AI-RELATED SKILLS IN THE BULGARIAN TOURISM INDUSTRY

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Abstract. The rapid development of artificial intelligence (AI) has transformed the skills required for tourism and hospitality employees. This study explores the evolution of AI-related skills in Bulgarian tourism industry by comparing survey data and interviews from 2019 (135 respondents, 16 interviewees) and 2023 (131 respondents, 22 interviewees). The findings reveal that Bulgarian tourism managers acknowledge the need for AI-related skills in the future and the insufficient current proficiency level of these skills in their organisations but they are not always ready to push the digitalisation of their businesses. The study highlights the sector's readiness for digital transformation and provides insights into skill gaps and future workforce needs. The results contribute to the ongoing discussion on AI adaptation in tourism, offering a localised perspective on the evolving skill landscape.
Keywords: AI skills; tourism; hospitality; Bulgaria
JEL: Z30, O3

Introduction

The widespread adoption of technology across various sectors has created a growing demand for employees with specific technological skills and competencies. Until recently, artificial intelligence-related skills were largely viewed as niche and abstract. However, following the COVID-19 pandemic and the subsequent rapid advancement and proliferation of automation technology, robots, and artificial intelligence (AI), it became evident that such technologies have significant potential for integration into nearly every aspect of daily life (Maslej et al. 2023). This created significant demand for employees with AI-related skills who can effectively and efficiently use AI in their daily work which resulted in higher salaries for them as well (Bone et al., 2024).

Tourism and hospitality (T&H) are no exception; in fact, due to their diverse nature and multitude of subsectors, T&H have integrated technological innovations throughout the entire guest journey (Lukanova & Ilieva, 2019). Customers increasingly interact with technology which now becomes an integral part of service delivery (Arici et al., 2024; Cobanoglu et al., 2021). Moreover, factors such as the industry's challenges with image, workforce shortages, and demographic shifts have accelerated the adoption of technological solutions aimed at maintaining smooth operations and high-

quality services (Puorto, 2025; Webster & Ivanov, 2020). AI technologies are increasingly adopted in hospitality as robotic waiters, chatbots, AI marketing tools, advanced security systems, etc. (Cobanoglu et al., 2021; Ivanov, 2023). In this regard, tourism and hospitality organisations would need employees with AI-related skills to fully utilise the new technologies. However, Singh and Hassan (2024) point out the existence of such skill gaps in tourism industry, especially in emerging technologies, digitisation, data analytics and robotics.

Considering the above, this paper investigates Bulgarian tourism and hospitality (T&H) managers' perceptions towards the current proficiency level and the future needs for AI-related skills in their organisations. It compares the evolution of managers' opinions based on data collected in 2019 and 2023 under the frameworks of NTG and PANTOUR projects, respectively.

Literature review

Digital skills research has been growing in parallel with the advancement and introduction of new technologies (Carlisle et al, 2023). Research on AI-related skills—as a niche and specialised area—has increased as well. This rise was particularly notable after the introduction of ChatGPT in 2022 and is especially relevant for T&H. A study by Hsu and Tse (2021) on the required technology competencies in hospitality showed that besides basic digital skills future hospitality practitioners should have expertise in more sophisticated AI-related technologies to conduct more efficient management and produce more innovative solutions. A cross-EU study by Van Haeften et al. (2024) revealed that there was a strong demand for AI professionals in T&H with a focus on the technical aspects, e.g. data scientists, machine learning engineers, data engineers. Besides, many managerial roles like project manager, product manager, or business unit managers are also considered to require AI-related skills. The overall implication is that AI literacy is mandatory also for policy-makers and decision-makers, but in a better regulated context to ensure ethical AI usage (Van Haeften et al, 2024). The demand for AI-skills is logically transferred to the training and educational institutions who need to organise workshops or short courses on the use of AI technologies (Stylianou & Pericleous, 2025).

The emergence of new jobs driven by AI-related skills has also attracted the attention of scholars. Mingotto et al. (2020) proved that integrating AI in hospitality not only required upskilling and reskilling of employees, but additionally created new roles and job positions, e.g. AI supervisor, innovator, coordinator and differentiator (Mingotto et al, 2020). This means that newly integrated technologies might partially replace the existing positions, but also generate new responsibilities and obligations, resulting into entirely new jobs.

In summary, the growing integration of AI in T&H is reshaping skill requirements, driving educational reforms, and giving rise to entirely new roles—highlighting the urgent need for coordinated efforts across industry, academia, and policymakers to prepare the workforce for an AI-driven future.

Methodology

The primary data on the AI-related skills in Bulgarian tourism industry was collected within the frameworks of the Next Tourism Generation project (2018-2022) and PANTOUR: Pact for Next Tourism Generation Skills project (2022-2026) (https://nexttourismgeneration.eu), both funded by the Erasmus+ programme. The research design in both projects relied on mixed methods research – an online questionnaire and interviews. Within the Next Tourism Generation project primary data collection took place between January and March 2019, across the 8 participating countries in the project (Bulgaria, Germany, Hungary, Ireland, Italy, Netherlands, Spain, UK). Within the PANTOUR project, primary data were collected between April and June 2023 in 11 countries (Bulgaria, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Portugal, Spain). This paper presents only results from the Bulgarian sample. The main target respondents in both projects were representatives from five tourism subsectors (accommodation, food and beverage outlets (F&B), travel agencies, visitor attractions, and destination management organisations (DMO)), but respondents from other tourism subsectors were also able to participate. The questionnaires and interviews collected data about the current proficiency levels and the required future proficiency levels of a set of digital, green and social skills. This paper focused only on the AI-related skills within the set of the digital skills. Similar to Castro and Ferreira (2019) respondents to the online questionnaires self-evaluated the level of the respective skills in their organisations through a 5-point scale (from 1-no skill present in the organisation to 5-expert level). A combination of convenience, self-selection and snowball sampling was applied for quantitative data collection. The links to the online questionnaires were emailed to the managers of organisations from the research population whose email addresses could be identified. The links were also posted in closed social media groups with tourism managers. Some T&H professional associations shared the links to their members. The researchers applied purposive sampling for the interviews and contacted organisations with different characteristics (sector, size) to receive a diverse sample. The questions in the interviews were similar to the questionnaires but were open-ended and delved deeper into interviewees' perceptions and opinions.

The samples' characteristics are presented in Table 1. Regarding the questionnaires, the structures of the two samples were statistically different

in terms of sector ($\chi2=34.107$, df=5, $p<0.001$) and organisation size ($\chi2=23.078$, df=4, $p<0.001$). Compared to 2019, the sample in 2023 included fewer representatives of DMOs and visitor attractions but more respondents from tour operators and travel agents, accommodation establishments and other tourism subsectors. Additionally, the 2023 sample included more respondents from individual or part-time activity and medium-sized organisations but fewer from small and micro organisations compared to 2019. The interviewees sample in 2023 was larger and more diverse compared to 2019 but the difference was not statistically significant. The non-parametric Wilcoxon signed ranks test, Mann-Whitney U-test and Kruskal-Wallis $\chi2$-test were employed for data analysis because the Kolmogorov-Smirnov and Shapiro-Wilk tests showed that the distribution of respondents' answers was not normal.

Table 1. Respondents' characteristics

a) Questionnaire

Characteristic	**2019**		**2023**		**Chi-squared test**
	Number of respondents	**Share (%)**	**Number of respondents**	**Share (%)**	
Subsector					
Destination management	31	23.0	7	5.3	$\chi2=34.107$ (df=5, $p<0.001$)
Food and beverage	8	5.9	5	3.8	
Visitor attractions	28	20.7	21	16.0	
Travel agents and tour operators	26	19.3	31	23.7	
Accommodation	42	31.1	51	38.9	
Other	0	0	16	12.2	
Size					
Large (250 or more employees)	10	7.4	11	8.4	$\chi2=23.078$ (df=4, $p<0.001$)
Medium (100-249 employees)	10	7.4	32	24.4	
Small (10-99 employees)	54	40.0	33	25.2	
Micro (Less than 10 employees)	58	43.0	44	33.6	
Individual or part-time activity	3	2.2	11	8.4	
Total	**135**	**100**	**131**	**100**	

b) Interviews

Sector	2019		2023		Chi-squared test
	Number of interviewees	Share (%)	Number of interviewees	Share (%)	
Tour operators and travel agencies	3	18.8	3	13.6	$\chi2=14.301$ (df=8, $p>0.05$)
Destination management organisations	0	0	2	9.1	
Attractions	0	0	3	13.6	
Accommodations	5	31.2	8	36.4	
F&B companies	2	12.5	3	13.6	
Training providers	6	37.5	0	0	
Event management companies	0	0	1	4.6	
Car rental companies	0	0	1	4.6	
Mixed (attractions + accommodation)	0	0	1	4.6	
Total	**16**	**100**	**22**	**100**	

Results and Discussion

Tables 2 and 3 and Figure 1 present the quantitative results. The results for 2019 have already been reported in Ivanova et al. (2022). As evident, in both years, respondents reported quite low values of current proficiency level of the respective AI-related skills ($M_{2019_current}=1.95$, $M_{2023_robots_current}=1.35$, $M_{2023_GenAI_current}=1.50$). However, they were more confident in 2019 compared to 2023 and the respective Mann-Whitney test values were all significant at $p<0.001$. The reason might be the new developments in AI and robotics during the analysed period and especially the introduction of ChatGPT and other generative AI applications which were not available in 2019 but were still a novelty during the data collection period in 2023. The differences in the samples' composition might also play a role. At the same time, respondents expected that the importance of AI and robotics skills in their organisations will increase by 2030 and so will the level of proficiency they would require at that time ($M_{2019_future}=3.37$, $M_{2023_robots_future}=3.02$, $M_{2023_GenAI_future}=3.35$, all Wilcoxon signed ranks test values were significant at $p<0.001$). The comparison between current and required future proficiency levels is presented in Figure 1. The absolute and percentage gaps in AI and robotics skills in 2019 and 2023 were substantial and even widened in 2023 compared to 2019, especially regarding the percentage gaps. The Kruskal-Wallis test (Table 3) revealed that the size and sector belongingness had no impacts on respondents' self-reported current and required future proficiency levels and the gaps between them because 17 out of 18 test values were not

statistically significant. Hence, the findings show quite uniform current proficiency levels of AI-related skills, required future proficiency levels and AI skills gaps in T&H organisations in the country.

Table 2. Current level of proficiency and future required proficiency level of AI-related skills

Digital skills	N	Current level		Future level		Absolute gap (future level – current level)		Percentage gap (Absolute gap/Current level)	Correlation between Current and Future levels	Wilcoxon signed ranks test (Current vs Future level)
		Mean	*Standard deviation*	*Mean*	*Standard deviation*	*Mean*	*Standard deviation*			
2019										
Artificial Intelligence (AI) and robotics skills	135	1.95	1.088	3.37	1.342	1.422	1.341	72.92%	0.407***	-8.380***
2023										
Use of robots	131	1.35	0.743	3.02	1.414	1.664	1.379	123.26%	0.309***	-8.604***
Use of generative AI applications (e.g. ChatGPT, Midjourney, DALL-E, etc.) for generating text and visuals.	131	1.50	0.915	3.35	1.397	1.847	1.454	123.13%	0.264***	-8.798***
Mann-Whitney U-test										
2019 AI and robotics skills vs 2023 Use of robots		5891.5***		7581*		8012				
2019 AI and robotics skills vs 2023 Use of generative AI		6588.5***		8794.5		7244**				
2023 Use of robots vs 2023 Use of generative AI		7940.5		7468		7852.5				

Notes: Levels of significance: ***p< 0.001, **p<0.01, *p<0.05; Coding – 1-no skills present, 5-expert.

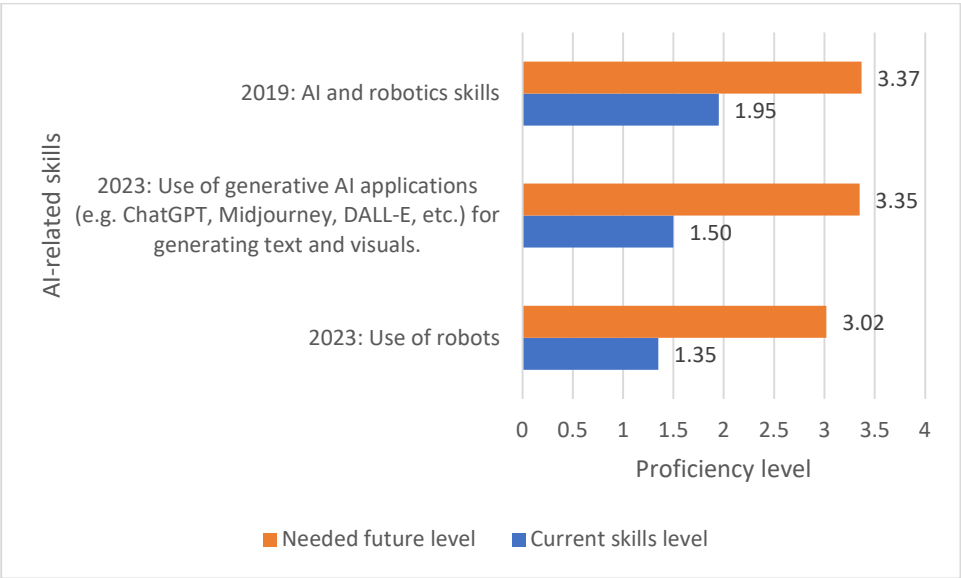

Fig. 1. Current level of proficiency and future required proficiency level of AI-related skills

Table 3. Differences among respondents based on tourist sector and size

Digital skills	N	Kruskal-Wallis $\chi 2$-test					
		Current level		**Future level**		**Absolute gap**	
		Sector	*Size*	*Sector*	*Size*	*Sector*	*Size*
2019							
Artificial Intelligence (AI) and robotics skills	135	5.602	2.828	11.420*	4.114	5.209	3.817
2023							
Use of robots	131	2.467	4.491	5.457	4.515	4.630	3.217
Use of generative AI applications (e.g. ChatGPT, Midjourney, DALL-E, etc.) for generating text and visuals.	131	1.628	1.008	2.739	0.510	1.546	0.975

Notes: Level of significance: *p<0.05; Micro (Less than 10 employees) and Individual or part-time activity merged into one group due to the small number of respondents in the Individual or part-time activity group in 2019.

The analysis of the interviews in 2019 showed that respondents were reluctant to delve too deep into the digitalisation. Most of them still claimed that hospitality was a 'people industry' and too much technologies would spoil the customer experiences. Although they recognised the need for digital literacy and technical expertise of their employee, very few of them considered particular advanced skills or competences. Sophisticated technologies and the need for AI-related skills were mentioned several times but with a vague idea about either the particular technology or the necessary expertise to utilise it. The majority of the respondents associated advanced and innovative technologies with the digital marketing and data analysis. Accommodation providers were more aware of the more complex technologies that would be beneficial for their business (e.g. AR, VR, Video processing, 3D image software), and yet, no one explicitly expressed any specific skills in this regard. On the other side, managers of travel agencies pointed out that in the future working with AI would be crucial and inevitably require to constantly update employees' skills. In the same line, trainers and consultants realised the future skill needs of working with robots, cyber security and 3D technologies that would require AI-related skills, despite the limited use of robots at that time in Bulgaria.

Four years later, in 2023, respondents were much more aware of the various cutting-edge technologies, and even had already started to introduce them in their everyday work. As one hotel manager noted: *"...Even at the moment I just received an offer to have an online training "How to use ChatGPT to boost your career in the hospitality and tourism"..."*. Along with the digital marketing skills, AI-related skills were the most frequently mentioned. Still, respondents considered them in relation to their own subsector, mostly as an addition to the other employees' expertise. An interesting opinion came from a hotel manager, that digital technologies were

so common now and would become even more in the future, so that every person starting from early age would learn how to use them. In this regard, the future employees by default will have specialised digital skills, so there will not be need for additional training. Surprisingly, some respondents (mostly from the F&B subsector) continue to insist that the technologies in the tourism and hospitality will not overtake the human factor at all.

Conclusion

The findings of this study showed that Bulgarian T&H managers acknowledge the need for AI-related skills in the future and the insufficient current proficiency level of these skills in their organisations they are not always ready to push the digitalisation of their businesses. As AI technologies continue to evolve, the demand for skills that enable individuals to work effectively with and alongside AI is becoming increasingly urgent (Hajal & Rowson, 2020). Beyond technical proficiency, there is a growing recognition of the need to develop broader human-centric abilities—such as critical thinking, creativity, and emotional intelligence—that are less likely to be replicated by machines (Hajal & Rowson, 2020). The hospitality and tourism sectors, in particular, face the dual challenge of integrating advanced technologies while preparing a workforce that can adapt to rapid change. Ironically, businesses may soon struggle to find suitable candidates for emerging roles, because the workers are displaced from their traditional roles (Bone et al., 2024). With the future pointing toward greater use of robotics, AI, and automation, it is essential that employees are equipped with the knowledge and skills to navigate these innovations (Maslej et al., 2023). Addressing these challenges calls for proactive collaboration between industry, education, and policy to future-proof the T&H workforce in an AI-driven economy. Universities need to introduce relevant trainings in the form of specialised courses on transversal AI-related skills (e.g. how to create content with the help of generative AI or how to design customer and employee experiences with robots, chatbots and artificial autonomous agents). Additionally, the use of generative AI can be incorporated in the assignment briefs or in-class activities in most modules. Training providers need to offer short skill-based courses on AI-related skills to address directly the T&H industry skills gaps.

The main limitation of the paper is its focus on one country only. Therefore, the conclusions are generalisable in this context only. Future research may focus on the AI-related skills gaps in other countries and provide international comparisons. Longitudinal studies that assess changes in the AI-related skills gaps in time are also needed.

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