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Digital Competencies for Future Tourism and Hospitality Professionals: A Higher Education Perspective

<https://doi.org/10.2478/ejthr-2026-0006>

received February 27, 2026; accepted May 15, 2026

Abstract: The digitalisation of the tourism sector includes both traditional tools, such as global distribution systems (GDS) and metasearch engines, and more recent disruptive technologies, such as artificial intelligence (AI) applications. Due to the widening gap between the adoption of new technologies by tourism organisations and the digital skills of their workforces, this study aims to evaluate the digital literacy of future tourism and hospitality professionals. The specific objectives are to (1) assess students' digital skills required for responsible interaction with digital content; and (2) identify any differences in digital competencies based on sociodemographic and fields of education and training. In 2025, a survey was conducted to collect 267 responses from tourism and hospitality undergraduates regarding their perceptions of their own digital skills. Results show that participants feel confident in basic digital tasks (e.g., searching, communicating, storing and assessing information). Over 50% of respondents indicated they had created playlists and videos and posted reviews, while a smaller proportion had designed

websites. However, lower proficiency was reported in more advanced tasks (e.g., website design and document anonymisation). These findings highlight the importance of enhancing digital literacy training - particularly in practical, industry-relevant tools - to facilitate greater collaboration between suppliers and customers.

Keywords: Digital Competencies; Tourism and Hospitality students; DigComp framework

1 Introduction

The tourism and hospitality sectors are among those in which technological evolution and digitalisation have had the most significant impact (Carlisle et al., 2023). On the one hand, digitalisation in this sector encompasses more conventional tools, such as global distribution systems (GDS) and online travel agencies (OTA). On the other hand, it includes more recent disruptive technologies, such as artificial intelligence (AI), big data, the internet of things (IoT), chatbots, facial recognition systems, blockchain and augmented and virtual reality (Buhalis et al., 2019). These technologies have led to significant advances in automating processes, personalising products and services, managing resources more efficiently, and improving the tourist experience. This gives organisations that have adopted them a significant competitive advantage, enabling them to outperform their rivals in the marketplace (Ivanov, 2022). At the same time, there is a growing discrepancy between the adoption of new technologies by tourism organisations and the readiness of their staff to keep up with these changes. Research has repeatedly highlighted the digital competence gap among the sector's workforce, encompassing both the adoption of emerging technologies and the utilisation of fundamental digital management tools (Carlisle et al., 2023; Pshenichnykh & Novi, 2023; Tzafilkou et al., 2022).

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There is a lack of up-to-date empirical knowledge on the level of digital skills among tourism and hospitality students, particularly with regard to basic digital skills relating to information management, analysis and protection. There is also a lack of knowledge on how these skills vary across different socio-demographic profiles and areas of training. This limits the ability of educational institutions and training decision-makers to develop curricula that align with the sector's growing digitisation needs. As such, this study offers an approach to address this issue.

In this context, it is crucial to understand how well current tourism and hospitality students are prepared to tackle the challenges posed by the sector's increasing digitalisation in their future careers.

Thus, the main aim of this article is to assess the levels of digital competencies and skills of future tourism and hospitality professionals currently studying at higher education institutions.

The specific aims are (1) to assess students' digital skills required for responsible interaction with digital content, particularly in the areas of searching for, finding and accessing information, as well as storing, critically analysing, and protecting digital data; and (2) to identify any differences in digital competencies based on sociodemographic and fields of education and training.

This article is organised into four sections. First, the theoretical background is presented, alongside a discussion of key concepts related to technology and the development of scales for measuring digital competence. Next, the research design and method of data collection are described. This is followed by a description of the results accompanied by a critical discussion. The final section briefly highlights the practical implications for bodies responsible for tourism training, and suggestions for future research in this area.

2 Literature review

2.1 Tourism, hospitality and technological development

Over the past decade, technological developments have led to significant changes in the design, creation, production, delivery and consumption of services in the tourism and hospitality sectors (Buhalis et al., 2019). The integration of various technological developments in tourism and hotel services (e.g., AI, IoT, augmented reality (AR), and the metaverse) has given rise to what is now known as the Tourism or Hotel Industry 4.0 (Elkhwesky et al., 2024).

Tourism and Hospitality 4.0 involves integrating technological developments into service and experience offerings to make them more personalised, immersive and interactive for consumers (Lu et al., 2021), whether they are at the beach or in a hotel.

At earlier stages of the technology development, the tourism and hospitality sectors relied mostly on ICT (Information and Communication Technology) or e-CRM (electronic Customer Relationship Management) to focus on efficiency, sales, and promotion (Luu et al., 2025). However, hotels have changed their management and service offerings (Elkhwesky et al., 2024) into smart environments (Buhalis et al., 2019). These smart environments, resulting from the technologies used in the service experience, are being implemented to acquire information and insights from service operations and tourists' interactions (Salguero & Espinilla, 2018). For tourism and hotel management, this represents an important tool to sustain high levels of efficiency and economic sustainability (Buhalis et al., 2019; Salguero & Espinilla, 2018).

As such, hotel management has had to alter its value proposition by incorporating higher levels of co-creation between tourists and tourism and hospitality service providers, supported by technology (Elkhwesky et al., 2024; Dang & Nguyen, 2023). This co-creation ranges from e-tourism to e-commerce services, including hotel accommodation reservations and the rental of transportation vehicles and equipment (Li, Zhou & Huang, 2023), as well as customer service communication and interaction via various digital platforms (e.g. email and social media (SM)) (Luu et al., 2025). As a result, this requires the sector's workforce to acquire the digital skills and competence to use these services effectively (Carlisle et al., 2023).

European tourism and hospitality companies appear to value employees with digital communication skills, such as proficiency SM and Microsoft Office, more than those with AI, robotics, AR or computer programming skills (Carlisle et al., 2023). This represents a gap that needs to be addressed, as both the tourism and the hospitality sectors rely heavily on the service supply chain supported by information technology that extends beyond traditional travel and tourism services (Elbelehy & Crispim, 2025). As Jalilvand et al. (2019, p. 881) claim, and as has been described thus far, IT 'competencies and capabilities are particularly valuable in the tourism industry because they enable hotels, for example, to coordinate and collaborate with their partners to satisfy customer requirements efficiently'. Adopting IT knowledge can indeed lead to higher levels of collaboration and coordination among suppliers, hotels, and customers regarding value co-creation (Jalilvand et al., 2019).

As described above, such digital skills are not yet widespread among the tourism and hospitality workforce. In fact, the digital transformation hastened by the COVID-19 pandemic only widened the skills gap between existing employees with in-house training and new recruits (Carlisle *et al.*, 2023). Therefore, it is essential to investigate how the future workforce acquires digital skills, what these skills are, and the places where they are acquired, primarily in higher education institutions.

2.2 Digital skills of students in higher education

As previously outlined, demanding professionals who possess a wide range of skills, including strong digital competence, are a must in today's rapidly changing societal landscape, in which we find new models of organisation across all sectors (López-Meneses *et al.*, 2020).

Over the past two decades, the concept of digital literacy or digital competence, (which is more often employed as a broader, education-oriented concept, see European Parliament and the Council, 2006), has changed from an individual's capacity to perform certain technical tasks to a concept that includes the ability to understand, integrate and utilise information from many sources and in a variety of formats on any digital device (Brečko, & Ferrari, 2016; Vázquez-Cano *et al.*, 2017). This paper will use the two terms interchangeably. The current societal structure requires higher education (HE) students from all further education and training (FET) to use technology in a functional way that enhances their academic, personal and professional development (Brande *et al.*, 2016). In an educational context, digital competence is defined as students' ability to use technology to access and consume information, as well as how they process, acquire and evaluate information collected via technology (He & Li, 2019).

Defining digital competences is not easy or straightforward, and as studies accumulate, more definitions are proposed. However, following Saltos-Rivas *et al.* (2021), the most complete definition in an academic context is the confident and critical use of information society technologies for work, leisure, and communication (Tsankov & Damyanov, 2017). As Spante *et al.* (2018) suggest, it could be the composition of technical competence: the ability to meaningfully use digital technologies for work, study and everyday life; the ability to critically evaluate digital technologies; and the motivation to participate in and commit to digital culture. Thus, 'measuring the degree or level of digital competence involves at least three areas: know-

ledge, skills and attitudes' (Saltos-Rivas *et al.*, 2021, p. 3). For higher education students, digital competence can be defined as the knowledge, skills, and attitudes they must have to use digital technologies responsibly and effectively to evaluate, consume, and produce learning information, and to communicate and collaborate with others for learning purposes (Wang *et al.*, 2021).

In the past few years, often motivated by the COVID-19 pandemic and its impacts on HE students' learning (Sánchez-Macías *et al.*, 2024; Salguero-Alcala *et al.*, 2024), several studies applied to HE students have come to light with the aim of measuring students' digital skills. These studies approach digital competencies from several perspectives.

Some conduct comparisons in different geographical and cultural contexts, such as Italy and Spain (López-Meneses *et al.*, 2020), China and Belgium (He & Li, 2019) and Turkey (Uzun, 2019). Another group of studies focus on different FET, with a special concern for future teachers' digital competences (see Ungerer, 2016; Røkenes & Krumsvik, 2016; Gudmundsdottir *et al.*, 2020). These examinations of digital competence in educational settings have increased in recent years, with many investigating educators' digital competence concerning professional development and their future ability to teach in a digital environment (e.g., Falloon, 2020; Gudmundsdottir *et al.*, 2020; Røkenes & Krumsvik, 2016). Additionally, some studies from South-America focus on HE students and highlight a positive correlation between digital competence and academic success (Salguero-Alcala *et al.*, 2024); for instance, Argentine students from a social sciences and humanities background revealed higher levels of digital competence and autonomy if they were female, used ICT for academic activities, had computer equipment, had regular access to the Internet, and used the computer for more hours (Sánchez-Macías *et al.*, 2024). Another study in Argentina analysed future nurse practitioners, aiming to improve their skills and patient care (Mercado *et al.*, 2024).

In order to gather the opinion of university students about the ability to work in digital skills, López-Meneses *et al.* (2020) focused on three areas of competence: (1) information and data literacy, (2) communication and collaboration, and (3) digital content creation amongst three university students' cohorts (one Italian and two Spanish universities) using a questionnaire. Two student profiles were identified based on time spent online: those who dedicated extensive time to gaming or social media, and those who used most of their online time to searching for information and completing academic work. Both groups ranked lower intermediate in their ability to create multimedia content with a range of

tools, which is considered to be crucial to perform adequate professional and academic tasks. No cultural differences were acknowledged.

A study by He and Li (2019) compared the effects of digital competence and technology across two samples of students from China and Belgium and examined how digital competence interacts with cultural differences. The results show the crucial role of digital competence and technological expectancy (i.e. expectations, social influence and facilitating conditions) in relation to digital informal learning and highlight the positive impact of digital competence in informal learning environments.

From the perspective of the teaching experience, some studies focus on 'digital curation tools' as a core competency for educators in higher education. These tools support learning and are student-centred and collaborative. These studies highlight the importance of various content-related tasks, such as collecting, interpreting, adapting, organising and narrating. It highlights the responsibility of higher education institutions to equip their graduates with the necessary skills and competencies for employment in a knowledge society (Ungerer, 2016).

The methodological approach varies, with more than half relying on quantitative data collected via questionnaires applied to students (e.g., Sánchez-Macías et al., 2024; Salguero-Alcala et al., 2024) or a mixed-method approach, combining interviews, participant observation and surveys (Røkenes & Krumsvik, 2016).

2.3 Digital competence scales to assess digital proficiency in HE students

Authors observe that teachers have frequently expressed their disappointment at the lack of valid and convenient tools to assess university students' digital competence so as to inform their digital lecture preparation. Therefore, several studies have been applied to HE students whose concern is to develop and validate instruments and scales to measure students' digital competence (e.g., He & Li, 2019; López-Meneses et al., 2020; Wang et al., 2021; Saltos-Rivas et al., 2021).

One instrument used to measure students' digital competence is the DigComp (Digital Compass for Europe) framework, which identifies the key components of digital competence. The latest version, the DigComp 2.2 framework, is divided into five dimensions: (1) information and data literacy; (2) communication and collaboration; (3) digital content creation; (4) safety, and (5) problem solving (European Commission, 2025). The aim of the Digital Compass for Europe is to 'set the ambitious policy

targets of reaching a minimum of 80% of the population with basic digital skills and having 20 million ICT specialists by 2030' (Vuorikari et al., 2022, p. 1)

Among the various studies that have proposed instruments and scales to measure digital competence, Martzoukou et al. (2020) developed a survey scale assessing students' technical digital competence and self-perceived competence in learning and in the digital context of everyday life. This scale addresses e-leisure, e-learning, e-democracy, e-government, and e-health activities. This instrument was applied to evaluate perceptions of digital competence among European students and researchers and concluded that students' digital competences are linked to previous experiences in everyday life digital environments. Also, López-Meneses et al. (2020) analysed the digital competence of university students in three areas of DigCom 2.1: information and data literacy, communication and collaboration, and digital content creation. Two student profiles were identified based on time spent online: those who devoted much of their time to gaming or social media, and those who used most of their time to searching for information and completing academic work. Wang et al. (2021) developed a psychometric scale to measure HE students' digital competence (DC-US) in digital enhanced learning (e.g., online open courses, mobile learning, and virtual reality-based learning). According to these authors, DC-US serves as an unbiased scale because, regardless of whether HE students are female or male, come from disciplines in the social or natural sciences and engineering, and have high or low socioeconomic status, the DC-US scale can generate valid, credible and consistent information. Wang et al. (2021) concluded that the DC-US contributes to defining HE students' digital competence by identifying two subscales of the DC-US (technical literacy and digital skills). Furthermore, Lucas et al. (2022) provided an instrument to measure higher education students' digital competence based on the DigComp framework. Interestingly, their results dispel the idea that ICT students are more digitally competent than those in other fields of study but suggest that male scores are higher than female's.

Finally, Tzafilkou et al. (2022) proposed a digital competence scale for students in HE (SDiCoS) for the pre-, during, and post-pandemic contexts of emergency remote education, including skills in online learning and collaboration, SM, smart and mobile devices, safety, and data protection. The final scale is composed of 28 items and six digital competence dimensions: (A) search, find and access; (B) develop, apply, modify; (C) communicate, collaborate, share; (D) store, manage, delete; (E) evaluate; and (F) protect. The results show that individual factors like the students' area

of study, computer experience and age revealed significant associations to the scale components, while gender revealed no significant differences, which is contradictory to the results by Lucas *et al.* (2022) on student gender.

The following section presents details of the questionnaire survey.

3 Materials and methods

3.1 Setting

The study was conducted at the University of Algarve (in southern Portugal, with around 10,000 students per year) among undergraduate students in both tourism and hospitality (around 500 students per year). The three-year tourism and hospitality degrees offer a variety of ITC courses (e.g. information technology for tourism, technologies and information systems, multimedia technologies, web writing and storytelling) to prepare the region's future workforce. Most tourism and hospitality graduates pursue careers in tourism or hospitality organisations in the Algarve region, as the region is highly reliant on the tourism and hospitality sectors economically, socially and culturally. These sectors account for 10% of all Portuguese overnight stays (approximately 20 million) and generate total revenue of €1.592 billion (INE, 2024).

3.2 Research design

A quantitative approach was used by administering a structured questionnaire to examine the perceptions of tourism and hospitality undergraduate students regarding their own ability to search for, develop, communicate, and store content, as well as to evaluate various situations and protect files and other sensitive materials. The research instrument, based on the SDiCoS, produced a final scale comprising the same six dimensions as Tzafilkou *et al.* (2022), but with 29 items, 26 of which were the same. The item concerning the ability to upload and share self-developed software or applications on social media was excluded due to the non-computing focus of the courses under study, as this competence was not considered representative of the participants' educational context; conversely, two additional items were included to assess respondents' ability to anonymise content created in Word, Excel or PowerPoint and to protect such files from unauthorised modification or tampering, as these skills more accurately reflect the participants' training

reality. These choices were based on recommendations from two independent researchers and the undergraduate students who participated in the pilot study (see below). The questionnaire was divided into two parts: the first part, based on Tzafilkou *et al.*'s (2022) work, focuses on the digital skills required to engage with and responsibly interact with digital content, comprising six dimensions: (1) searching, finding and accessing; (2) developing, applying and modifying; (3) communicating, collaborating and sharing; (4) storing, managing and deleting; (5) evaluating; and (6) protecting. Respondents were asked to rate a total of 29 statements on a five-point Likert scale, where 1 = totally disagree and 5 = totally agree. The second part characterises the respondents and their digital behaviour with regard to websites, playlists, videos, online shopping, and time spent on the internet.

The questionnaire was approved by the Ethics Committee of the HEI and included a section on the HEI's privacy policy and informed consent from individual respondents authorising the collection and analysis of data for the purpose of the study. A pilot test involving ten participants was conducted, revealing the need for minor adjustments to the scale items and linguistic clarification of some terms.

3.3 Sample and data collection

Data were collected using a non-probability method, convenience sampling, between March and May 2025. Respondents were undergraduate students enrolled in the tourism and hospitality courses at the School of Management, Hospitality and Tourism, University of Algarve, in Faro, Portugal. All academic years, i.e., 1st, 2nd, and 3rd year, participated voluntarily. The questionnaires were administered either in person via self-completion or through a short personal interview conducted by a member of the research team during scheduled class times. Each questionnaire took approximately 10 minutes to complete, and a total of 267 responses were considered valid.

3.4 Data analysis

A descriptive analysis of each dimension of digital skills was performed, with the mean, median, mode, and standard deviation reported for each item. Following this, inferential statistics were conducted to examine differences in digital skills by sociodemographic and academic variables. As normality was violated (Kolmogorov–Smirnov with Lilliefors correction and Shapiro–Wilk tests, $p < .001$),

non-parametric tests were applied, namely the Kruskal–Wallis test for comparisons of more than two groups and the Mann–Whitney U test for two-group comparisons, with a conservative correction used to control for Type I error. Dunn’s post hoc test with Bonferroni correction was subsequently employed to explore pairwise differences following the Kruskal–Wallis tests.

4 Results

This section presents the results of the digital literacy study conducted among undergraduate students and is organised into four main parts. The first and second parts characterise the respondents and their digital behaviour regarding websites, playlists, videos, online shopping, and time spent on the internet. The third part focuses on the digital skills required to engage with and responsibly interact with digital content, comprising the six dimensions listed in section 3.2. The final section presents the results of the inferential analyses, examining differences in digital skills across sociodemographic and academic variables.

4.1 Characterisation of respondents

The sample consisted of 267 individuals, 56.6% of whom identified themselves as women, 41.9% as men and a small percentage (1.5%) chose not to reveal their gender. The 266 participants have an average age of 21.0 years. Regarding the courses they are attending, the majority of the students are enrolled in an undergraduate programme in tourism (61.4%) and hospitality (38.6%). When analysing their high school background, almost half (47.2%) come from languages and humanities, less than a fifth come from vocational courses (18.7%), and the remaining from economic sciences (17.6%), science and technology (9.4%) and visual arts (4.9%) (see Table 1).

4.2 Online engagement

The majority of the participants have already created playlists (94.7%), videos (89.8%), and reviews on user platforms (78.3%), demonstrating a rather high level of engagement in passive digital activities. In contrast, only about a third (36.4%) have created a website, making it the least common activity among respondents (see Table 2).

On average, respondents spend the most time browsing social networks (4 hr 5 mins), and some students

Table 1: Sample characteristics

	n	Valid percentage
Gender		
Male	112	41.9%
Female	151	56.6%
Prefer not to say	4	1.5%
		Mean: 21.0
Age	266	Median: 20.0
		Mode: 20
Course attended		
Tourism	164	61.4%
Hospitality Management	103	38.6%
Previous field of education and training		
Languages and Humanities	126	47.2%
Vocational Course	50	18.7%
Economic Sciences	47	17.6%
Science and Technology	25	9.4%
Visual Arts	13	4.9%

Table 2: Engagement in digital content creation

	Yes	No
I’ve already created a website (n=264)	96 (36.4%)	168 (63.6%)
I’ve already created a playlist (n=264)	250 (94.7%)	14 (5.3%)
I’ve already created videos (n=264)	237 (89.8%)	27 (10.2%)
I’ve already left reviews on user platforms (n=254)	199 (78.3%)	55 (21.7%)

report devoting up to 14 hours a day to this activity. Using productivity tools (1 hr 56 mins) and carrying out academic research (1 hr 39 mins) are also popular. Activities such as researching day-to-day matters and playing online games recorded lower average times (1 hr 34 mins and 1 hr 29 mins, respectively, although some respondents stated that they dedicate up to 10 hours a day to online games (see Table 3).

Highlighting their preference for this type of digital consumption, the majority of participants shop online fairly regularly (15.7%), 36.7% do so ‘sometimes’, 28.5% ‘often’, and 16.5% ‘very often’. Only 1.1% say they have never shopped online.

4.3 Digital skills

This section presents a table for each of the six dimensions mentioned earlier, along with a brief overview of their key issues.

Students reveal very high confidence in all five items, with over 80% of respondents selecting ‘agree’ or ‘totally

Table 3: Time distribution across digital activities (in minutes)

Activities	n	Mean	Median	Mode	SD	Minimum	Maximum
Browsing social networks	264	245 (4 hr 05 mins)	240	180	133.44	0	14
Carrying out academic research	257	99 (1 hr 39 mins)	60	60	94.834	0	10
Using productivity tools	260	116 (1 hr 56 mins)	120	120	89.18	0	9
General research on everyday topics/issues	257	94 (1 hr 34 mins)	60	60	80.788	0	8
Play online games	250	89 (1 hr 29 mins)	15	0	143.83	0	10

Table 4: Searching, finding and accessing information

Dimension A. Search, find, access	n	1	2	3	4	5	Don't know	Mean	Median	Mode	SD
1. I can search and find a specific object or similar objects using various search engines and data-bases, using appropriate keywords and advanced criteria, and filters	266	1.1	1.1	6.7	55.4	35.2	0.4	4.2	4	4	0.7190
2. I can search and find a specific person on various social networks using various techniques and filters	261	0.0	2.6	9.7	49.8	35.6	1.1	4.2	4	4	0.7270
3. I can search and find groups on specific topics on various social media platforms	264	0.0	3.4	11.2	47.2	37.1	0.7	4.2	4	4	0.7681
4. I can navigate in the real world using the advanced features of a navigator	266	1.1	1.1	6.0	43.1	48.3	0.4	4.4	4	5	0.7471
5. I can watch (read, listen, view) content in various formats on various smart devices	262	0.4	0.7	8.2	28.5	60.3	0.4	4.5	5	5	0.7152

agree' (mode = 4). This indicates a high level of confidence and self-perceived expertise in searching for, finding and accessing specific information, objects, people and groups. Students seem even more at ease using advanced features of a navigator, and watching, reading, listening to and viewing content in various formats on various smart devices (mode = 5) (see Table 4).

For the dimension of developing, applying and modifying data, the percentage of students who agree or totally agree shows a slight decrease. They appear to be quite comfortable using calendars (item 6: 79% agree/totally agree) and creating documents in different formats (item 8: 75.6% agree/totally agree). In contrast, the percentage of students who agree or totally agree with the statement 'I can design a website' (item 7) decreases drastically to 49%, and the percentage of students who agree or totally agree with the statement 'I can apply

statistical techniques' (item 10) is 57.3%. This could indicate that these skills are not practised or covered sufficiently during their course. Finally, around one-fifth of the students state that they do not know how to apply Creative Commons licences, and only one-quarter rate this item as 'agree' or 'totally agree' (see Table 5).

For the dimension focused on communication, collaboration and information sharing, students seem to be comfortable overall with the various tasks at hand. Almost 80% agree or strongly agree with the statement 'I can convert content from one format to another' (item 11; mode = 4), and 91.3% say they can collaborate with others using different devices (mode = 5). However, respondents feel less optimistic about teaching e-courses or delivering lectures or presentations using various digital tools, with only 53.5% agreeing or totally agreeing with the statement and 15.7% disagreeing. These responses again demons-

Table 5: Developing, applying and modifying data

Dimension B. Develop, apply, modify	n	1	2	3	4	5	Don't know	Mean	Median	Mode	SD
6. I can create an event and set notifications using a digital calendar	258	0.4	3.7	13.5	39.7	39.3	3.0	4.2	4	4	0.8411
7. I can creatively design and/or develop a website using various digital tools	234	6.0	11.2	21.3	33.3	15.7	11.6	3.5	4	4	1.1316
8. I can create a document with text, diagrams, tables, reports, and advanced formatting	258	0.4	6.7	13.9	43.4	32.2	1.9	4.0	4	4	0.8901
9. I can apply Creative Commons licenses to content or software that I have created	202	8.6	17.2	23.6	18.4	7.9	22.1	3.0	3	3	1.1611
10. I can apply statistical techniques using appropriate software	250	2.6	11.2	22.5	41.6	15.7	5.6	3.6	4	4	0.9935

Table 6: Communicating, collaborating and sharing information

Dimension C. Communicate, collaborate, share	n	1	2	3	4	5	Don't know	Mean	Median	Mode	SD
11. I can convert content from one format to another	253	0.7	2.2	12.0	43.8	36.0	3.4	4.2	4	4	0.8009
12. I can collaborate with people using various smart devices, platforms, and digital tools	262	0.4	1.1	5.2	44.9	46.4	1.9	4.4	4	5	0.6782
13. I can teach an e-course or an e-seminar, give a lecture or make a presentation using various digital tools	238	4.5	11.2	19.9	36.3	17.2	10.5	3.6	4	4	1.0916

trate a surprising lack of skills, given that an important component of the course syllabus is delivering oral presentations, even though e-teaching is not a common practice among students (see Table 6).

Overall, the scores for storing, managing and deleting digital content were high (see Table 7), suggesting that students are generally comfortable with taking photos and videos in various formats (item 14), downloading and saving files (items 15 and 16), and using basic storage tools (items 16 and 18). Respondents also seem quite confident when dealing with social networks (item 17) and smart devices (item 16). Indeed, none of the items revealed any limitations or unawareness. Overall, these results suggest that students possess the basic skills required for storing digital information, as well as the strategic understanding and habits necessary for effectively organising digital content in the long term. This competency area is particularly important in academic and professional contexts, where efficient file management can enhance productivity and reduce the risks associated with data loss or clutter.

Although the rate of agreement remains high, students expressed less confidence in their ability to evaluate or

critique the quality, truthfulness and trustworthiness of web content (see Table 8) than in their ability to store, manage and delete it. For the former, ‘agree’ was selected more often than ‘totally agree’ for all statements except ‘I can critique an object and/or a smart device on relevant social media’ (item 20) for which a similar number of responses were given to both options (41.9% and 41.6%, respectively; mode = 5); for the remaining statements, the mode was 4. Also, the ‘neither agree nor disagree’ and ‘disagree’ ratings received more responses than in the previous dimension. This suggests that students do not feel totally confident in exercising their judgment and critical thinking skills with regard to the information available on the web.

A similar pattern to that observed in the previous dimension emerges in the protection dimension (Table 9). In general, students seem fairly confident in their ability to protect their personal data, computers, and files (items 25, 26, and 29). However, for items 27 (‘identity theft, harassment, bullying or slander’) and 28 (‘anonymise content’), fewer than 30% of respondents selected the ‘totally agree’ rating. Item 28 was rated ‘neither agree nor disagree’ by 18% of respondents — the highest figure for this option

Table 7: Storing, managing and deleting skills

Dimension D. Store, manage and delete	n	1	2	3	4	5	Don't know	Mean	Median	Mode	SD
14. I can take a photo or a video and save it in various formats, using various smart devices and digital recording tools	260	0.4	3.0	15.0	36.3	42.7	2.6	4.21	4	5	0.8414
15. I can download content and save it directly to the relevant folder	265	0.4	0.4	6.4	35.2	56.9	0.4	4.49	5	5	0.6692
16. I can copy and save screenshots from various smart devices	267	0.0	1.1	5.6	30.3	62.9	0.0	4.55	5	5	0.6548
17. I can delete some of my connections/friends in various social networks	262	0.4	0.0	7.1	31.1	59.6	1.1	4.52	5	5	0.6648
18. I can organise the files on my computer into a hierarchical folder structure	250	0.0	1.9	8.2	33.0	50.6	4.1	4.41	5	5	0.7351

Table 8: Evaluation competencies

Dimension E. Evaluate	n	1	2	3	4	5	Don't know	Mean	Median	Mode	SD
19. I can evaluate an object and/or a smart device using appropriate quality criteria	254	0.4	1.9	19.9	43.8	29.2	4.5	4.05	4.0	4.0	0.7938
20. I can critique an object and/or a smart device on relevant social media	263	0.4	2.6	12.0	41.6	41.9	1.1	4.24	4.0	5.0	0.7958
21. I can evaluate whether some information is (1) hoax, (2) fake, (3) scam, or (4) fraud	256	0.4	2.6	15.7	44.9	32.2	3.7	4.11	4.0	4.0	0.7974
22. I can evaluate whether a website is secure and trusted	256	0.4	3.0	16.5	49.8	26.2	2.6	4.03	4.0	4.0	0.7792
23. I can identify the intellectual property rights of content that I have found on Internet	247	0.7	6.7	19.9	44.9	20.2	5.2	3.83	4.0	4.0	0.8793
24. I can evaluate whether an email is spam, adware, phishing, or fraud	251	0.4	1.1	18.4	42.7	31.5	3.0	4.10	4.0	4.0	0.7780

Table 9: Protection competencies

Dimension F. Protect	n	1	2	3	4	5	Don't know	Mean	Median	Mode	SD
25. I can regularly change my passwords and settings of my smart devices and Internet accounts	259	0.4	3.0	7.1	42.7	43.8	1.9	4.31	4.0	5.0	0.7698
26. I can protect various smart devices and e-accounts using different passwords and frequently changing them	264	2.2	5.2	12.7	41.9	36.7	1.1	4.07	4.0	4.0	0.9568
27. I can protect myself and others against identity theft, harassment, bullying, or slander	256	1.1	4.9	16.5	44.2	29.2	4.1	4.00	4.0	4.0	0.8878
28. I can anonymise my content created in Word, Excel, or PowerPoint	242	1.5	7.1	18.0	36.3	27.7	9.4	3.90	4.0	4.0	0.9803
29. I can protect my files so that no one can modify or tamper with them.	254	0.4	3.4	13.5	39.3	38.6	4.9	4.18	4.0	4.0	0.8333

in this dimension, indicating less self-certainty regarding these particular skills.

4.4 Digital skills and competence among tourism and hospitality students

Following the descriptive analysis of the variables under study, an inferential analysis was performed to identify any differences in digital skills based on sociodemographic and academic factors. The Kolmogorov–Smirnov (with Lilliefors correction) and Shapiro–Wilk normality tests revealed that all variables deviated significantly from a normal distribution ($p < .001$). As the assumption of normality was violated, non-parametric statistical tests were employed. The Kruskal–Wallis test was used to compare more than two independent groups (gender and field of previous studies), and the Mann–Whitney U test was used to compare two independent groups, degree programme: Tourism ($n=164$) vs. hospitality ($n=103$). Due to multiple statistical comparisons, a conservative correction procedure was applied to control for Type I error.

The results of the Kruskal–Wallis test revealed no statistically significant differences between gender groups (male, female and ‘prefer not to say’) for most of the analysed variables, except for the item ‘I can evaluate whether certain information is hoax, fake, scam or fraud’ (Dimension E), for which statistically significant differences were observed ($p = 0.022$). Dunn’s post hoc test with Bonferroni correction was then conducted, revealing a statistically significant difference only between the ‘Prefer not to say’ and ‘Male’ groups (adjusted $p = 0.025$), with no significant differences observed for the remaining pairwise comparisons. Examination of the mean ranks indicates that the male group exhibited higher levels of competence (135.50) than the ‘prefer not to say’ group (43.63).

Regarding the degree programme attended, the Mann–Whitney U test revealed that only the response to the item ‘I can apply statistical techniques using appropriate software to make forecasts or projections’ (Dimension B) differed significantly between students enrolled in the Tourism and the Hospitality programmes ($p = 0.001$). No statistically significant differences were found for the remaining analysed items. An inspection of mean ranks suggests that hospitality students perceived themselves as more competent in applying statistical techniques (mean rank = 145.57) than tourism students (mean rank = 113.41). These findings suggest that differences between programmes are specific to the digital competences assessed rather than generalised.

With regard to the area of previous studies, the Kruskal–Wallis test revealed that, of the 29 analysed variables, only

the item ‘I can apply statistical techniques using appropriate software to make forecasts or projections’ (Dimension B) showed statistically significant differences ($p = 0.016$), with the null hypothesis retained for all other variables. Dunn’s post hoc test with Bonferroni correction revealed that students from a vocational education background had higher mean ranks (145.34) than those from languages and humanities (109.88), suggesting a higher perceived level of competence in using statistical software.

4.5 Discussion

The findings of this study emphasise the crucial importance of digital skills among students of tourism and hospitality. Our study is supported by previous research emphasising the necessity of digital literacy as a fundamental skill for the 21st-century tourism and hospitality workforce. Contrary to previous studies (e.g., Mejías-Acosta et al., 2024), our results reveal no significant differentiation between user-oriented profiles (dimensions 1, 4, 5, and 6) and content-creator profiles (dimensions 2 and 3). In fact, the survey results suggest that students’ self-assessment of digital competence is very high across almost every area, contradicting other studies that suggest overall proficiency falls at the intermediate level (Lucas et al., 2022).

On average, respondents spend a significant amount of time on digital activities, primarily browsing social networks (median = 180 minutes) and utilising productivity tools (median = 120 minutes). Other studies have shown that many students spend between 5 and 10 hours online (Amin et al., 2021). However, we were unable to establish the two distinct profiles for these activities indicated by López-Meneses et al. (2020).

It is worth noting the lower level of confidence shown by respondents when dealing with the Creative Commons Agreement (Table 5), particularly in dimensions 5 (evaluating and identifying intellectual property rights) and 6 (protecting and anonymising content), which fall into the intermediate level (3-score range). This concurs with findings indicating that only 20% of students are at the three most advanced proficiency levels in the ‘safety’ competence area out of six overall levels (Lucas et al., 2022). Additionally, Tzafilikou et al. (2022) identified a lack of skills in protection and file management tasks among the 18–24 age group (the mean age of the undergraduates in the current study is 21). Considering the amount of time reported to be spent on various internet activities (see Table 3) and the high level of engagement in passive digital activities such as creating playlists, videos and reviewing content, this is an important issue that should be addressed in future HI curricula.

Furthermore, the respondents of this study could be considered to be in a field of study and training related to 'services', and these FET usually score higher in digital competencies (Lucas *et al.*, 2022). Students in both areas of study, regardless of gender, showed no significant differences, as supported by the results of Tzafilkou *et al.* (2022). However, other studies have found females to have an advantage (Sánchez-Macías *et al.*, 2024).

An interesting variable to consider is that the academic success rate in IC subjects such as computer skills and computer systems and technologies, for both cohorts of students (hospitality and tourism) in the 2024-25 academic year, when the questionnaires were administered, was 50% (tourism students) and 57% (hospitality students). These were the lowest success rates among the 32 different subjects available as part of the undergraduate degree programmes (ESGHT-UA1g, 2025a; ESGHT-UA1g, 2025b).

As an additional note, the attendance rates of these students in Information and Technology classes, where much of this content is taught, were around 50% or less. This calls into question their self-reported confidence in performing and developing many of the tasks listed in the questionnaire.

5 Conclusions, limitations, and implications

As stated above, few empirical studies have examined the level of digital skills among tourism and hospitality students, particularly in basic digital skills related to information management, analysis, and protection. This study contributes to the growing, albeit limited, body of research on university students' digital competence across various dimensions. Compared with previous studies, this is the only one to focus specifically on tourism and hospitality undergraduates. We applied a model based on the DigComp 2.0 scale and the scale developed by Tzafilkou *et al.* (2022). This model comprises six dimensions and 28 items and has already been tested and validated. The scale can be widely used across different populations and areas of study or profession and could support and develop the skills of both younger and more mature students (Tzafilkou *et al.*, 2022).

The general digital competence of students (who will become future professionals) and the absence of significant differences between tourism and hospitality students suggests that: (a) digital skills have become a foundational component of service-sector human capital, rather than functioning as a differentiating asset between related disciplines; (b) digital competence appears to

represent a common capability among students, which is aligned with broader industry digitalisation trends. It is generally assumed that HE students are highly proficient digital natives who possess the all-encompassing digital competence needed to successfully navigate digital environments in their daily lives, even in challenging contexts. While the current study supports this assumption, students' self-perception must still be evaluated in the context of their real-life skills.

Future research should therefore focus on identifying real-life tasks for students to perform to validate these findings and assess whether safety- and problem-solving-related competencies correspond to the self-assessments reflected in these results.

Regarding limitations, similar to all self-reported instruments, these findings may be subject to individual bias and reporting errors. The size and homogeneity of the sample prevent inferences. Future research could therefore explore this topic further through in-depth interviews and field observations to better understand students' academic achievements and aptitude for solving real-world tasks. Nevertheless, this study provides an important tool for assessing digital competence among higher HE students and assists teaching staff and HE administrators in identifying the most effective ways to develop skills for the 21st-century job market.

Funding

This work is financed by National Funds through FCT - Foundation for Science and Technology, IP, under project CiTUR doi.org/10.54499/UID/04470/2025 and project CinTurs https://doi.org/10.54499/UID/04020/2025.

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