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EXPLORING POST-PANDEMIC PERCEPTION OF INDUSTRY 4.0 TECHNOLOGY IMPLICATIONS IN TOURISM: A STUDY OF CENTRAL EUROPEAN TRAVELERS

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Purpose: This study underscores the accelerated integration of technological solutions within the tourism industry post-pandemic, highlighting the service sector's heightened openness to digital advancements. Authors stress the need for tourism companies to invest in digital technologies and resilient innovation for sustainable Industry 4.0, considering social impact. This research is the perception of the importance of digitalization tools application to tourism sphere especially in the post-pandemic period.
Design/methodology/approach: Focusing on Central European travelers, a survey of 553 individuals was conducted to gauge perceptions regarding the importance of digital technologies in tourism. Significantly, gender disparities in touchless technology usage were observed, with women exhibiting less interest compared to men. Moreover, variations in the evaluation of specific technological tools within tourism services indicate diverse preferences among respondents.
Findings: What was found in the course of the work? This will refer to analysis, discussion, or results.
Research limitations/implications: While the study contributes valuable insights, its limitations, such as generalization and sample size constraints should be acknowledged.
Practical implications: The paper delves into the practical implications of these findings for travel agencies, contributing to a broader theoretical understanding of how digital innovations can enrich the travel experience. From a practical perspective, the research encourages prioritizing the development of tourism technologies and investing in advanced capabilities, especially those related to artificial intelligence (AI).
Originality/value: The empirical analysis provides valuable insights into the relationship between demographic factors and technology acceptance in the tourism industry. Understanding these dynamics can be incredibly beneficial for businesses and policymakers aiming to improve the adoption and integration of digital technologies in tourism. This knowledge enables not only enhancing travel safety, efficiency, and engagement for travelers but also informs strategic decisions regarding the development of the tourism.

Keywords: digitization, Industry 4.0, post-pandemic perception, technology implication, innovation.
Category of the paper: Research paper.

1. Introduction

The pandemic accelerated the digital transformation of the tourism industry, merging traditional tools with digital solutions, offering a competitive advantage likely to persist post-pandemic (Perelygina, Kucukusta, Law, 2022; Reinhold, Zach, Krizaj, 2017). The emerging technologies has become promising tourism innovations which accelerate towards Industry 4.0 in tourism industry (Pencarelli, 2020).

Authors stress the need for tourism companies to invest in digital technologies and resilient innovation for sustainable Industry 4.0, considering social impact. This research is the perception of the importance of digitalization tools application to tourism sphere especially in the post-pandemic period. During the ongoing changes in the wide context or disruption in technology due to the pandemic, there may have been differences in consumer perception and preferences.

This research aims to address these changes. However, there is a significant gap in the source literature regarding the perception of digital technology's significance in shaping Industry 4.0-based travel perceptions for tourism, particularly concerning specific applications and demographics (Breier et al., 2021). Although Hao (2021) explored the acceptance of digital technologies in tourism, but the implications on tourist behavior and perception are still lacking.

Some studies have explored various aspects of technology adoption in tourism, highlighting gender differences in technology use and willingness to adopt new technologies (Sun, Mao, 2020). While some research suggests that males generally exhibit more favorable attitudes toward technology use, the differences are often characterized as small effect size (Cai, Fan, Du, 2016). Additionally, the influence of gender on technology adoption varies across different contexts (Goswami, Dutta, 2015). Despite the attention given to different aspects of tourism (Buhalis, 2019; Dredge, Phi, Mahadevan, Meehan, Popescu, 2019; Marta, Melnyk, Baran, 2021; Oztemel, Gursev, 2020; Yousaf, Radulescu, Sinisi, Serbanescu, Păunescu, 2021), including digitalization, there remains a noticeable gap in understanding the importance of applying digital tools in tourism in the post-pandemic era. Therefore, this paper seeks to explore the post-pandemic perception of Industry 4.0 technology implications among Central European travelers. To achieve this, the study has developed specific research hypotheses (RHs):

RH1: Statistically significant gender differences exist in the perception of digital technology' importance for the post-pandemic tourism.

RH2: Statistically significant differences exist in the order of importance of digital tools in tourism.

2. Digitization in tourism in the context of Industry 4.0

Technological advancements have greatly impacted the travel industry, leading to substantial growth in the online tourism and opportunities for digitization (Marta et al., 2021; Pencarelli, 2020). This technological progress has transformed communication and interactions (Akhtar et al., 2021; Omarova et al., 2021), evolving the tourism ecosystem into a complex smart tourism (Sigala, 2018). This section reviews digital technology, such as mobile apps, self-driving cars, antimicrobial surfaces, and contactless lifts (An, Ma, Du, Xiang, Fan, 2020; Gretzel, Sigala, Xiang, Koo, 2015; Mpotaringa, Tichaawa, 2021), supporting the transition to Tourism 4.0 (Zupan Korze, 2019) and contributing to the literature on technological and social change in tourism (Barcelos, Dantas, Senecal, 2019; Buhalis, 2019; Jansson, 2018; Kotoua, Ilkan, 2017; Labanauskaite, Fiore, Stašys, 2020).

Table 1 presents the most analyzed innovative solutions used in post-pandemic tourism reality. There is a correspondence between these digital technologies and those from Table 8 (Table 8 is elaborated in detail because of own research data). They are grouped in the following eight categories.

Table 1.
Literature review of the selected digital technologies in tourism

Tourism solution	Main findings	Authors
Biometrics	Biometrics are biological measurements — or physical characteristics — that can be used to identify individuals. For example, fingerprint mapping, facial recognition, and retina scans are all forms of biometric technology, but these are just the most recognized options.	Kim, Brewer, Bernhard, 2008; Költzsch, 2006; Olechowski, 2020; Pai, Wang, Chen, Cai, 2018; Xu, Zhang, Zhang, Wang, 2021
Cloud technology	Cloud computing is on-demand delivery of IT over the Internet with pay-as-you-go pricing. Instead of buying, owning, and maintaining physical data center, one can access technology services, such as computing power, storage, and databases, on an as-needed basis from a cloud provider.	Ardito, Cerchione, Del Vecchio, Raguseo, 2019; Jovicic, 2019; Lau, 2020; Nam, Dutt, Chathoth, Khan, 2021; Pencarelli, 2020; Saratchandra, Shrestha, 2022
Artificial Intelligence (AI) (Chatbots)	A chatbot is a software application or web interface crafted to replicate human conversation via text or voice exchanges. Typically, web-based, modern chatbots utilize generative artificial intelligence systems, allowing them to participate in natural language dialogues with users, mimicking human-like behavior as conversational partners.	Gaur, Afaq, Singh, Dwivedi, 2021; Zhong et al., 2020; Gursoy, Chi, 2020, Gursoy, Chi, 2020; Li, Yin, Qiu, Bai, 2021; Belanche, Casaló, Flavián, Schepers, 2020; Chen, Tzeng, Tham, Chu, 2021; Choi, Choi, Oh, Kim, 2020; Lau, 2020; Liu; Hung, 2021; Murphy, Gretzel, Pesonen, 2019; Olechowski, 2020; Qiu, Li, Li, 2021; Touni, Magdy, 2020; Zhong, Sun, Law, Zhang, 2020
Augmented Reality (AR)	A technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view.	Olechowski, 2020; Mohanty, Hassan, Ekiz, 2020; Yung, Khoo-Lattimore, 2019

Cont. table 1.

Virtual Reality (VR)	The computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors.	Marlinda, Cipto, Al-Fadhat, Jubba, 2021; Kazak, Chetyrbok, Oleinikov, 2020; Olechowski, 2020; Yung, Khoo-Lattimore, 2019
Touchless payments	Contactless payment systems are credit cards and debit cards, key fobs, smart cards, or other devices, including smart phones and other mobile devices, that use radio-frequency identification (RFID) or near-field communication (NFC) for making secure payments.	Rahimizhian, Irani, 2020
Disinfection robots	All types of UV-disinfection robots offer a non-touch technology, delivering disinfection by irradiation of effective intensity to kill microorganisms, but with no mechanical removal of dirt or biological material, which contain bacteria and viruses.	Zeng, Chen, Lew, 2020; Zhong et al., 2020; Chuah, Aw, Cheng, 2021

Source: own elaboration.

Beside the introduction of new digital technologies, including platforms, applications, and devices, (e.g., 3D visualization and augmented reality applications (Sayabek, Galiya, Zhanna, Asel, 2020), the pandemic enhanced user interactions in travel services and transport infrastructure (Gretzel, Stankov, 2021; Kim, Lee, Preis, 2020), emphasizing its impact on travelers' experiences (Kim et al., 2020; Ponsignon, Derbaix, 2020).

Having the background, this paper exploring factors influencing tourists' decisions to use technology addressing differences in consumer preferences arising from the pandemic and disruptive technologies.

To bridge this research gap, a questionnaire survey investigates people seeking travel information online and their use of innovative information and communication technologies remains crucial. This serves two main purposes: (1) understanding travel demand, and technological changes in tourism; and (2) the increasing need for digital technology in tourism.

3. Material and methods

This research aims to explore people's perceptions of the importance of digital technology, particularly fast-emerging digital solutions in the tourism industry. The authors employed a quantitative questionnaire-based approach to gather insights from interviews with individuals across various industries. The collected data was then analyzed statistically. This methodology is suitable for uncovering statistical variations in the significance of digital technologies, making it well-suited for quantitative investigation.

3.1. Data collection and sample

The study was conducted with a random sample of 553 respondents aged 17-69. The initial phase attracted a total of 725 respondents from 36 countries. The respondents were mainly within Europe, but also from other continents (Asia, America). Finally, the valid survey sample that participated in this study aimed to explore importance of the perception of digital technology in the tourism sector as a means of supporting tourism in the post-pandemic era, and the responses 553 persons (N = 553). Respondents who participated in this study were originally from the Central European region. Each respondent was personally contacted by telephone (CATI – Computer Assisted Telephone Interview) and electronically (CAPI – Computer Assisted Personal Interview). These two methods are very popular because of easy telecommunication and technological progress. They make it possible to form individual formula, therefore it has been chosen to be used by the Authors of the paper.

Questionnaire research was chosen due to its suitability (Phipps, Butani, Chun, 1995; Roopa, Menta Satya, 2012). It enabled the standardized collection of quantitative data for consistent and coherent analyses. Questionnaires were distributed between April 2021 and September 2022 via the MS Forms. Data was managed by using MS Excel. Participants provided consent before receiving either a printed or electronic version of the two-part questionnaire.

The two parts-questionnaire was designed to collect data on: (1) general perception of tourist technologies in the tourism sector; (2) evaluations of digital technology and their potential applicability in tourism services. The following statements are outlined in Table 2.

Table 2.
Statements with the use of Likert scale

1st part of questionnaire	**5-point Likert scale statements**
Statement 1: Modern tourism technologies can be tools to increase confidence in travel in the post-pandemic period.	1 - disagree, 2 - rather disagree, 3 - neither agree nor disagree, 4 - rather agree after 5 - agree
Statement 2: Modern tourism technologies are tools that speed up travel processes.	
Statement 3: Digital technologies represent a tool for comfortable travel.	
2nd part of the questionnaire	**7-point Likert scale statements**
Twenty digital elements distinguished and evaluated (as presented in Table 8) for their suitability and a potential application in the practice	1 - completely unimportant, 2 - unimportant, 3 - slightly unimportant, 4 - neither important nor unimportant, 5 - moderately important, 6 - very important and 7 - completely important

Source: own elaboration.

3.2. Data analysis

Collected data was analysed through statistical techniques. To verify these hypotheses, validated methods were used. The authors of the research conducted a Mann-Whitney U significance test to verify gender's influence on consumers' decisions (RH1). Friedman's ANOVA and Kendall compliance coefficient were applied to evaluate the importance of the chosen digital tools) (RH2).

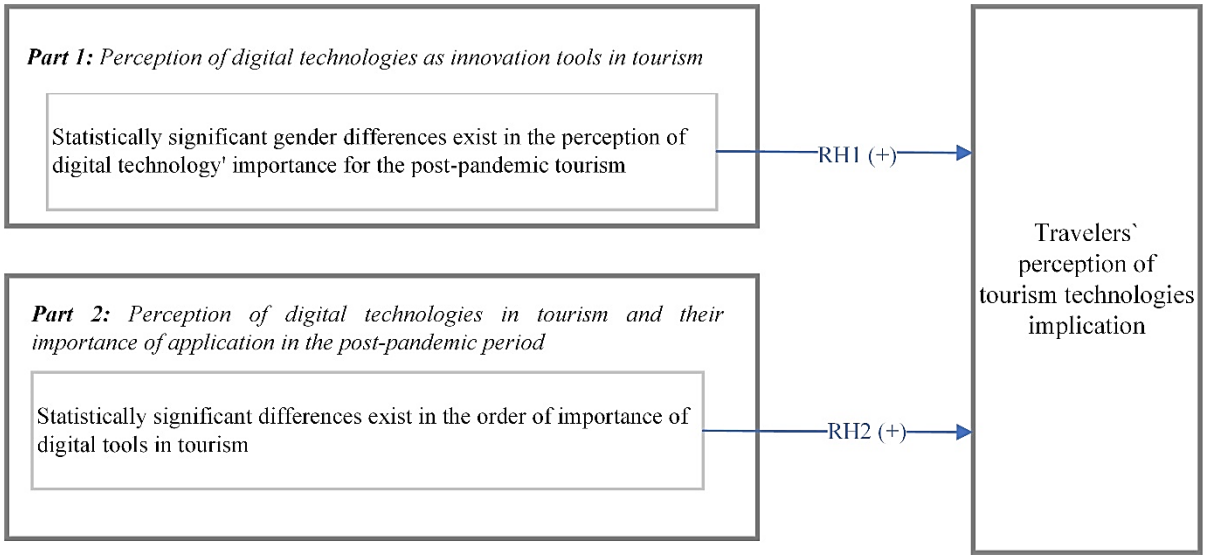

Figure 1. Hypotheses-research model.

Source: own elaboration.

Figure 1 exhibits a research model derived from the stated hypotheses, illustrating the relationship between the perception of the importance of digital technologies and their positive impact on travelers' perception of tourism technologies.

4. Results

In this paper, we present research findings that explore the perception of the significance of tourism technologies and their potential impact on implementation in the tourism sector.

The Mann-Whitney U test was used to test the significance of differences for respondents gender, meaning comparison of two independent samples (RH1). The results showed that there is a statistically significant variation between gender and the frequency of using digital tools. According to accepted significance level ($p > 0.05$) gender influences the use of technologies significantly (Table 3).

Table 3.
Gender and frequency of using platforms to book accommodation (Mann-Whitney U significance test's results)

Range	Women	Men	Probability test (p)
Frequency of using digital tools (1 - didn't use; 5 - a few times a year)	2.1	2.9	0.0069357

Source: own elaboration.

In the process of coding, women were classified as group # 1 and men – as group # 0. Median at level 2 shows that half of women used the tools once and they are not sure if they use it again in the future, whereas the others use the technologies occasionally or more often. Among men the range of answers from 1-5 was very broad which means that the frequency of using the technologies among men is differentiated.

Table 4.
Respondents´ age structure

	N	Average age	Median age
Women	369 (66.73 %)	30.0000	25
Men	184 (33.27 %)	35.0815	37
Total	553(100%)	31.6908	29
	Min	Max.	StDev
Women	18	69	11.7269
Men	18	66	11.6895
Total	18	69	11.9468

Source: own elaboration.

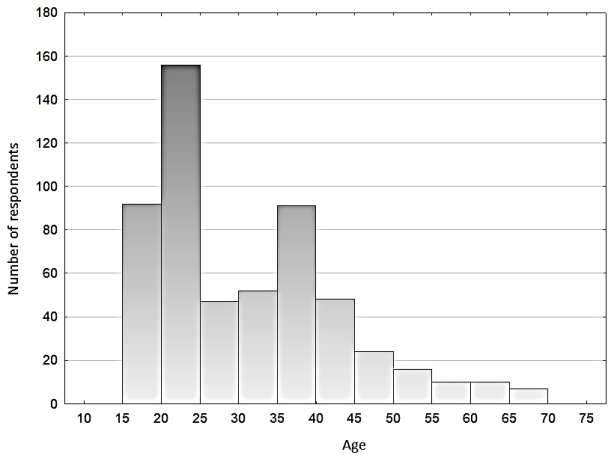

Figure 2. Composition of no. of respondents by age.

Source: own elaboration using STATISTICA.

In Table 4, authors evaluated the research sample according to the gender and age of the respondents. The age range of respondents was from 17 to 69 years, with a mean age of 31.7 years (median age was 29 years) and a standard deviation of 11.9468 years. Figure 2 visualizes a more specific distribution of respondents by their age.

Part 1: Perception of digital technologies as innovative tools in tourism

The largest age group among respondents was 20-25 years old, comprising nearly 160 respondents who are considered trendsetters in technology adoption and cannot imagine traveling without it. Additionally, two age groups, 15-20 and 35-40, each with 90 respondents, share a strong reliance on technology for travel, as depicted in Figure 2.

The first part of the research focused on digitization tools in travel services, addressing the following questions: (1) Can digital technologies enhance confidence in travel during the post-pandemic period? (2) Can digital technologies expedite travel processes? (3) Can digital technologies enhance travel comfort?

Table 5.
Statement 1: Digital technologies as tools to increase confidence in travel in the post pandemic period

Question 1	Frequency	Cumulative frequency	Relative abundance (in %)	Cumulative relative abundance (in %)
do not agree	6	6	1.08	1.08
rather disagree	53	59	9.58	10.66
neither agree nor disagree	179	238	32.37	43.03
rather agree	228	466	41.23	84.26
agree	87	553	15.74	100

Source: own elaboration.

New technologies are already being used to mitigate the effects of the pandemic and promote confidence in travel (Lau, 2020). The idea of this question was to verify the claim that digital technologies are the tools of increasing confidence in travel (Table 5). Most respondents (almost 57%) declared the agreement with the statement 1. From the gender point of view, it was on the side of both men and women who had a predominantly university`s degree, living predominantly in the urban environment. A significant increase in the number of marked answers occurred, "I neither agree nor disagree". With this statement, almost a third of respondents (32.37%) agreed who were not sure of their contribution to increasing confidence in travel. One tenth of the respondents disagreed with the above-mentioned statement.

Table 6.
Statement 2: Digital technologies as tools that speeds up travel processes

Question 2	Frequency	Cumulative frequency	Relative abundance (in %)	Cumulative relative abundance (in %)
do not agree	7	7	1.27	1.27
rather disagree	8	15	1.45	17.73
neither agree nor disagree	84	99	15.19	17.91
rather agree	290	389	52.44	70.35
agree	164	553	29.65	100

Source: own elaboration.

The contribution of digital technologies in terms of process acceleration has also been described from several perspectives, not only from the tourism industry. According to (Buhalis, 2019), the use of technology in the tourism and hospitality has accelerated operations and made

travel more efficient and enjoyable. The intention of this question was to find out whether the respondents perceive it in this way. Most reviewers (nearly 52.44%) agree with the statement and choose the option "mostly agree", nearly 1/3 completely agree with this opinion and only 15.19 % of respondents disagree with this opinion. Only a very small percentage of respondents do not consider these technologies (<3%) as tools to accelerate processes in tourism. In terms of variables, consent was on the side of both genders, where the higher education predominated and residence in the urban environment (Table 6).

Table 7.
Statement 3: Digital technologies as a tool of comfortable travel

Question 3	Frequency	Cumulative frequency	Relative abundance (in %)	Cumulative relative abundance (in %)
do not agree	5	5	0.90	0.90
rather disagree	26	31	4.70	5.60
neither agree nor disagree	106	137	19.17	24.77
rather agree	264	401	47.74	72.51
agree	152	553	27.49	100

Source: own elaboration.

In the short term, the transition to modern technology in services bring security to customers, thus contributing to their comfort (Önder, Gunter, 2022). This statement was also confirmed by (Luengo-Oroz et al., 2020) who described that companies ensure comfortable travel through the application of digital technologies. The convenience of these elements lies mainly in the acceleration of processes and the possibility of their own participation in them such as: the currently very well-known online check-in. This question was aimed at verifying the claims made by the respondents. The results confirmed that almost half of the respondents agreed with the question/statement represented by 47.74% respondents. It was equally on the side of men and women when women were dominated by the secondary education. Men dominated by higher education. In terms of residence, the urban environment by both genders prevailed by default (Table 7).

Part 2: Perception of specific digital technologies in travel services and their importance of application in the post-pandemic period

The objective of Part 2 of the survey was to find out an answer whether there is consistency between the assessment of the importance of selected elements of digital instruments in the field of travel services by respondents. The idea was also to find out whether it is possible to identify the most important digital instruments that could support the credibility of travel in the post-pandemic period. The respondents' task was to evaluate the importance of digital technology in tourism. The order of the ratings was presented using a Likert scale from 1 (completely unimportant) to 7 (completely important). The Friedman ANOVA test and the Kendall coefficient of agreement were applied to test these hypotheses (RH2). The test results for the tourism are shown in Table 8.

Table 8.
Friedman ANOVA a Kendall compliance coefficient (technologies are not prioritized)

	ANOVA X^2	**p-value**	**Compliance coefficient**	**Average ranking r**
	2353.826	0.0000	0.2240	0.2226
Variable	Average ranking	Sum of orders	Average	Standard deviation
1 Biometric check-in	8.2098	4540.0	4.4304	1.5438
2 Contactless kiosks	9.2143	5095.5	4.7233	1.3491
3 Contactless lifts	9.9684	5512.5	4.8246	1.5132
4 Disinfection robots	12.3056	6805.0	5.3382	1.4767
5 Thermal screening filters	9.6121	5315.5	4.7830	1.4682
6 Automatic hygiene dispensers	14.6655	8110.0	5.8101	1.3209
7 Automatic disinfectant dispensers	14.5967	8072.0	5.8029	1.3617
8 Mobile applications for entry	9.5307	5270.5	4.7975	1.4061
9 Contactless payments	14.2396	7874.5	5.7233	1.3410
10 Antibacterial surfaces	134693	7448.5	5.5479	1.4465
11 Virtual tours	9.260	5121.0	4.7125	1.4862
12 Sensor room control	12.8978	7132.5	5.4539	1.3494
13 Voice control (light, opening, etc.)	8.6637	4791.0	4.5967	1.4640
14 Contactless scanning of personal documents	10.1573	5617.0	4.8535	1.4958
15 The whole automated process before boarding the vehicle	10.1989	5640.0	4.8969	1.4085
16 Humanoid robots	5.7848	3199.0	3.7776	1.6048
17 Digital marking	10.6465	5887.5	4.9675	1.5177
18 Holographic buttons	8.2541	4564.5	4.4756	1.4471
19 Self-service baggage handling	10.8047	5975.0	4.9747	1.4693
20 Autonomous vehicles	7.5199	4158.5	4.2640	1.5201

Source: own elaboration.

Friedman's ANOVA analysis confirmed a significant difference in the importance of individual digital technologies and mechanical solutions in tourism services, rejecting the RH2 hypothesis suggesting their identical medians. The Kendall coefficient also highlighted low agreement among respondents' evaluations, indicating varying preferences for digital technologies.

In terms of importance, automatic dispensers of hygiene products and disinfectants ranked highest in the market service, followed by touchless payments, antibacterial surfaces, and disinfection robots. Conversely, humanoid robots, autonomous vehicles, holographic buttons, and voice control were deemed less crucial. Elements like sensory control of premises, touchless scanning of personal documents, automated pre-boarding processes, digital marking, self-service luggage check-in, touchless kiosks, elevators, thermal screening filters, mobile entrance apps, and virtual tours fell into the medium-importance category, with voice control and holographic buttons. Notably, hygiene and health-related technologies were considered most important.

In summary, respondents' perceptions varied widely, with over a quarter of the elements viewed as important in travel services, while humanoid robots were less favored. Technologies linked to hygiene and health stood out as significant in this context.

5. Discussion

The research indicated significant differences in the frequency of digital technology usage based on gender. Specifically, the Mann-Whitney U test revealed a statistically significant variation between gender and the frequency of using digital tools ($p = 0.007$). Women had a lower median frequency of use (2.1) compared to men (2.9), suggesting that gender influences technology usage patterns in tourism. Variations in tool evaluations (RH2) highlighted differing preferences among respondents, prioritizing urgent implementation of certain tools like hygiene product dispensers and touchless payments.

The study also observed diverse age distributions among respondents, with the 20-25 age group showing the highest interest in digital technologies. This age cohort, considered trendsetters in technology adoption, comprised the largest portion of respondents (approximately 160). These findings suggest that younger demographics may be more receptive to technological innovations in tourism. Analysis based on respondents' education levels revealed noteworthy insights. Respondents with higher education demonstrated a higher frequency of digital technology usage, as evidenced by their higher average age and median age compared to those with secondary education. This highlights the role of education in shaping technology acceptance in the tourism sector.

The study found a significant percentage of respondents expressing agreement with the use of digital technologies to enhance confidence in travel during the post-pandemic period. Approximately 57% of respondents agreed or rather agreed with the statement, indicating a growing acceptance of technology to mitigate the effects of the pandemic and promote trust in travel.

The Friedman ANOVA analysis identified significant variations in the perceived importance of different digital technologies in travel services. For instance, automatic dispensers of hygiene products and disinfectants ranked highest in importance, while elements like humanoid robots and holographic buttons were deemed less crucial. These findings underscore the importance of prioritizing certain technological innovations over others to meet consumer preferences and needs effectively.

Based on the research findings, the authors identified five groups of adaptive digital technologies, ranging from hygiene-related elements to digital tools for travel automation and control. The digital technology might positively influence tourism, leading to shorter personal service times and safer interactions. The integration of tourism technology with personal devices can further reduce the time spent on various activities.

The five groups of adaptive digital technologies identified in the analysis, considering technological attractiveness and accessibility, can be summarized (in Figure 3) as follows:

1. The first group focuses on non-contact elements related to hygiene, with high demand for automatic disinfectant dispensers, general maintenance of common areas, and individual vehicle cleanliness. An exception is contactless payments, which also garnered interest.
2. The second group emphasizes the digitization of information and automation of travel processes, with a preference for automating air travel processes due to their complexity.
3. The third group consists of specific digital tools for use in crowded areas, including digital kiosks and mobile entry applications.
4. The fourth group includes elements for digital control and inspections, such as virtual space inspections, voice control, and holographic buttons.
5. The fifth and final group comprises elements with limited attractiveness, primarily designed for time-saving purposes, but currently not in high demand by the public.

This typology provides valuable insights for researchers and practitioners, encouraging further individual examination of travelers' willingness to use digital technologies in the post-pandemic reality.

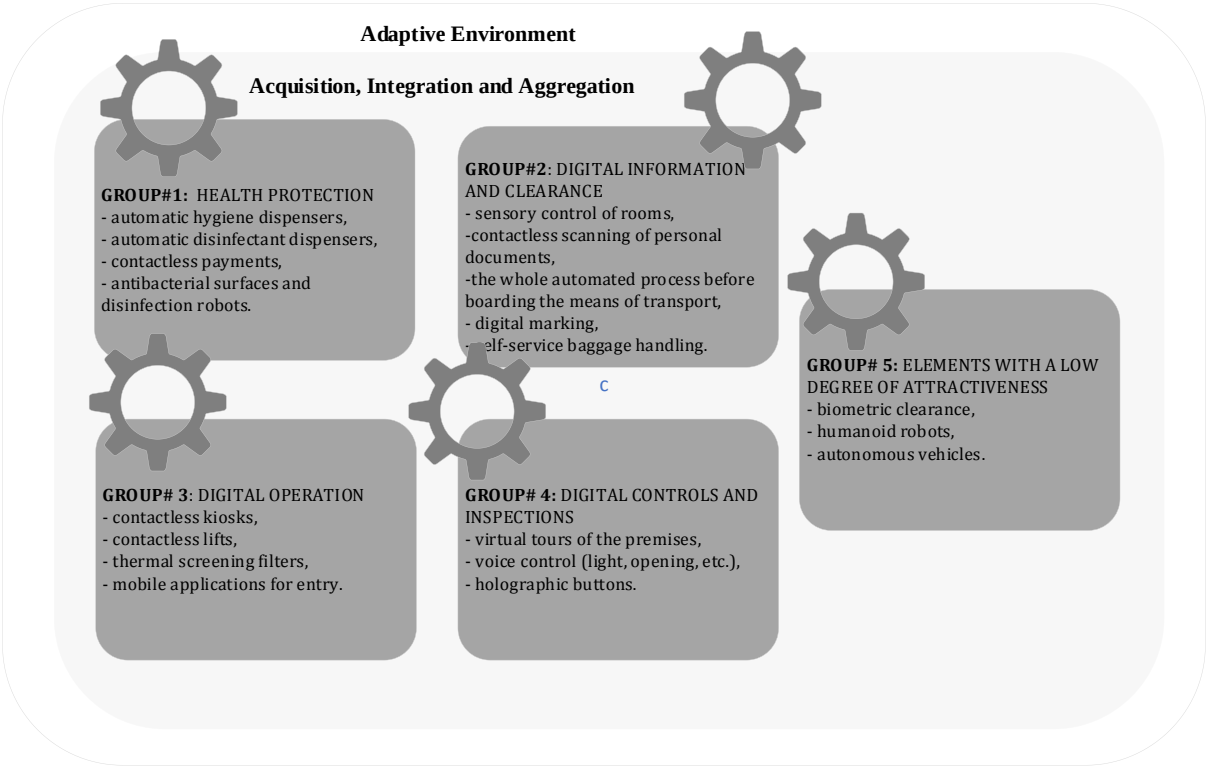

Figure 3. Technology groups within adaptive environment (own elaboration).

Source: own elaboration.

Based on the findings of this study, several practical implications can be drawn for the tourism industry (as presented in Table 9).

Table 9.
Potential implications for tourism

Implications	Actions
Gender-informed technology development	Design technology solutions that appeal to both male and female demographics to maximize adoption and satisfaction. The study's findings suggest that gender influences technology usage patterns in travel services, with women demonstrating a lower frequency of digital technology usage compared to men.
Building education-based strategy	Develop educational initiatives and user-friendly interfaces to facilitate technology adoption among all education levels, recognizing the role of education in shaping technology acceptance in the tourism sector (due to respondents with higher education demonstrated a higher frequency of digital technology usage).
Addressing gender differences	Focus on catering to the preferences of elder demographics by offering innovative digital solutions that enhance their travel experiences, because the 20-25 age group showed the highest interest in digital technologies.
Investing in digital technologies	Invest in digital technologies and resilient innovation (biometric check-in, AI) for sustainable growth and competitive advantage.
Adapting to evolving trends	Remain adaptable and responsive to changing trends by conducting comparative studies across regions and time frames to track evolving consumer preferences and behaviors.

Source: own elaboration.

From a practical perspective, the research encourages prioritizing the development of tourism technologies and investing in advanced capabilities, especially those related to artificial intelligence (AI). With the anticipated advancement of biometric check-in, comprehensive research in the broader digital travel ecosystem is crucial. It also highlights opportunities for entrepreneurs to compete in the digital tourism market by developing more advanced technological innovations, particularly in personalization.

The conducted research present diverse approach to issues concerning tourists' perception in the context of post-covid times use of digital technologies. The paper shows the tourists' attitudes, perception, and opinions, whereas other studies do not present such an approach (Chuah, Aw, Cheng, 2021; Hao 2021; Saratchandra, Shrestha, 2022). Among main findings of the paper is also the conclusion that mentality towards the use of modern digital technologies has changed drastically because, paradoxically, the pandemics enabled accessibility to these technologies.

While the study's conclusions holds for its sample, conducting similar research in other regions like North America could yield different results, as suggested by (Dredge et al., 2019). Moreover, changing post-pandemic-related circumstances may influence respondents' opinions, emphasizing the need for comparative studies to track evolving trends.

6. Conclusions

This study investigated travelers' perception of technologies' importance in tourism. The empirical analysis revealed significant gender-based differences in touchless technology usage frequency, with women demonstrating less interest than men (2.1 vs. 2.9, respectively)

indicating gender influence on technology adoption in tourism. Moreover, the study noted a higher interest in touchless technologies among the 20-25 age group, suggesting younger demographics as trendsetters in technology adoption. Respondents with higher education showed a greater frequency of digital technology usage. Additionally, a considerable percentage of respondents expressed agreement with using digital technologies to enhance travel confidence post-pandemic, indicating growing acceptance of technology in mitigating pandemic effects. The analysis of perceived importance of digital solutions highlighted variations, with automatic hygiene product dispensers ranking highest. These findings emphasize the need for businesses to prioritize certain technological innovations based on consumer preferences.

While the study contributes valuable insights, its limitations, such as generalization and sample size constraints should be acknowledged. Future research should aim to address these limitations by conducting targeted studies in different regions and exploring specific segments of tourism participants. Researchers can employ a similar methodological framework to enhance the generalizability of findings and ensure robustness in data analysis. Comparative studies considering larger samples and time frames can also provide insights into evolving trends and changing consumer preferences.

In summary, the empirical analysis provides valuable insights into the relationship between demographic factors and technology acceptance in the tourism industry. Understanding these dynamics can be incredibly beneficial for businesses and policymakers aiming to improve the adoption and integration of digital technologies in tourism. This knowledge enables not only enhancing travel safety, efficiency, and engagement for travelers but also informs strategic decisions regarding the development of the tourism.

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Conflict of Interest

The authors declare no conflict of interest.

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