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Digital literacy of farmers in the context of rural tourism services provision in Serbia

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Abstract

Purpose – Digital transformation in the sector of rural tourism, along with the digital literacy of farmers, is increasingly becoming an imperative for the successful operation of rural tourist households. However, research in this field is scarce in Serbia, which motivated the authors to explore it in more detail. The aim of the research was to examine the awareness of the members of rural tourist households of the need and importance of possessing digital literacy for managing the tourist offer, as well as to study the factors affecting this awareness. **Methodology** – We used online survey research and a semi-structured questionnaire designed for these needs. The sample involved 131 rural tourist households. Conclusions were drawn using descriptive statistics and non-parametric statistical technique for comparing groups Kruskal-Wallis test. **Findings** – Members of rural tourist households in Serbia are highly aware of the need and importance of digital literacy for performing tasks in the field of rural tourism. The Kruskal-Wallis test showed that only the respondents' attitude towards the importance of marketing for rural tourism development had a statistically significant effect on these attitudes ($p=0.000$). **Implications** – Despite the subjectivity inherent in this research, the obtained results enrich scientific knowledge in this field and provide useful information for practitioners and policymakers in the areas of rural development and rural tourism.

Keywords: rural tourist households, digital knowledge & skills, marketing, survey research

JEL classification: D1, J24, R2, Z30

Digitalna pismenost farmera u kontekstu pružanja usluga seoske turističke ponude u Srbiji

Sažetak

Svrha – Digitalna transformacija u sektoru seoske turističke ponude, uz digitalnu pismenost farmera, sve više je imperativ uspešnog poslovanja seoskih turističkih domaćinstava. Ipak, istraživanja ove oblasti u Srbiji su oskudna, što je motivisalo autore da je detaljnije istraže. Cilj istraživanja bio je da se ispita svest članova seoskih turističkih domaćinstava o potrebi i

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značaju posedovanja digitalne pismenosti za upravljanje turističkom ponudom, kao i faktori koji na ovu svest imaju uticaja. **Metodologija** – Koristili smo online anketno istraživanje i polustrukturirani upitnik dizajniran za ove potrebe. Uzorak čini 131 seosko turističko domaćinstvo. Za zaključivanje je korišćena deskriptivna statistika i neparametarska statistička tehnika poređenja grupa Kruskal-Wallis test. **Rezultati** – Članovi seoskih turističkih domaćinstava u Srbiji imaju visoku svest o potrebi i značaju digitalne pismenosti za obavljanje poslova u sektoru seoske turističke ponude. Kruskal-Wallis test pokazao je da statistički značajan uticaj na ove stavove ima samo stav ispitanika o značaju marketinga za razvoj turističke ponude ($p=0.000$). **Implikacije** – I pored subjektivnosti koja je u osnovi istraživanja, rezultati obogaćuju naučna znanja u ovoj oblasti i pružaju korisne informacije praktičarima i kreatorima javnih politika u oblasti ruralnog razvoja i seoskog turizma.

Ključne reči: seoska turistička domaćinstva, digitalna znanja i veštine, marketing, anketno istraživanje

JEL klasifikacija: D1, J24, R2, Z30

1. Introduction

Rural tourism, as part of the multifunctional agriculture concept (farm-related activities) contributes to strengthening the agricultural sector and local farmers, as well as revitalizing rural areas. Therefore, it significantly attracts the attention of academic circles (Anuj et al., 2023; Kachniewska, 2015; Knickel et al., 2024; Leković et al., 2020; Mihailović et al., 2020; Seetanah & Fauzel, 2023). This form of tourism is an extremely significant segment of agricultural and rural development in Serbia. It brings numerous economic and social benefits for local communities in rural areas, whose survival is greatly endangered by depopulation, migrations and rural poverty (Borović et al., 2022; Bratić, 2021; Dašić et al., 2020; Dimitrijević et al., 2022; Panić et al., 2024; Ristić et al., 2020; Todorović & Bjeljac, 2009; Vesić et al., 2022).

Today the sectors of agriculture and rural tourism, as well as all other sectors of economy and society, are strongly influenced by information and communication technologies (abbr. ICTs). It is indisputable that these sectors are moving in the direction of intensive digital transformation. In the sector of agriculture, Agriculture 4.0 technologies are becoming increasingly prevalent. They involve both highly sophisticated digital solutions in the agricultural production process, as well as less technologically complex, less challenging or demanding solutions which include using the Internet, digital tools and devices, social media marketing and alike (Alavion & Taghdisi, 2021; Bolfe et al. 2020; Elghannam et al., 2020; FAO, 2022; Kernecker et al., 2020; Morepje et al., 2024; Zhong et al., 2024). Also, digitalization has become an imperative for sustainable business activities in the sector of tourism (Anuj et al. 2023; Muangasame & Tan, 2023; Munitlak Ivanović et al., 2020; Ndhlovu et al., 2024; Rodrigues et al., 2023; Schönherr et al., 2023; Seetanah & Fauzel, 2023; Verhun et al., 2022). According to Verhun et al. (2022), the most frequently used digital tools in the field of tourism and hospitality are “digital marketing in the travel industry; digital presence of companies through travel websites; digital presence of consumers through online travel search, online booking and travel planning technologies; social media” (p. 869). In addition, digitalization is becoming increasingly present in the field of public services and administration (primarily through eGovernment) and is also affecting the agricultural sector and residents of rural areas (Panganiban, 2019; Sheikh & Berenyi, 2023; Vázquez-López & Marey-Perez, 2021; Ziolo et al., 2022).

Serbia is showing improvement in all dimensions of the Digital Economy and Society Index, and in this regard the country is the leader in the region (Regional Cooperation Council, 2022). In all its forms, digitalization is present in the sectors of agriculture and tourism in

Serbia, and farmers and residents of rural areas are already required to communicate with the government through various digital platforms, such as eTourist or eAgrar (Bešić et al., 2024; Ćirić et al., 2018; Dašić et al., 2023; Ilić Kosanović et al., 2019; Jurjević et al., 2019; Kljajić et al., 2024; Kovljenić et al., 2023; Lazić et al., 2023; Manasijević et al., 2019; Mihailović et al., 2024; Munitlak Ivanović et al., 2020; Radičić, 2022).

In order to use all the possibilities and benefits offered by the new digital age and Agriculture 4.0 technologies, farmers engaged in agriculture and rural tourism should have a certain level of digital literacy, i.e., they should possess certain digital knowledge and skills. In this paper, the authors follow the definition of digital literacy (abbr. DILT) by Eshet-Alkalai (2004), who defines it as follows: “*more than the mere ability to use software or operate a digital device; it includes a large variety of complex cognitive, motor, sociological, and emotional skills, which users need in order to function effectively in digital environments*” (p. 93).

DILT of farmers in Serbia is not at an impressive level, primarily due to their age and educational structure, low computer literacy and small farm size, which is the reason why the application of digitalization in the agricultural sector is still in its early stages (Dašić et al., 2023; Ilić-Kosanović et al., 2019; Jurjević et al., 2019; Kljajić et al., 2024; Kovljenić et al., 2023; Radičić, 2022). Scarce studies dealing with DILT in the tourism and hospitality sector indicate that employees in this sector and supply-side stakeholders possess only basic digital skills which are mainly defined by their level of education (Lazić et al., 2023; Petković et al., 2024). A gap in these studies is evident when it comes to the bearers of the rural tourist offer, i.e., owners and/or members of rural tourism households (abbr. RTHs) and their DILT.

Bearing in mind the above mentioned, the subject of the paper is examination of the attitudes of the holders of the rural tourist offers in Serbia regarding the need and importance of acquiring digital knowledge and skills in order to successfully manage RTHs in the period of intensive digitalization of this sector. The aim of this research is to identify the factors which affect or may affect the formation of these attitudes. The research hypothesis is that awareness of the need for and importance of digital literacy in RTH management is shaped by factors such as: the region (RTH headquarters), the age and education of rural tourism providers, their experience in that business, views on the importance of marketing for rural tourism development, and also different economic dimensions of engaging in rural tourism.

The examined variable is formulated as “*Awareness of the need and importance of digital literacy for the management of the RTHs*”. On the other hand, various demographic, spatial, social and business dimensions of respondents (providers of rural tourism services) were selected as the factors which could have an impact on examined variable, like: (a) region or seat of RTH; (b) age and education of respondents; (c) experience in the field of rural tourism; (d) economic dimension of dealing with rural tourism (capacity size of RTH; content of the tourist offer; degree of satisfaction with tourist visits and occupancy rate, degree of satisfaction with the income from rural tourism); (e) respondents’ views on the importance of marketing for rural tourism development.

2. Rural tourism in Serbia: Analysis of the sector

Rural tourism sector in Serbia is under the competence of the Ministry of Tourism and Youth, which keeps records of RTHs on the eTourist portal (on this portal, RTHs submit requests for accommodation categorization and register and deregister tourists). Business operation in this sector is regulated by the Hospitality Law (National Assembly, 2019).

Serbia has enormous potential and a rich resource base in every sense for the development of rural tourism, and thus for the revitalization and sustainable development of rural areas (Borović et al., 2022; Gajić et al., 2018; Panić et al., 2024; Todorović & Bjeljic, 2009; Vesić

et al., 2022; Vujko et al., 2016). Rural tourism services in Serbia have a satisfactory to high level of quality, the regions of Šumadija and Western Serbia stand out as a significant tourist destination, and the expansion of this form of tourism is yet to be expected in the future (Cvijanović et al., 2023; Dimitrijević et al., 2022; Gajić et al., 2023).

The number of agricultural holdings in Serbia that engage in rural tourism as the other gainful activity related to the holding increased between the two Censuses of Agriculture (2012-2023) from 514 (2012) to 880 (2023) (Census of Agriculture 2023). This can be partly explained by the support that RTHs obtain through various competitions provided by the Ministry of Tourism and Youth, the support within the IPARD II programme (Measure 7), and primarily the support provided by the Ministry of Tourism and Youth for the development of the domestic tourist offer by means of voucher distribution schemes. Also, the COVID-19 pandemic led to increased demand in the rural tourism sector in Serbia, bringing new, positive impulses to this sector and raising hopes that engaging in rural tourism could be promising and economically sustainable in the future (Cvijanović et al., 2023; Gajić et al., 2023; Vesić et al., 2022). According to research on the impact of the pandemic on the rural tourism sector in Serbia, a group of authors Cvijanović et al. (2023) indicated that in 2021, compared to the baseline year of 2018, there was an increase in the number of RTHs, as well as in the number of guests and overnight stays in rural tourism, leading to higher revenues for RTHs. In a survey conducted among tourists who used rural tourism accommodation during the pandemic, the authors identified their main reasons for staying in rural areas, and those were: peace and quiet, the beauty of the landscape, relaxation, and homemade food (Cvijanović et al., 2023).

With the strong influence of digitalization and social media in our daily and business lives, growing affirmation of e-marketing, and the popularization of gastronomy (as part of cultural identity), new dimensions and perspectives of development for this form of tourism in Serbia are emerging (Bešić et al., 2024; Gajić et al., 2018; Marković & Pindžo, 2020; Munitlak Ivanović et al., 2020).

However, despite all the above, this sector of tourism in Serbia is still in its initial development phase, with underutilized natural, human, and economic potential (Bratić, 2021; Borović et al., 2022; Gajić et al., 2018). According to the group of authors Borović et al. (2022), *“fragmented and dispersed peasant holdings, orientation towards other types of tourism and mass tourism, insufficiently developed awareness of the value of the environment, are just some of the factors that have influenced the weak development of rural tourism”* (pp. 934-935). In comparative analyses, it is often emphasized that this sector still cannot compete in quality with rural tourism offerings in economically developed European countries (Dimitrijević et al., 2022; Gajić et al., 2018; Vujko et al., 2016).

Key directions for the development of rural tourism in Serbia include educating the population interested in engaging in these activities, strengthening their digital knowledge and skills, improving their organization and cooperation, establishing tourist information points in villages, building appropriate infrastructure, enhancing recreational amenities, and similar initiatives (Bešić et al., 2024; Borović et al., 2022; Bratić, 2021; Ćurčić et al., 2021; Lazić et al., 2023; Petković et al., 2024; Todorović & Bjeljac, 2009). It is essential to monitor market trends, work on market segmentation, invest in marketing and promotion, and establish tourism clusters, where each cluster would identify its market advantage and develop appropriate forms of tourism accordingly—such as agritourism, gastronomic tourism, and ecotourism (Borović et al., 2022; Bratić, 2021). Additionally, policymakers, practitioners, and local community representatives should, in the coming period, place a strong emphasis on a balanced, sustainable, and responsible development of rural tourism in Serbia, where environmental preservation and ecological aspects would gain significantly greater importance (Bešić et al., 2024; Bratić, 2021; Panić et al., 2024).

3. Digital knowledge and skills of farmers and bearers of the tourist offer in Serbia

The Statistical Office of the Republic of Serbia continuously conducts research on the use of ICTs in Serbia, and the data indicate that Serbia is making progress in this area compared to previous years. The results for 2024 show that 73.4% of households in Serbia own a personal computer, while 88.8% have an internet connection (Josipović et al., 2024). Certain advantages in owning and using computers, as well as having internet access, are observed in the Belgrade region (compared to the Southern and Eastern Serbia region), among the younger population compared to the older, more educated individuals compared to the less educated, residents of urban areas compared to other settlements, and households with higher monthly incomes compared to those with the lowest incomes. For example, the digital divide is evident in the following categories of households and individuals (Josipović et al., 2024):

- Type of settlement. In other settlements (which can be interpreted as rural areas), 65% of households own a computer, and 84.3% have an internet connection (compared to 77.5% of households owning a computer and 91.1% having an internet connection in urban areas);
- Household monthly income. In the income category above 90,000 dinars, as many as 94.3% of households own a computer, and 98.7% have an internet connection, while in the income category up to 30,000 dinars, only 25.1% of households own a computer, and 58.1% have an internet connection;
- Age. In the past three months, only 31.3% of older individuals (aged 65-74) used a computer, while 94.8% of individuals in the 16-24 age group used a computer in the same period;
- Education. As many as 92.3% of individuals in the higher education category used a computer in the past three months, compared to 51.0% of those in the no education and primary education category.

The percentage of individuals with basic or above-basic overall digital skills in Serbia for 2023 was 33.6%, while in the EU-27 it was significantly higher (55.6%) (Eurostat database). Serbia also exhibits a digital divide based on age and education. Thus, individuals with basic or above-basic overall digital skills make up only 5.3% of the 65-74 age group, compared to 58.9% of the 25-34 age group. Additionally, the percentage of respondents with basic or above-basic overall digital skills is highest among those with high formal education (58.8%) and lowest among those with no or low formal education (17.7%) (Eurostat database).

DILT in the tourism and hospitality sector. Digital skills of supply-side participants in the tourism and hospitality sector in Serbia have not been sufficiently examined and analyzed in the literature. There are still no studies related to digital knowledge and skills of farmers engaged in rural tourism as the other gainful activity. For now, the researches of Lazić et al. (2023) and Petković et al. (2024) are available. According to Lazić et al. (2023), employees in the tourism and hospitality sector (management and staff job positions) in Serbia are still not sufficiently prepared to work and function in a digital environment, considering the fact that they possess only basic DILT skills which are sufficient for performing simple and technologically undemanding tasks. The results of Lazić et al. (2023) also showed “*notable correlations between digital skills levels and education and job position, highlighting the importance of education in shaping individuals’ digital skills*” (p. 35). Studying the digital skills of the tourism supply-side stakeholders in Serbia, Petković et al. (2024) indicated that “*in the tourism and hospitality sector, digital skills become one of the critical factors as they enable organizations and professionals to effectively utilize and adapt to the latest technological developments, improving the overall travel experience and/or operational*

efficiency of service providers” (p. 137). According to this authors’ research, low digital skills are particularly present among civil servants, specifically among tourism inspectors in Serbia.

DILT of farmers and rural residents. In Serbia, issues related to the DILT of farmers are primarily associated with the use of: (a) social networks, which are increasingly present in farmers’ everyday life and business operations, even among small-scale farmers; (b) the internet and e-marketing; and (c) digital technologies in agricultural production processes (Ćirić et al., 2018; Dašić et al., 2023; Ilić Kosanović et al., 2019; Kljajić et al., 2024; Kovljenić et al., 2023; Sljukic et al., 2021). Although digitalization is becoming more widespread in agricultural practice and it is evident that it has the potential to improve farmers’ positions, its growth is significantly limited by the low DILT levels among farmers and the low awareness of the importance of digitalization in business operations. This is the result of numerous factors, and the most significant of which include: the dominance of small-scale family farms (with subsistence or semi-subsistence farming); high land fragmentation; low labor productivity and low economic strength of farms; unfavorable age and educational structure of farmers; insufficient advisory support, and lack of training programs (Dašić et al., 2023; FAO, 2020; FAO, 2022; Horvat et al., 2020; Ilić Kosanović et al., 2019; Jurjević et al., 2019; Kovljenić et al., 2023; Paraušić et al., 2021; Radičić, 2022; Sljukic et al., 2021).

Data from the 2023 Census of Agriculture indicate that the average size of a family farm in Serbia is only 5.7 hectares, while its average economic size is €10,497 (Census of Agriculture, 2023). As many as 44.6% of farm managers belong to the 65+ age group, 54% from the total number of farm managers have only completed primary school, and during 2023, only 2.8% of farm managers attended agricultural training courses (Census of Agriculture, 2023). As a result of such an unfavorable structure of agriculture, the following data related to the application of computers in business are not surprising. Namely, only one-third of agricultural holdings have internet access, only 6.6% use a computer to improve agricultural business operations, and just 1.7% use some type of farm management software (Census of Agriculture, 2023).

Ćirić et al. (2018) highlight a correlation between farmers’ innovativeness (willingness to adopt new ideas and technologies) and their readiness to accept the internet and social networks in daily business operations. However, numerous authors argue that DILT among Serbian farmers is significantly influenced by their age, education, and economic strength (income from farming or other activities) (Dašić et al., 2023; Ilić Kosanović et al., 2019; Jurjević et al., 2019; Kovljenić et al., 2023; Radičić, 2022). More developed digital skills (which impact the broader acceptance of the internet, social networks, e-business, and digitalization of business processes) are more common among: younger farmers, more educated farmers, and farmers with greater economic strength (Dašić et al., 2023; Ilić Kosanović et al., 2019; Jurjević et al., 2019; Kovljenić et al., 2023). In general, the unfavorable age and educational structure of farmers, the absence of training programs and advisory support, along with the low economic and financial strength of farms, are the main reasons contributing to the low DILT levels among farmers in Serbia.

In considering the digital literacy of farmers in Serbia, experiences from other countries can be useful. So, in the study examining the factors affecting the adoption of ICTs (e-marketing) by the rural population in Iran, Khalil Moghaddam and Khatoon-Abadi (2013) underline that the expansion of informatics in school curricula and popularity of internet-based jobs among the young generation in Iran are important factors for the adoption of ICTs. They also state that a higher education level of the family members, as well as greater application of ICTs in the household are positively correlated with the adoption of ICTs, i.e., adoption of e-marketing by respondents (users of the Gharn Abad ICT centre). However, there is no

correlation between the formal education of the Gharn Abad ICT centre users and ICT adoption. Similarly, no correlation was found between the adoption of ICTs and the economic status of respondents (users of the Gharn Abad ICT centre) (Khalil-Moghaddam & Khatoon-Abadi, 2013). Using an example of Ghana, Abdulai et al. (2023) examined factors which affected the possibility of small-scale farmers' participation in digital agricultural services. The results showed that the following groups were more likely to participate: (a) men (compared to women); (b) farmers belonging to a farmers' association; (c) farmers with a better access to extension services; as well as (d) farmers who possess mobile phones and possibility to make phone calls. Analyzing the application of the eGovernance digital platform in the agriculture of Bangladesh, Sheikh and Berenyi (2023) emphasize the low capability of primarily conventional and poor small-scale farmers to adjust to the digital age. Kernecker et al. (2020) express a similar attitude stating that the adoption of digital solutions in agriculture increases with the size of the farm. Simultaneously, Zhong et al. (2024) believe that age and level of education have a significant impact on the Internet skills of individuals and development of e-commerce in the agricultural sector.

Recommendations. It is unquestionable that digital competencies of farmers and rural residents should be improved in order to be adapted to the digital age. In the process, significant attention should be paid to older generations of farmers, those with lower levels of education and small-scale farmers. Government bodies and departments, as well as development agencies, should have a critical role in the process. Throughout the literature, it is underlined that support for improving the DILT of rural population is primarily necessary in the following fields: (a) providing information and education on using ICTs (formal and informal education, organizing different educational and training programmes; opening digital centers and educational facilities, etc.); (b) facilitated access to digital tools (mobile phones, computers, the Internet, etc.); (c) empowering farmers' associations/groups; (d) more efficient access of farmers to extension services, along with strengthening the capacity of these services; (e) investing in rural infrastructure (physical and communication infrastructure), particularly in remote and inaccessible areas (Abdulai et al., 2023; Alavion & Taghdisi, 2021; Dašić et al., 2023; FAO, 2022; Ilić Kosanović et al., 2019; Jurjević et al., 2019; Kovljenić et al., 2023; Mokhtar et al., 2022; Panganiban, 2019; Sheikh & Berenyi, 2023; Vázquez-López & Marey-Perez, 2021).

4. Materials and methods

Sample of respondents. The sample includes representatives of agricultural holdings based in Serbia, which deal with rural tourism as the other gainful activity (related to the holding). At the beginning of the questionnaire, the researchers underlined the request for the questionnaire to be completed by the individuals who are most engaged in operational and management activities in RTH. Due to the nature of the research, purposeful-random sampling was used, while participation in the questionnaire was anonymous. The methods of sampling and surveying, as well as the sample size, ensure the representativeness of the sample for research, as well as the credibility of the results.

The sample includes the representatives of 132 RTHs in Serbia, accounting for 15% of the total number of households which stated that they engaged in tourism as the other gainful activity in the 2023 Census of Agriculture (Census of Agriculture, 2023). At the same time, due to the low response of RTHs in the Belgrade region (only one response), this household was excluded from further analysis. Therefore, the sample was lowered to 131, but its representativeness and reliability of the results were not altered.

Due to the exclusion of one RTH from the Belgrade region, the sample encompassed three regions in Serbia. The sample structure per region is as follows: Vojvodina region (8%),

Šumadija and Western Serbia region (60%), and Southern and Eastern Serbia region (33%). The territorial distribution of the RTHs in the sample is also highly representative, i.e., it is adjusted to the regional distribution of households recorded by the 2023 Census of Agriculture as engaging in tourism as the other gainful activity ([Census of Agriculture, 2023](#)).

Description of the study. For the needs of the research and data collection, the authors used survey research which [Sapsford \(2007\)](#) defines as “the collection of quantified data from a population for purposes of description or to identify covariation between variables that may point to casual relationships or predictive patterns of influence” (p. 3). A semi-structured questionnaire was prepared and designed. It contained a large number of questions but only a set of questions was used for the requirements of this paper. A comprehensive review of the literature preceded the creation of the questionnaire. In order to check the questionnaire validity, a pilot study was conducted (an online study by means of a pre-test questionnaire). The final version of the questionnaire was created after correcting unclear or ambiguous questions. In addition, prior to finalizing the interview, the authors conducted semi-structured interviews by phone with three RTH representatives.

Data collection was carried out by distributing the final questionnaire to respondents accompanied by a request to complete it. The questionnaire was sent online using the Google Forms software. The distribution process was mainly conducted by sending a link to the questionnaire electronically (via email or Viber) to RTH representatives, whose contacts were obtained with the help of the representatives of various tourist organizations. The online survey was conducted from November 2023 to May 2024. The response rate was 70% and the final sample size (RTH representatives who completed and electronically sent the questionnaire) amounted to 132 RTHs.

Variables in the research. In order to provide responses to the asked research questions one continuous variable and nine categorical variables were used.

The continuous variable was defined as follows: “Awareness of the need and importance of digital literacy for the management of the RTH”. DILT was explained to respondents using the following concepts: Internet skills; smartphone and social media marketing skills; computer proficiency; skills of Viber communication and communication via other social networks; knowledge and usage of online advertising, and alike. Using the Likert scale, respondents evaluated this variable using ratings from 1 to 5: rating 1 – no need or significance; rating 5 – extremely high need and significance.

Categorical variables of factors used to create respondent groups are presented in Table 1. These variables refer to various dimensions of RTHs (spatial, demographic, social and business dimensions), while three variables refer to examining respondents’ attitudes related to the satisfaction with rural tourism income, tourist visits and occupancy rates, as well as their views on the importance of marketing for successful RTH management. These variables were selected based on the comprehensive literature review ([Dašić et al., 2023](#); [Ilić Kosanović et al., 2019](#); [Jurjević et al., 2019](#); [Kernecker et al., 2020](#); [Khalil-Moghaddam & Khatoon-Abadi, 2013](#); [Lazić et al., 2023](#); [Petković et al. 2024](#); [Sheikh & Berenyi, 2023](#); [Zhong et al., 2024](#)).

Table 1: Categorical variables in the research

Name of the factors	Levels of the factors
Region (seat of the RTH)	Gp1: Vojvodina; Gp2: Šumadija and Zapadna Srbija; Gp3: Južna and Istočna Srbija;
Age of the person most involved in operational and management activities in RTH	Gp1: Young (≤ 40); Gp2: Middle-aged (41-64); Gp3: Elderly (≥ 65);
Education of the person most involved in operational and management activities in RTH	Gp1: Primary school; Gp2: Secondary (high) school; Gp3: Faculty, Master's degree, Ph.D.;
Experience in the field of rural tourism (years of dealing with rural tourism)	Gp1: Beginners and less experienced (less than 5 years); Gp2: Moderately experienced (5-14 years); Gp3: Very experienced (15 years or more);
Capacity size (number of individual beds per household)	Gp1: Small capacity (1-4 beds); Gp2: Medium-size capacity (5-9 beds); Gp3: Large capacity (≥ 10 beds)
Content of the tourist offer	Gp1: Accommodation only; Gp2: Full board (accommodation with food and beverage service); Gp3: Full board and other activities
Satisfaction with tourist visits and occupancy rates*	Gp1: Dissatisfied to slightly satisfied; Gp2: Moderately satisfied; Gp3: Satisfied to extremely satisfied
Satisfaction with the income from rural tourism*	
Importance of marketing for rural tourism development (advertising, farm promotion, etc.)**	Gp1: Not important to slightly important, Gp2: Moderately important; Gp3: Important to extremely important;

* The groups were formed based on the responses to the question: “How satisfied are you with tourist visits to your RTH and occupancy rates?” and “How satisfied are you with the income from rural tourism?”. The responses were given on the Likert scale in the range from 1 (Dissatisfied) to 5 (Extremely satisfied)

** The groups were formed based on the response to the question “How important are knowledge and investment in marketing for RTH management?”. The responses were given on the Likert scale in the range from 1 (Not important) to 5 (Extremely important)

Source: Authors' research

Statistical procedures. Conclusions were drawn using descriptive statistics, as well as non-parametric statistical technique for comparing groups based on the values of the continuous examined variable (Kruskal-Wallis test). This test was used for testing the null hypothesis (H_0) stating that k ($k > 2$) independent samples belong to the same base set, i. e., that there is no difference in the mean ranks and medians of the continuous variable between the three base sets to which the samples (respondent groups) belong. All necessary assumptions for the application of these techniques were fulfilled: random, independent samples belonged to continuous sets; data for the examined variable were available in the form of ranks, i.e., on an ordinal measurement scale. The selection of this technique proved to be appropriate for the nature of the research, the variable types, and also in accordance with the test results that indicate that the continuous variable does not have a normal distribution (Sig. of tests especially of Kolmogorov-Smirnov test is not greater than 0.05) (Table 2).

Table 2: Tests of normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Awareness of the need and importance of digital literacy for the management of the RTH	0.336	131	0.000	0.713	131	0.000

a. Lilliefors Significance Correction

Source: Authors' research

The data were processed using the statistical software Statistical Package for Social Sciences (SPSS). An alpha level of 0.05 was used as the basis for the conclusions.

5. Results and discussion

Sample description. When it comes to the question which individual (individuals) in RTH is most engaged in operational and management activities related to rural tourism, the response structure shows that these are mainly female individuals (since 59% of respondents provided this response), with a quarter of respondents stating that these are male individuals, and 16% of them stating that several people are engaged in these activities (the most frequent response is that all or most family members are involved).

Regarding the structure of people in RTHs who are most engaged in operational and management activities related to tourism according to age and education, the results indicate the following:

- ✓ the group of young individuals (≤ 40) involved the lowest number of respondents, only 20 (18%);
- ✓ the group of middle-aged individuals (41-64) contained the largest number of respondents, 67 (61%);
- ✓ the elderly group (≥ 65) included 23 respondents (21%);
- ✓ there are only 9 respondents with only elementary education (8%);
- ✓ there are 66 respondents with secondary education (60.0%);
- ✓ there are 35 (32%) respondents with higher education (college, faculty, master's degree, Ph.D.)

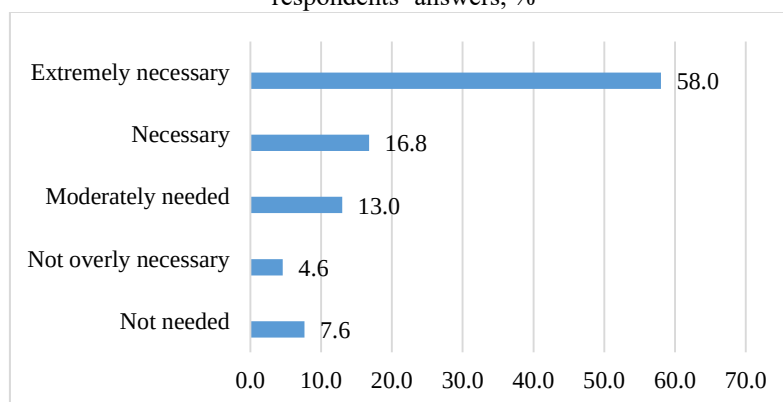
Regarding the experience in rural tourism, the largest percentage of respondents (43%) have been engaged in this activity for 5 to 14 years, which makes them moderately experienced. About a third of respondents are beginners (with up to 5 years of experience), while about a quarter are experienced respondents (with 15 or more years of experience).

The capacity size indicates that the largest percentage of respondents (47%) have medium-size capacities (with 5-9 individual beds). Approximately a third have larger accommodation capacities (10 or more individual beds), while about a quarter have small accommodation capacities (1-4 individual beds). Regarding the structure of the tourist offer, it is interesting to note that approximately the same percentage of respondents stated that they offered only accommodation (32%), or accommodation with food (37%), or accommodation including food and other activities, such as organizing excursions, renting bicycles, etc. (31%).

Description of the continuous variable. The average rating of the variable "Awareness of the need and importance of digital literacy for the management of RTH" amounts to 4.13, MED=5, Mode=5. The IQR (interquartile range) is 2 and indicates that 50% of mid-position responses (percentiles 25-75) of respondents were in the range from the rating of 3 to the

maximum rating of 5. Figure 1 shows the response scale, where it can be noticed that as many as 58% of respondents provided the highest rating for this variable.

Figure 1: Awareness of the need and importance of DILT for the management of RTH, respondents' answers, %



Source: Authors' research

Testing of H_0 . Table 3 shows the results of the H_0 testing by applying the Kruskal-Wallis test for examining the differences in the values (Mean rank and MED) of the continuous variable according to the levels of the factors.

Table 3: Testing the differences in the values of the continuous variable between the groups

Factors	Continuous variable: Awareness of the need and importance of digital literacy for the management of RTH
Region (seat of RTH)	Gp1, n=10: Vojvodina, Mean rank=70.00; Gp2, n=78: Šumadija and Zapadna Srbija, Mean rank=68.36; Gp3, n=43: Južna and Istočna Srbija, Mean rank=60.79; χ^2 (2, n=131)=1.533, $p=0.465$. No statistical significance*
Age of the person most involved in operational and management activities at RTH*	Gp1, n=20: Young, Mean rank=60.18; Gp2, n=67: Middle-aged, Mean rank=57.67; Gp3, n=23: Elderly, Mean rank=45.11; χ^2 (2, n=110)=4.044, $p=0.132$. No statistical significance*
Education of the person most involved in operational and management activities at RTH*	Gp1, n=9: Primary school, Mean rank=43.00; Gp2, n=66: Secondary school, Mean rank=56.05; Gp3, n=35: Higher education (faculty, master's degree, PhD), Mean rank=57.69; χ^2 (2, n=110)=1.991, $p=0.370$. No statistical significance*
Experience in the field of rural tourism	Gp1, n=41: Beginners and less experienced, Mean rank=74.35; Gp2, n=56: Moderately experienced, Mean rank=65.56; Gp3, n=34: Very experienced, Mean rank=56.65; χ^2 (2, n=131)=5.088, $p=0.079$. No statistical significance*

Capacity size	Gp1, n=30: Small capacity, Mean rank=68.92; Gp2, n=62: Medium-size capacity, Mean rank=68.50; Gp3, n=39: Large capacity, Mean rank=59.78; $\chi^2(2, n=131)=1.872, p=0.392$. No statistical significance*
Content of the tourist offer	Gp1, n=42: Accommodation only, Mean rank=70.54; Gp2, n=49: Full board, Mean rank=61.28; Gp3, n=40: Full board and other activities, Mean rank=67.03; $\chi^2(2, n=131)=1.741, p=0.419$. No statistical significance*
Importance of marketing for rural tourism development	Gp1, n=23: Not important to slightly important, Mean rank=35.26, MED=3.0; Gp2, n=22: Moderately important, Mean rank=53.82, MED=4.0; Gp3, n=86: Important to extremely important, Mean rank=77.34, MED=5.0; $\chi^2(2, n=131)=31.378, p=0.000$. Statistical significance**
Satisfaction with tourist visits and occupancy rate	Gp1, n=9: Dissatisfied to slightly satisfied, Mean rank=63.94; Gp2, n=30: Moderately satisfied, Mean rank=73.87; Gp3, n=92: Satisfied to extremely satisfied, Mean rank=63.64; $\chi^2(2, n=131)=2.097, p=0.351$. No statistical significance*
Satisfaction with the income from rural tourism	Gp1, n=16: Dissatisfied to slightly satisfied, Mean rank=58.41; Gp2, n=60: Moderately satisfied, Mean rank=68.03; Gp3, n=55: Satisfied to extremely satisfied, Mean rank=66.00; $\chi^2(2, n=131)=1.017, p=0.601$. No statistical significance*

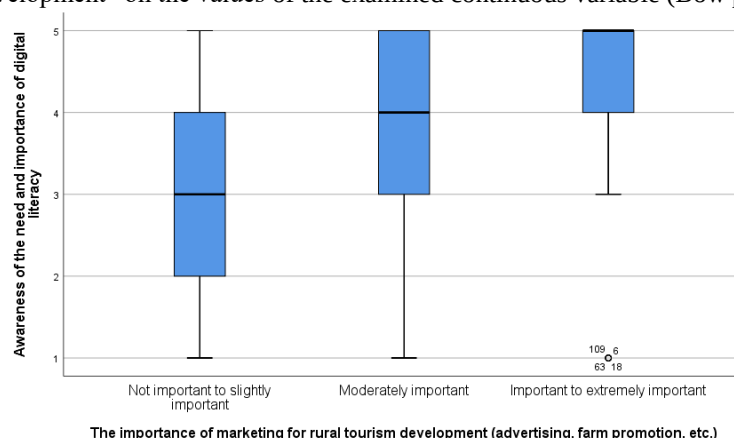
* Respondents who declared that more than one person was engaged in operational and management tasks related to rural tourism were excluded from the sample

** The value is significant at the level equaling 0.05

Source: Authors' research

The results show that statistical significance can be seen in only one factor - "Importance of marketing for rural tourism development", which is the only factor to affect the variability of our examined variable ($p=0.000$) (Table 3). Namely, a statistically significant difference in the respondents' attitudes based on values of this variable exists only between the participants who differ according to their perception of the importance of marketing for the development of their RTH. The mean rank and MED are the highest in the third respondent group (marketing is important to extremely important for rural tourism development) compared to the other two groups, which indicates that this group is most aware of the need and importance of DILT (Table 3). The IQR for the examined variable according to the levels of the factors is presented in Figure 2. The IQR results show that the third group of respondents, who evaluate the importance of marketing for RTH management as important to extremely important, provides higher ratings for our examined variable compared to the other two groups. As much as 50% of the mid-position responses of the respondents from the third group evaluated the examined variable in the range from the rating of 4 to the highest rating of 5 (Figure 2).

Figure 2: IQR of the impact of the factor “Importance of marketing for rural tourism development” on the values of the examined continuous variable (Bow plot)



Source: Authors' research

Discussion. Women, middle-aged individuals and those with secondary education are predominantly involved in the management of RTHs in Serbia. The most common RTHs are those with moderate experience in the business, as well as medium-sized ones in terms of accommodation capacity. Regarding the structure of the tourist offer, it can be concluded that there is no typical RTH since approximately the same percentages of respondents provide three different tourist services (accommodation only; accommodation with food; accommodation with food and additional activities).

Individuals who are most engaged in operational and management tasks related to rural tourism on RTHs in Serbia are highly aware of the need and importance of DILT for performing activities in this area.

Testing of *No* has shown that numerous factors identified by the authors in the research as independent variables which could affect the awareness of the need and importance of DILT for performing tasks in rural tourism, have no impact on it. Thus, respondents' views on this issue are not influenced by: the location of the RTH (region); age (respondents' age); or their level of education. At the same time, there is no difference between the attitudes of the respondents who differ in experience in rural tourism, capacity size or content of the tourist offer. We assumed that DILT would be more positively rated by respondents who were more satisfied with tourist visits and capacity occupancy rate, and by those who were more satisfied with the income from rural tourism (than those who were not satisfied or were less satisfied with these dimensions of business). However, the research did not prove this assumption.

The only factor that has an impact on respondents' perception of the need and importance of DILT is respondents' attitude towards the importance of marketing for rural tourism development. The representatives of RTHs who believe that marketing has a significant role in the development of their business in the field of tourism also believe that acquiring DILT is extremely important and necessary. On the other hand, those who do not think that marketing activities are important for their business operation do not see the acquisition of DILT as a significant requirement.

It can be concluded that our results do not confirm studies of numerous authors who state that the DILT of farmers, rural residents and employees in the tourism and hospitality sector is significantly affected by their economic power, formal education and age (Ilić Kosanović

et al., 2019; Jurjević et al., 2019; Kernecker et al., 2020; Kovljenić et al., 2023; Lazić et al., 2023; Petković et al., 2024; Sheikh & Berenyi, 2023; Zhong et al., 2024). This can be explained by the fact that the studies of the cited authors did not involve the DILT of farmers operating in the sector of rural tourism. In addition, it can be explained by the assumption that the opinions of RTH holders about the significance and importance of possessing digital knowledge differ from the attitudes of farmers who are only engaged in agriculture, as well as from the views of the employees in the tourism and hospitality sector. On the other hand, our findings are in concordance with the research by Khalil-Moghaddam and Khattoon-Abadi (2013), who also do not associate formal education and economic status of rural residents with their DILT, or with the degree of adopting ICTs.

6. Conclusion

On a daily basis we are witnessing the advancement of digitalization in all spheres of economy and society, as well as the speed of the digital transformation of our reality. Digitalization impacts the sector of agriculture and other activities that farmers engage in with the aim of generating additional income, such as rural tourism. In order for digitalization to bring benefits to agricultural households and rural areas, it is requisite for holders and members of RTHs to possess a certain level of DILT or higher level of digital skills.

The authors' research on the sample of 131 RTHs in Serbia shows that holders of RTHs possess a high awareness of the need and importance of DILT for performing tasks in the field of rural tourism. The results of the Kruskal-Wallis test show that respondents' age and education, region (seat of the RTH), as well as the years spent in this business (experience) have no statistically significant impact on this awareness. Similarly, no statistically significant impact has been found for various economic factors, such as: RTH capacity size; content of the tourist offer; degree of respondents' satisfaction with tourist visits and capacity occupancy rates, and degree of respondents' satisfaction with the income from rural tourism. Only one factor has a statistically significant impact on the attitude towards DILT, and it is the respondents' view on the importance of marketing for rural tourism development ($p=0.000$). Thus, respondents who perceive marketing as an important activity for improving their tourist business operation have a higher awareness of the need and importance of DILT, and vice versa.

A major limitation of the study is the subjectivity of respondents' attitudes, considering it is generally difficult to achieve objectivity in social studies (Shipman, 2014). Nevertheless, the research results enrich the scarce scientific knowledge in the field, and provide practitioners and policymakers in the field of rural development and rural tourism with useful information for planning and implementation of future activities. Further research should be directed towards examining the opinions of supply-side participants in the sector of rural tourism about the following questions: which marketing activities are important and necessary for RTHs; which digital skills are most required for farmers, and which strategies represent the most efficient way to improve digital knowledge and skills of rural residents.

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Conflict of interest

The authors declare no conflict of interest.

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