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Digital skills in tourism and hospitality as a precondition for the sector resilient growth: The case of Serbia

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Abstract: Advanced digital solutions, modern technologies and artificial intelligence have fundamentally transformed the pace of change and existing business models in the tourism and hospitality (T&H) sector. Implementing advanced digital solutions through new and improved tourism products and services can transform the customer experience while increasing the sector's productivity and resilience. However, in order to adequately leverage advanced digital technologies, the T&H sector's workforce must have a sufficient level of digital skills, competencies, and capabilities. Accordingly, this paper aims to assess the digital skills of the T&H sector employees in Serbia and identify the key factors that influence their level. The findings suggest that the digital skills of employees in the T&H sector in Serbia should be improved through formal and informal education in order for the sector to reposition itself in a more resilient and sustainable manner and in line with the 2030 Agenda.

Keywords: digital skills, workforce, tourism and hospitality, Serbia
JEL classification: Z310, L83, J240

Digitalne veštine u turizmu i ugostiteljstvu kao preduslov za rezilijentni rast sektora: Slučaj Srbije

Sažetak: Napredna digitalna rešenja, moderne tehnologije i veštačka inteligencija fundamentalno su uticali na brzinu promena i postojeće poslovne modele u turizmu i ugostiteljstvu. Primena naprednih digitalnih rešenja, kroz nove i unapređene turističke proizvode i usluge, može da transformiše korisničko iskustvo, uz povećanje produktivnosti i jačanje otpornosti sektora. Međutim, kako bi se napredne digitalne tehnologije koristile adekvatno i efektivno, zaposleni u turizmu i ugostiteljstvu moraju da poseduju adekvatan nivo digitalnih veština, kompetencija i sposobnosti. Shodno tome, rad nastoji da oceni nivo digitalnih veština zaposlenih u sektoru turizma i ugostiteljstva u Srbiji, odnosno da identifikuje faktore koji opredeljuju njihov nivo. Rezultati sugerišu da bi digitalne veštine zaposlenih trebalo da se unaprede kroz formalno i neformalno obrazovanje, kako bi se sektor repozicionirao na rezilijentnijim i održivijim osnovama i u skladu sa Agendom 2030.

Ključne reči: digitalne veštine, radna snaga, turizam i ugostiteljstvo, Srbija
JEL klasifikacija: Z310, L83, J240

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1. Introduction

The tourism business model was already changing before the pandemic, with the introduction of a range of digital solutions designed to improve the end-user experience. Post-disaster was an opportunity to re-evaluate the effectiveness of response methods and incorporate lessons learned into future planning and resilience building (Fountain & Cradock-Henry, 2020). Information and communication technology (ICT) played an important role in this process, leading Pradhan et al. (2022) to declare digital technology an indispensable component of the tourism sector. ICT has revolutionized the sector structure by removing barriers to entry, reducing costs, ensuring price transparency, and reforming and increasing the efficiency of services. In addition, recent advances in network bandwidth, search tools, and transmission capacity have had a major impact on the number of tourists using technology to book and organize their trips. Finally, modern technology has accelerated the process of sector globalization by offering providers effective tools to expand, manage, and distribute their services worldwide.

However, in order to use technology successfully and appropriately, employees in the T&H sector must acquire an appropriate level of digital skills, competencies, and capabilities. Often referred to as 21st-century skills, these abilities have an impact on how employees respond to unforeseen circumstances (Koehorst et al., 2021). According to the "Survey on European Skills and Jobs", approximately 85.0% of all jobs in the European Union require at least basic digital skills (Cedefop, 2018), while tourism organizations consider digital skills critical for the sector's success (Zaragoza-Saez et al., 2021). People employed in the tourism sector need to be able to use devices, interact, obtain information, and solve problems through various digital solutions (UNESCO, 2018). Digital skills enable employees to be more productive and efficient (Erdogan et al., 2011), i.e., to remain competitive in the challenging labour market. A workforce with above-average digital skills can help the sector streamline work, reduce costs, and increase revenue. Conversely, a lack of digital skills needed to perform certain tasks affects economic efficiency and company production, which may lead to layoffs and subsequently a decline in company morale (Banović & Pavlović, 2021). Unfortunately, the COVID-19 pandemic significantly widened the digital skills gap, particularly among T&H employees, who suffered the most during periods of full closure (Carlisle et al., 2021).

The importance of the tourism sector in Serbia can be estimated by its contribution to GDP, which has registered an average annual growth rate of 5.0% over the last decade (Lazić & Bradić-Martinović, 2022a). Considering that it acts in synergy with other sectors both directly and indirectly as a source of employment and income (OAS, n.d.), the rise of tourism in the Western Balkans has long been regarded as a driver of economic development in the entire region (Selimi et al., 2017). Moreover, the sector has strong potential to contribute to the development of rural, coastal, peripheral or underdeveloped areas. Similarly, tourism infrastructure contributes to local development, while the jobs created or maintained can help compensate for industrial or rural losses caused by the sector (Eurostat, 2022).

Since the T&H sector has been identified as a priority area for Serbia's future socioeconomic growth and development, and its further digitalization is considered a critical factor for the sector's future expansion, the assessment and evaluation of the digital skills of the T&H workforce would be crucial. Accordingly, the paper aims to assess the digital skills of the workforce of the T&H sector in Serbia and identify the key factors that influence their level.

Based on the above challenges, the following research questions were stated:

1. What is the perceived level of digital skills among tourism and hospitality employees in Serbia?

2. Which factors determine the perceived level of digital skills of employees in the tourism and hospitality sector in Serbia?

2. Theoretical background

2.1. The role of ICT in T&H and its potential for the future

Tourism was one of the first sectors to digitalize its business processes worldwide, pioneering online booking of air travel and hotels (UNWTO, n.d.). The implementation of modern ICT solutions through new and improved tourism products and services can alter the customer experience while increasing the sector's productivity and resilience (Lazić & Bradić-Martinović, 2022b; Milovanović et al., 2022), both of which play a mediating role between organizational factors and labour outcomes (Jakubiv et al., 2022). Even before the COVID-19 pandemic, ICT had transformed the pace of change and existing tourism business models (Calvaresi et al., 2021). Advanced digital solutions, modern technology, and artificial intelligence have fundamentally revolutionized the structure of the industry (Buhalis & Moldavska, 2021; Mihailović et al., 2020) by lowering barriers to entry, simplifying price comparison, restructuring distribution methods via the Internet, lowering prices, and increasing production efficiency (Assaf & Tsionas, 2018). Accordingly, tourism services have become the largest category of products and services offered online (Abou-Shouk et al., 2013).

The COVID-19 pandemic sped up the sector's digital transformation (Lazić, 2022). The 'new normal' in the hospitality industry includes the increased use of advanced digital solutions and artificial intelligence (Leung, 2019). According to Oracle (2020), 78.0% of hospitality organizations believe voice-activated gadgets for controlling room lighting and temperature will soon be commonplace. In addition, high-quality Wi-Fi, touchscreen technology, and RFID or tablet-controlled hotel rooms are some of the factors influencing digitally savvy guests' experiences (Ristova Maglovska, 2020). Similarly, mobile access to services such as hotel and airline ticket reservations and recommendations for local attractions can help policymakers increase visitor interest and generate additional tax revenue (Snow et al., 2016). It can be concluded that advanced digital technology and artificial intelligence are influencing both the industry and guest/visitor behaviour (Tuo et al., 2021).

The pandemic has revealed that customer priorities are changing and evolving, so businesses must be prepared to adapt to navigate the dynamic landscape. Fostering a culture of innovation, combined with increased use of advanced digital solutions and sustainable development, creates various opportunities for the sector's resilient growth. Therefore, the resilience of the post-pandemic recovery will largely depend on how effectively structural issues are resolved, how readily companies adopt new technologies, and the extent to which digitalization and digital skills are embraced.

2.2. The importance of digital skills for the T&H sector

Unlike other industries, the T&H sector is highly dependent on the skills, competencies, and abilities of its human capital. The European Commission report (2016) examined and identified a wide range of skill requirements for the T&H sector, including digital skills, professional and business skills, social skills, and language skills. However, demand for digital skills has skyrocketed in the post-COVID-19 environment as employment in the T&H sector has slowly but gradually rebounded and the digital connectivity of the population has increased significantly (Carlisle et al., 2021). Nowadays, digitally savvy tourists research the information they need to plan and book their trip almost entirely online (Xiang et al., 2015),

which gives businesses the opportunity to be in constant interaction with their customers, track their preferences over time, and develop strong bonds and customer loyalty (Buhalis et al., 2019).

With technological advancement being the main driver of changing skill requirements in future work settings (Cedefop, 2018), Bikse et al. (2021) conclude that one of the biggest barriers to the sector's digital transformation is human capital. Innovative and high-quality customer service delivered by appropriately skilled employees is a critical requirement for the sector to succeed on stable ground. In other words, the rapid integration of ICT and tourism management has made the acquisition of appropriate digital skills in the tourism business critical to the sector's success. New skill-intensive technologies require individuals who are able to search for relevant information, justify their decisions, come up with innovative ideas, and solve problems in digital environments (Yang, 2015). In addition, the emergence of new occupations and the redefinition of existing ones require workers' digital skills to constantly evolve and improve (Hsu, 2018), making their assessment a highly popular topic in contemporary literature.

Accordingly, the concept of the digital divide, defined as the gap between those who are able to use modern digital technologies and those who are not or prefer not to (ENTELIS, 2020), has been explored in academic literature since the 1990s (Wu et al., 2014). Originally, the concept referred to accessibility to digital technologies (Van Dijk, 2006), while the modern understanding of the concept also questions the possession of skills and abilities to use modern digital solutions. Although there is ample evidence in the academic literature to support this concept in the general population, academic research on ICT in the T&H sector mostly focuses on the breakthrough growth and impact of the technology itself, as well as the importance and benefits of using ICT to manage business operations (Ivanov, 2019). Moreover, due to the lack of a clear definition, digital skills are often confused with digital literacy and competencies, which further complicates scientific research on this topic.

Recognizing the importance of strengthening digital skills in a modern information society, government agencies and training organizations have directed their research towards this topic while focusing their education and training programs on the digital skills of current and prospective workforce members. In addition, the importance of digital skills development has been recognized in most of the European Commission policy documents, as well as in the national strategic documents of the Republic of Serbia.

Although the importance of fostering digital skills in the T&H industry has been recognized as crucial for the future economic prospects of the sector, there is little scientific evidence on the level of digital skills of the workforce in the Serbian T&H sector. To the best of our knowledge, no comparable research has been conducted so far. Instead, several reports (Regional Cooperation Council, 2021; OECD, 2021a) and research papers (Bradić-Martinović & Petković, 2022; Luković, 2020) point to the high average level of digital skills among the general population in Serbia compared to other Western Balkan countries.

This paper fills the gap by providing empirical evidence on the perceived level of digital skills of T&H employees in Serbia and the factors that influence their level. The theoretical framework developed by the European Commission was used to identify the perceived level of digital skills, while the influencing factors were identified by simultaneously applying a chi-square test of independence and a binary logistic regression. As T&H has the opportunity to leverage digitalization to accelerate the sector's recovery from the 2020 collapse, the results obtained are intended to serve as a starting point for addressing skills gaps and shortages during the transition. By leveraging digitalization, the Serbian T&H sector would improve its chances of being resilient in the post COVID-19 era.

3. Research design and sample characteristics

Data collection was conducted between mid-January and early February 2023 with technical support from Microsoft Office Forms app. The link to the online questionnaire was distributed randomly by email to respondents employed in the Serbian T&H sector, with equal representation of the countries' geographical regions. The questionnaire consisted of 11 questions divided into two parts. The first part refers to the sociodemographic data of the respondents, while the second part contains questions about the self-assessment of their digital skills.

The sociodemographic distribution of the sample is presented in Table 1.

Table 1: Sample description

Socio and demographic characteristics	% of respondents N=220
Gender	
Male	52.3
Female	47.7
Age	
16-28	19.1
29-45	51,8
46-65	29.1
> 65	-
No answer	-
Education	
Primary	-
Secondary	38.2
Higher or Academic	61.8
Tourism sector	
Catering	40.9
Tourism	50.9
Creative Industries	8.2
Job position	
Management	40.4
Staff	59.6
Monthly income	
Up to 300 EUR	4.6
301-650 EUR	39.5
651-1,270 EUR	37.6
More than 1,270 EUR	11.0
No answer/Other	7.3

Source: Authors' research

4. Methodology

The Digital Skills Indicator (DSI) has been used as a conceptual framework for measuring the digital skills of employees in the T&H sector (RQ1). The European Commission developed the DSI as part of DG CONNECT – the Directorate General for Communications Networks, Content and Technology, which develops and implements policies to make Europe fit for the digital age. The European Commission's Digital Competence Framework

(DigComp) served as the theoretical basis for the indicator. The framework consists of five competence areas: Information, Communication, Content Creation, Safety and Problem-solving. Prior to Fall 2022, the DSI was calculated based on four competency domains, excluding Safety, which is the version of the indicator used in this paper[1]. For a comprehensive explanation of the methodology used for the index calculation, see "Digital Skills Indicator derived from a Eurostat survey on ICT usage by Individuals - Methodological note" (European Commission, 2015).

In addition, a two-layered methodology was used to identify the factors that determine the perceived level of digital skills of employees in the Serbian T&H sector (RQ2). In the first iteration, the Pearson chi-square test of independence (Pearson, 1900) is used to determine the presence of a statistically significant relationship between two categorical variables. Specifically, the test is used to examine the distinct impact of the sociodemographic variables on the previously calculated DSI values. By analyzing the joint frequency of the data values within a cross-tabulation, it is possible to determine the association or independence of the variables using the chi-square test. The test evaluates the compatibility of the observed distribution with an expected distribution under the assumption of independence. Consideration is given to two categorical variables with r and c categories. The null hypothesis states that no relationship exists between these variables. The p-value represents the probability of obtaining a test statistic greater than the observed value. The null hypothesis is confidently rejected if the p-value falls below the predetermined significance level.

In the second iteration, a predictive logistic regression model was built to determine which factors determine higher levels of digital skills. Specifically, a binary logistic regression (Fritz & Berger, 2015) was performed to determine which factors, when combined, increase the likelihood that an employee in the T&H sector in Serbia will have a higher level of digital skills. The Omnibus Test of Model Coefficients is used to assess whether adding independent variables to the new model improves the baseline model. The goodness of fit of the model is also tested using the Hosmer & Lemeshow test. Results are presented using the model's coefficients (B), the standard errors of the coefficients (S.E.), the Wald test of coefficients significance (Wald, Df, Sig.) and the odds ratios (Exp(B)).

5. Results

Based on the data collected during the survey, the DSI values of Serbian employees in the T&H sector were calculated to answer the first research question and are presented in Table 2. In order to estimate whether the average skill level of employees in the T&H sector is higher or lower than that of the general population, DSI values for the general population in Serbia and the European Union, whose membership Serbia aspires to attain, are also presented in Table 2.

[1] Since the data were collected as part of an online survey, it should be noted that applied method of data collection cannot provide any information about Internet use in the last three months.

Table 2: Comparative analysis of DSI levels (%)

Sample / general population of Serbia / general population of EU (2021)

Level of skills	**Serbia**		**European Union general population**
	Sample	**General population**	
Individuals with no skills	-	4.9	3.0
Individuals with low level of skills	**20.0**	25.8	35.1
Individuals with basic level of skills	**49.1**	29.0	27.5
Individuals with above basic level of skills	**30.9**	12.3	26.4

Note: The EU statistical report states that it was not possible to assess the level of digital skills of 18.9% of respondents in Serbia and 11.0% of respondents in the EU
Source: Authors' research and Eurostat Database (2021)

The sample-based analysis indicates that 49.1% of respondents have basic digital skills, while 30.9% consider their digital skills to be above the basic level. Only 20.0% of respondents reported having low digital skills. The values obtained indicate that the digital skills of respondents employed in the Serbian T&H sector are generally higher than those of the general population (both in Serbia and European Union). Nevertheless, it is important to note that the data from our sample and those collected by the Statistical Office of the Republic of Serbia and presented by Eurostat are not fully comparable due to different data collection methods. Specifically, the national statistical agency collects data using telephone surveys, while an online survey was used for data collection in this study. Consequently, it was not possible to survey people without digital skills or people who have not used the Internet in the last three months, which is the key requirement for distinguishing between people with and without digital skills. However, considering that the focus of this study is on improving digital skills to support the resilient growth and competitiveness of the T&H sector, and that only 4.9% of respondents reported a lack of such skills in the general population, it can be concluded that the method of data collection does not affect the impartiality of the conclusions drawn.

To answer the second research question, the results of a chi-square test of independence performed using the cross-tabulation of the different sociodemographic factors and the previously calculated DSI values are presented in Table 3.

Table 3: Chi-square test of independence

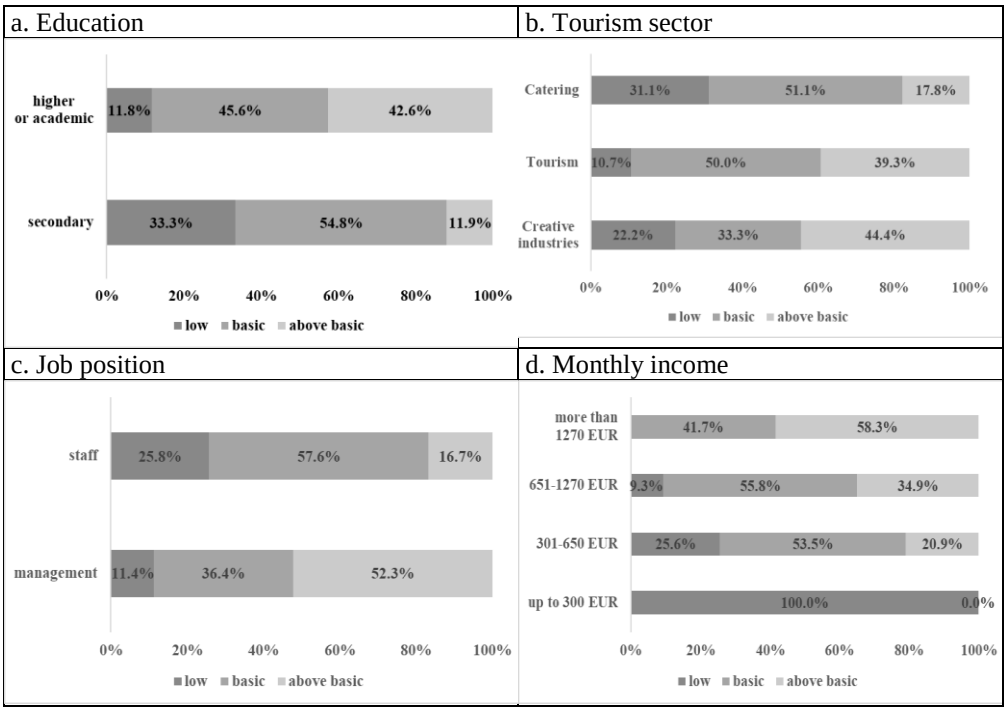
Factors	**Value**	**Df**	**Asymptotic Sig. (2-sided)**	**Phi**
Gender	3.553	2.000	0.169	0.180
Age	2.639	4.000	0.620	0.155
Education	14.423	2.000	0.001	0.362
Tourism sector	10.031	4.000	0.040	0.302
Job position	15.983	2.000	0.000	0.381
Monthly income	31.936	8.000	0.000	0.539

Note: reference values for Phi: >0.1 low level, 0.1-0.5 moderate level and >0.5 high level ($p<0.05$)
Source: Authors' research

The results indicate a statistically significant relationship between the DSI value and the following factors: 'education', 'tourism sector', 'job position' and 'monthly income'. In contrast, the results show no significant correlation for 'age' and 'gender'. The Phi coefficient is calculated as a complementary correlation metric. This statistic serves as an indicator of the strength of the relationship between the variables. Its values indicate a strong correlation between 'monthly income' and DSI level, while the intensity of the relationship between 'education', 'tourism sector' and 'job position' is moderate.

In addition, a cross-tabulation analysis was performed to improve the understanding of the relationship between variables. The graphical representation of the results is shown in Figure 1, which is divided into four subfigures. Each subfigure contains graphs corresponding to socio-demographic factors that have statistically significant relationships with DSI levels.

Figure 1: Frequency distribution for cross tabulation between DSI and socio-demographic variables



Source: Authors' research

As shown in Figure 1.a, respondents with higher or academic education have higher than average (above-basic) levels of DSI at 42.6%, while only 11.9% of respondents with secondary education have similar levels of digital skills. The correlation between the level of digital skills and the tourism sector is also noteworthy, as the data in Figure 1.b show. According to the structure presented, individuals in the creative industry have the most advanced skills, while those in the hospitality sector have the lowest. Cross-tabulation made it possible to determine the correlation between job position and DSI level. The results show that a greater proportion of those in managerial positions have advanced skills, while only 16.7% of those in lower positions do. The data presented in Figure 1.d also indicates a positive correlation between monthly income and digital skills. In particular, lower-income individuals tend to have lower levels of DSI, while higher-income individuals tend to have higher levels of DSI. Notably, none of the highest income respondents reported low levels of digital skills.

As explained in the methodology, binary logistic regression was performed in the second iteration to comprehensively answer the second research question by assessing the influence of the combined socio-demographic factors. To achieve the stated objective, the socio-demographic variables listed in Table 1 were used as predictors, resulting in a total of six independent variables, while the dependent variable was represented by the calculated values of the DSI indicator. The variable selection technique used for this purpose is Forward Stepwise using the Wald criterion. Variable selection was performed through two iterations of the algorithm, as shown in Table 4.

Table 4: Omnibus test of model coefficients

		Chi-square	**df**	**Sig.**
Step 1	Step	15.662	1	.000
	Block	15.662	1	.000
	Model	15.662	1	.000
Step 2	Step	4.284	1	.038
	Block	19.945	2	.000
	Model	19.945	2	.000

Source: Authors' research

Table 5 shows the metrics for model fit. The explanatory power of the model, as measured by the Nagelkerke R-squared, covers 23.4% of the variance in the dependent variable (Table 5). In addition, the model correctly classifies 70.0% of the cases (Table 6).

Table 5: Model summary

Step	**-2 Log likelihood**	**Cox & Snell R-squared**	**Nagelkerke R-squared**
1	120.380[a]	0.133	0.187
2	116.096[b]	0.166	0.234

Source: Authors' research

Table 6: Classification table

Step 1	Overall Percentage (%)	70.9
Step 2	Overall Percentage (%)	70.0

Source: Authors' research

The Hosmer-Lemeshow statistic is used to evaluate the goodness of fit of a logistic regression model. If the significance value is less than 0.05, it indicates a poor fit. However, in the case of this study, the model fits the data well (Table 7), indicating that there is no significant difference between the observed and predicted outcomes.

Table 7: Hosmer and Lemeshow test

Step	**Chi-square**	**df**	**Sig.**
1	0.000	0	
2	4.041	2	0.133

Source: Authors' research

Table 8 shows the variables that were selected for the final model. Statistical analysis revealed that only two independent variables, 'education' and 'job position', had a statistically significant impact on the level of digital skills. The results suggest that the higher the level of education, the higher the likelihood of having digital skills beyond the basic

level. Similarly, career advancement within the organizational structure increases the likelihood that the respondent has above-basic digital skills.

The variable 'job position' is the most robust predictor of the responses given by the respondents. The results show that individuals who hold managerial positions are 3.6 times more likely than staff members to report having digital skills beyond the basic level, holding all other factors constant in the model. Therefore, individuals who hold managerial positions are more likely to make a valuable contribution to improving the resilience of the tourism industry in Serbia in the coming period. The data also show that individuals with higher levels of education are 3.2 times more likely to have above-basic digital skills than those with lower levels of education. Finally, the results of the study indicate that there is no significant influence of 'gender', 'age', 'tourism sector' and 'monthly income' on the level of digital skills of the respondents.

Table 8: Variables in the equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Job position	1.700	0.447	14.443	1	0.000	5.476
	Constant	-1.609	0.330	23.744	1	0.000	0.200
Step 2[b]	Education	1.158	0.582	3.964	1	0.046	3.183
	Job position	1.278	0.484	7.080	1	0.008	3.621
	Constant	-4.544	1.566	8.421	1	0.004	0.011

Note: Education (0 – secondary; 1 – higher or academic); Job position (0 – staff; 1 – management)
Source: Authors' research

6. Discussion

Based on the analysis of the sample of employees in the T&H sector in Serbia, it can be concluded that almost half of the respondents reported having a basic level of digital skills. As mentioned above, Cedefop (2020) indicated that more than 85.0% of jobs, regardless of the sector (including tourism), require at least basic digital skills. The same source indicates that this level is sufficient for performing routine work and tasks that do not require interaction with other people. However, employees in the T&H industry who perform more complex tasks (usually in managerial positions) are expected to have higher digital skills. Considering that most respondents in the observed sample are in managerial positions (59.6%), it can be concluded that the general level of digital skills is relatively satisfactory.

The situation is somewhat different for advanced digital skills, considering that 29.1% of respondents reported having above-basic digital skills. It is these skills that are in high demand when using advanced advertising and data analytics techniques, as they relate to the tourism-specific digital skills defined by the OECD (OECD, 2021b). The most prominent examples are tourism digital marketing specialists, tourism new technology and innovation specialists, tourism business development managers, and tourism information technology specialists. Consequently, the overall conclusion of the conducted research is that T&H employees in Serbia have a sufficient level of digital skills to perform basic tasks, but on average they lack advanced skills, which could be a significant limitation for the application of advanced digital solutions.

The results of the analysis related to the determinants of digital skills of individuals employed in the T&H sector show that two main factors - education and job position – emerged as the most influential. The findings underscore the importance of education in

shaping individuals' digital skills and highlight the nuanced relationship between educational background and digital proficiency, which is consistent with previous research on this topic. For example, in a sample of citizens in the Twente region of the Netherlands, Van Deursen (2010), Van Deursen and Van Dijk (2008a; 2008b) and Van Deursen et al. (2011) found that education level was the most important correlating factor - the four categories of digital or Internet skills differed significantly by education level. Using data from the 2011 Oxford Internet Surveys (OxIS), Helsper and Eynon (2013) showed that education level was related to all indicators of digital skills and self-efficacy - individuals with a university degree felt more competent in all skill areas than individuals without a university degree. Hargittai (2010) demonstrated that education has such a strong effect on the level of digital skills that even the educational level of parents can explain the differences in the level of digital skills of their children, while Gui and Argentin (2011) confirmed the exact correlation and indicated that the relationship is more robust for male children. In the domestic literature, there are only a modest number of studies on this topic. However, based on microdata from the sample of the Statistical Office of the Republic of Serbia (Survey on ICT Usage in Households and by Individuals), Bradić-Martinović (2022) confirmed a significant relationship between the level of digital skills of Serbian citizens and their level of education.

Although there is a lack of empirical research directly linking digital skills to job positions, scholars have studied the impact of skills on leadership positions. In that regard, Nowacka and Rzemieniak (2022) found that digital and cognitive competences are essential for making accurate management decisions and consciously choosing leadership tactics in an organisation. In addition, Peng (2017) noted that managerial and professional positions benefit more from computer proficiency compared to other job categories. Thus, considering managerial positions as abstract occupations, Peng et al. (2018) suggest that the growing demand for abstract occupations drives up the demand for individuals with advanced levels of education, while the computerization of routine tasks lowers the demand for individuals with intermediate skill levels.

7. Conclusion

With the aim of supporting the digital transformation of the sector, the pilot research presented in this paper was developed to investigate the perceived level of digital skills of T&H employees in Serbia and to identify the key factors influencing this level. The study concludes that, on average, employees in the T&H sector have basic digital skills that enable them to perform simple and moderately complex tasks in a digital environment. These findings suggest that the perceived level of digital skills in the T&H sector is insufficient to achieve strong long-term growth and resilience. The results also show notable correlations between digital skills levels and education and job position, highlighting the importance of education in shaping individuals' digital skills. In this regard, post-COVID is an impetus for developing countries to harness the green technological revolution to boost economic growth, increase resilience to shocks, and reduce inequality. Experience from previous technological revolutions shows that early adopters can advance faster and enjoy the benefits over a longer period of time.

The Government of the Republic of Serbia is actively working to improve the digital literacy of its citizens. For example, the Regional Development Agency "Braničevo-Podunavlje" and the Regional Development Agency of Eastern Serbia (RARIS) held training on the new centralized information system for the travel and tourism industry (e-Tourist) in October and November 2021. The Vojvodina Education Center for Vocational and Work Skills Training offers a wide range of courses, including advanced courses in web programming, design and multimedia, which are highly valued in the province's tourism industry. The Republic of

Serbia is committed to improving the digital literacy of its population, as evidenced by the above initiatives, with the "Strategy for Digital Skills Development in the Republic of Serbia for the period from 2020 to 2024" (Official Gazette RS 21/2020) serving as a guiding document. However, the Serbian government should take further measures to identify and monitor various digital divides in order to develop a systematic approach to digital learning. In particular, the country should prioritize the improvement of the formal education system through its further digitalization, paying special attention to the needs of the T&H sector and collaboration with industry in curriculum design. It would be desirable if this process were guided by a deep understanding of the need for advanced skills to provide a basis for more intensive development of the T&H sector through technological advances. Moreover, it is unlikely that the development of novel digital educational materials will lead to a successful outcome. On the contrary, the first step should be to use existing resources that are also curriculum-aligned.

Studies on digital skills in the T&H sector, in general, and Serbia, in particular, are scarce. The findings in this study not only send an important signal to other researchers to address this issue, but also have practical implications for various stakeholders. Policymakers and educational institutions can use these findings to prioritize digital literacy initiatives within formal education systems aimed at equipping students with the necessary skills to meet the demands of the digital age. In addition, employers and recruiters can use these findings to inform recruitment and training strategies and design appropriate executive short programs as they recognize the importance of advanced digital skills and competencies across career fields. By recognizing the interplay between education, job position, and digital skills, decision-makers can make informed choices to promote digital inclusion and improve individuals' readiness for the evolving digital landscape.

Nonetheless, the main limitations of this study relate to the sample size and the method of data collection. The authors are aware that a more realistic insight into the actual level of digital skills of employees in the T&H sector could be obtained if the questionnaire was distributed both online and in paper form. Consequently, future research should be directed towards this goal and include a larger sample of respondents. In addition, the self-assessment method often leads to biased evaluations. However, measuring digital skills is not straightforward, and objectively determining individuals' knowledge requires testing, i.e., an experimental method that could be costly and time-consuming. Since the European Union has conducted the same self-assessment surveys of European citizens over the last fifteen years, on the basis of which the DSI is calculated, the use of the same method could be considered appropriate.

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Conflict of interest

The authors declare no conflict of interest.

References

1. Abou-Shouk, M., Megicks, Ph., & Lim, W. M. (2013). Perceived benefits and e-commerce adoption by SME travel agents in developing countries: Evidence from

Egypt. *Journal of Hospitality & Tourism Research*, *37*(4), 490–515. https://doi.org/10.1177/1096348012442544

2. Assaf, G. A. & Tsionas, M. (2018). The estimation and decomposition of tourism productivity. *Tourism Management*, *65*, 131–142. https://doi.org/10.1016/j.tourman.2017.09.004
3. Banović, J., & Pavlović, D. (2021). Information and communication technology's skills among the working population of Serbia. *Economic Analysis: Applied research in emerging markets, 54*(2), 118–127. https://doi.org/10.28934/ea.21.54.2.pp118-127
4. Bikse, V., Lusena-Ezera, I., Rivza, P., & Rivza, B. (2021). The development of digital transformation and relevant competencies for employees in the context of the impact of the COVID-19 pandemic in Latvia. *Sustainability*, *13*, 9233. https://doi.org/10.3390/su13169233
5. Bradić-Martinović, A., & Petković, G. (2022). Digitalne veštine kao uslov za uspešnu primenu inovacija u turizmu – Šansa ili ograničenje za Srbiju [Digital skills as a condition for the successful application of innovations in tourism – A chance or a limitation for Serbia]. In M. Mosurović Ružičić, M. Lazarević-Moravčević & M. Paunović (Eds.), *Nauka i inovacije kao pokretači privrednog razvoja [Science and innovation as drivers of economic development]* (pp. 89–108). Belgrade, Serbia: Institute of Economic Sciences.
6. Bradić-Martinović, A. (2022). *Digitalne veštine građana Srbije [Digital skills of citizens of Serbia]*. Belgrade, Serbia: Institute of Economic Sciences.
7. Buhalis, D., & Moldavska, I. (2021). In-room voice-based AI digital assistants transforming on-site hotel services and guests' experiences. In W. Worndl, Ch. Koo & J. L. Steinmetz (Eds). *Information and Communication Technologies in Tourism 2021* (pp. 30–44), Springer. https://doi.org/10.1007/978-3-030-65785-7_3
8. Buhalis, D., Harwood, T., Bogicevic, V., Viglia, G., Beldona, S., & Hofacker, C. (2019). Technological disruptions in services: Lessons from tourism and hospitality. *Journal of Service Management*, *30*(4), 484–506, https://doi.org/10.1108/JOSM-12-2018-0398
9. Calvaresi, D., Ibrahim, A., Calbimonte, J-P., Schegg, R., Fragniere, E., & Schumacher, M. (2021). The evolution of chatbots in tourism: A systematic literature review. In W. Worndl, Ch. Koo & J. L. Steinmetz (Eds). *Information and Communication Technologies in Tourism 2021* (pp. 3–16), Springer. https://doi.org/10.1007/978-3-030-65785-7_1
10. Carlisle, S., Ivanov, S., & Dijkmans, C. (2021). The digital skills divide: Evidence from the European tourism industry. *Journal of Tourism Futures*, ahead-of-print. https://doi.org/10.1108/JTF-07-2020-0114
11. Cedefop (2018). *Insights into skill shortages and skill mismatch: Learning from cedefop's European skills and jobs survey, Cedefop reference series no 106.* Retrieved Januar 10, 2023 from https://www.cedefop.europa.eu/en/publications/3075
12. Cedefop (2020). *Skills developments and trends in the tourism sector. Skills panorama analytical highlights.* Retrieved January 16, 2023 from https://skillspanorama.cedefop.europa.eu/en/analytical_highlights/skillsdevelopments-and-trends-tourism-sector.
13. ENTELIS (2020). *Towards full digital inclusion: The Entelis Manifesto against the digital divide*. Retrieved May 5, 2023 from https://entelisplus.entelis.net/wp-content/uploads/2020/11/entelis_manifesto_en.pdf
14. Erdogan, B., Bauer, T. N., Peiro, J. M., & Truxillo, D. M. (2011). Overqualified employees: Making the best of a potentially bad situation for individuals and organizations. *Industrial and Organizational Psychology*, *4*(2), 215–232. https://doi.org/10.1111/j.1754-9434.2011.01330.x
15. European Commission (2015). *Digital skills indicator – derived from Eurostat survey on ICT usage by individuals. Methodology note - 2015*. Retrieved February 20, 2023 from

https://eufordigital.eu/wp-content/uploads/2019/10/Digital-Skills-Indicator-survey-on-ICT-usage-by-Individuals_Methodological.pdf.

16. European Commission (2016). *A new skills agenda for Europe: Working together to strengthen human capital, employability and competitiveness, COM/2016/0381 final.* Retrieved January 30, 2023 from https://eur-lex.europa.eu/legal-content/EN/TXT?uri=CELEX:52016DC0381
17. Eurostat (2021). *Individuals' level of digital skills (dataset).* Retrieved February 2, 2023 from https://ec.europa.eu/eurostat/databrowser/view/isoc_sk_dskl_i21/default/table?lang=en
18. Eurostat (2022). *Enlargement countries – Tourism statistics*. Retrieved February 6, 2023 from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Enlargement_countries_-_tourism_statistics&oldid=571024#Employment_in_the_tourism_sector
19. Fountain, J., & Cradock-Henry, N. (2020). Tourism management perspectives recovery, risk and resilience: Post-disaster tourism experiences in Kaikōura, New Zealand. *Tourism Management Perspectives*, *35*(2–4), 100695. https://doi.org/10.1016/j.tmp.2020.100695
20. Fritz, M., & Berger, P.D. (2015). Chapter 11 - Will anybody buy? Logistic regression. In M. Fritz & P. D. Berger (Eds.) *Improving the User Experience through Practical Data Analytics: Gain Meaningful Insight and Increase your Bottom Line* (pp. 271–304). https://doi.org/10.1016/B978-0-12-800635-1.00011-2
21. Gui, M., & Argentin, G. (2011). Digital skills of internet natives: Different forms of digital literacy in a random sample of northern Italian high school students. *New Media & Society*, *13*(6), 963–980. https://doi.org/10.1177/1461444810389751
22. Hargittai, E. (2010). Digital na(t)ives? Variation in internet skills and uses among members of the "Net Generation". *Sociological Inquiry*, *80*(1), 92–113. https://doi.org/10.1111/j.1475-682X.2009.00317.x
23. Helsper, E., & Eynon, R. (2013) Pathways to digital literacy and engagement. *European Journal of Communication*, *28*(6), 1–25.
24. Hsu, C. H. (2018). Tourism education on and beyond the horizon. *Tourism Management Perspectives*, *25*, 181–183. https://doi.org/10.1016/j.tmp.2017.11.022
25. Ivanov, S. (2019). Ultimate transformation: How will automation technologies disrupt the travel, tourism and hospitality industries? *Zeitschrift für Tourismuswissenschaft [Journal of Tourism Science]*, *11*(1), 25–43. https://doi.org/10.1515/tw-2019-0003
26. Jakubiv, M., Pršić, M., & Ćirić, M. (2022). The effects of organizational factors on work outcomes – The role of employee resilience in hospitality kitchens. *Hotel and Tourism Management*, *10*(2), 71–89. https://doi.org/10.5937/menhottur2202071J
27. Koehorst, M., van Deursen, A., van Dijk, J., & de Haan, J. (2021). A systematic literature review of organizational factors influencing 21st-century skills. *SAGE Open*, 1–16. https://doi.org/10.1177/21582440211067251
28. Lazić, M., & Bradić-Martinović, A. (2022b). Analysis of the impact of the COVID-19 pandemic on tourism demand in the Republic of Serbia – Challenges and opportunities. In H. Hanić & A. Veljković (Eds.). *Izazovi i perspective marketinga [Challenges and Perspectives of Marketing]* (pp. 239–248). Zlatibor, Srbija: Srpsko udruženje za marketing.
29. Lazić, M. (2022). Creative industries as a driver of innovations and competitiveness – Global and national overview. In M. Mosurović Ružičić, M. Lazarević-Moravčević & M. Paunović (Eds.). *Nauka i inovacije kao pokretači privrednog razvoja [Science and innovation as drivers of economic development]* (pp. 129–148). Belgrade, Serbia: Institute of Economic Sciences.
30. Lazić, M., & Bradić-Martinović, A. (2022a). Analysis of tourism demand in selected WB6 countries during the COVID-19 pandemic. In V. Bevanda & S. Štetić (Eds.), *Modern Management Tools and Economy of Tourism Sector in Present Era* (pp. 51–72).

Belgrade, Serbia: Association of Economists and Managers of the Balkans. https://doi.org/10.31410/tmt.2021-2022.51

31. Leung, R. (2019). Smart hospitality: Taiwan hotel stakeholder perspectives. *Tourism Review*, *74*(1), 50–62. https://doi.org/10.1108/TR-09-2017-0149
32. Luković, V. (2020). Online platforms as modern tools in tourism in extraordinary times: Case for further digitalization in Western Balkans. In V. Bevanda & S. Štetić (Eds.), *Modern Management Tools and Economy of Tourism Sector in Present Era* (pp. 555–568). Belgrade, Serbia: Association of Economists and Managers of the Balkan. https://doi.org/10.31410/tmt.2020.555
33. Mihailović, B., Radić Jean, I., Popović, V., Radosavljević, K., Chroneos Krasavac, B., & Bradić-Martinović, A. (2020). Farm differentiation strategies and sustainable regional development. *Sustainability*, *12*(17), 1–18. https://doi.org/10.3390/su12177223
34. Milovanović, V., Chong Ka Leong, D., & Paunović, M. (2022). Benefits from adopting technologies for the hotel's supply chain management. *Hotel and Tourism Management*, *10*(2), 91–103. https://doi.org/10.5937/menhottur2202091M
35. Nowacka, A., & Rzemieniak, M. (2022). The impact of the VUCA environment on the digital competences of managers in the power industry. *Energies 15*(1), 185. https://doi.org/10.3390/en15010185
36. OAS (n.d.). *Annex 2. Tourism as an economic development tool*. Retrieved January 1, 2023 from http://www.oas.org/dsd/publications/unit/oea78e/ch10.htm.
37. OECD (2021a). *Competitiveness in South East Europe 2021, A policy outlook.* Retrieved May 3, 2023 from https://www.oecd-ilibrary.org/development/competitiveness-in-south-east-europe-2021_cf2e0fc7-en
38. OECD (2021b). *Preparing the tourism workforce for digital future. OECD tourism papers No. 2021/02*. Retrieved May 3, 2023 from https://doi.org/10.1787/d465eb68-en
39. *Official Gazette RS, 21/2020*. Retrieved May 30, 2023 from https://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/vlada/strategija/2020/21/2/reg/
40. Oracle (2020). *HOTEL 2025: Emerging technologies destined to reshape our business.* Retrieved January 30, 2023 from https://www.oracle.com/webfolder/s/delivery_production/docs/FY16h1/doc31/Hotels-2025-v5a.pdf
41. Pearson, K. (1900). On the criterion that a given system of deviations from the probable in the case of a correlated system of variables is such that it can be reasonably supposed to have arisen from random sampling. *Philosophical Magazine*. *Series 5*, *50*(302), 157–175. https://doi.org/10.1080/14786440009463897
42. Peng, G. (2017). Do computer skills affect worker employment? An empirical study from CPS surveys. *Computers in Human Behavior*, *74*, 26–34. https://doi.org/10.1016/j.chb.2017.04.013
43. Peng, G., Wang, Y., & Han, G. (2018). Information technology and employment: The impact of job tasks and worker skills. *Journal of Industrial Relations*, *60*(2), 201–223. https://doi.org/10.1177/0022185617741924
44. Pradhan, S., Lama, S. & Bunker, D. (2022). ICT adoption for tourism disaster management: A systematic review. In T. Huggins & V. Lemiale (Eds.), *CoRe Research Paper – Open Track Proceedings of the ISCRAM Asia Pacific Conference 2022*, Australia, Melbourne.
45. Regional Cooperation Council (2021). *Digital skills – Needs and gaps in the Western Balkans, scope and objectives for a fully-fledged assessment*. Retrieved May 6, 2023 from https://www.rcc.int/pubs/129/digital-skills-needs-and-gaps-in-the-western-balkans--scope-and-objectives-for-a-fully-fledged-assessment
46. Ristova Maglovska, C. (2020). What do hotel guests really want? An analysis of online reviews using text mining. *Hotel and Tourism Management*, *8*(1), 37–48. https://doi.org/10.5937/menhottur2001037R

47. Selimi, N., Sadiku, L., & Sadiku, M. (2017). The impact of tourism on economic growth in the Western Balkan countries: An empirical analysis. *International Journal of Business and Economic Sciences Applied Research*, *10*(2), 19–25. https://doi.org/10.25103/ijbesar.102.02
48. Snow, C., Hakonsson, D., & Obel, B. (2016). A smart city is a collaborative community: Lessons from smart Aarhus. *California Management Review*, *59*(1), 92–108. https://doi.org/10.1177/0008125616683954
49. Tuo, Y., Ning, L., & Zhu, A. (2021). How artificial intelligence will change the future of tourism industry: The practice in China. In W. Worndl, Ch. Koo, & J. L, Steinmetz (Eds.), *Information and Communication Technologies in Tourism 2021* (pp. 83–94). https://doi.org/10.1007/978-3-030-65785-7_7
50. UNESCO (2018). *Digital skills critical for jobs and social inclusion*. Retrieved February 15, 2023 from https://en.unesco.org/news/digital-skills-criticaljobs-and-social-inclusion
51. UNWTO (n.d.). *Digital transformation*. Retrieved February 6, 2023 from https://www.unwto.org/digital-transformation
52. Van Deursen, A. (2010). *Internet skills – Vital assets in an information society*. Thesis. Enschede, Netherlands: University of Twente.
53. Van Deursen, A., & Van Dijk, J. (2008a). Measuring digital skills – Performance tests of operational, formal, information and strategic Internet skills among the Dutch population. In D. Jurafsky, J. Chai, N. Schluter & J. Tereault (Eds.), *58th Conference of the International Communication Association*, Canada, Montreal: International Communication Association.
54. Van Deursen, A., & Van Dijk, J. (2008b). Using online public services: A measurement of citizens' operational, formal, information and strategic skills. *Lecture Notes in Computer Science*, No. 5184, 195–206.
55. Van Deursen, A., Van Dijk, J., & Peters, O. (2011) Rethinking internet skills: The contribution of gender, age, education, internet experience, and hours online to medium and content-related internet skills. *Poetics*, *39*, 125–144. https://doi.org/10.1016/j.poetic.2011.02.001
56. Van Dijk, A. (2006). Digital divide research, achievements and shortcomings. *Poetics*, *34*(4/5), 221–235. https://doi.org/10.1016/j.poetic.2006.05.004
57. Wu, T-F., Chen, M. Ch., Yeh, Y. M., Wang, H. P., & Chang, S. Ch. H. (2014). Is digital divide an issue for students with learning disabilities? *Computers in Human Behavior*, *39*, 112–117. http://dx.doi.org/10.1016/j.chb.2014.06.024
58. Xiang, Z., Magnini, V. P., & Fesenmaier, D. R. (2015). Information technology and consumer behavior in travel and tourism: Insights from travel planning using the internet. *Journal of Retailing and Consumer Services*, *22*, 244–249. https://doi.org/10.1016/j.jretconser.2014.08.005
59. Yang, I. T. C. (2015). Virtual CEOs: A blended approach to digital gaming for enhancing higher order thinking and academic achievement among vocational high school students. *Computers & Education*, *81*, 281–295. https://doi.org/10.1016/j.compedu.2014.10.004
60. Zaragoza-Saez, P., Marco-Lajara, B., & Ubeda-Garcia, M. (2021). Digital skills in tourism. A study from the Next Tourism Generation (NTG) Alliance. *Measuring Business Excelence*, *26*(1), 106–121. https://doi.org/10.1108/MBE-11-2020-0151

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