The digital skills divide: evidence from the European tourism industry

Sheena Carlisle, Stanislav Ivanov and Corné Dijkmans

Sheena Carlisle is based at the Tourism, Hospitality and Events Department, Cardiff School of Management, Wales Centre for Tourism Research (WCTR), Cardiff Metropolitan University, Cardiff, UK.
Stanislav Ivanov is based at the Varna University of Management, Varna, Bulgaria.
Corné Dijkmans is based at the Breda University of Applied Sciences, Breda, The Netherlands.

Abstract

Purpose – *This paper aims to present the findings from a European study on the digital skills gaps in tourism and hospitality companies.*

Design/methodology/approach – *Mixed methods research was adopted. The sample includes 1,668 respondents (1,404 survey respondents and 264 interviewees) in 5 tourism sectors (accommodation establishments, tour operators and travel agents, food and beverage, visitor attractions and destination management organisations) in 8 European countries (UK, Italy, Ireland, Spain, Hungary, Germany, the Netherlands and Bulgaria).*

Findings – *The most important future digital skills include online marketing and communication skills, social media skills, MS Office skills, operating systems use skills and skills to monitor online reviews. The largest gaps between the current and the future skill levels were identified for artificial intelligence and robotics skills and augmented reality and virtual reality skills, but these skills, together with computer programming skills, were considered also as the least important digital skills. Three clusters were identified on the basis of their reported gaps between the current level and the future needs of digital skills. The country of registration, sector and size shape respondents' answers regarding the current and future skills levels and the skills gap between them.*

Originality/value – *The paper discusses the digital skills gap of tourism and hospitality employees and identifies the most important digital skills they would need in the future.*

Keywords *Staff development, Digital competences development, Digital skills development, Digital skills gaps*

Paper type *Research paper*

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1. Introduction

1.1 Rationale

Tourism creates employment for people of different ages and skill levels with around half of the tourism workforce in OECD member countries working in small and medium enterprises or SME's (OECD, 2018). Tourism generates export revenues and makes relevant contributions to the GDP of countries worldwide. In 2016, tourism directly contributed, on average, 6.9% of employment, 21.7% of service exports and 4.2% of GDP in OECD countries (OECD, 2018). According to Eurostat (2020) 11.7 million people, 9% of the labour market worked in tourism. According to the World Travel and Tourism Council (WTTC), tourism accounted for 10.4% of global GDP and 313 million jobs or 9.9% of total employment in 2017 (WTTC, 2019). Clearly, these figures have changed in 2020 as Covid-19 severely impacts employment statistics in the tourism industry. However, in a post-Covid environment as employment steadily returns and as digital connectivity of populations has increased significantly, the need for digital skills have become increasingly important. The need to virtualise work due to Covid-19 has accelerated digital transformation, as well as deepened differences of digital skills gaps across people and companies. This indicates that a significant number of employees require new digital skills in the workplace via in-house training and those who need to improve their digital skills prior to entering the industry.

Digitalisation of tourism services is changing the structure of the industry by altering barriers to entry, facilitating price comparison, revolutionising distribution channels through the internet, optimising costs and improving production efficiency (Assaf and Tsionas, 2018). According to Abou-Shouk *et al.* (2013), the tourism industry has become the largest category of products and services sold over the Internet. This is supported by the internet penetration rate which globally is 51.7% and in some regions such as North America or Europe, the figure is more than 80% (Clement, 2020). With international tourism growing more quickly over the past five years than the world goods trade (World Tourism Organization (UNWTO), 2019), digital tourism services continue to be one of the main online commercialisation sectors.

Given that digital citizens investigate information required to prepare and book their travel experiences via the Internet or electronic devices, including smartphones and other portable devices (Amaro and Duarte, 2015; Chung and Koo, 2015; Filieri and McLeay, 2014; Navío-Marco *et al.*, 2018; Suki and Suki, 2017; Wang *et al.*, 2016), the emphasis on employees' skills to respond to these trends is becoming increasingly important. As these more digitally savvy tourists enter the travel market it allows companies to stay permanently connected with their customers, track their preferences over time (Buhalis *et al.*, 2019) and build close relationships and loyalty (Asperen *et al.*, 2018).

In addition to the fast and effective response required for digitally savvy customers, travel and tourism companies manage and monitor their business functions via computer technology for human resource management (Boella and Goss-Turner, 2019), customer reservations and electronic point of sales contact (EPOS) (Cunha and Miguel, 2019), supply chain management (Kayikci, 2019), property management systems (PMS) for monitoring and enhancing inventory control, environmental impact measurement, waste reduction, monitoring staff, gathering customer data, financial accounting, customer self-service, etc.

Other developments include digital innovations that support the implementation and monitoring of sustainable tourism development in destinations (Ali and Frew, 2014). Here, carbon calculators, environmental management systems, geographical information systems and computer simulations can all be used to enhance practical applications of sustainable development.

Virtual reality (VR) and augmented reality (AR) simulations are becoming increasingly important (Guttentag, 2010; Israel *et al.*, 2019; Tussyadiah *et al.*, 2018; Yung and Khoo-Lattimore, 2019). Immersive previews or pre-experiences give customers a VR experience of their hotels, destinations and holidays. While VR's most promising travel applications are in marketing and sales-related fields, VR also provides alternatives for tourist experiences in areas where the environment is too vulnerable or culturally sensitive to allow actual visitors (OECD, 2018). All these information and communication technologies (ICTs) tools require the capacity to use and manage them within the organisation. Although many digital skills may be outsourced to external companies the extensive field of VR, AR, artificial intelligence (AI) and Social Media needs a strategic understanding of the use and potential of ICT by senior management to deliver business transformation and avoid costly risk of losing relevance and competitiveness in the digital landscape. Ultimately, robots, artificial intelligence and service automation are disrupting the way travel, tourism and hospitality companies operate and raise specific skills requirements for employees (Ivanov, 2019; Ivanov and Webster, 2019). Therefore, bridging this tech skills gap to enable staff already in the workforce to become digitally-empowered can support in-house digital innovation and provide sustainable digital skillsets for all levels of staff. The effective and efficient use of technology to serve customers and implement the various business processes within the company requires that tourism and hospitality employees have digital skills respective to their job position. On the one hand, if employees have greater digital skills than the required level for their job positions, they will be able to be more productive and efficient, although they may be considered overqualified (Erdogan *et al.*, 2011). On the other hand, if the level of their digital skills is lower than the level necessary for the respective job role,

the lack of sufficient digital skills could be a hurdle to economic efficiency and productivity. In this respect, it becomes important to put emphasis on digital skills to support job roles and functions that can cut across different job positions s as the wide variety of job roles in tourism need to work with more sophisticated devices and software packages. Therefore, it is important to identify the digital skills gaps of tourism and hospitality employees according to their role in the company and identify those digital skills that tourism and hospitality companies would need to invest in.

1.2 Aim and objectives

In light of the above discussion, the main purpose of this paper aims at assessing the digital skills gaps of tourism and hospitality employees according to their job roles. The specific objectives include:

- evaluating tourism and hospitality employees' *current* proficiency level of digital skills;
- evaluating their required *future* proficiency level;
- identifying the gaps between the current and the required future proficiency levels;
- evaluating the role of country of registration, tourism sector and organisation size on the digitals skills gaps and proficiency levels; and
- identifying the digital skills training received by tourism and hospitality employees and the role of country of registration, tourism sector and organisation size on type of training received by the employees.

This paper is organised as follows. Section 2 provides a focussed review of related literature. Section 3 details the methodology. Section 4 presents the quantitative and qualitative results, while Section 5 discusses the findings in the context of prior literature. Finally, Section 6 summarises the theoretical contribution of the paper, elaborates the managerial implications, addresses the research limitations and future research directions and concludes the paper.

2. Literature review

2.1 Information and communication technologies and digital skills in tourism and hospitality

The Internet has changed the entire tourism value chain for creation, marketing, distribution and consumption (Minghetti and Buhalis, 2010; Salavati and Hashrim, 2015). Xiang (2016) argues that knowledge created in the past two decades can be characterised as consisting of two eras, i.e. the age of digitisation (1997–2006) and of acceleration (2007 and further). The digitisation era was characterised by the development and maturity of the internet as a commercial tool. Typical for the age of acceleration were the rise and growth of user-generated content (i.e. via social media) and the emergence of completely new technologies (Xiang, 2016). This so-called "Web 4.0" will continue to create new structures in all elements of the tourism ecosystem with intelligent agents powered by AI, big data, robotics and AR/VR as important drivers of change (Kurgun *et al.*, 2018; Navío-Marco *et al.*, 2018). Tourism management has become fully inseparable from information technology, making the availability of the right digital skills in tourism companies of utmost relevance. Digitisation and Web 4.0 is redefining jobs and is also creating new ones, which requires new competences and skills (Hsu, 2018). This leads to the important question of how digital skills in tourism organisations are currently covered and what the expectations are for the future.

Since the start of this century, academic literature emerged about the *digital divide*. Originally, this concept referred to the gap between those who did and those who did not have access to information technology (Van Dijk, 2006; Maurer and Lutz, 2011). However, in the past 10 years, the focus of attention shifted from *access* to information technology to

skills and capabilities to use these technologies, particularly when educational solutions to the digital divide challenge are proposed.

Related to tourism, however, academic research about information technology in this industry is focussed on the innovative development and influence of technology itself and the importance and benefits of applying ICT to manage business operations (Buhalis and Law, 2008; Ali and Frew, 2014; Januszewska *et al.*, 2015; Ivanov, 2019). Much research in the field of digital skills gaps in tourism is produced by government departments and training organisations, who are ever more focussing on education and training policies upon digital skills of citizens and future employees.

The following paragraphs will review the literature that draws attention to this range of digital skills needs within the tourism industry. Many governments, companies and educational institutions are grappling with the question of how such technologies will affect and support the development of societies, labour and business models and how best to train for these new digital skillsets that are required by rapidly changing digital technology. The following paragraphs firstly provide key references to (the importance of) digital skills in the academic literature, followed by a review of the more recent EU commissioned research on digital skills gaps.

2.2 Digital skills identification in the academic literature

Hyper-connected societies, markets and industries are adapting continuously to digital innovation. The World Economic Forum (2016) notes that in many countries the most in-demand occupations did not exist 10 or even 5 years ago. Technical skills will be indispensable and permanent education, adaptability and agility are the new normal. Therefore, digital fluency will be key (i.e. "the ability to reformulate knowledge and produce information to express oneself creatively and appropriately in a digital environment"; Wang *et al.* (2012)).

Buhalis and Law (2008) composed a list of digital skills that not only reflects social media and mobile technologies but also operational and management use of technology, including software applications, cloud computing, AI, computer programming, robotics, voice technology, data analytics and blockchain technology. As unique, customised and personalised tourism experiences become increasingly popular, digital fluency and making sense of data including customer-generated data via online marketing, branding and distribution, data collection, data management and data analytics will be crucial. Using data from Booking.com, Facebook, Google, TripAdvisor, Expedia should be a part of the everyday routine to improve products and services (Joosten, 2017). Companies such as Facebook offer newly hired graduates very high salaries that most companies within the tourism industry cannot afford (Dogru *et al.*, 2019).

Skills in creating experiences, both in the real world and with the use of AR, VR or in mixed reality with special attention to gamification, will be important (Hsu, 2018; Sousa and Rocha, 2019). Where VR generally removes users from their surroundings and immerses them in 3D environments, augmented reality and mixed reality (or merged reality which embeds virtual objects in real-world environments and creates the possibility to interact with them) have the potential to make travel easier, more convenient, more educational and safer by enhancing the experience rather than replacing it. For tourism, this means that (AI-powered) augmented reality mobile apps (Loureiro *et al.*, 2020) are currently revolutionizing, facilitating and enlivening the processes of accessing information and tour guiding, hotels can integrate AR in many innovative ways to inform their customers about local sights, local transportation, restaurant choices via reception-less check-in at tablet-based kiosks and create customer experiences (Park and Stangl, 2020). Furthermore, skills development in online safety, privacy and cybersecurity will become more important (García and Ruiz, 2020).

Data analytics and the process of gathering and analysing large quantities of online customer data will also enable different kinds of personalised, customer-centric interactions, experiences and services. It is surprising that given the proliferation of electronic distribution marketing and extensive distribution channels to entice customers into purchasing travel experiences there has been a much slower adoption of expertise in-house for companies. According to Navío-Marco *et al.* (2018), the incorporation of the ICTs into top-level decision-making processes is still a rarity in many hotel and tourism organisations (see also Law *et al.*, 2014), with intervention mainly from externally outsourced ICT companies to manage and develop online marketing and complete data analytics to support product development. This is surprising, given that much marketing and distribution depends heavily on electronic distribution channels (Baek, 2017) to improve operating efficiency and increase profits (Law *et al.*, 2014). In-house knowledge and capacity in ICT could help reduce this dependency but also help improve decision-making become more closely aligned to the business.

Lamest and Brady (2019) also emphasise the need for firms to have strategic capabilities to manage and ultimately benefit from social media through high-level skills in data analytics and utilisation of data for decision-making (Dong and Wu, 2015; Davenport, 2015). This is a critical factor for differentiation and competitive advantage that businesses need to address to maximise the appropriate use of information available to the business (Dong and Wu, 2015). The wide use of social media by companies also increases the need for enhanced personal and communication skills of staff, as a "human voice" and an informal but polite communication style on social media platforms maximise its impact (Dijkmans *et al.*, 2020). Lamest and Brady (2019) also state how the amount of data within companies, in terms of volume, velocity, variety, frequency and number of channels has increased significantly (Davenport, 2015; McAfee and Brynjorfsson, 2017), requiring a change in the skills to manage and analyse such quantities of data (Wedel and Kannan, 2016), which can improve the performance of organisations (Rialti *et al.*, 2019). This skills gap is of interest as rich customer insights that could be used to create unique customer experiences and organisational benefits could be overlooked. Olsen *et al.* (2014, p. 568) found that companies invest in the collection and measurement of customer satisfaction but "only scarce resources are used to put the knowledge gained towards improving the organisation, its processes and its services". Importantly, they suggest more training to improve cross-functional information sharing.

2.3 Digital skills policy development on a European level

The European Centre for the Development of Vocational Training (Cedefop, 2018) states that technological changes are the major driver of changing skill needs in future work environments. Cedefop's "European skills and jobs survey" shows that in the digitalised economy about 85% of all EU jobs need at least a basic digital skills level. However, to survive in the digital economy, not only good digital skills are required but also "a healthy mix of cognitive (problem-solving, creativity, learning to learn) and socio-emotional (communication, collaboration) skills" (Cedefop, 2018, p. 13).

The New Skills Agenda for Europe, an initiative launched by the European Commission in 2016 to improve skills levels, also has a strong focus on digital skills at all levels and includes a flagship initiative called the "Coalition for Digital Skills and Jobs", followed by the Digital Education Action Plan 2018–2020 to develop the use of technology in education and the development of digital competencies. Digital skills are lacking in Europe at all levels while employment in digital technology continues to grow and the number of unfilled vacancies for ICT professionals is expected to almost double to 756,000 by 2020 (European Commission, 2016a, 2016b). In the European Commission (2016a) report which reviewed trends in skills development, mapping and performance of tourism education and training, a wide range of skills needs for the tourism and hospitality industry in the EU were researched and identified such as digital skills, professional and business skills (finance, marketing, sales, management),

soft skills (multicultural skills, interpersonal skills) and language skills (particularly English, but other languages in certain regions/countries).

The present research also built upon previous EU projects such as the Smart Project Experience and E-Tourism Training Guidelines (2015) which notes a blurring of boundaries between travel agencies and tour operators with many operative occupations becoming redundant, particularly support and administrative roles due to online bookings. However, new occupations (online marketing managers, social media managers) are needed in medium to large businesses due to the increase in online sales and marketing, customer self-service and promotion via social media. Digitalisation has also influenced job roles in resort planning, sustainable tourism building design, MICE (Meetings, Incentives, Conference and Events) specialists, adventure guides, experience creators, marine sports instructors and sustainable destination tourism managers (European Commission, 2016a). The report concluded that "the main skill gaps and shortages reported by employers relate to soft skills, language skills, interpersonal skills and ICT skills rather than to tourism-specific skills" (Centre for Strategy and Evaluation Services, 2016, p. 97). According to Langford *et al.* (2019), the future of the travel experience should be a seamless blend of talent and technology where machines are tasked to do more of the computer-based work, thus freeing humans to provide better service experiences and more meaningful connections and enabling large companies to interact with their clients in similar ways as small businesses who really know their customers.

The Digital Competence Framework for Citizens, also known as DigComp, presents a common framework of digital competencies needed in an increasingly globalised and digital world. The European Commission first published DigComp in 2013 and revised and renamed DigComp 2.0 in 2016. DigComp 2.0 provided an updated vocabulary of digital competences at a European level and used in the terminology of the survey. This was developed by the Institute for Prospective Technological Studies of the European Commission's Joint Research Centre. DigComp 2.0 structures 21 competences in 6 competency areas as a tool to improve citizens' digital competence (Vuorikari *et al.*, 2016).

3. Methodology

3.1 Quantitative research

This research is part of a large European survey on the skills gaps of tourism and hospitality employees, implemented within the framework of the Next Tourism Generation (NTG) Alliance funded by the KA 2 Erasmus + Programme (https://nexttourismgeneration.eu/). The NTG project aims to establish a blueprint strategy for digital and sustainability skills development in tourism in the European Union. This research formed part of the process for establishing a Skills Assessment Methodology to understand the level of digital skills gaps in the participating partner countries. The research population included companies and organisations from the five identified tourism sectors in the NTG project (accommodation establishments, tour operators and travel agents, food and beverage, visitor attractions and destination management organisations) registered mainly in 8 European countries (UK, Italy, Ireland, Spain, Hungary, Germany, the Netherlands and Bulgaria). The scope of the countries included in the analysis reflected the geographical scope of the partners in the NTG Alliance. Given the range and diversity of populations and economies of the countries surveyed it became evident that the survey could be replicated in other countries in the future. The scope of the tourism sectors also reflects the parameters of the NTG Alliance project. Mixed methods research was used for the project. Quantitative data were collected via an online questionnaire between 14th January and 28th February 2019, distributed by email to the companies' and organisations' managers whose contact details could be identified and in relevant social media groups. Industry contacts and relevant tourism and hospitality associations were used to increase the number of responses. The final sample includes 1,404 companies and organisations. Its characteristics

are presented in Table 1(a). Naturally, the countries with larger economies and tourist industries (Italy, Germany, UK and Spain) had more respondents than the other countries in the sample. Moreover, participation in the research was entirely voluntary and respondents from some countries (e.g. Italy), were more willing to complete the questionnaire than others (Spain) which were underrepresented.

The questionnaire was originally developed in the English language and then translated into the official languages of the countries by the teams of the alliance partners, who are native speakers. The questionnaire included several blocks of questions. The first block focused on the demographic characteristics of the organisations the respondents worked for – type, size, sector, country and job position. The second, third and fourth blocks collected data about the current proficiency level, the required future proficiency level and the training provided by the organisation for three groups of skills – digital, environmental and social skills. This paper focusses on digital skills only. The environmental and social skills go beyond the scope of the paper. The list of the skills was developed by the teams of the 14 alliance members based on the review of the literature, trade press publications and own industrial experience and research expertise. The level of proficiency was measured on a 5-point scale – from 1 (no skills) to 5 (expert). As it was practically impossible to evaluate the proficiency level of the digital skills in each of the 1,404 companies and organisations included in the analysis; their managers as most knowledgeable respondents self-evaluated the level of proficiency of each skill in their company/organisation, similar to previous studies (Castro and Ferreira, 2019).

Table 1 Sample's characteristics

Characteristic	*No. of respondents*	*Share (%)*
a) Questionnaire		
Country		
UK	233	16.6
Italy	370	26.4
Ireland	74	5.3
Spain	139	9.9
Hungary	123	8.8
Germany	246	17.5
The Netherlands	40	2.8
Bulgaria	135	9.6
Other	44	3.1
Sector		
Destination management	295	21
Food and beverage	201	14.3
Visitor attractions	212	15.1
Travel agents and tour operators	171	12.2
Accommodation	525	37.4
Size		
Large (250 or more employees)	128	9.1
Medium (100–249 employees)	128	9.1
Small (10–99 employees)	512	36.5
Micro (Less than 10 employees)	501	35.7
Individual or part-time activity	135	9.6
Total	*1,404*	*100*

Sector	*The Netherlands*	*Italy*	*Ireland*	*UK*	*Bulgaria*	*Germany*	*Hungary*	*Spain*	*Total*
b) Interviews									
Tour operators and travel agencies	7	3	7	8	3	5	6	3	*42*
Destination management organisations	5	5	6	13	0	6	6	6	*47*
Attractions	6	3	7	9	0	7	6	2	*40*
Accommodations	7	16	6	11	5	7	6	14	*72*
F&B companies	5	7	6	9	2	6	8	5	*48*
Training providers	0	0	0	0	6	9	0	0	*15*
Total	*30*	*34*	*32*	*50*	*16*	*40*	*32*	*30*	*264*

The questionnaire was anonymous and no personal identifying data were collected. Ethics clearance was obtained from Cardiff Metropolitan University (Wales, UK).

The skewness and kurtosis values were mostly within the range [−1; +1] and all were within the [−2; +2] range. Hence, considering the large sample size (1,404 respondents), the empirical distribution of responses was considered as being close to normal (Kim, 2013). That is why parametric statistical tests were used to analyse the data. In particular, paired-samples t-test was used to assess the differences between the current proficiency level and the required future proficiency level of digital skills. ANOVA was used to assess the role of country of registration, sector and size in respondents' answers regarding the current proficiency level of digital skills, the required future proficiency level and the absolute gap between the current and future proficiency levels. Exploratory factor analysis was used to identify patterns in the digital skills gaps. Finally, cluster analysis was adopted to reveal the existence of any groups of respondents based on their reported digital skills gaps.

3.2 Qualitative research

After the finalisation of the NTG desk research and surveys, interviews were conducted in all 8 partner countries to build on the quantitative results and acquire additional in-depth understanding and insights into the future of digital, green and social skills from the perspective of managers and executives working in the tourism industry (Bradford and Cullen, 2013). In this study, we used semi-structured interviews, a common research method in the social sciences. While a structured interview has a rigorous set of questions, which does not allow one to divert, a semi-structured interview is open, allowing new ideas to be brought up during the interview as a result of what the respondent says and thus maintaining flexibility (Galletta, 2013). This approach helped to gain views and opinions of managers and executives towards digital skills gaps of their employees and issues surrounding changing digital trends, digital innovation and skills development of their employees. The interviewer in a semi-structured interview generally has a framework of themes to be explored. This type of interview allows for new insights and ideas to be brought up during the interview as a result of the participants' responses and elaborations. As a comparison of insights gathered during all the interviews is necessary, it is beneficial for interviewers to have an interview guide, which is an informal grouping of themes and questions that the interviewer can ask in different ways for different participants. Therefore, an interview guide was created with themes and example questions, which the interviewers could tailor to the interview context and the specific interview participant.

A purposive sampling method was applied, as interviewees were selected based on specific criteria, i.e. working in a specific subsector and function, level of seniority (Sirakaya-Turk *et al.*, 2017). All interviews were conducted by senior researchers from the partner institutes involved in the NTG project. In total, 264 semi-structured interviews were conducted (i.e. 16 in Bulgaria, 40 in Germany, 32 in Hungary, 34 in Italy, 32 in Ireland, 30 in the Netherlands, 30 in Spain and 50 in the UK) with senior managers, human resource managers, company owners and executives, entrepreneurs, heads of department in all five tourism sectors under investigation.

On a per-subsector basis, interviews were held with 42 respondents from tour operators and travel agents, 47 from the destination management sector, 72 from accommodation providers, 40 from visitor attractions and 48 from companies in the food and beverage sector. Additionally, 15 interviews were held with training and consultancy companies in tourism, as the expectation was that representatives of these companies were able to provide additional insights in skills development for the tourism sector. For a total overview of interviews, Table 1(b).

Interviews lasted 45 min on average and were recorded. Afterward, a content analysis was performed on the interpretation gathered. Textual abstracts were made of each interview.

After coding (i.e. annotating and labelling relevant words, phrases, sentences or sections with codes), data was conceptualised and categories were made by grouping the codes created during annotation. In the interviews, the following five themes were covered in relation to skills needs in the tourism industry of the future:

1. *Company and background information*. To obtain an overview of the background of the participant and his/her company.
2. *The future of tourism in general*. To get an understanding of respondents' thoughts on tourism and the tourism industry over the course of 10 years.
3. *Digital skills*. To obtain an overview of current digital skills those that are rated by interviewees as the most important in 10 years' time.
4. *Environmental management skills*. To acquire insights into environmental management skills of today and those thought to be relevant in 10 years' time.
5. *Social skills*. To collect insights into social skills (i.e., personal, communication and diversity skills) that are important now and that will be important in the 10 years ahead.

Given the topic of this study, in our further analysis, we will focus exclusively on the results regarding *Digital Skills*. The 10-year timeframe was used to put the discussion in a specific temporal context.

4. Results

4.1 Quantitative research

4.1.1 The general picture. Table 2 presents the current level of proficiency of digital skills, the required future level of proficiency and the absolute and percentage gaps between them. Expectedly, respondents were most confident in using an operating system (m = 3.88) and widespread software packages such as MS Office products (m = 3.84), while they evaluated as lowest their current level of proficiency for high-tech products like AI and robotics (m = 1.87) and augmented and virtual reality (m = 2.02). Proficiency in online marketing and communication (m = 4.22), social media (m = 4.21) and MS Office skills (m = 4.19) would be most required in the future, while computer programming skills (m = 3.01) and AI and robotics skills (m = 3.01) would be least needed. Hence, it seems that respondents consider as most required in the future those digital skills that have direct application in daily activities of tourist companies and do not require to invest much time to gain. Additionally, Table 2 reveals that the current and required future levels of proficiency of digital skills are strongly and positively correlated and the gaps between them are positive and statistically significant (all $p < 0.001$) for all digital skills. Therefore, respondents acknowledge that the level of proficiency needs to be increased for all digital skills. The lowest gaps are found for basic digital skills such as operating system use (absolute gap = 0.2578, percentage gap = 6.64%) and MS Office skills (absolute gap = 0.3419, percentage gap = 8.90%). The highest gaps respondents found in advanced digital skills such as augmented and virtual reality skills (absolute gap = 1.1738, percentage gap = 58.11%) and AI and robotics skills (absolute gap = 1.1624, percentage gap = 62.16%), but nevertheless these two skills are considered as least required in the future for tourism and hospitality companies.

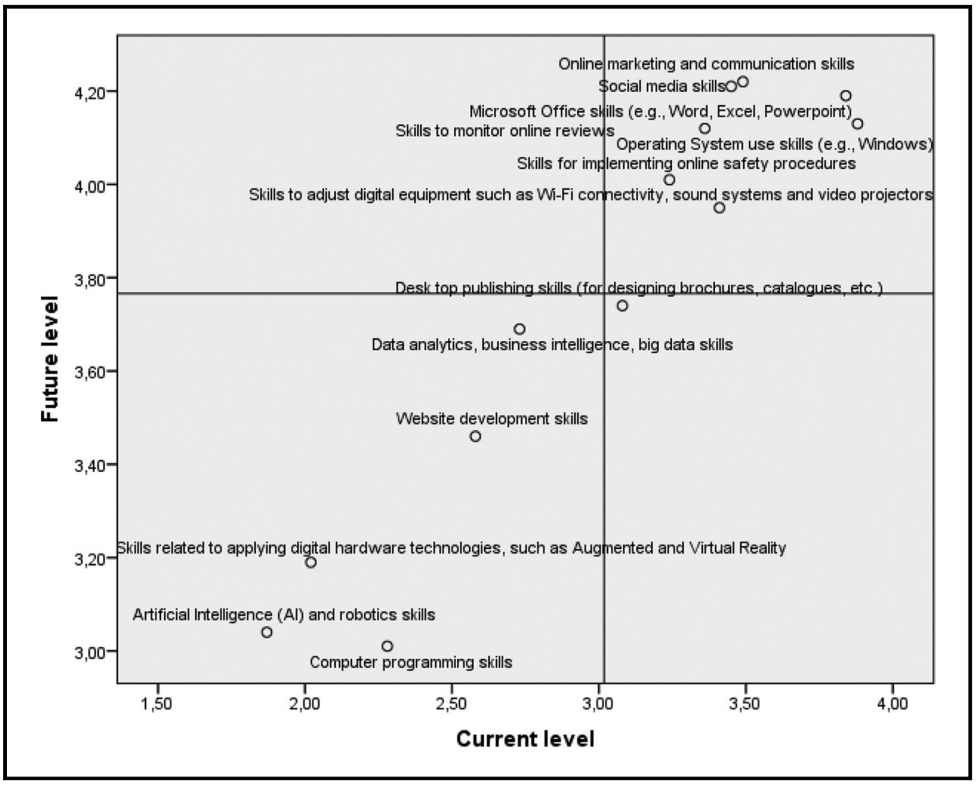
Finally, Figure 1 maps the current and the required future level of proficiency of each digital skill. As evident, the current level of proficiency is related to the required future level of proficiency of the skills. Those digital skills with a current level of proficiency below or above the average level are the same as the digital skills with a required future level of proficiency below or above the average level with one minor exception (Desktop publishing skills). The results from Figure 1 and the strong positive correlations between the current and future proficiency levels (Table 2) lead us to conclude that a potential anchoring bias (Tversky and Kahneman, 1974) exists in the way tourism and hospitality employees perceive the future skills requirements – their forecasts

Table 2 Current level of proficiency and future required proficiency level of digital skills

	Current level		*Future level*		*Absolute gap (future level – current level)*		*Percentage gap (absolute gap/ current level)*	*Correlation between current and future levels*	*Paired samples t-test (current vs future level)*
Digital skills	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*			
Operating system use skills (e.g. Windows)	3.88	0.870	4.13	0.925	0.2578	0.7611	6.64	0.642***	−12.694***
Microsoft office skills (e.g. Word, Excel and Powerpoint)	3.84	0.864	4.19	0.872	0.3419	0.7964	8.90	0.579***	−16.085***
Skills for implementing online safety procedures	3.24	1.014	4.01	1.004	0.7657	1.0166	23.63	0.492***	−28.222***
Online marketing and communication skills	3.49	0.980	4.22	0.943	0.7301	0.9695	20.92	0.492***	−28.216***
Skills to adjust digital equipment such as Wi-Fi connectivity, sound systems and video projectors	3.41	1.056	3.95	1.032	0.5370	0.9314	15.75	0.602***	−21.605***
Desktop publishing skills (for designing brochures, catalogues, etc.)	3.08	1.134	3.74	1.113	0.6603	1.0007	21.44	0.603***	−24.723***
Computer programming skills	2.28	1.212	3.01	1.358	0.7336	1.0553	32.18	0.668***	−26.049***
Website development skills	2.58	1.239	3.46	1.290	0.8718	1.0946	33.79	0.626***	−29.844***
Social media skills	3.45	1.067	4.21	0.998	0.7642	0.9878	22.15	0.544***	−28.990***
Skills to monitor online reviews	3.36	1.136	4.12	1.034	0.7550	1.0214	22.47	0.562***	−27.696***
Data analytics, business intelligence and big data skills	2.73	1.197	3.69	1.228	0.9580	1.1341	35.09	0.563***	−31.651***
Artificial intelligence (AI) and robotics skills	1.87	1.073	3.04	1.362	1.1624	1.1942	62.16	0.541***	−36.471***
Skills related to applying digital hardware technologies such as augmented and virtual reality	2.02	1.113	3.19	1.341	1.1738	1.1950	58.11	0.545***	−36.804***

Notes: $n = 1{,}404$; level of significance: ***$p < 0.001$; coding – 1-no skills present, 5-expert

Figure 1 Current level-future level digital skills map



about the future digital skills requirements are based on their evaluations of the current proficiency levels.

4.1.2 The role of country of registration, tourist sector and organisation size. Findings show that the country of registration, size and sector shape significantly respondents' answers regarding their current level of digital skills proficiency, the required future level of proficiency and the gap between these two levels (Tables 3(a, b)). On a country level, German respondents were more reserved in the evaluation of their current proficiency levels – for 9 out of 13 digital skills they had the lower mean value (Table 3(b)). At the same time, Bulgarian, Italian, Spanish and Dutch respondents seemed more confident in their digital skills as for 3–4 of the digital skills they reported highest means. The respective F-test values were mostly significant at $p < 0.001$ (Table 3(a)), as well as the post hoc Turkey's HSD-test values between the minimum and maximum means. Respondents from Ireland are mostly sceptical about the future skills requirements (for 8 out of 13 digital skills they reported the lowest means), while Bulgarian participants put the greatest emphasis on future skills requirements (they had the highest mean for 9 out 13 digital skills). Surprisingly for 3 of the skills (online marketing and communications, social media skills and skills to monitor online reviews) actually the Irish respondents had the highest mean values for future skills requirements. Finally, looking at the skills gaps we see that German respondents identified the largest gaps for 6 digital skills, while Italian respondents had the lowest gaps for the other 6 digital skills. For 7 of the skills gaps, the differences are significant at $p < 0.01$ (Table 3(a)).

The analysis on sector level depicts an interesting situation – respondents from food and beverage (F&B) outlets consider their sector as largely low-tech. For 8 out of 13 digital skills they reported the lowest current level of proficiency and the lowest future proficiency requirements for 12 skills. At the same time, respondents from visitor attractions and accommodation

Table 3 Differences amongst respondents on the basis of country of registration, tourist sector and size

	ANOVA (F-statistic)								
	Current level			Future level			Absolute gap		
Digital skills	*Country*	*Sector*	*Size*	*Country*	*Sector*	*Size*	*Country*	*Sector*	*Size*
a) ANOVA results									
Operating system use skills (e.g. Windows)	4.125***	5.040***	0.142	4.150***	4.738***	1.941	1.396	1.083	3.301*
Microsoft office skills (e.g. Word, Excel and Powerpoint)	2.566**	8.180***	0.774	2.316*	4.652***	3.171*	1.022	0.792	5.782***
Skills for implementing online safety procedures	4.733***	5.135***	3.581**	2.095*	1.965	6.810***	5.763***	2.078	4.513***
Online marketing and communication skills	1.842*	3.220*	0.844	1.681	4.737***	3.947**	3.873***	2.944*	1.833
Skills to adjust digital equipment such as Wi-Fi connectivity, sound systems and video projectors	10.289***	5.118***	1.930	4.991***	1.441	4.562***	3.963***	2.550*	1.230
Desktop publishing skills (for designing brochures, catalogues, etc.)	6.796***	5.648***	1.696	2.932**	2.368	1.133	2.622**	2.450*	1.105
Computer programming skills	4.392***	3.187*	12.624***	4.658***	1.643	8.418***	1.421	0.827	0.692
Website development skills	2.544**	6.429***	9.066***	3.250***	4.329**	6.575***	1.936	0.509	3.005*
Social media skills	3.275***	2.197	2.268	2.355*	2.398*	4.721***	2.899**	1.185	1.696
Skills to monitor online reviews	10.050***	14.523***	1.505	2.119*	2.742*	3.713**	9.479***	8.868***	0.475
Data analytics, business intelligence and big data skills	4.959***	5.822***	5.421***	0.788	5.250***	9.259***	5.789***	8.934***	1.461
Artificial intelligence (AI) and robotics skills	6.889***	1.229	3.245*	2.930**	3.472**	7.411***	3.843***	6.597***	3.854**
Skills related to applying digital hardware technologies such as augmented and virtual reality	5.089***	1.670	2.111	2.361*	9.186***	6.022***	4.656***	6.951***	2.853*

Digital skills	Respondents with the lowest and highest mean value								
	Current level			Future level			Absolute gap		
	Country	*Sector*	*Size*	*Country*	*Sector*	*Size*	*Country*	*Sector*	*Size*
b) Respondents with the lowest and highest mean value									
Operating system use skills (e.g. Windows)	*The Netherlands*	*F&B*	*Medium*	*Ireland*	*F&B*	*Individual*	*Ireland*	*DMO*	*Individual*
	Italy	TOTA	Large	Bulgaria	TOTA	Large	The Netherlands	ACC	Medium
Microsoft Office skills (e.g. Word, Excel and Powerpoint)	*Ireland*	*F&B*	*Medium*	*Spain*	*F&B*	*Individual*	*Italy*	*DMO*	*Individual*
	Bulgaria	DMO	Large	Bulgaria	TOTA	Medium	Other	F&B	Medium
Skills for implementing online safety procedures	*Germany*	*DMO*	*Medium*	*Spain*	*F&B*	*Individual*	*Italy*	*ACC*	*Individual*
	Italy	TOTA	Large	Ireland	TOTA	Large	Germany	DMO	Medium
Online marketing and communication skills	*Germany*	*F&B*	*Individual*	*Ireland*	*F&B*	*Individual*	*The Netherlands*	*ACC*	*Individual*
	The Netherlands	ACC	Medium	Bulgaria	TOTA	Medium	Ireland	DMO	Small
Skills to adjust digital equipment such as Wi-Fi connectivity, sound systems and video projectors	*Germany*	*DMO*	*Individual*	*Ireland*	*F&B*	*Micro*	*The Netherlands*	*VA*	*Micro*
	Bulgaria	VA	Large	Bulgaria	ACC	Large	Germany	DMO	Medium
Desktop publishing skills (for designing brochures, catalogues, etc.)	*Germany*	*DMO*	*Micro*	*Ireland*	*F&B*	*Individual*	*The Netherlands*	*TOTA*	*Large*
	Bulgaria	VA	Large	Bulgaria	VA	Large	Germany	DMO	Medium
Computer programming skills	*Germany*	*DMO*	*Micro*	*Ireland*	*F&B*	*Individual*	*Ireland*	*F&B*	*Individual*
	Spain	VA	Large	Bulgaria	TOTA	Large	Bulgaria	DMO	Medium
Website development skills	*Bulgaria*	*F&B*	*Small*	*Ireland*	*F&B*	*Individual*	*Italy*	*VA*	*Individual*
	The Netherlands	VA	Large	The Netherlands	VA	Large	Bulgaria	DMO	Medium
Social media skills	*Germany*	*F&B*	*Individual*	*Spain*	*F&B*	*Individual*	*The Netherlands*	*VA*	*Large*
	Bulgaria	VA	Large	Ireland	DMO	Medium	Germany	DMO	Medium
Skills to monitor online reviews	*Germany*	*DMO*	*Individual*	*Germany*	*VA*	*Individual*	*Italy*	*ACC*	*Individual*
	Italy	ACC	Medium	Ireland	ACC	Large	Germany	DMO	Medium
Data analytics, business intelligence and big data skills	*Germany*	*F&B*	*Individual*	*Hungary*	*F&B*	*Micro*	*Italy*	*ACC*	*Individual*
	The Netherlands	ACC	Large	Bulgaria	DMO	Large	Germany	DMO	Medium
Artificial intelligence (AI) and robotics skills	*Germany*	*DMO*	*Micro*	*UK*	*F&B*	*Individual*	*Italy*	*F&B*	*Individual*
	Spain	ACC	Large	Bulgaria	DMO	Large	The Netherlands	DMO	Large
Skills related to applying digital hardware technologies such as augmented and virtual reality	*UK*	*F&B*	*Micro*	*Ireland*	*F&B*	*Individual*	*Italy*	*F&B*	*Individual*
	Spain	DMO	Large	Bulgaria	DMO	Large	Bulgaria	DMO	Large

Notes: 1. Lowest values in *italic*, highest values in normal font. 2. Abbreviations: DMO – destination management organisations, F&B – food and beverage, VA – visitor attractions, TOTA – tour operators and travel agents, ACC – accommodation establishments. $n = 1{,}404$; level of significance: ***$p < 0.001$; *$p < 0.01$; *$p < 0.05$

establishments were more confident about their current level of proficiency. Tour operators and travel agents and DMOs report the highest future digital skills requirements, while the gaps are highest for the DMOs (in 11 out of 13 skills) (Table 3(b)). Most of the differences are statistically significant (Table 3(a)).

Unsurprisingly, the individual and part-time enterprises self-reported the lowest current proficiency for five skills, lowest future proficiency requirements for 11 skills and the smallest gap for 10 skills. At the same time, large companies (over 250+ employees) reported the highest current proficiency for 10 skills and highest future skills requirements for 9 skills. Considering the diversity of job positions in large companies and a large number of tourists they need to serve, digitalisation is a pathway towards improving their efficiency, hence the high digital skills requirements. Ultimately, medium-sized enterprises (100–250 employees) had the highest gaps for 10 skills. ANOVA showed that differences in the mean values of responses were statistically significant mostly for the future skills requirements (Table 3(a)).

4.1.3 Factor analysis. The Exploratory Factor Analysis (Table 4) based on the gaps between the current and required future proficiency levels of digital skills identified two factors. Factor 1 "Advanced digital skills" (AVE = 49.125%, Cronbach's alpha = 0.879, CR = 0.880) included skills that require significant training and have high gaps (Table 2), namely: AI and robotics, Augmented and virtual reality, Data analytics, business intelligence, big data, Website development, Computer programming, Skills to monitor online reviews. These are the skills that determine most of the variation in the digital skills gaps. The second factor "Basic digital skills" (AVE = 11.929%, Cronbach's alpha = 0.871, CR = 0.895) consisted of skills that were more widely spread within the tourism and hospitality industry, require minimal specialised training and have low gaps: MS Office skills, Operating systems use, Online marketing and communication skills, Skills for implementing online safety procedures, Skills to adjust digital equipment. One of the items (Desktop publishing skills) appeared in both factors.

4.1.4 Cluster analysis. The cluster analysis revealed the existence of three groups of respondents on the basis of the absolute digital skills gaps. Clusters' characteristics are presented in Table 5, while Table 6 shows the differences in the skills gaps between the

Table 4 Factor analysis

	Factor loadings	
	Factor 1	*Factor 2*
Digital skills gaps	*Advanced digital skills*	*Basic digital skills*
Artificial intelligence (AI) and robotics skills	0.847	
Skills related to applying digital hardware technologies such as augmented and virtual reality	0.831	
Data analytics, business intelligence, big data skills	0.723	
Website development skills	0.692	
Computer programming skills	0.687	
Skills to monitor online reviews	0.555	
Microsoft Office skills (e.g. Word, Excel and Powerpoint)		0.847
Operating system use skills (e.g. Windows)		0.823
Online marketing and communication skills		0.670
Skills for implementing online safety procedures		0.646
Skills to adjust digital equipment such as Wi-Fi connectivity, sound systems and video projectors		0.635
Social media skills		0.574
Desktop publishing skills (for designing brochures, catalogues, etc.)	0.517	0.525
Cronbach's alpha	0.879	0.871
Composite reliability	0.880	0.895
Variance extracted	49.125%	11.929%
Kaiser-Meyer-Olkin measure of sampling adequacy	0.898	
Bartlett's test of sphericity (df = 78)	10,471.134 ***	

Notes: *** Significant at $p < 0.001$

Table 5 Cluster analysis – clusters' characteristics

Characteristic	*Cluster 1*	*Cluster 2*	*Cluster 3*	*Chi-square*
Country				
UK	71	120	42	$\chi2 = 64.998$ *** (df = 16)
Italy	164	152	54	
Ireland	19	47	8	
Spain	57	54	28	
Hungary	43	64	16	
Germany	58	133	55	
The Netherlands	14	22	4	
Bulgaria	43	50	42	
Other	12	25	7	
Sector				
Destination management	76	153	66	$\chi2 = 15.999$ * (df = 8)
Food and beverage	77	92	32	
Visitor attractions	78	97	37	
Travel agents and tour operators	55	89	27	
Accommodation	195	236	94	
Size				
Large (250 or more employees)	40	74	14	$\chi2 = 22.545$ ** (df = 8)
Medium (100–249 employees)	36	65	27	
Small (10–99 employees)	156	253	103	
Micro (Less than 10 employees)	188	223	90	
Individual or part-time activity	61	52	22	
Total	*481*	*667*	*256*	

Notes: $n = 1{,}404$; level of significance: ***$p < 0.001$; *$p < 0.01$; *$p < 0.05$

clusters. The 481 respondents within Cluster 1 were quite confident in their skills and did not consider that the future levels of proficiency of their digital skills need to be much different from the current levels – the gaps in Table 6 are close to zero. On the other extreme were the 256 respondents from Cluster 3 – their digital skills gaps were highest, especially for the advanced digital skills such as AI and robotics, Augmented and virtual reality, Data analytics, business intelligence, big data, Website development. Within the middle were the 667 respondents in Cluster 2 that had identified some digital skills gaps, but they were smaller than the gaps of Cluster 3. All differences between the three clusters were statistically significant at $p < 0.001$ (Table 6). Looking at clusters' characteristics in Table 5 we see that most of the respondents from the UK and Germany were classified in Cluster 2, Italian respondents – into Clusters 1 and 2, while Bulgarian respondents were more uniformly distributed amongst the clusters ($\chi2 = 64.998$, $p < 0.001$). Respondents from accommodation establishments were dominating in Clusters 1 and 2 ($\chi2 = 15.999$, $p < 0.05$). Only 11% of large companies were classified in Cluster 3, but 20% of small and 21% of micro-enterprises ($\chi2 = 22.545$, $p < 0.01$).

4.1.5 Digital skills training. Table 7 shows the training that respondents received to upgrade their digital skills. A significant number of respondents (517 or 36.82%) reported they had received no digital skills training. On the job training was by far the most popular type of training, provided to 558 or 62.9% of respondents who received training, followed by online courses (n = 365). Apprenticeship (n = 66) and payment for higher education programmes (n = 65) were the least popular programmes. There were significant differences in the types of training provided by country ($\chi2 = 286.13$, $p < 0.001$), sector ($\chi2 = 113.91$, $p < 0.001$) and organisation's size ($\chi2 = 63.99$, $p < 0.001$). On the job training was most popular in Italy (n = 162), while in Germany respondents received a one-day off-site training by an external provider (n = 126) and an online course (n = 105). Less than half of respondents from the F&B sector received any digital skills training, mostly on the job. DMOs relied equally on online courses (n = 113), on the job training (n = 112) and one-day off-site training by an external provider (n = 110). For accommodation establishments, the on the job training (n = 222) was complemented by online

Table 6 Cluster analysis – differences amongst clusters to the digital skills gaps

Digital skills gaps	*Cluster 1* n = *481*		*Cluster 2* n = *667*		*Cluster 3* n = *256*		*F-statistic*
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	
Operating system use skills (e.g. Windows)	−0.091	0.642	0.286	0.674	0.840	0.808	153.345***
Microsoft office skills (e.g. Word, Excel and Powerpoint)	−0.073	0.675	0.390	0.654	0.996	0.870	195.022***
Skills for implementing online safety procedures	0.010	0.700	0.889	0.788	1.863	0.904	484.698***
Online marketing and communication skills	−0.002	0.720	0.876	0.744	1.727	0.828	465.064***
Skills to adjust digital equipment such as Wi-Fi connectivity, sound systems and video projectors	−0.108	0.626	0.622	0.758	1.527	0.863	419.847***
Desktop publishing skills (for designing brochures, catalogues, etc.)	−0.060	0.679	0.751	0.795	1.777	0.859	484.885***
Computer programming skills	0.012	0.674	0.781	0.792	1.965	1.060	485.694***
Website development skills	0.048	0.686	0.945	0.787	2.230	0.969	640.219***
Social media skills	0.056	0.688	0.891	0.806	1.766	0.885	414.009***
Skills to monitor online reviews	−0.004	0.661	0.892	0.806	1.824	0.968	462.919***
Data analytics, business intelligence, big data skills	0.002	0.709	1.138	0.788	2.285	0.966	715.834***
Artificial intelligence (AI) and robotics skills	0.200	0.708	1.348	0.911	2.488	1.063	594.825***
Skills related to applying digital hardware technologies such as augmented and virtual reality	0.164	0.727	1.384	0.888	2.523	0.966	678.704***

Notes: $n = 1404$; df = 2; level of significance: ***$p < 0.001$

Table 7 Digital skills training provided by tourism and hospitality companies

Characteristic	*No training provided*	*Total*	*Training provided*									
			On the job training	*Online course*	*One day on-site training by an external provider*	*Several days of on-site training by an external provider*	*One day off-site training by an external provider*	*Several days of on-site training by an external provider*	*Apprenticeship*	*Vocational training*	*Higher education*	*Chi-square*
Country												
UK	*107*	*126*	98	53	35	20	38	14	10	13	10	286.13
Italy	*144*	*226*	162	68	34	38	25	30	8	26	8	df = 64
Ireland	*26*	*48*	32	15	14	16	10	13	3	3	11	p < 0.001
Spain	*53*	*86*	44	46	17	20	16	14	6	5	7	
Hungary	*44*	*79*	59	26	23	13	16	10	11	8	4	
Germany	*48*	*198*	69	105	67	39	126	73	11	15	11	
The Netherlands	*12*	*28*	20	14	8	4	4	4	11	4	6	
Bulgaria	*60*	*75*	60	30	14	11	7	8	5	10	6	
Other	*23*	*21*	14	8	6	3	3	2	1	3	2	
Sector												
Destination management	*62*	*233*	112	113	74	50	110	70	12	19	16	113.91
Food and beverage	*111*	*90*	64	24	20	14	14	7	14	11	12	df = 32
Visitor attractions	*70*	*142*	82	61	37	21	29	18	7	15	14	p < 0.001
Travel agents and tour operators	*61*	*110*	78	50	27	18	25	19	14	14	9	
Accommodation	*213*	*312*	222	117	60	61	67	54	19	28	14	
Size												
Large (250 or more employees)	*25*	*103*	69	57	36	36	23	21	12	16	16	63.99
Medium (100–249 employees)	*35*	*93*	53	43	31	27	21	19	13	11	11	df = 32
Small (10–99 employees)	*160*	*352*	216	146	86	61	98	70	20	28	21	p < 0.001
Micro (Less than 10 employees)	*211*	*290*	186	101	61	38	94	54	19	30	15	
Individual or part-time activity	*86*	*49*	34	18	4	2	9	4	2	2	2	
Total	*517*	*887*	*558*	*365*	*218*	*164*	*245*	*168*	*66*	*87*	*65*	

Notes: $n = 1{,}404$

courses (n = 117). Unsurprisingly, 80.47% of employees in large companies (n = 103) received digital skills training, while only 57.88% (n = 290) of respondents in micro-enterprises did. On the job training and online courses were the most popular types of training for all respondent groups.

4.2 Qualitative research

Specifically, for each sector, the following results were derived from the data.

4.2.1 Tour operators and travel agents. Digital skills are key in this sector, both today and in the future. At the same time, a serious shortage of digital skills seems to exist across the industry. In the Bulgarian interviews, it was mentioned that although stakeholders are aware of the importance of digital skills in general, they have no clear idea of exactly which skills are needed to properly manage their companies in the current market. Most staff members – except in the technology-based companies – do not have to be digital specialists; they do not have to know how to build a website or how to construct AI-powered systems as this will mostly be outsourced, in particular in small and medium-sized companies. However, staff should understand the underlying concepts of AI-powered systems and technologies to be able to decide what kind of digital tool would be helpful to solve a problem. Skills related to digital marketing and social media, including the role of influencers are considered very important, although in various countries (e.g. Italy, Bulgaria) respondents were not able to specify which skills or competencies will be needed for this in the future. Some participants noted a lack of business communication skills for social media. Interviewees felt that analytical skills and making sense of big data are more needed at managerial than operational levels.

4.2.2 Destination management organisations. The expectation in several countries is that DMO's will move away from simply providing information (which visitors can access themselves through the internet) to providing inspiration and experiences for visitors. Another aspect of the changing role of DMO's is that instead of being a communication partner for local stakeholders, they are now in the process of assuming the role of consultants and provide advice on how to attract (new) target groups; they also need to better support local stakeholders when it comes to digital development and, for example, developing new products and creating a wider audience on TripAdvisor, Booking.com, etc. In other words, community management (stimulating the network of regional/local entrepreneurs to be digitally active) regarding digitisation will become more and more important for DMO's. At the management level, skills are also needed for data-analytics and data-driven marketing, understanding algorithms, developing strategies based on data gathering and being able to measure results of campaigns. Skills for conducting tourism market studies and tourism trend analysis were also mentioned (Italy), as well as data protection, business intelligence and the ability to make strategic decisions regarding digital solutions (Germany). In Ireland, it was noted that "collecting and analyzing data effectively can help destination managers to develop and market a destination but it was acknowledged that many do not collect such information and those that do often do not know how to analyse it effectively". In the UK report, it was noted that in 2030, it will be important for businesses to understand the concept of immersive technology to animate the experiences they offer. This was supported in other countries where several respondents commented that developments in AR, VR, beacons, QR codes, etc., should be closely watched.

4.2.3 Accommodation providers. Currently, the trend is towards more travel and more accommodation bookings, both for leisure and business purposes. Not only more "digital natives" will travel but also more elderly visitors, more tourists from Asia and other origins, more families and more business travelers (who will – as was mentioned in the Bulgarian interviews – expect to find mobile offices in their accommodation). Basically, all staff will, therefore, need digital skills and know-how to work with computers, tablets, mobile applications, Office, e-mail,

hotel software (such as Flexys, Hostware and Opera). Front desk (and other) staff need to be able to work with property management systems (PMS); sales staff with CRM cloud-based systems (such as SalesForce). For accommodations that also host events, knowing how to work with projectors, video equipment and sound systems is required. Housekeeping, technical and maintenance departments are also increasingly working with mobile applications and online services. Housekeeping apps are connected to check-in and out, for example, enabling staff to clean those rooms that are needed first or to control the robotic vacuum cleaner. AR and VR are on the rise, especially to add "experience value" to accommodations. Although knowledge of the possibilities of AR and VR is important to be able to make decisions, the actual production of AR and VR tools is mostly outsourced to specialised companies.

4.2.4 Visitor attractions. This sector is perceived as lagging behind compared to other tourism companies and hotels regarding the use of big data, online marketing (particularly in many small companies still non-existent today) and social media management. Nevertheless, digitisation and automation are increasing and digital skills (working with computers, tablets, mobile applications, Microsoft Office, e-mail, a variety of software such as PMS, reservation and ticketing systems, etc.) will become more important both for operating businesses and improving the visitor experience. A key difference is that soon everybody will need to have such digital skills. Now, technical staff, housekeeping or gardeners are not always required to have digital skills. Online marketing and social media skills are considered increasingly indispensable. It was noted that while most young people have plenty of knowledge of social media, business communication skills for social media are lacking. Writing skills for producing content and announcements for online and social media is another problem area. Being able to update websites and other online media (including graphics and visual design) is also seen as important. As experiences are central to attractions and guests are asking for increasingly higher levels of experience and customisation, creativity, storytelling skills and the ability to create experiences without or with the use of AR, VR, mixed reality and mobile phone applications are even more important here than in the other sectors.

4.2.5 Food and beverage operations. Several interviewees, notably in Spain, foresee huge changes in the food and beverage sector related to digital innovations. Technology is already having a large impact, partly because technological innovations in this sector have been lagging until recently and partly because the relationship with the customers has to a large extent been digitised. Eating habits are changing and for current and future generations eating in restaurants will be a "new normal" as will be buying (semi) ready-made meals or ordering food online and having it delivered to their homes. Today, many people "only cook at home to celebrate something" (a respondent from Spain). In Italy, a drive for a better quality of future gastronomic offerings was noted with a focus on regional specialties and locally sourced ingredients in line with the demand for local experiences. This increasing demand requires a sector that can supply huge quantities of (semi) prepared foods which will trigger industrialisation of the sector (a respondent from Spain). Food will be prepared at central locations and distributed to multiple outlets and restaurants (a respondent from Hungary). The use of online applications and technologies has already greatly increased: online reservations, ordering food online, having conversations with chatbots about one's orders, digital payments, reviews and producing "Instagramable" food dishes are all part of daily routines in many countries today.

5. Discussion

The primary data results indicate a range of key issues, themes and trends arising from the quantitative and qualitative data, which has implications for current and future digital training provision. The ongoing importance of skills assessment, previously highlighted by the World Economic Forum (2016) and European Commission (2016a, 2016b, 2018b) is highly evident given the range of responses according to characteristics of the tourism and hospitality

business across Europe. The research confirms the influence of the rapidly changing digital environment via the perception of digital skills and the readiness of research participants to recognise and articulate digital skills gaps. The research raises significant questions in relation to how to respond to the gaps in skill sets and support the development of digital skills training across the five sectors according to the size of business and current and future skills requirements. This may, however, also imply an overemphasis on digital skills compared to the reality of working in the service sector which relies heavily on personal communication skills.

The differentiation between low and high digital skills is a key element of the research findings. Traditionally, highly advanced and specialist skills and employment for data scientists, computer programmers and robotic engineers are considered largely separate to the tourism and hospitality sectors (Buhalis and Law, 2008), although increasingly this level of expertise needs to be directly linked to the opportunities and exploitation of new uses of digitalisation in the five tourism sectors (Buhalis *et al.*, 2019) where the interface between tourism and technology can occur more effectively (Langford *et al.*, 2019) to support a high-quality visitor/guest experience. The extent to which tourism employment should include these high-level skills, including computer programming, data analytics and the use of AI and the increasing interface between tourism and technology is an ever-evolving area of work. The results imply the largest digital skills gaps in AI and Robotics and yet it is seen as a predominant skill that is needed within the sector. Considering the sweeping adoption of automation technologies by tourism and hospitality companies, their employees would need relevant technical skills to operate them (Ivanov, 2019). Clearly, more research is needed to understand what level of knowledge is needed within the tourism and hospitality sector to engage and work directly with the IT sector and qualified data analysts, computer programmers and engineers (Autor *et al.*, 2003).

Essentially the lower-rated digital skills such as knowledge of operating systems and use of computers for day-to-day operations and management tasks are, perhaps, more assumed to be learned before arrival on the job (i.e. part of the general skills set), although prior studies have shown that the share of people with basic digital skills varies greatly across countries (Praničević *et al.*, 2019). Where there are low skills gaps these may be largely addressed via in-house digital training. Knowledge and skills in the use of the digital property and financial management systems are largely based on familiarity through work experience or on-the-job training at the specific work location according to the system used (Lee and Bugler, 2017).

The skills gaps in this study associated with social media and digital marketing are considered much lower than the advanced skills needed for the development and adoption of AR and VR. However, the use of data arising from customer social media use implies a higher level of skill (Lamest and Brady, 2019) to maximise the opportunities that the data present for product development and enhanced customer experiences, as well as marketing and promotion of a business. The skills gaps identified in this study, represent how social media is used at tourism companies which has fundamentally changed. Social media used to be the domain of specialist social media managers. However, in just a short space of time, activities on social media have been radically democratised and decentralised by easy to use social media management technologies (Stelzner, 2019; Buffer, 2019). Since then, employees of tourism companies have been asked to use social media themselves and has become more common. That is, social media and digital marketing are part of a company's own business operations and therefore, strategically, the skills gaps in this field are felt more prominent to companies than the gaps in technologically oriented areas such as robotics and AI.

The highest gaps derived from respondents is found in augmented and virtual reality skills (absolute gap = 1.1738, percentage gap = 58.11%) and AI and robotics skills (absolute gap = 1.1624, percentage gap = 62.16%), but nevertheless these two skills are considered as least required in the future for tourism and hospitality companies. This implies some uncertainty as to how these advanced skills are needed although for the visitor attraction sector there are extensive rapidly changing opportunities for increased adoption of AR and VR interpretation

within the heritage and cultural organisations to improve the visitor experience of historical and cultural properties (Litvak and Kuflik, 2020). As experiences are central to attractions and guests are asking for increasingly higher levels of experience and customisation, creativity, storytelling skills and the ability to create experiences without or with the use of AR, VR, mixed reality and mobile phone applications are even more important here than in the other sectors. Additionally, tour operators (Maaiah *et al.*, 2019) and restaurants (Cassar and Inguanez, 2018) are also moving towards increased use of AR and VR. The standard lower basic transversal office skills that go across all sectors (such as operating system use, MS Office skills) are stated with fewer gaps are arguably due to the dominant importance of these in day to day operational and managerial tasks.

The response of managers within organisations to their staff's digital skills requirements is demonstrated through the different types of digital training offered according to business needs. Here, micro and small enterprises have less leverage and capacity to complete training for themselves or their work colleagues. The reasons and factors influencing this, compared to larger service organisations, represent a complex picture related to time, money and availability of bespoke training provision, knowledge to access free or *reduced* cost online training networks and provision to respond to their digital skills needs (Kergroach, 2020; Arendt, 2008).

Skills assessment methodologies are vital to create sound evidence of skills gaps and identify which digital competencies are needed for the rapidly changing digital environment for the tourism industry. These skills needs are required using an ongoing system of skills assessment at European, national and regional levels. The survey and interviews with owners, senior managers and executives provided the evidence to support justification for future digital skills enhancement strategies; however, more research is needed directly with employees to gain an understanding of their own digital skills.

6. Conclusion

6.1 Contribution

This paper contributes to the body of knowledge by investigating the digital skills gaps in tourism and hospitality companies through mixed methods research. In particular, the paper focused on managers and executives (1,404 questionnaire respondents and 264 interviewees) in five sectors (accommodation establishments, tour operators and travel agents, food and beverage, visitor attractions and destination management organisations) in 8 European countries (UK, Italy, Ireland, Spain, Hungary, Germany, the Netherlands and Bulgaria). The most important future digital skills reported by respondents include online marketing and communication skills, social media skills, MS Office skills, operating systems use skills and skills to monitor online reviews. The largest gaps between the current and the future skill levels were identified for AI and robotics skills and AR and VR skills, but these skills, together with computer programming skills, were considered also as the least important digital skills for tourism and hospitality employees in the future. The respondents were not uniform in their answers and three clusters were identified on the basis of their reported gaps between the current level and the future needs of digital skills. The country of registration, the sector and the company size influence respondents' answers regarding the current and future skills levels and the skills gap between them.

6.2 Managerial implications

Digitisation, data, AI and robotisation are causing tremendous changes in the tourism industry; the two main signalled trends are towards more "tech" developments on the one hand and less but more "personalised" customer service on the other hand. Future tourism employees must be able to cope with these two developments. Digital fluency will be key for every employee in general and more specifically for working in the information-intensive tourism industry. Our

research has shown that many systems and software packages are used (e.g. for reservations, marketing, maintenance, finance): the future will bring only more diversity in systems, applications and software. For tourism education, it will be impossible to train students in the use of all these systems and in all upcoming changes. This is the main reason why self-learning capacities are so important: these will enable people to cope with digital innovations in the future.

Taking the results of the research into account, future digital skills across all tourism subsectors should consist of:

- Self-learning capacities (permanent education, adaptability, agility and flexibility – necessary to cope with ongoing digital innovations and disruptive business models);
- Digital fluency;
- Skills for conducting E-business: all skills necessary for online branding, marketing and distribution (including websites, social media, reviews), data collection, data analytics and data management (including protection, ethics and cybersecurity);
- As AI, VR and AR driven technologies will be increasingly important in all tourism sectors, a better understanding of these fields is essential;
- As unique, customised and personalised experiences are the future in all tourism sectors, skills in creating experiences both in the real world and with the use of AR, VR or in mixed reality with special attention to gamification, as well as creating online and video content will become more important; and
- It is important to note that profession-specific knowledge (about attractions, hotels, food, "non-googleable" travel options) will remain important.

This raises important challenges for the future of tourism education: a growing need is visible for technical skills in tourism-related industries, but it is highly unlikely that the typical tourism education of today can deliver the type of technical specialists that are increasingly needed. Data analysts, technical staff and AI specialists working for OTA's, for example, do not necessarily need to have a degree in tourism – working at companies such as Skyscanner, Expedia and Booking.com does not require a background in tourism or a tourism degree (although "affinity with travel" is sometimes asked). The same applies to creators of video content or of experiences involving VR, AR or mixed reality: all these jobs do not necessarily require a degree in tourism: technical and creative backgrounds are more important. However, even though the future tourism industry will be even more powered by tech, it will be driven by people and behaviour. Technology also shapes the way people interact, referring to e.g. online behaviour. Educational programs in the field of tourism are part of the economic domain and rely on the social sciences and are focused on management and "people" and not on "tech" as such. Educational programs in tourism should not drift away too far from their home ground and should primarily be dealing with the effects of digitisation on the socio-economic, commercial, managerial, sustainable and ethical aspects of tourism – instead of focusing on technology as such (e.g. machine learning, programming, software development, artificial intelligence). Lifelong learning and skills to bridge the gap between technology and the human approach needed in the tourism industry should be at the core of future tourism employees' education. Therefore, "High Tech with a Human Touch" summarises the skills needs for the future of tourism.

6.3 Limitations and future research

The main limitation of this research is that, although the respondents came from eight countries, they were all based in Europe. Hence, findings are generalisable within the context of the European tourism industry, but not on a global scale. Another limitation stems from the fact

that managers self-evaluated the level of proficiency of the digital skills in their organisations; thus, it is possible that they over- or under-estimated the actual level of proficiency. Future research needs to focus on the digital skills gaps in tourism and hospitality in other countries and cultural contexts. Additionally, future research may delve deeper into the factors that drive the digital skills gaps and the ways to close these gaps. Issues and barriers regarding access to digital training and skills development are equally a key factor for current and future employees. Finally, further research may shed light on the impact of the digital skills gaps on the performance of tourism and hospitality organisations, particularly as the tourism industry enters a post-Covid 19 digital landscape.

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About the authors

Sheena Carlisle is based at Tourism, Hospitality and Events Department, Cardiff School of Management, Wales Centre for Tourism Research (WCTR), Cardiff Metropolitan University, Cardiff, UK. Dr Sheena Carlisle is a Senior Lecturer in Tourism Management at Cardiff Metropolitan University with 18 years of teaching and consultancy work in Tourism Higher Education. Her qualifications include: BA (Hons) Hospitality Management, MA (Exon) Tourism and Social Responsibility, Msc Built Environment Research Methods and PhD in Political Economy and Sustainable Tourism Development. Currently, Project Manager at Cardiff Metropolitan University for the Erasmus + Next Tourism Generation Skills Development Project with 14 partners across Europe, Sheena is developing research and training tools for digital and sustainability skills delivery in tourism. Teaching experience includes a wide range of academic subjects including: Business and Tourism Ethics, Crisis, Risk and Strategic Change Management, Marketing, Tourism in Developing Countries, Sustainable Tourism and Destination Management. Previous career experience in social housing association management developed her interest and commitment to community involvement and social justice, combined with early work experience in Visitor Attraction Management at Heritage Sites in the UK and Africa. Sheena has a passion for Sustainable development, community engagement, the Arts, Heritage and Culture bringing an eclectic portfolio of experience to research, enterprise and teaching Projects.

Stanislav Ivanov is based at the Varna University of Management, Varna, Bulgaria. Dr Stanislav Ivanov is currently Professor and Vice-Rector (Research) at Varna University of Management, Bulgaria (www.vum.bg) and director of Zangador Research Institute (www.zangador.institute). Prof. Ivanov is the Founder and Editor-in-chief of two academic journals: *European Journal of Tourism Research* (http://ejtr.vumk.eu) and *ROBONOMICS: The Journal of the Automated Economy* (https://journal.robonomics.science). Additionally, he serves in the Editorial boards of over 30 other journals. His research interests include robonomics, robots in tourism/hospitality, the economics of technology, revenue management, destination marketing, tourism and economic growth, political issues in tourism, etc. His publications have appeared in different academic journals – *Annals of Tourism Research*, *Tourism Management, Tourism Management Perspectives, Journal of Tourism Futures* and other journals. For more information about Prof. Ivanov please visit his personal website: www.stanislavivanov.com. Stanislav Ivanov can be contacted at: stanislav.ivanov@vumk.eu

Corné Dijkmans is based at the Breda University of Applied Sciences, Breda, The Netherlands. He is specialised in the digital transformation of tourism. He holds a PhD in Communication Science, an MSc in Business Economics and an MSc in Marketing Management. He is participating in several national and international projects related to digital tourism. His research has been published in international ISI-ranked journals and has been presented at international conferences in the field of e-tourism and online communication. Currently, as manager of Research and Business Innovation, he is also responsible for the academic and applied research programme of the Academy for Tourism of Breda University of Applied Sciences (the Netherlands).