mail: abmartinovic@ien.bg.ac.rs
[2] E-mail: milena.lazic@ien.bg.ac.rs
[3] E-mail: jelena.banovic@ien.bg.ac.rs

proficiency. These findings underscore the critical role of education (formal and informal) in digital skills building, suggesting that comprehensive and targeted educational initiatives could effectively enhance digital skills and competencies across the sector.

KEYWORDS: *digital skills, tourism sector, gender gap, women, Serbia*

Introduction

In today's rapidly digitalizing landscape, mastering digital skills is essential in all professional fields, including tourism. Incorporating digital technologies has fundamentally revolutionized how businesses operate and interpersonal communication, making the development of digital skills a fundamental element for individual and organizational performance.

The significance of digital skills extends prominently into tourism, an industry undergoing profound transformations due to digitalization. The contemporary tourism sector increasingly relies on digital technologies to enhance visitor experiences, streamline operations, and tailor services to consumer preferences. From virtual tours and online bookings to digital marketing strategies and customer engagement through social media, leveraging digital tools is indispensable. Digital transformation not only improves accessibility and convenience but also opens up new avenues for cultural exchange and economic development. It allows tourism providers to reach a global audience, adapt to changing consumer behaviors, and respond dynamically to market trends. As such, digital skills are essential for stakeholders within the tourism sector to capitalize on these opportunities.

Serbian tourism holds significant potential due to its rich cultural and natural resources, pivotal for economic and regional development. Recognizing this, there is a compelling need to enhance all aspects of this sector to better integrate Serbia into the global tourism market (Micić, 2018). Strategic efforts incorporated in the last Tourism Development Strategy for the Republic of Serbia from 2016 to 2025 involve enhancing infrastructure, promoting regional tourism, and integrating sustainable practices to ensure long-term growth in this sector (Gushchina, Nesterova, & Hussein, 2023). However, the evaluation of the Strategy revealed significant challenges facing Serbian tourism, particularly the lack of adequate digitalization. Specifically, the Strategy failed to sufficiently address the digitalization needs of the sector, rendering it outdated. Apart from the digital platform *E-Turista* and several initiatives to enhance digital

literacy, there has been no systematic effort to develop comprehensive digital capabilities within the sector. Considering that the current Strategy is nearing the end of its implementation, conducting a more in-depth analysis of digital skills in tourism is vital. Such research would provide the necessary data and insights for developing the next Strategy, enabling policymakers to formulate appropriate measures for enhancing this critical dimension.

This study focuses on the tourism sector in Serbia, aiming to determine the extent and nature of digital skills among male and female employees (supply-side stakeholders). The research questions guiding this study are:

1. Is there a gender gap in the Serbian tourism sector regarding digital skills?
2. Do socio-demographic variables exhibit a statistically significant correlation with specific skills?

The inspiration for the research presented in this paper stemmed from the findings of a previous study that demonstrated that gender does not have a statistically significant impact on overall digital skills (Petković, et al., 2024). However, it was decided to raise whether these findings hold for various digital tasks performed by different groups of employees (i.e., the catering sub-sector, tourism organizations, tourism agencies, travel guides, tourism inspectors, and administrative officers).

The paper is organized as follows: the first part comprehensively reviews the relevant literature. This section establishes the context for the analysis by examining important themes and findings from previous studies on gender inequalities in digital skills within the tourism sector. The methodology section of the study describes the research design, data-collecting procedures, and statistical tools used to investigate the proposed relationships. The subsequent section presents the results, providing a comprehensive description of the evidence regarding gender disparities in different digital skills. The discussion section analyzes these results within the framework of current literature. In conclusion, the paper provides a concise overview of the main findings, constraints of the present study, and recommendations for future investigation.

Literature Review

Despite the growing importance of digital skills in general, the gender digital divide continues to disproportionately affect women, impacting

various sociological and economic aspects of their lives (Lestaria & Sunarto, 2018; Arroyo, 2020; Palomares-Ruiz et al., 2021a). Grande-de-Prado et al. (2020) noted that women face challenges in digital problem-solving, exhibit poorer navigation skills, and show less interest in ICT-related skills than men despite greater familiarity with social media. Such inequalities restrict access to information and communication technologies, limiting women's participation in the digital society and contributing to financial disparities, including limited mobile and e-banking services (Robinson et al., 2015; Kulkarni & Ghosh, 2021). Khumalo and Saurombe (2022) highlighted that gender disparities in digital skills affect employment opportunities and entrepreneurship while worsening inequalities in healthcare, politics, and social capital (Robinson et al., 2015). In developing countries, these challenges are exacerbated by socio-cultural norms (Antonio & Tuffley, 2014; Drabowicz, 2014; Nakajima et al., 2016). Achieving gender equality in digital access and skills is crucial for meeting Sustainable Development Goals (Kashyap et al., 2020) and fostering women's entrepreneurial potential (Setiawati et al., 2022), which plays a vital role in development indicators (Noor, Asghar & Sarwar, 2021).

Faced with swift technological progress, the tourism sector has progressively acknowledged the need for digital competencies. Despite the ongoing development of research in this field, recent studies offer valuable insights into the current digital skills and the areas that must be addressed to fulfill future requirements. Research highlights a growing mismatch between current digital proficiency levels and the technological demands of the tourism sector, with studies emphasizing the need for enhanced digital education, skills in online marketing, social media, artificial intelligence, and the development of online learning communities to foster continuous improvement and competitiveness in the sector. For instance, Zaragoza-Sáez, García-Haro and Buhalis (2021) emphasize the importance of improving digital education to meet the requirements of technology-driven settings in various areas of tourism, while Carlisle, Ivanov and Dijkmans (2021) underscore the need for future digital skills such as online marketing, social media, and artificial intelligence. Marx et al. (2021) also found that tourism stakeholders have a significant interest in online learning communities, indicating a strong desire to enhance digital skills through collaborative and ongoing learning environments. Lazić et al. (2023) highlight the importance of both formal and informal educational efforts in improving digital skills in Serbia's tourism sector, suggesting the incorporation of digital skills into educational curricula, preferable in

branded educational institutions (Marjanović, et al., 2023), while Gabidullina et al. (2022) stress the crucial importance of digital competencies for tourism students, equipping them with the necessary skills to adapt to the industry's changing demands.

The research that has been done on gender differences in digital skills reveals that there is a wide range of outcomes depending on the industries and population segments that are being considered. Martínez-Cantos (2017) and Grande-de-Prado et al. (2020) highlight notable gender inequalities, especially in complex digital tasks and among certain demographic groups. Generally, males perceive themselves as more skilled in ICT-related tasks. Rodríguez-Pasquín et al. (2023) and Singh (2017) underline the ongoing digital divide, particularly in developing countries, where women are often underrepresented in online communities and lack fundamental digital competencies. Kashyap et al. (2020) present further evidence of substantial discrepancies in digital proficiency between genders across different countries, particularly in less developed areas. Bradić-Martinović and Banović (2018) also highlight the disparity in digital skill levels between women and men in Serbia, with women exhibiting lower proficiency, while Kamberidou and Pascall (2019) state that despite efforts to attract and retain women in ICT and related sectors, a gender imbalance persists. The same is observed in the context of the population with disabilities in Serbia, as shown by Lazić et al. (2023b).

In contrast, some studies suggest that the digital skills disparity between genders may not be present in all occupations. For instance, Sánchez Prieto et al. (2020) found no notable gender disparities in digital teaching abilities among teachers in Andalusia. Similarly, Barbuta and Ghetau (2023) found that rural students in Moldova generally do not exhibit significant gender differences in digital competencies. However, girls outperform boys in digital content creation and online safety. Palomares-Ruiz et al. (2021) and Ilomäki (2011) demonstrate that gender disparities in digital competencies are negligible or absent in specific educational settings, suggesting that these discrepancies can vary considerably depending on the context and demographic factors. Montuori et al. (2022) report that boys initially demonstrate superior coding abilities in primary school, but this advantage is not influenced by variations in executive functions, indicating other contributing factors. Hervé et al. (2021) and Anderson (2004) highlight the substantial impact of socioeconomic status and gender attitudes on these disparities. Losh (2004) points out that although gaps in

digital access and usage have decreased over time, notable variations still exist based on gender, education, and occupation. Vasquez Huatay et al. (2023) propose comprehensive technological literacy workshops to address gender inequalities in digital competencies among secondary school students in Peru. These studies demonstrate a complex situation where differences in digital skills between genders continue to exist in various fields but are not consistently present. Consequently, this implies that focused actions may be required to address specific gaps in different contexts or sectors.

By studying the disparity in digital skills between genders in the tourism sector, we can draw attention to the research conducted by Carlisle et al. (2021). It offers valuable insights into the digital skills gap in the European tourism industry. It emphasizes the significance of addressing gender-specific obstacles in acquiring digital skills within the tourism and hospitality workforce. The study is foundational in understanding gender dynamics in digital skill acquisition in the tourism sector, highlighting the need for targeted interventions to bridge the gender gap. In addition, Petković et al. (2024) analyze the advancement of Serbian tourism's digitalization by studying skills development. Their discoveries stress the crucial importance of digital skills in promoting the digital revolution of the tourism sector, thereby contributing to a more detailed comprehension of the advancements and obstacles encountered by the industry. The authors observed that gender did not significantly impact the level of digital skills. This implies that other variables (education and tourism sub-sectors) may be more influential in this context. Lazić et al. (2023a) discovered that the Serbian tourism and hospitality workforce has fundamental digital skills, but substantial improvements are necessary to enhance these skills further.

While substantial research on digital skills in different sectors and population segments exists, there remains a significant gap in empirical studies explicitly focusing on the gender gap within the tourism sector. The reviewed studies collectively highlight the critical importance of digital skills, the need for innovative educational frameworks, and the challenges posed by gender disparities in the evolving landscape of tourism. Addressing these disparities requires a comprehensive approach involving educational reforms, targeted policy interventions, and ongoing support for women at all stages of their digital skills journey. By bridging this gap, more equitable access to the opportunities and benefits of the digital age can be ensured, and as the tourism sector continues to evolve, leveraging digital

skills to enhance competitiveness and sustainability will be crucial. This paper addresses a gap in the existing literature by providing first-hand evidence of gender disparities in the Serbian tourism industry (supply side). In addition, this paper builds upon the previous pilot study conducted by Lazić et al. (2023a) by including a larger sample of the respondents.

Data and Methodology

As part of developing the new Serbian tourism strategy, an in-depth analysis was conducted to assess the digital skills of the various stakeholders on the industry's supply side. The participants consisted of individuals employed in the catering sub-sector, tourism organizations, tourism agencies, guides for tourists, tourism inspectors, and administrative officers. In order to enhance stakeholder diversification, the administrative staff was categorized to encompass employees in tourism organizations, tourism inspectors, and civil servants at both the national and local (municipal) levels, as identified in a complementary study conducted by Van Deursen and Van Dijk (2010).

Data - The Ministry of Tourism and Youth of the Republic of Serbia distributed the questionnaire to stakeholders via local authorities and internally among the Ministry's employees. To gather primary data, an online survey was carried out with the assistance of Microsoft Office 365 Forms. The data collection period was from March 1 to April 14, 2023, with 422 participants from cities and municipalities (119). Following the initial analysis, four responses were identified as outliers - one from a respondent with a primary school qualification and three from participants over 65 years old. The study was performed on 418 submissions after removing these outliers. The survey was carried out anonymously, and participation was voluntary. According to the data from the Central Registry of Compulsory Social Insurance of the Republic of Serbia, 81,800 persons were employed in the tourism sector in 2023. Based on their assumptions, the Ministry demanded 4 representatives from the catering sub-sector, 2 from tourism organizations, 1 from tourism agencies, 1 from guides for tourists, 1 tourism inspector, and 2 administrative officers per municipality to fill out the survey. The sample structure, presented in Table 1, shows that the structure generally follows the request, except for a smaller number of respondents in catering and a larger number of employees in tourist organizations. This discrepancy is explained by the fact that employees of

private companies engaged in catering do not have the same obligation towards the Ministry as in tourist organizations.

Methodology - The research employs the Digital Competences Framework - DigComp 2.0 methodology (European Commission, 2016) to assess individuals' proficiency in digital skills. Although the EU has made progress in developing the DigComp methodology, with versions 2.1 (published in 2017) and 2.2 (published in 2022), the research conducted for the Ministry of Tourism and Youth of the Republic of Serbia uses version 2.0 of this methodology to maintain comparability with previous studies. Further information may be found in Bradić-Martinović (2022). This methodology is a widely accepted standard in the European Union for evaluating digital abilities. The central component of this framework is the Digital Skills Indicator (DSI), which consists of four dimensions: Information Skills - IS, Communication Skills - CS, Problem Solving Skills - PSS and Software Skills for Content Manipulation - SSCM (JRC & DG EAC, 2014). To ensure statistical comparability across Europe, European countries collect annual data from a representative sample of adults aged 16 to 74 to support this evaluation. The collected data is then used to compute the DSI, which has been tracked since 2015. In addition to questions extending beyond the DSI, the questionnaire also asks respondents to assess their level of digital competence. The questions related to the DSI were chosen from the original questionnaire for this study, as shown in Table 3. These questions encompassed information on gender, age, education, and the tourism sub-sectors.

The Chi-Squared Test of Independence was also utilized to assess whether there is a significant relationship between gender and various digital skills and abilities among stakeholders on the supply side in the tourism sector. Key metrics evaluated include the Pearson Chi-Square, Likelihood Ratio, and Linear-by-Linear Association values. The Pearson Chi-Square indicates whether the observed differences are statistically significant, with a p-value less than 0.05 suggesting a significant association. The Likelihood Ratio provides a measure of fit between the observed data and the expected model, also with a p-value threshold of 0.05. The Linear-by-Linear Association assesses the strength and direction of the relationship between the variables, with significance indicated by a p-value less than 0.05. These metrics collectively help identify whether variations in digital skills are due to chance or signify a significant association,

highlighting potential gender-related disparities in digital proficiency within the tourism sector in Serbia.

Results and Discussion

Table 1 provides a comprehensive description of the characteristics of the individuals who participated in the online survey.

Table 1: Characteristics of the entire sample in terms of socio-demographic attributes

Characteristics	**Categories**	***n* (%)**
Gender	Female	244 (58.4)
	Male	174 (41.6)
Age	16-28	23 (5.5)
	29-45	246 (58.9)
	46-65	149 (35.6)
Education	Secondary	71 (16.9)
	Higher	270 (64.7)
	Master or PhD	76 (18.2)
	Missing	*1 (0.2)*
Stakeholders involved in the supply side (employees)	Catering sub-sector	101 (24.2)
	Tourism organization	156 (37.3)
	Tourism agency	33 (7.9)
	Travel guide	24 (5.7)
	Tourism inspector	32 (7.7)
	Administrative officer*	71 (17.0)
	Missing	*1 (0.2)*

* Comprises individuals employed in the tourism industry within municipalities as well as those working for the Ministry of Tourism and Youth RS.

Source: Author's calculations

The socio-demographic characteristics of the sample highlight the fact that there is a diverse distribution of participants with regard to gender, age, education, and employment within the tourism sector. The majority of respondents were women (58.4%), with men comprising 41.6% of the sample. Based on the research of the Statistical Office of the Republic of Serbia (2019), the gender proportion in the Serbian tourism sector shows a higher representation of women compared to men. In 2019, women constituted approximately 59.85% of the workforce in this sector, indicating

a significant female presence in tourism-related jobs. This aligns with global trends, where women often make up a larger share of the tourism workforce due to the nature of the industry, which includes roles in hospitality, customer service, and administrative positions that are traditionally female-dominated (OECD, 2022). The age distribution was predominantly between 29-45 years (58.9%), followed by the 46-65 age group (35.6%), and a smaller proportion aged 16-28 years (5.5%). In terms of educational attainment, most participants had higher education (64.7%), with significant representation from those with Master's or PhD degrees (35.6%) and secondary education (17.0%). Finally, employment roles within the tourism sector were varied, as presented in Table 1. These demographic characteristics offer a comprehensive perspective on the individuals involved in the study, representing a diverse and representative sample from the tourism industry. Reports by the International Labor Organization (ILO, 2024) indicate that while many employees possess secondary education, there is a growing trend towards higher education and specialized training to meet the evolving demands of the industry.

Table 2: Characteristics of the females in terms of socio-demographic attributes

Characteristics	**Categories**	***n* (%)**
Age	16-28	14 (5.7)
	29-45	153 (62.7)
	46-65	77 (31.6)
Education	Secondary	35 (14.3)
	Higher	161 (66.0)
	Master or PhD	48 (17.7)
Stakeholders involved in the supply side (employees)	Catering sub-sector	41 (16.8)
	Tourism organization	109 (44.7)
	Tourism agency	16 (6.6)
	Travel guide	12 (4.9)
	Tourism inspector	18 (7.4)
	Administrative officer*	47 (19.3)
	Missing	*1 (0.3)*

Source: Authors' calculations

For a more comprehensive understanding, considering the significant involvement of women in the sample, Table 2 presents extensive information specifically related to this portion of the sample. The majority

of these women are aged 29-45 (62.7%) and have higher education (66.0%). Most are employed in tourism organizations (44.7%), followed by administrative officers (19.3%) and the catering sub-sector (16.8%). The distribution emphasizes the notable representation of highly educated women within the tourist industry (holding MA and PhD degrees) which can be attributed to targeted initiatives aimed at empowering and educating women (Banović, 2023). The Serbian government, in collaboration with international organizations, has implemented initiatives to advance gender equality and offer specialized educational opportunities for the tourism sector. These programs have greatly enhanced women's educational achievement and their active involvement in tourism, specifically in rural and less developed areas (Radović Marković & Živanović, 2019). Consequently, women in Serbia are more present in the Serbian tourism sector.

Initially, we conducted independent calculations for each DSI dimension for both women and men in order to provide a deeper understanding of the skill levels in individual activities. The results of this analysis are presented in Table 3.

Table 3: The distribution of respondents based on individual indicators within gender and the DSI dimensions

Dimensions and indicators	**Ability to execute***		**Dimensions and indicators**	**Ability to execute***	
	W (%)	**W (%)**		**W (%)**	**W (%)**
Dim. 1. Information skills			**Dim. 2.** Communication Skills	99.2	98.3
● Duplicated or relocated files or folders	89.3	88.5	● E-mail communication	86.5	85.1
● **Stored files on online storage (cloud)**	**48.8**	**54.6**	● Taking part in online communities	**61.6**	**66.7**
● Gathered data from websites of public authorities and services	82.0	78.2	● **Using the internet to make phone calls or video calls**	72.0	75.3
● Obtaining information regarding commodities or services	90.6	89.6	● Uploading self-produced material to any website for distribution.		
● **Searching for health-related web content**	**67.6**	**59.8**			

Dimensions and indicators	Ability to execute*		Dimensions and indicators	Ability to execute*	
	W (%)	W (%)		W (%)	W (%)
Dim. 3. Problem Solving Skills			**Dim. 4.** Software Skills for Content Manipulation		
A – Problem solving			*A – Basic*		
● Moving data between various electronic devices	89.8	88.5	● Worked with word processor	89.8	87.9
● **Setting up programs and mobile apps**	**58.6**	**68.4**	● **Worked with spreadsheet programs**	**57.8**	**41.4**
● Modifying the preferences of any program, such as security or operational system programs	48.0	50.0	● Managed media files (pictures, videos, and audio) using software	66.0	68.4
B – Familiarity with online services	81.6	75.3	*B – Above basic*	**64.3**	**56.9**
● Recent 12 months of online shopping	**29.5**	**44.8**	● **Produced a presentation or document that incorporates text, images, tables, or charts**		
● **Internet retail**	43.0	38.5	● Utilized advanced spreadsheet functions to efficiently arrange and analyze data, including sorting, filtering, employing formulas, and generating charts	42.2	41.4
● Make use of various educational tools available online	34.4	39.1	● Have created some computer code	6.1	8.6
● Online banking transactions					

* The respondents' answers (Yes/No) for each task show their ability to execute it successfully.

Source: Authors' calculations

Upon analyzing the indicative data in Table 3, it becomes evident that there are disparities in skill levels between men and women. However, it is worth noting that women exhibit higher proficiency in certain activities, while men excel in others. Hence, it is unfeasible to draw a general conclusion regarding the potential correlation between the respondents' gender and their level of digital skills. Furthermore, the existing literature also does not provide a universal conclusion on this matter. To gain a more thorough understanding of the potential presence of a statistically significant disparity, we began by assuming that gender plays a role in activities where there are substantial variations in skill levels between women and men. Once the activities were identified, we proceeded to develop the following hypotheses:

H_{01}: There is a statistically significant correlation between gender and the ability to store data on cloud-based storage platforms.

H_{02}: There is a statistically significant correlation between gender and the ability to search for health-related web content.

H_{03}: There is a statistically significant correlation between gender and the ability to use the internet to make phone calls or video calls.

H_{04}: There is a statistically significant correlation between gender and the ability to set up programs and mobile apps.

H_{05}: There is a statistically significant correlation between gender and the ability to sell items online.

H_{06}: There is a statistically significant correlation between gender and the ability to work with spreadsheet programs.

H_{07}: There is a statistically significant correlation between gender and the ability to produce a presentation or document that incorporates text, images, tables, or charts.

In order to evaluate the proposed hypotheses, we employed the chi-squared test of independence, which examines the relationship between gender and binary skills outcomes. The systematized results are shown in Table 4.

The test results indicate that the null hypothesis cannot be rejected for the following activities: storing data on cloud-based storage platforms (H_{01}), searching for health-related web content (H_{02}), making phone calls or video calls over the internet (H_{03}), working with spreadsheet programs (H_{06}) and creating presentations or documents that incorporate text, images, tables, or charts (H_{07}). This means there is no significant correlation between gender and listed activities. However, the results also show that the null hypothesis can be rejected in the case of the ability to set up programs and mobile apps (H_{04}) and sell items online (H_{05}), meaning that there is a correlation between gender and knowledge and ability to perform these tasks.

Table 4: Chi-Square test results for particular activities

Test / Skills	Value	*df*	Asymptotic Significance (2-sided)
Store data on cloud-based storage platforms			
Pearson Chi-Square	1.380	1	.240
Likelihood Ratio	1.382	1	.240
Linear-by-Linear Association	1.377	1	.241
Search for health-related web content			
Pearson Chi-Square	2.730	1	.098
Likelihood Ratio	2.720	1	.099
Linear-by-Linear Association	2.724	1	.0.99
Use the internet to make phone calls or video calls			
Pearson Chi-Square	2.970	2	.226
Likelihood Ratio	3.330	2	.189
Linear-by-Linear Association	2.863	1	.091
Set up programs and mobile apps			
Pearson Chi-Square	4.157	1	.041*
Likelihood Ratio	4.191	1	.041*
Linear-by-Linear Association	4.147	1	.042*
Sell items online			
Pearson Chi-Square	10.360	1	.001*
Likelihood Ratio	10.313	1	.001*
Linear-by-Linear Association	10.336	1	.001*
Work with spreadsheet programs			
Pearson Chi-Square	1.759	2	.415
Likelihood Ratio	2.110	2	.348
Linear-by-Linear Association	1.393	1	.238
Produce a presentation or document that incorporates text, images, tables, or charts			
Pearson Chi-Square	2.374	1	.123
Likelihood Ratio	2.367	1	.124
Linear-by-Linear Association	2.368	1	.124

Source: Author's calculations

The lack of significant gender gaps in these domains could be attributed to the prevalent availability and overall familiarity with these technologies in modern digital environments. Both genders have equal access and exposure to these tasks in their personal and professional lives, resulting in similar levels of proficiency. This is consistent with the overall trend of decreasing gender disparities in fundamental digital literacy skills as digital technologies become more embedded in daily life. Nevertheless, the analysis also pinpointed areas where gender disparities are more evident. More precisely, the null hypothesis was rejected for proficiency in setting up programs and mobile applications and selling goods online. The results demonstrate a noteworthy association between gender and the ability and competence to carry out these tasks, implying that there are disparities between men and women in their skill levels and potentially their self-assurance in these more complex or specialized digital activities.

These findings raise important considerations. The significant gender gap in setting up programs and mobile apps may reflect underlying differences in technical training, exposure to advanced digital tools, or even cultural influences that steer men and women towards different skill sets. Similarly, the ability to sell items online being gendered might point to disparities in e-commerce knowledge, entrepreneurial experience, or even access to resources and support systems necessary for online selling. Addressing these gaps is crucial for ensuring that both men and women can equally benefit from the digital transformation in the tourism sector. Targeted training programs and initiatives aimed at increasing women's proficiency in these areas could help bridge the gap.

To further explore the differentiation in digital skills between women and men, we undertook a detailed analysis of the particular dimensions of DSI. Prior to the analysis, we classified the respondents according to their participation in various sub-sectors of the tourism sector. The results can be seen in Table 5.

Table 5: Sector-specific frequencies for the Above basic level in each dimension of DSI and across genders (%)*

Sub-sector	IS		CS		PS		SS	
	W	M	W	M	W	M	W	M
Catering sub-sector	90.2	93.3	95.1	98.3	87.8	88.3	51.2	56.7
Tourism organization	99.1	91.3	98.2	95.7	89.9	85.1	76.1	78.7
Tourism agency	81.3	94.1	87.5	88.2	68.8	94.1	56.3	70.6
Travel guide	83.3	100.0	100.0	100.0	91.7	91.7	75.0	75.0
Tourism inspector	100.0	64.3	88.2	64.3	72.2	50.0	66.7	35.7
Administrative officer	83.0	100.0	76.6	79.2	80.9	95.8	68.1	50.0
Average	89.48	90.5	90.93	87.62	81.88	84.17	65.57	61.12

* Note: The above basic skill level is determined as follows: IS and CS - more than one `Yes` for the corresponding tasks in Table 3; for PSS, at least one `Yes` in either A or B for corresponding tasks; and for SSCM, at least one `Yes` for both A and for B, in line with JRC & DG EAC (2014).

Source: Authors' calculations

The table presents sector-specific frequencies for DSI's above basic level, comparing women (W) and men (M) across various sub-sectors. In the IS and CS women employed in "Tourism organizations" and "Tourism inspectors" exhibit higher proficiency compared to men. Conversely, men generally surpass women in "Travel guide" and "Administrative officer" roles in the same dimensions. The PSS dimension shows mixed results, with men slightly outperforming women in most sub-sectors except "Tourism organization" and "Travel guide." Finally, in the SSCM dimension, women consistently demonstrate lower proficiency across all sub-sectors compared to men, with notable gaps in "Tourism inspector" (66.7% vs. 35.7%) and "Administrative officer" (68.1% vs. 50.0%). Overall, the key results emphasize the existence of gender disparities in several dimensions.

Applying the same reasoning as before, we have determined the most notable differences between women and men, which has resulted in the development of the following hypotheses:

H_{08}: There is a statistically significant correlation between gender and Information skills of Tourism inspectors.

H_{09}: There is a statistically significant correlation between gender and Communication skills of Tourism inspectors.

H_{010}: There is a statistically significant correlation between gender and Problem-solving skills of employees in tourism agencies.

H_{011}: There is a statistically significant correlation between gender and Problem-solving skills of Tourism inspectors.

H_{012}: There is a statistically significant correlation between gender and Software skills for content manipulation of Administrative officers.

The results of the Chi-Square test are presented in Table 6.

Table 6: Chi-Square test results for particular sectors and dimensions of DSI

Test / Skills	**Value**	**df**	**Asymptotic Significance (2-sided)**
Information skills of Tourism inspectors			
Pearson Chi-Square	7.619	1	.006*
Likelihood Ratio	9.488	1	.002*
Linear-by-Linear Association	7.381	1	.007*
Communication skills of Tourism inspectors			
Pearson Chi-Square	2.789	1	.095
Likelihood Ratio	2.813	1	.093
Linear-by-Linear Association	2.702	1	.100
Problem-solving skills of employees in tourism agencies			
Pearson Chi-Square	3.566	1	.059
Likelihood Ratio	3.812	1	.051
Linear-by-Linear Association	3.458	1	.063
Problem-solving skills of Tourism inspectors			
Pearson Chi-Square	1.659	1	.198
Likelihood Ratio	1.662	1	.197
Linear-by-Linear Association	1.607	1	.205

Test / Skills	Value	df	Asymptotic Significance (2-sided)
Software skills for content manipulation of Administrative officers			
Pearson Chi-Square	2.205	1	.138
Likelihood Ratio	2.180	1	.140
Linear-by-Linear Association	2.174	1	.140

Source: Author's calculations

The test findings suggest that the null hypothesis cannot be rejected for Information skills of Tourism inspectors (H_{08}), which means that gender and their ability to perform tasks classified as information skills are correlated. On the other hand, the null hypothesis can be rejected in the case of Communication (H_{09}) and Problem-solving skills (H_{011}) of Tourism inspectors, Problem-Solving skills of employees in tourism agencies (H_{010}) and Software skills for content manipulation of Administrative Officers (H_{012}).

For Communication and Problem-solving skills among Tourism inspectors, the significant correlation with gender may point to differences in training, job roles, or also workplace culture that affect men and women differently. Male and female inspectors might receive different levels of encouragement or opportunities to develop these skills, or broader societal norms could influence confidence and competence in these areas. The disparity in Problem-solving skills among employees in tourism agencies could be due to varying degrees of exposure to problem-solving scenarios or different expectations placed on male and female employees. The significant gender difference in Software skills for content manipulation among Administrative Officers may indicate that women and men are not equally encouraged or required to develop these skills, potentially due to differing job responsibilities or access to training resources.

Our study's findings reveal a nuanced landscape of digital skills among tourism industry stakeholders, underscoring the absence of significant gender differences in fundamental digital tasks such as data storage on cloud platforms, internet communications, and basic software proficiency. These results align with existing literature that suggests minimal gender discrepancies in essential digital competencies, particularly within universal and routinely executed tasks (Martínez-Cantos, 2017). The findings of our study concerning the minimal gender discrepancies in essential digital

competencies also echo those of Zaragoza-Sáez et al. (2021), who also observed limited gender differences in fundamental digital skills across tourism and hospitality sectors. However, our research further identifies significant gender disparities in advanced digital skills, aligning with Zaragoza-Sáez et al.'s observations of varying digital competency levels in specialized ICT applications within the industry. The results presented in the study by Petković et al. (2024) highlight significant disparities in advanced digital skills within the Serbian tourism and hospitality sector, which aligns with findings from other research indicating a widespread skills gap in more complex ICT competencies across various industries. Notably, their analysis revealed that while basic digital skills are commonly possessed, more sophisticated skills like problem-solving in digital environments and software manipulation are lacking, especially among administrative officers and tourism inspectors. This observation is consistent with broader trends where advanced digital skills remain a challenge, underscoring the need for targeted educational and training programs to address these deficiencies effectively.

Even though our research explores digital skills in the tourism sector, particularly focusing on the gender disparities in digital skills acquisition, similar challenges are evident in other demographic sectors, as highlighted by a recent study on persons with disabilities in Serbia. This study underscores the gap in digital competencies and the necessity for targeted educational initiatives to enable inclusive participation in digital platforms (Lazić, Vukmirović, & Banović, 2022).

Contrastingly, our research indicates significant gender-related disparities in more complex digital functions like program setup and online sales, a finding that echoes broader studies which highlight pronounced gender gaps in advanced ICT usage and complex digital interactions in male-dominated fields (Sánchez-Rivero et al., 2023). Such disparities may reflect not only skill gaps but also differences in role assignments and professional encouragement within the workplace. Moreover, while no substantial gender-based differences were noted in the informational skills of tourism inspectors, significant divergences were identified in their communication and problem-solving abilities. This suggests that gender may influence the development of these skills differently, potentially due to varied workplace experiences or societal expectations. These findings are consistent with research that points to enduring gender divides in specific

ICT domains, influenced by both social norms and organizational structures (Grande-de-Prado et al., 2020).

Conclusion

The paper provides a comprehensive analysis of gender inequalities in digital skills within Serbia's tourism sector, revealing notable deficiencies, particularly in more complex digital activities. The findings highlight insignificant gender disparities in basic digital skills, yet point to significant inequalities in more advanced digital competencies. Such insights are crucial for developing targeted measures to promote equal improvement of digital skills among women in this important economic sector.

Considering these results, it is evident that there is a pressing need for specific to the sector digital training programs that are specifically designed to tackle and reduce these proficiency deficiencies. The primary focus of successful intervention programs should be the development of advanced digital skills, especially in domains where gender disparities are substantial. By implementing comprehensive training programs, organizations may guarantee that both male and female employees possess the necessary abilities to excel in an increasingly digital work environment. For example, the Ministry for Tourism and Sport of RS could consider implementing tailored training programs focusing on enhancing communication, problem-solving, and software skills, ensuring equal opportunities for both genders to develop and excel in these critical areas.

The research also highlights the wider implications that these findings have for digital equity in the workplace. A persuasive argument can be made for the implementation of legislative interventions that encourage the development of an inclusive digital culture within the tourism sector. In order to compensate for the inequities that have been identified, it is necessary to adopt policies that are intentionally tailored to support the development of advanced digital skills among under-represented groups, notably women. These gender differences in the tourism sector in Serbia could be a roadmap for tailor-made training that would precisely target the missing knowledge that is necessary for the further development of the sector and its digital transformation. Policy measures play a crucial role in reducing the digital divide and promoting the ongoing use of advanced digital tools that are necessary for navigating the changing technological environment. Chetty et al. (2018) propose a three-pronged digital skills

strategy that focuses on monitoring evolving digital skills requirements, incorporating extensive training in digital skills into national education programs and adapting these programs to fit with the existing socio-cultural norms. This holistic approach can help to create a favorable environment for the effective acquisition and use of digital skills.

Future studies should aim to delve deeper into the structural reasons behind these skill disparities and examine the long-term impacts of targeted training programs. Additionally, longitudinal research could assess the efficacy of policy changes and training implementations over time, providing a more dynamic understanding of how digital skill gaps in the tourism sector evolve in response to specific interventions. By addressing these areas, further research can continue to inform policy decisions and educational strategies that aim to foster a more equitable digital skill distribution, ultimately enhancing the overall competitiveness and efficiency of the tourism sector in Serbia.

Limitations and Future Research

While this paper addresses an important and underexplored topic in the existing literature, providing first-hand evidence of gender disparities in the Serbian tourism industry (supply side) using a robust sample constructed for the development of the Tourism Improvement Strategy, it is not without its limitations. The first limitation pertains to the evaluation method, specifically self-assessment. Although self-assessment is widely recognized as a common type of competence evaluation (Laanpere, 2019), its inherent characteristics can lead to biased evaluations. However, our analysis adhered strictly to the assessment type and methodology employed by the European Union over the past fifteen years, which underpins the calculation of the DSI. In light of the limitation, future research should explore alternative methods of incorporating knowledge and ability assessments within real-life scenarios.

Acknowledgments

The research presented in this paper was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia under contract number 451-03-47/2023-01/200005 and Deutsche

Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH under contract number 83386917.

References

[1] **Anderson, R. E.** (2004). Gender and Computers: Understanding the Digital Divide. *Journal of Marriage and Family, 66*, 542-543.

[2] **Antonio, A. & Tuffley, D. (2014)**. The gender digital divide in developing countries. *Future Internet, 6*(4), 673-687.

[3] **Arroyo, L.** (2020). Implications of digital inclusion: Digitalization in terms of time use from a gender perspective. *Social Inclusion, 8*(2), 180-189.

[4] **Banović, J.** (2023). Digital Skills among Women in Tourism in Serbia. Proceedings, 85(1), 38. https://doi.org/10.3390/proceedings2023085038.

[5] **Barbuta, A. & Ghetau, C.** (2023). The Digital Divide and Gender Disparity: A Study of Rural Students in the Republic of Moldova. *International Journal of Advanced Studies in Sexology, 5*(1), 30-38.

[6] **Bradić-Martinović, A.** (2022). *Digitalne veštine građana Srbije*. Institut ekonomskih nauka. Beograd. https://www.library.ien.bg.ac.rs/index.php/monog/article/view/1554/1266

[7] **Bradić-Martinović, A. & Banović, J.** (2018). Assessment of Digital Skills in Serbia with Focus on Gender Gap. *Journal of Women's Entrepreneurship and Education, 1-2,* 54-67.

[8] **Carlisle, S., Ivanov, S., & Dijkmans, C.** (2021). The digital skills divide: Evidence from the European tourism industry. *Journal or Tourism Futures, 9(2)*, 240-266.

[9] **Chetty, K., Aneja, U., Mishra, V., Gcora, N., & Josie, J.** (2018). Bridging the digital divide in the G20: skills for the new age. *Economics*, 12. https://doi.org/10.5018/economics-ejournal.ja.2018-24

[10] **Drabowicz, T.** (2014). Gender and digital usage inequality among adolescents: A comparative study of 39 countries. *Computers & Education, 74,* 98-111. https://doi.org/10.1016/j.compedu.2014.01.016

[11] **EUROSTAT.** (2024). *Digital Skills in 2023: Impact of Education and Age*. Available at https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20240222-1?&

[12] **European Commission.** (2016). DigComp 2.0: The Digital Competence Framework for Citizens. Joint Research Centre, European Commission. https://joint-research-centre.ec.europa.eu/digcomp_en

[13] **Esteve-Mon, F., Llopis-Nebot, M., & Adell-Segura, J.** (2020). Digital Competence and Computational Thinking of Student Teachers. *International Journal of Emerging Technology in Learning, 15*, 29-41. https://doi.org/10.3991/ijet.v15i02.11588

[14] **Gabidullina, E., Khalfin, A., & Khisamutdinova, A.** (2022). Formation of competencies of future tourism specialists in the context of digital transformation of the educational process. *Bulletin USPTU Science education economy Series economy*.

[15] **Grande-de-Prado, M., Cañón, R., García-Martín, S., & Cantón, I.** (2020). Digital Competence and Gender: Teachers in Training. A Case Study. *Future Internet, 12*, 204.

[16] **Hafkin, N. J. & Huyer, S.** (2007). Women and gender in ICT statistics and indicators for development. *Information Technologies and International Development, 4*(2), 25-41.

[17] **Hervé, J., Mani, S., Behrman, J., Nandi, A., Lamkang, A. S., & Laxminarayan, R.** (2021). Gender Gaps in Cognitive and Noncognitive Skills: Roles of SES and Gender Attitudes. *IZA Institute of Labor Economics Discussion Paper Series, No. 14132*. https://docs.iza.org/dp14132.pdf.

[18] **ILO.** (2024). International Labour Organization. Hotels, catering and tourism sector. https://www.ilo.org/industries-and-sectors/hotels-catering-and-tourism-sector

[19] **Ilomäki, L.** (2011). Does Gender Have a Role in ICT Among Finnish Teachers and Students? *Scandinavian Journal of Educational Research*, *55*(3), 325–340. https://doi.org/10.1080/00313831.2011.576910.

[20] **Ivanović, Đ., Simović, V., Domazet, I. & Antonijević, M.** (2021). Average Matching Levels for Two DigComp Competence Areas of the Female Entrepreneurs in Serbia. *Journal of Women's Entrepreneurship and Education*, 3-4. 42-60. https://doi.org/10.28934/jwee21.34.pp42-60

[21] **Fang, M. L., Canham, S. L., Battersby, L., Sixsmith, J., Wada, M., & Sixsmith, A.** (2019). Exploring Privilege in the Digital Divide: Implications for Theory, Policy, and Practice. The Gerontologist, *59*(1), e1–e15. https://doi.org/10.1093/geront/gny037.

[22] **Friemel, T. N.** (2014). The Digital Divide has Grown Old: Determinants of a Digital Divide Among Seniors. New Media & Society, *18*(2), 313–331. https://doi.org/10.1177/1461444814538648

[23] **Jiménez-Hernández, D., González-Calatayud, V., Torres-Soto, A., Mayoral, A., & Morales, J.** (2020). Digital Competence of Future Secondary School Teachers: Differences According to Gender, Age, and Branch of Knowledge. *Sustainability*. https://doi.org/10.3390/su12229473

[24] **JRC & DG EAC**. (2014). *Digital Skills Indicator – derived from Eurostat survey on ICT usage by Individuals, Methodological note – 2015*. Retrieved January 9, 2024 from https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=14342.

[25] **Kamberidou, I., & Pascall, N.** (2019). The digital skills crisis: engendering technology–empowering women in cyberspace. *European Journal of Social Sciences Studies, 4*(6), 1-33.

[26] **Kashyap, R., Fatehkia, M., Tamime, R. A., & Weber, I.** (2020). Monitoring global digital gender inequality using the online populations of Facebook and Google. *Demographic Research, 43*, 779-816.

[27] **Khumalo, Z. & Saurombe, M.** (2022). Women taking up space: a conceptual analysis of the gender-digital divide in south Africa. *Proceeding of the International Conference on Social Sciences, 8*(1), 2022, 118-136.

[28] **Kulkarni, L. & Ghosh, A.** (2021). Gender disparity in the digitalization of financial services: challenges and promises for women's financial inclusion in India. *Gender, Technology and Development, 25*(2), 233-250.

[29] **Laanpere, M.** (2019). Recommendations on assessment tools for monitoring digital literacy within UNESCO's Digital Literacy Global Framework. UNESCO Institute for Statistics Information, Paper No. 56, Montreal. https://doi.org/10.15220/2019-56-en

[30] **Lazić, M., Vukmirović, V. & Banović, J.** (2022). Digitalne kompetencije osoba sa invaliditetom u Srbiji i uključivanje u rad na onlajn platformama (Digital Competencies of Persons with Disabilities in Serbia and Inclusion in Online Platform Work). Policy brief. Institute of Economic Sciences, Belgrade, Serbia. https://ien.bg.ac.rs/cms_upload/pages/files/7793_digcomposi_sazetak_za_javne_politike.pdf

[31] **Lazić, M., Bradić-Martinović, A., & Banović, J.** (2023a). Digital skills in tourism and hospitality as a precondition for the sector resilient growth: The case of Serbia. *Hotel and Tourism Management, 11*(1), 25-40.

[32] **Lazić, M., Vukmirović, V., Banović, J., Simović, V., & Paunović, M.** (2023b). Digital competences as a precondition for an inclusive digital economy – Is there a gender gap among persons with disabilities in Serbia?. *Journal of Women's Entrepreneurship and Education*, 1-2, 51-71. https://doi.org/10.28934/jwee23.12.pp51-71

[33] **Lestaria, A. P. & Sunarto, S.** (2018). Digital gender gap pattern in Indonesia. *E3S Web of Conferences, 73*, 11007.

[34] **Losh, S.** (2004). Gender, Educational, and Occupational Digital Gaps 1983-2002. *Social Science Computer Review*, *22*, 152-166.

[35] **Majranović, J.**, **Domazet, I., Miljković, J.** (2023). Higher Education Branding through Instrumental Values. *Journal of Women's Entrepreneurship and Education*, *3-4*. 75-94. https://doi.org/10.28934/jwee23.34.pp75-94

[36] **Martínez-Cantos, J.L.** (2017). Digital skills gaps: A pending subject for gender digital inclusion in the European Union. *European Journal of Communication, 32*(5), 419-438.

[37] **Marx, S., Freundlich, H., Klotz, M., Kylänen, M., Niedoszytko, G., Swacha, J., & Vollerthum, A.** (2021). Towards an Online Learning

Community on Digitalization in Tourism. EMOOCs 2021, Potsdam, Universitätsverlag Potsdam. https://doi.org/10.25932/PUBLISHUP-51598

[38] **Montuori, C., Ronconi, L., Vardanega, T. & Arfé, B.** (2022) Exploring Gender Differences in Coding at the Beginning of Primary School. *Frontiers in Psychology, 13*, 887280.

[39] **Nakajima, N., Jung, H., Pradhan, M., Hasan, A., Kinnell, A., & Brinkman, S.** (2016). Gender Gaps in Cognitive and Non-Cognitive Skills in Early Primary Grades: Evidence from Rural Indonesia. Policy Research Working Paper; No. 7833. World Bank, Washington, DC.

[40] **Noor, A., Asghar, Z., Sarwar, H.& Arfeen, I.** (2021). Role of the ICT in Women Empowerment and Achieving SDGs: A Case Study of Women Labor Force in Developing Countries. Etikonomi, *20*(2), 339–348. https://doi.org/10.15408/etk.v20i2.22045.

[41] **OECD**. (2022). Tourism Trends and Policies. https://www.oecd-ilibrary.org/sites/a94c5f34-en/index.html?itemId=/content/component/a94c5f34-en

[42] **Palomares-Ruiz, A., Cebrián-Martínez, A., García-Toledano, E. & López-Parra, E. (2021).** Digital gender gap in university education in Spain. Study of a case for paired samples. *Technological Forecasting and Social Change, 173*, 1-9.

[43] **Petković, G., Bradić-Martinović, A. & Lazić, M.** (2024) Skills development as an indicator of the Serbian tourism digitalization progress. *Ekonomika preduzeća*, *72*(1-2), 137-149.

[44] **Radović-Marković, M. & Živanović, B.** (2019) Fostering Green Entrepreneurship and Women's Empowerment through Education and Banks' Investments in Tourism: Evidence from Serbia. *Sustainability, 11*(23), 6826..

[45] **Robinson, L., Cotten, S., Ono, H., Quan-Haase, A., Mesch, G., Chen, W., Schulz, J., Hale, T. & Stern, M.** (2015). Digital inequalities and why they matter. *Information Communication & Society, 18*(5), 569-582.

[46] **Rodriguez-Pasquín, M., Garcia-Luque, O. & Lopez-Martinez, M.** (2023). Digitalization and skills in Spain: regional differences and gender gaps. *Sociología y Tecnociencia, 13*(2), 94-117.

[47] **Sánchez Prieto, J., Trujillo Torres, J.M., Gómez García, M. & Gómez García,** G. (2020) Gender and Digital Teaching Competence. *Dual Vocational Education and Training. Education Sciences. 10*(3), 84.

[48] **Sánchez-Rivero, M., Gutiérrez-Fernández, M., Fernández-Torres, Y., & Gallego-Sosa, C.** (2023). A gender-oriented analysis of digital skills and ICT use intensity in tourism companies in Extremadura (Spain). *Gender in Management: An International Journal*. https://doi.org/10.1108/gm-04-2022-0147

[49] **Setiawati, R., Adriani, Z., & Wediawati, B.** (2022). Entrepreneurial interest in startup business based on entrepreneurial literacy and digital literacy. *Jurnal Perspektif Pembiayaan Dan Pembangunan Daerah*, *10*(4), 235-250.

[50] **Singh, S. (2017).** Bridging the gender digital divide in developing countries. *Journal of Children and Media*, *11*(2), 245–247.

[51] **Statistical Office of the Republic of Serbia**. (2019) Tourism sector publications available at https://www.stat.gov.rs/sr-latn/publikacije/

[52] **Van Deursen, A., Van Dijk, J.** (2010) Civil Servants' Internet Skills: Are They Ready for E-Government?. *Part of the Lecture Notes in Computer Science book series* (LNISA,volume 6228). https://link.springer.com/chapter/10.1007/978-3-642-14799-9_12

[53] **Vasquez Huatay, K. C., Mendoza Mendoza, A. P., Farías Rodríguez, J. C., & Montes Ninaquispe, J. C.** (2023). Digital Literacy in Basic Secondary School Students: A Gender Comparative Study. *2023 IEEE 3rd International Conference on Advanced Learning Technologies on Education & Research (ICALTER)*, 1-4.

[54] **Zaragoza-Sáez, P., García-Haro, M., & Buhalis, D.** (2021). Developing digital skills in tourism and hospitality: A blueprint strategy from the Next Tourism Generation (NTG) Alliance. *Tourism Management Perspectives, 39*, 100812.

[55] **Zhou, M.** (2014). Gender difference in web search perceptions and behavior: Does it vary by task performance?. *Computers & Education*, *78*, 174-184.

Article history: Received: July 8th, 2024
Accepted: October 8th, 2024
First Online: October 8th, 2024