

# **Evaluating Generation Z's environmental awareness and accommodation preferences through online travel agencies**

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## **Abstract**

Generation Z have become hugely important travellers in recent years. They are transforming the way accommodation is chosen through Online Travel Agencies (OTAs), which means it is important to understand their preferences. As a result, this paper focuses on the scoring systems of the OTAs and examines the priorities of this generation, with the view to improving the rating procedures and facilitating the selection of accommodation. For this purpose, the paper presents a new approach that combines decision-making procedures and compositional data analysis to examine the preferences of this type of traveller. Likewise, this contribution explores the environmental awareness of young people through Expedia's eco-friendly criterion, it being the first OTA to incorporate environmental aspects into its scoring system.

**Keywords:** Online travel agencies, Generation Z, decision-making, compositional data, Expedia.

## **1. Introduction**

Young travellers play a key role in the tourism industry. According to the report published by the United Nations World Tourism Organization (UNWTO) in 2010, during the first decade of the 2000s, approximately 20% of tourists were young people, aged between 16 and 29 years old and this proportion is expected to increase in the coming years due to demographic and social trends.

Among young tourists, we can highlight those forming Generation Z, known as Gen Z, consisting of individuals born approximately between the mid-1990s and mid-2000s. Specifically, according to Monaco (2018), between 1995-1997 and 2010-2012. This generation has changed the way that trips are planned and organised (Barbe & Neuburger, 2021). As stated in the UNWTO report published in 2010, Gen Z do not always prefer crowded tourist destinations. They want to discover new cultures and have adventures and tend to plan their trips carefully. This generation prefers to use public transport and low-cost accommodation options such as hostels, apartments or friends' houses. Another important characteristic of this group is their relationship with new technologies and the use of social networks. Gen Z use new technologies to select destinations, book hotels and flights, and shares their experiences on social networks (Zhang et al., 2024). This reliance on new technology has made Information and Communication Technologies (ICTs) indispensable tools for Gen Z. In particular, many individuals in this generation book their travel through Online Travel Agencies (OTAs). OTAs have emerged as fundamental elements in planning and booking trips. These online platforms not only provide a wide range of accommodation options, flights, and activities, but also play an important role in providing travellers with valuable information for their decision-making procedures (Gavilan et al., 2018; Talwar et al., 2020).

In addition, in recent years, electronic word-of-mouth (e-WOM), which includes reviews, opinions, and comments on products or services shared through social networks, forums and websites, has become extremely important in the tourism sector. In general, these reviews include numerical scores and written comments that provide more details about the traveller's experience. When assessing this feedback from users, factors such as the credibility of the source and the quality and quantity of reviews are decisive elements for potential customers, influencing their intention to book (Camilleri & Filieri, 2023; Filieri et al., 2021). These reviews significantly affect the scoring systems of the OTAs, which rank and recommend accommodation based on them. The scoring systems used by these platforms show some variation in terms of the presentation and explanation of the ratings. Some OTAs focus mainly on an overall score, while others provide additional details, such as the score achieved by establishments in relation to a set of criteria. In addition, the way the overall score is calculated can vary between platforms due to the different

number of required and optional questions that users must complete (Kim et al., 2023). For example, on Booking.com, guests are only required to select an overall score from 1 to 10 to rate their experience at the accommodation, while the evaluation of other criteria such as cleanliness, staff, or location is optional (Mellinas & Martin-Fuentes, 2021).

These calculation differences can generate complaints and confusion among users, as evidenced by comments in the Booking Partner Hub or the Airbnb Community, where hosts and guests share their questions and complaints about how the overall scores for establishments are calculated. Additionally, the methodology used by the OTAs to determine the overall accommodation score is controversial. The literature suggests that the evaluation of different criteria affects the accommodation selection decision-making process and, therefore, it is advisable to try to determine the weights of these criteria (Chou et al., 2008; Crouch, 2011). However, as Zaman et al. (2016) pointed out, there are few studies focused on determining the weight of the criteria that significantly influence travellers' decision-making processes. For this reason and given that Gen Z is a significant group of travellers for the tourism industry, it is important to understand what weights these individuals attribute to the criteria used by the OTAs. To this end, the main objective of this contribution is to analyse Gen Z's preferences when selecting accommodation through OTAs and their environmental awareness. For this purpose, two multi-criteria decision-making methods have been used: the Analytical Hierarchy Process (AHP) and the Best Worst Method (BWM). This methodology is applied to the criteria used by the Expedia Group, one of the first OTAs to introduce environmental aspects into the criteria displayed on its website. In addition, a compositional analysis was conducted to explore potential gender differences in criteria prioritisation.

The rest of the paper is organised as follows: Section 2 provides the theoretical framework. Section 3 presents the research aims and research questions addressed in this paper. Section 4 describes the methodology used. Section 5 sets out and discusses the results obtained, and Section 6 concludes by summarising the main theoretical and practical contributions, as well the limitations and some future directions for research.

## **2. Theoretical framework**

### *2.1 The scoring systems of the leading OTAs*

In the context of OTAs, the literature has highlighted the fundamental role played by online reviews when choosing accommodation and tourist destinations (Gavilan et al., 2018; Zhao et al.,

2015). These reviews greatly influence the reputation of the accommodation, acting as e-WOM recommendations (Carvalho et al., 2024; Deng et al., 2020). Previous studies have highlighted their correlation with booking decisions, finding that positive comments can significantly enhance an accommodation option’s visibility, while negative reviews may discourage potential guests (Camilleri & Filieri, 2023; Ye et al., 2009). Likewise, these online reviews serve as a powerful tool for potential travellers, offering firsthand information and shared experiences from previous guests. This enables prospective customers to plan their trips with greater security and confidence (Chakraborty, 2019; Su et al., 2022).

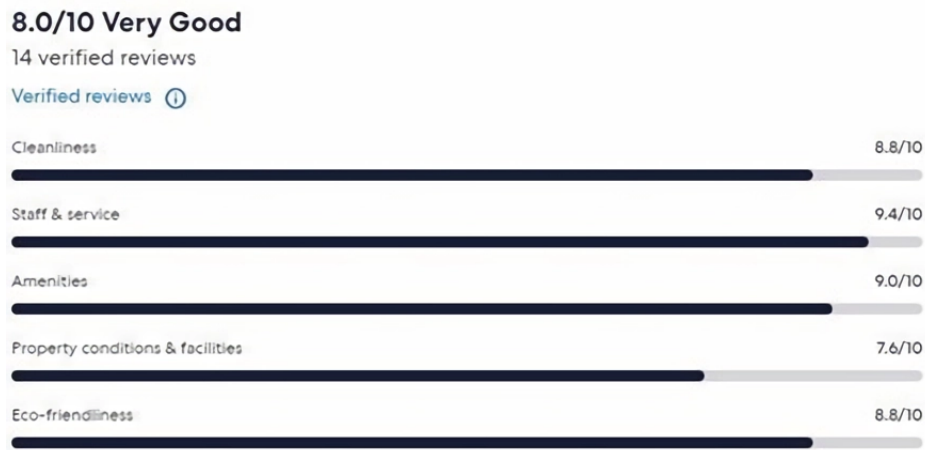
The way these reviews or assessments are presented can vary on each OTA. Besides using different scales and methods to calculate accommodation scores, these platforms also differ in the information provided about the assessment criteria. While some OTAs may explicitly detail criteria such as cleanliness, location, amenities, or staff, others may be more general. This difference might be a consequence of internal policies or the availability of information about the accommodation. However, this variability may affect the ability of users to compare and book accommodation (Ghasemaghaei et al., 2018; Schneider et al., 2021).

Table A.1 (see the Appendix) summarises the scales and methodologies used by the main OTAs to determine the overall score for accommodation, as well as the criteria displayed on their websites. As can be seen, the information provided by each OTA differs in relation to the criteria, scales, and methodologies for calculating the overall score. Currently, most OTAs display an overall score for the accommodation options on their website calculated as the arithmetic mean of the overall scores given by individual reviewers. However, some platforms choose to present the overall scores as the arithmetic mean of the scores given for each criterion. This is the case with Trip.com and Agoda, and, until a few years ago, Booking.com.

Figure 1a shows the scores received by an accommodation option on Trip.com. The overall score displayed on this platform (4.3) is not calculated as the mean of the scores given by the 60 reviews, but rather as the arithmetic mean of the scores for the four criteria.



(a) Trip.com. Scores and criteria.



(b) Expedia. Scores and criteria.

**Figure 1:** Example of overall scores on Trip.com and Expedia.  
**Source:** Trip.com and Expedia.

In the case of Booking.com, this OTA initially used a 2.5-10 scale (represented by a smiley face scale) to calculate an overall score. Users rated six criteria: host(s), facilities, cleanliness, comfort, value for the money, and location, using a smiley face scale. Then, the overall score for the accommodation was determined as the arithmetic mean, where each criterion was assigned equal weight (González del Pozo & García-Lapresta, 2021; Mellinas et al., 2015). In 2019, Booking.com made a significant change to its rating system. Since then, users have selected an overall score, on a scale of 1 to 10, to rate their experience at the accommodation. This is the only question they must answer to submit their review, since the evaluation of the other six mentioned criteria is optional and does not count toward the final result. Therefore, the score given for this required question is the only assessment considered in the calculation of the accommodation's overall rating, which is obtained as the arithmetic mean of the individual scores provided by users (Mellinas et al., 2016).

The Expedia Group platform has recently changed its rating system, shifting from a scale of 1 to 5 to a scale of 1 to 10 (Zhang et al., 2019). This change allows guests to select more precise scores in comparison to the former scale of 1 to 5 and facilitates comparison with other platforms like Booking.com (Kim et al., 2023). To calculate the overall scores, Expedia does not use the same procedure as Trip.com. As can be seen in Figure 1b, the overall score is not the arithmetic mean of the scores across the five criteria. Expedia calculates the accommodation's overall score by considering the arithmetic mean of the overall scores given by individual reviewers.

After presenting and comparing the different scoring systems used by the main OTAs, summarised in Table A.1, it can be concluded that two important problems affect the

comparability and transparency of the scores provided by these platforms. The first is the variability in the rating scales and evaluation criteria across the different platforms. This can make a direct comparison of scores complicated and create problems for users in their decision-making processes. The second is the lack of clarity in the methodology for calculating the overall scores, which can generate uncertainty among users. OTAs often show overall scores along with the evaluation criteria, but do not provide a clear explanation of how these scores are calculated. This can lead to misunderstandings, since some users may incorrectly assume that the overall scores are a weighted average of the individual criteria, a practice that is currently adopted by Agoda and Trip.com, and was previously used by Booking.com (Mellinas et al., 2015).

In addition, as illustrated in Figure 1 and Table A.1, OTAs usually evaluate various aspects of each accommodation option, such as cleanliness, location and value for money, among others. The scores assigned to these criteria are displayed on their websites. Despite this, when calculating and presenting the overall score for an accommodation option, the OTAs take the mean of the overall scores given by users, without including any weighting of the different criteria. This practice is justified as being a method for focusing on overall user opinion, avoiding unfairly penalising accommodation for aspects beyond their control, such as location, or for other aspects which may be affected by local regulations or other external factors that limit the ability of the accommodation's owners to improve them (Mellinas et al., 2019). Nevertheless, not all criteria are equally important for all individuals in all situations. As a result, not considering all the information related to their criteria is out of line with decision theory. This theory emphasises the importance of considering the weights of the criteria in the final assessment so that decisions can be made that better adapt to individuals' needs and preferences (Bueno et al., 2021; Chou et al., 2008; Jannach et al., 2014).

Regarding the environmental strategies of the leading OTAs, each platform has adopted different approaches. Booking.com used the "Travel Sustainable Programme" until March 2024, after which it switched to relying on sustainable certifications provided by third-party organisations. According to Booking.com, these recognised certifications, such as the "Green Key Certificate", provide credibility to their sustainability initiatives. Airbnb has also adopted a more environmentally friendly strategy by offering tips on reducing energy consumption, managing waste efficiently, using green cleaning products and promoting sustainable transport (Arzoumanidi et al., 2022). However, none of these platforms have implemented an environmental criterion that users can evaluate. Expedia, on the other hand, has focused on highlighting sustainable aspects to meet the growing demand for responsible tourism and promote this offering (Expedia Group, 2024). For this reason, at the end of 2022, the platform introduced an eco-friendly criterion into its rating system, becoming one of the first online travel agencies to

incorporate this criterion directly into its reviews. This approach enables users to participate in the decision-making process, allowing sustainability to be evaluated from the consumer's perspective. The result is a more dynamic and reliable assessment procedure.

## *2.2 Gen Z's accommodation preferences*

Since the leading OTAs ask their users to rate the accommodation where they are staying on the basis of different criteria, it is fundamental to understand the importance that they assign to each of these aspects (Pinto & Castro, 2019). We need to know their preferences so that we can not only improve services and marketing strategies, but also provide accurate overall ratings for accommodation options.

A significant body of research focuses on understanding users' accommodation preferences through analysing reviews and opinions published on websites using statistical techniques, regression analysis, decision-making methods, or compositional data analysis. For instance, Leoni & Boto-García (2023) and Viglia et al. (2014) used regression analysis to study the effects on hotel service valuation and examine the relationships between consumers' preferences and reviews. Conversely, Ye et al. (2018) conducted an analysis of spatial and temporal accommodation patterns in Hong Kong, Pan et al. (2008) applied qualitative analysis to identify tourism trends and Ferrer-Rosell et al. (2022) studied TripAdvisor hotel reviews by means of compositional data techniques.

Additionally, some authors employ multi-criteria techniques to investigate this issue. For example, Zhang et al. (2011) analysed the competitiveness of tourist destinations using the TOPSIS multi-criteria decision-making method. Ku & Fan (2009) concluded that safety and product quality were the most influential factors affecting customers' online purchases of room products by means of the AHP. Fang & Partovi (2021) proposed a model to calculate and compare criteria for hotels and restaurants on the TripAdvisor using the AHP; and Chou et al. (2008) aimed to identify and model tourists' preferences for choosing optimal accommodation through the fuzzy AHP methods. In addition, Rezaei et al. (2018) used the BWM for calculating the weights of criteria in baggage handling services, and Moslem et al. (2020) applied the BWM weighting procedure to analyse mobility options in Italian cities after the pandemic.

The importance of young travellers to the tourism sector is undeniable. As a result, several studies have focused on analysing their preferences and behaviours. For example, Tavares et al. (2018) conducted a study to identify the travel profiles of Gen Z in Brazil. They concluded that destinations characterised by a historical, cultural or religious tourism offer are less demanded by Gen Z individuals. Ferreira et al. (2024) highlight the relationship between Gen Z and new

technologies, noting how they share leisure and travel experiences that influence the decisions of other travellers. Regarding the types of accommodation preferred by Gen Z, Wiastuti et al. (2020) indicate that these individuals tend to stay in hotels and relatives' homes and that they usually travel with family or friends. Furthermore, Jiang & Hong (2023) examine the accommodation preferences of this generation and conclude that emotional, epistemic and ecological values have a positive impact on destination attachment, while functional, economic and social values do not significantly influence destination attachment.

On the other hand, Gen Z individuals are increasingly concerned about the sustainability of tourism destinations, actively promoting practices that minimise the negative environmental impact of tourism. As a result, some literature has explored the relationship between Gen Z and sustainable tourism, addressing aspects such as environmental awareness and the environmental friendliness of accommodations. Çalışkan (2021) pointed out that the individualistic nature of Gen Z may create an ambiguous situation about sustainable tourism; however, their collaborative and collective tendencies may facilitate the implementation and evaluation of sustainable practices. Homer & Kanagasapathy (2023) conducted a conceptual mapping of Gen Z perceptions, which allowed them to identify the most important dimensions for this generation, including social, cultural, management and environmental protection aspects. The mapping revealed a high level of awareness and concern for sustainability among this generation as this generation seeks environmentally friendly travel options. Similarly, Kubíková & Rudý (2024) concluded that Gen Z is characterised by a strong interest in sustainable tourism, prioritising experiences over possessions and demonstrating greater environmental awareness. Salinero et al. (2022) discussed the pro-sustainable behaviour of this generation in tourism, identifying internal and external factors, among which personal responsibility and social norms. This relationship regarding the importance of personal and social norms in sustainable tourism has also been addressed by D'Arco et al. (2023). However, to date, the profile of Gen Z travellers and their relationship with OTAs has not been analysed. Therefore, this contribution seeks to address this gap in the literature by exploring the characteristics, preferences, and behaviours of Gen Z in the context of OTAs.

### **3. Research aims and questions**

The main objective of this contribution is to analyse the environmental awareness of Gen Z and their preferences when selecting accommodation given the criteria displayed by the OTAs. To do that, the contribution proposes three research questions.



- Research question one (**RQ1**): What types of OTAs are most used by Gen Z to book accommodation, and what types of establishments do they stay in? This question is addressed through a survey that contains specific questions about this aspect. Descriptive statistics are employed to analyse the gathered data.
- Research question two (**RQ2**): What criteria are most valued by Gen Z when selecting accommodation? Specifically, how much importance do they place on the environmental aspect? To address this issue, the multi-criteria decision-making methods AHP and BWM have been used to obtain the criteria weights. In addition, given the increasing interest in sustainable tourism, this study aims to investigate whether the sustainability criterion is also valued by Gen Z. For this purpose, this work is based on the Expedia Group, an OTA that has recently introduced an eco-friendly criterion into the accommodation ratings published on its website.
- Research question three (**RQ3**) involves an analysis of the criteria by gender: How does gender affect the composition of the criteria? To address this issue, the weights obtained using the multi-criteria decision-making methods have been considered. It is important to note that these weights represent the relative importance of each criterion compared to the total. As a result, they are compositional data (CoDa). Analysing this type of data using traditional methods presents various problems, such as spurious correlations. Therefore, the freeware CoDaPack (Comas Cufí & Thió Fernández de Henestrosa, 2011) is used to analyse the composition of the weights in each criterion.

## 4. Methodology and data

To answer the questions raised in Section 3, a multi-criteria analysis was carried out to determine the preferences of Gen Z.

### *4.1 Participants and questionnaire*

The study participants were young university students from Spain, considered by several authors such as Chaturvedi et al. (2020) and Jiménez-García et al. (2023) as a good representative sample of Gen Z. The survey was conducted between December 2023 and March 2024, ensuring that all surveyed students fulfilled the necessary requirements to form part of the sample. A total of 497 valid responses were obtained (45.79% male and 54.21% female). The sample size has been calculated to ensure a margin of error of 4.40%, assuming a conservative proportion of 0.5, which

maximises variability and ensures greater precision. This margin of error has been determined with a confidence level of 95%. In addition, this size was considered adequate considering other contributions focused on obtaining the criteria weights in the tourism sector (Zaman et al., 2016) and similar studies conducted recently on Gen Z individuals (Ferreira et al., 2024; Wiastuti et al., 2020).

In the questionnaire, participants were asked to indicate which OTAs they were most familiar with, which ones they had used recently, and with whom they usually travelled. Moreover, the questionnaire included multi-criteria questions aimed at determining the importance attributed to five criteria presented on the Expedia website: “Cleanliness”, “Staff & service”, “Amenities”, “Property conditions & facilities”, and “Eco-friendliness”. To effectively capture preferences, this multi-criteria section of the questionnaire was designed using the BWM approach, which requires participants to choose the option they believe is the best and the one they consider the worst among the presented criteria. Initially, they are asked to choose the best criterion, and then they must indicate how important that criterion is in relation to the others using Saaty’s scale (Table 1), which is commonly used in AHP and BWM. This scale assigns numerical values ranging from 1 to 9; a value of 1 indicates that two criteria have equal importance, while a value of 9 denotes the extreme importance of the chosen criterion (best or worst) compared to all others. For example, if a participant selects “Cleanliness” as the best criterion, they must indicate how important they consider “Cleanliness” in relation to other criteria, such as “Staff. & service”, “Amenities” etc. This process is repeated with the worst criterion. This approach allows for the quantification of subjective judgments concerning the relative significance of each criterion in decision-making procedures.

**Table 1:** Saaty’s scale of relative importance.

Intensity of importance	Definition	Explanation
1	Equal importance	Two elements contribute equally to the objective
3	Moderate importance	Experience and judgment slightly favour one element over another
5	Strong importance	Experience and judgment strongly favour one element over another
7	Very strong or demonstrated importance	An element is favoured very strongly over another, its dominance demonstrated in practice
9	Extreme importance	The evidence favouring one element over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values between two adjacent judgments	When compromise is needed between two judgments

## 4.2 Multi-criteria decision-making analysis

This section presents the two multi-criteria decision-making procedures used to calculate the weights in the evaluation procedures: the AHP (Saaty, 1980) and the BWM (Rezaei, 2015).

The AHP is a methodology developed by Thomas Saaty in the late 1970s. It is one of the most widely used multi-criteria decision-making methods based on a hierarchical structure. It involves pairwise comparisons to evaluate the relative importance of criteria, allowing decision-makers to express the strength of their preferences. Additionally, it is a versatile tool that can be applied to multiple decision-making contexts and problems. In contrast, the BMW introduced by Jafar Rezaei in 2015 offers several advantages over the AHP. The BMW requires fewer comparisons and questions, which reduces the time required by the decision-maker to complete the questionnaire. Moreover, this method is relatively easier to understand and apply compared to the AHP, and it demonstrates better performance in terms of consistency.

AHP and BWM were chosen due to their structured approach to tackling complex decision-making problems, allowing for the integration of both qualitative and quantitative assessments. Both methods are flexible, easy to use, and have proven to be robust in various applications. However, they do present limitations, such as the inherent subjectivity in decision-makers' judgements, which can introduce biases, as well as the complexity that arises in large data sets. Despite these drawbacks, AHP and BWM are valuable tools in the context of this study, facilitating a clear and understandable analysis of the criteria involved in the decision-making process (Belton & Stewart, 2002).

### 4.2.1 The Analytic Hierarchy Process (AHP)

AHP establishes priorities among elements by determining the criteria weights, reflecting the preferences of decision-makers and stakeholders. These weights are derived from matrices containing pairwise comparisons of elements. AHP employs a scale ranging from 1 to 9 (Saaty, 1980). Their descriptions and interpretations are set out in Table 1.

A comparison matrix, called  $A$ , is formed through the comparison of each element with another. If there are  $n$  criteria, with weights  $w_1, w_2, \dots, w_n$ , the pairwise comparison matrix has the following structure:

$$A = \begin{pmatrix} 1 & w_1/w_2 & \dots & w_1/w_n & w_2/w_1 & 1 & \dots & w_2/w_n & \vdots & \vdots & w_n/w_1 & w_n/w_2 & \dots & 1 \end{pmatrix},$$

where the relative weight of element  $i$  compared to element  $j$  is  $a_{ij} = w_i/w_j$ .

Any pairwise comparison matrix satisfies the following properties:

$$a_{ij} \geq 0, \text{ for all } i, j.$$

$$a_{ji} = 1/a_{ij}, \text{ for all } i, j.$$

$$a_{ii} = 1, \text{ for all } i.$$

The consistency of judgments is related to the transitivity of preferences in the comparison matrix. In summary, a matrix  $A$  is consistent if  $a_{ij} = a_{ik} \times a_{kj}$ , for all  $i, j$ . The weighting vector from a matrix  $A$ ,  $w = w_1, w_2, \dots, w_n$ , is the nontrivial solution of the following system:  $Aw = \lambda w$ ,  $w$  being the eigenvector and  $\lambda$  the eigenvalue associated with  $A$ . The sum of the weights should be equal to one. Finally, a pairwise comparison matrix  $A$  is consistent if, and only if,  $\lambda_{max} = n$ . The eigenvector of the matrix can be calculated through different methods, approximate or exact (Saaty, 1980). Thus, the inconsistency in pairwise comparisons of the AHP method is determined from the eigenvalue of the matrix. However, one of the drawbacks of AHP is that it requires many comparisons; for instance, a matrix with 5 criteria requires 10 comparisons, which can complicate the verification of consistency. Therefore, in this contribution, we checked the consistency of the respondents' answers using the BWM method, which will be explained in more detail in the following subsection.

#### 4.2.2 The Best–Worst Method (BWM)

The BWM can be used to determine the criteria weights through the following steps:

1. Identify the set of criteria:  $c_1, c_2, \dots, c_n$ .
2. The decision-maker selects the best and worst criteria.
3. Determine the preference for the best criterion compared to all other criteria by assigning a number between 1 and 9 (See Saaty's scale in Table 1).
4. Determine the preference for all other criteria with respect to the worst criterion using the above scale.
5. Calculate the optimal weights for the criteria:  $w_1^*, w_2^*, \dots, w_n^*$ .

The optimal weights are calculated by solving the following optimisation problem:

$$\min \{ |w_B - a_{Bj}w_j|, |w_j - a_{jW}w_W|$$

such that

$$\sum_{j=1}^n w_j = 1$$

$$w_j \geq 0, \text{ for all } j.$$

The problem can be converted into the following problem:

$$\min \xi$$

such that

$$\left| \frac{w_B}{w_j} - a_{Bj} \right| \leq \xi, \quad \text{for all } j$$

$$\left| \frac{w_j}{w_W} - a_{jW} \right| \leq \xi, \quad \text{for all } j$$

$$\sum_{j=1}^n w_j = 1$$

$$w_j \geq 0, \text{ for all } j,$$

where  $w_B$  and  $w_W$  denote the weights of the best and worst criteria, respectively,  $a_{Bj}$  indicates the importance of the best criterion compared to criterion  $j$ , and  $a_{jW}$  indicates the preference for criterion  $j$  compared to the worst criterion.

The BWM also proposes a consistency ratio to assess the reliability of comparisons. It evaluates how consistent the decision maker's preferences are by comparing the best and worst criteria with the others. If the consistency ratio value is below a predefined threshold, the comparisons are considered consistent. If the consistency ratio exceeds that threshold, the comparisons are too inconsistent (Liang et al., 2020). This ratio can be calculated either separately or collectively. In our contribution, the consistency ratio was checked individually.

### 4.3 Compositional data analysis

Compositional data is a special type of data that describes the parts of a whole, focusing on the relative proportions between them rather than their absolute values. They reflect the proportion or composition of different parts within a set, where the total sum of all the parts is constant (e.g., 1 or 100%). These data are found in a wide range of fields, including geology, chemistry, economics, and medicine. The weights of a set of criteria can be considered compositional data because they represent the relative distribution of importance among the criteria, and the total sum of these weights is constant.

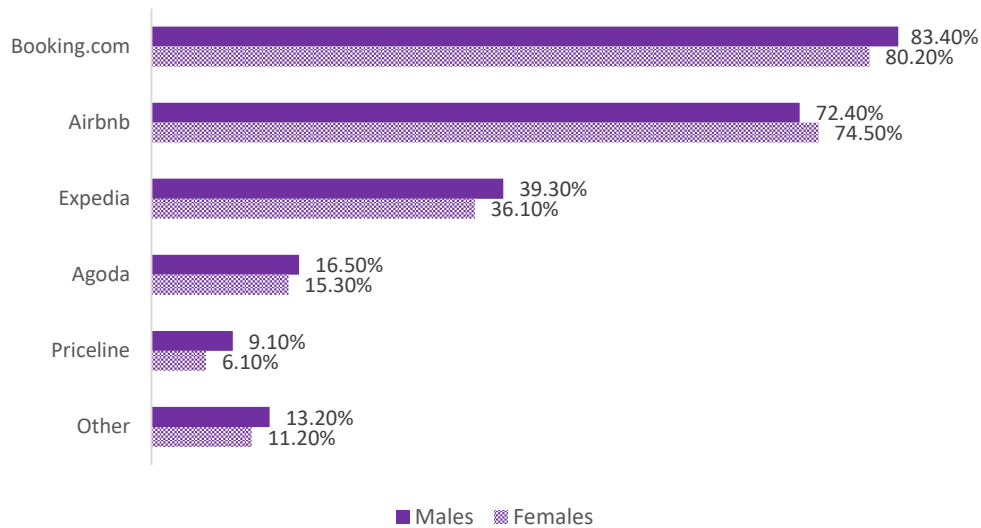
Analysing this type of data presents some challenges, particularly the issue of spurious correlation, as noted by Pearson (1897). This complexity and controversy persisted among researchers until the 1980s, when Aitchison laid the statistical foundation for analysing such data (Aitchison, 1982). Therefore, compositional data require the use of special statistical methodologies that consider the characteristics of this type of data. Such techniques include log-ratio transformations such as the centred log-ratio transformation (clr), additive log-ratio transformation (alr), or isometric log-ratio transformation (ilr), as well as specifically designed multivariate statistical tests and procedures for compositional data. In addition, the compositional methodology also employs visualisation techniques adapted to the nature of the data, for example, the geometric mean barplot, ternary/quaternary plot or CLR-biplot, among others.

Compositional data analysis can be carried out using specialised R packages (Martín Fernández et al., 2015; Van Den Boogaart & Tolosana-Delgado, 2013) or with the freeware CoDaPack (Comas Cufí & Thió Fernández de Henestrosa, 2011). The latter is the tool used in this contribution.

## **5. Results and discussion**

### *5.1 Gen Z travel choices*

To answer the last research question raised in Section 3, this subsection presents the main results obtained. To determine the preferences of Gen Z, the first part of the survey included questions relating to the OTAs used by participants to book their trips, who they travel with, and the types of accommodation they stay in. Additionally, to explore potential gender-based differences, we separately analysed the responses for males and females. These results are set out in Figures 2 and 3.



**Figure 2:** Most popular OTAs used by Gen Z, segmented by gender.

**Source:** Authors' own work.

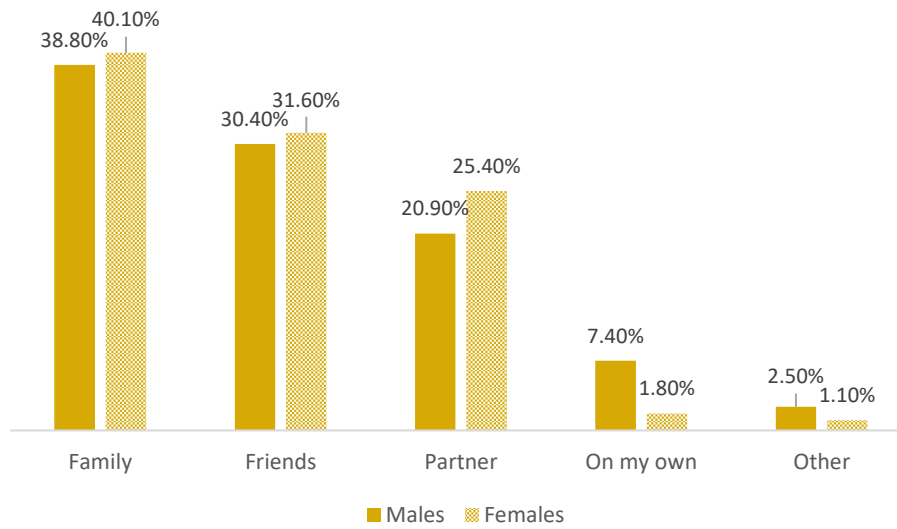
Figure 2 presents the OTAs most used by survey participants, segmented by gender. These results reflect the diversity of user preferences, influenced by factors such as accessibility, availability of options, and price perception. The results show that Booking.com and Airbnb are the most popular OTAs for both genders, with males having a slightly higher use of Booking.com (83.40%) than females, and females having a slightly higher use of Airbnb (74.50%) than males. Expedia is the third most used option, followed by Agoda, Priceline, and other platforms, which appear to be more popular among men than women. These results coincide with those published by Pinto & Castro (2019), who show that consumers book primarily through Booking.com, followed by accommodation websites, and thirdly through platforms such as Airbnb or Expedia. Likewise, the use of these platforms is consistent with Boto-García et al. (2021), who pointed out the travellers' preference to book their destinations directly online rather than by phone or through traditional travel agencies.

Gen Z preferences for travel companions and types of accommodation are shown in Figure 3. Participants show diverse preferences when choosing travel companions. The results shown in Figure 3a indicate that both men and women prefer to travel with family and friends. Traveling with family is the most popular option, chosen by 38.80% of males and 40.10% of females. As noted, Jiménez-García et al. (2023), this result may be since many individuals of this generation are not yet financially independent, so they depend on their families to travel. The second most popular option is traveling with friends, selected by 31.60% of males and 30.40% of females. Traveling with a partner is significantly more common among women (25.40%) compared to men

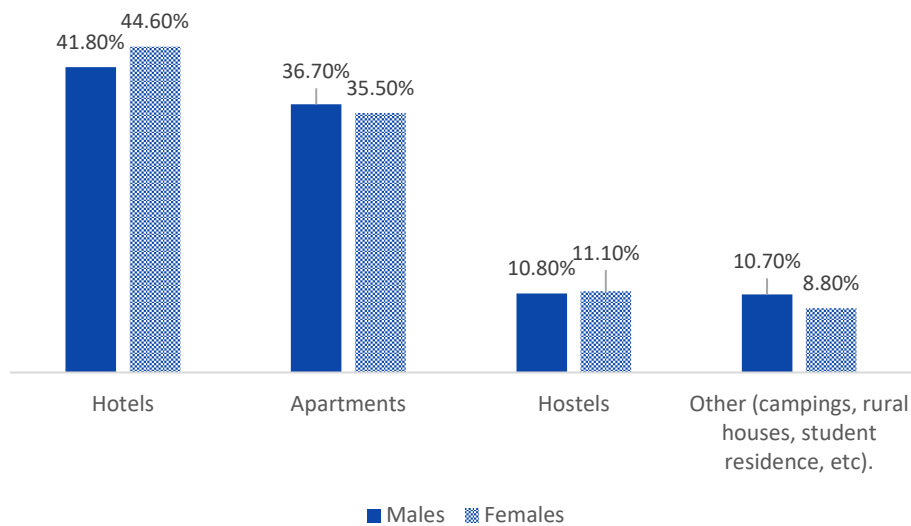
(20.90%). This inclination to travel with partners may suggest that women place a higher value on emotional connections and shared experiences during their trips. In contrast, men might exhibit a stronger tendency to travel with friends, which could be attributed to different social dynamics and expectations regarding independence. Nevertheless, our results highlight the significance of friendships and romantic relationships over individual autonomy in the travel decisions of young people, as pointed out by Kamenidou et al. (2021).

When considering the results of the types of accommodation (Figure 3b), these show that both men and women predominantly prefer hotels and apartments. The former are the most popular accommodation choice, accounting for 41.80% of men and 44.60% of women. This preference of Gen Z individuals for hotels is also supported by the paper of Wiastuti et al., (2020) who indicate that most travellers from this generation tend to prefer local hotels over accommodations from international chains. On the other hand, as mentioned above, Gen Z uses a lot of technology, this preference for hotels can be attributed to the fact that hotels frequently offer technological services, including robots, artificial intelligence and service automation, which can improve their satisfaction and may lead them to prefer this type of accommodation (Zhang et al., 2023). From the apartment perspective, authors such as Amaro et al. (2019) and Polisetty & Kurian (2021) highlighted the growing popularity of Airbnb in recent years, indicating several reasons why travellers choose this platform, including the variety of accommodation options, competitive prices, and flexibility. This aligns with the results presented in Figure 2, where Airbnb is identified as one of the favourite platforms among young people. In addition, apartments rank as the second preferred option, chosen by 36.70% of men and 35.50% of women. This trend shows an inclination toward convenience and privacy among respondents, as noted by Mody & Hanks (2020). Finally, the participants show a relatively lower preference for hostels and other types of accommodation such as camping or rural houses, even though these establishments offer lower prices and a great diversity of tourist experiences according to Robinson & Schänzel (2019).





a) Travel companions.



b) Accommodations.

**Figure 3:** Types of travel companions and accommodation of Gen Z, segmented by gender.

**Source:** Authors' own work.

## 5.2 Weighting OTAs' criteria for Gen Z

To determine the preferences of Gen Z when choosing accommodation and to analyse the importance placed by these individuals on environmental aspects, two multi-criteria decision-making procedures were used: AHP and BWM. As can be seen in Table A.1, many OTAs

currently do not include environmental criteria in their scoring systems. There are several studies that examine the relationship of these platforms' criteria through regression techniques (Ramanathan, 2012), PLS models (Nilashi et al., 2022) or even multi-criteria decision analysis (Zaman et al., 2016). However, these works do not consider the environmental dimension. For this reason, in this contribution, the above multi-criteria decision-making procedures have been applied to the criteria used by Expedia, this being one of the first OTAs to introduce an eco-friendly criterion.

To calculate these weights, the Aggregation of Individual Priorities (AIP) approach was employed. In this framework, the geometric mean is commonly used as the aggregation procedure (Escobar et al., 2015). Moreover, compositional data statistics also often apply this mean, as it is less affected by extreme values and provides a more representative measure of the central tendency.

The results presented in Table 2 can be divided into two groups. The first group is formed by the criteria "Cleanliness" and "Property conditions & facilities", which have a higher relative weight, and the second group is composed of "Staff & service", "Amenities" and "Eco-friendliness", whose importance is lower in comparison with the weights for the criteria in the first group. This grouping pattern is consistent for both males and females. These results coincide with those presented by authors such as Kreeger et al. (2023), Prasad et al. (2014) and Ramanathan (2012), who indicated that the most important aspects for guests are cleanliness and providing comfortable rooms and facilities. In addition, the study published recently by Kleger (2024) also highlights a preference among travellers for the distinctive features and amenities of Airbnb such as parking availability, fully equipped kitchens or free Wi-Fi.

Focusing on ecological aspects, as emphasised by authors such as Çalışkan (2021), Kim et al., (2023) and Salinero et al., (2022), among others, Gen Z have positive attitudes towards ecological practices and sustainable tourism. Similarly, the results obtained by Nowacki et al. (2023) and Saul & Heo (2023) indicate that Gen Z individuals are environmentally aware and show interest in the sustainable practices of accommodations. However, the importance assigned to the eco-friendliness criterion compared to the others is quite low in both procedures. This suggests that Gen Z may not prioritise ecological aspects when selecting accommodation. This is consistent with the findings of Qiu et al. (2022) and Pinho & Gomes (2023), whose studies on tourism and Gen Z do not provide solid evidence of strong environmental awareness among young people.

The preference of this generation for property conditions and facilities over ecological aspects may be due to a lack of environmental awareness (Agrawal et al., 2023) or financial priorities

(Robinson & Schänzel, 2019). Likewise, it could also be because some accommodation options are not transparent about their current environmental practices, which may confuse young consumers (Acampora et al., 2022).

**Table 2:** Criteria weights obtained through multi-criteria decision-making methods: AHP and BMW.  
Expressed as percentages (%).

		Cleanliness	Staff & service	Amenities	Property conditions & facilities	Eco-friendliness
Male	AHP	25.03	12.20	14.75	35.32	12.70
	BWM	24.81	13.67	16.58	35.64	9.30
Female	AHP	27.24	14.41	15.41	28.86	14.08
	BWM	26.54	14.60	16.30	30.66	11.90
Total	AHP	25.93	13.35	15.15	32.10	13.47
	BWM	25.78	14.19	16.46	32.91	10.66

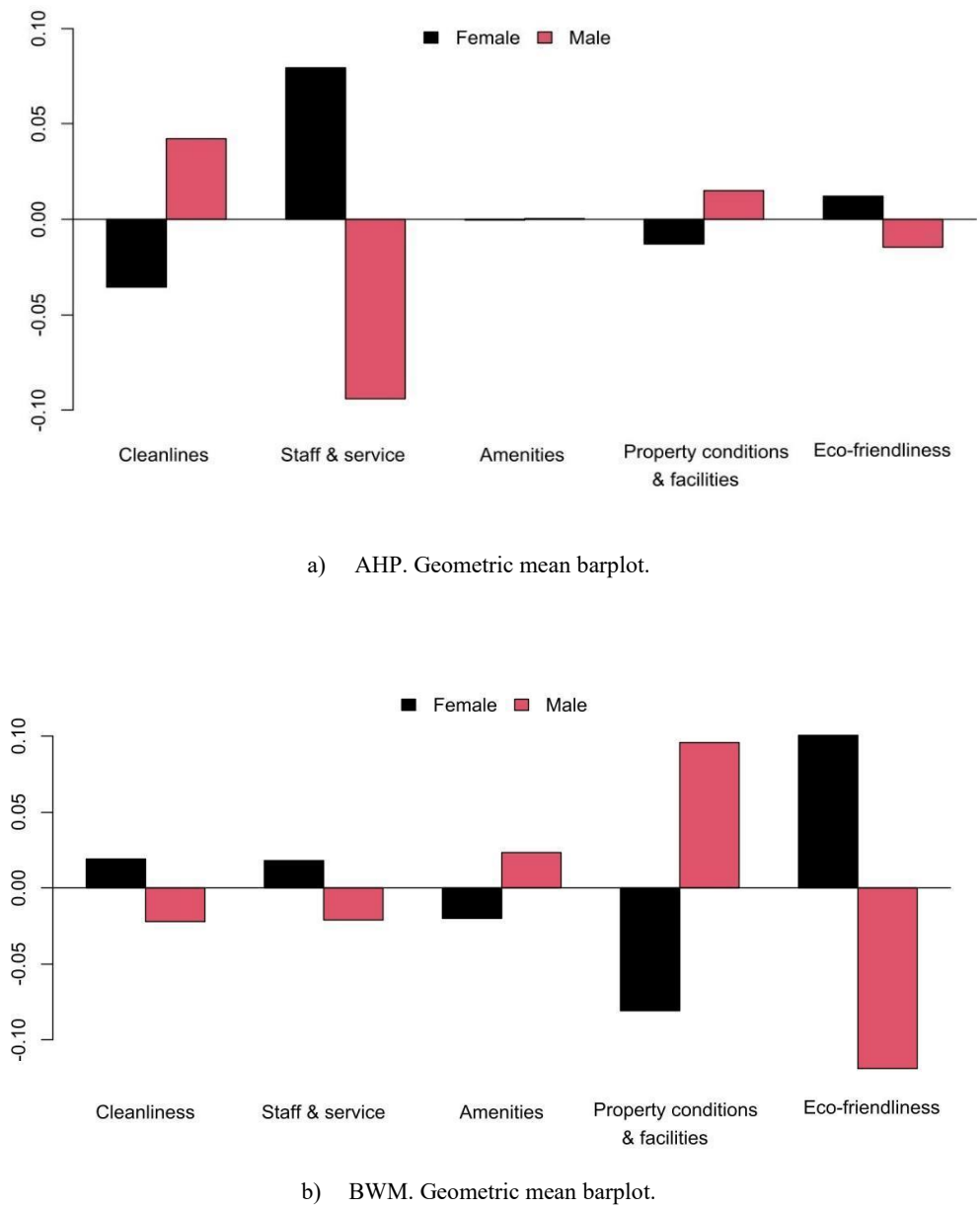
From a gender perspective, women are expected to be more concerned about the environment than men (Homer & Kanagasapapathy, 2023; Skanavis & Sakellari, 2008). The results of our study support this conclusion, since females assign greater importance to the ecological criterion in both methodologies (see Table 2). On the other hand, it is interesting to note that in the AHP analysis (females), the criteria “Property conditions & facilities” and “Cleanliness” have similar weights: 28.86% and 27.24%, respectively, indicating little difference between them. One possible reason for this result could be that the participants perceive these two criteria as closely related, an issue that will be addressed in more detail in the following subsection.

### *5.3 Analysis of criteria weights by gender*

In multi-criteria analysis, it is common to propose and apply methods to determine the weight of several criteria, which are subsequently used to order a set of alternatives without carrying out a more detailed study of them (Peng et al., 2018; Zaman et al., 2016). Moreover, considering that gender differences in tourism research have been confirmed in several studies (Agrawal et al., 2023; Kim et al., 2007; Skanavis & Sakellari, 2008), this subsection analyses the weights presented in subsection 5.2 through a compositional data approach.

The criteria weights were explored using appropriate statistical techniques and representations for this type of data, conducting a MANOVA analysis using CoDaPack. This freeware provides several statistics test, such as Pillai’s trace, Wilk’s lambda, and Hotelling’s trace, as explained by Ferrer-Rosell et al. (2015) and Martín Fernández et al. (2015). In our case, the three statistical

tests returned p-values of 0.0475 (for AHP) and 0.0186 (for BWM) respectively. Therefore, our analysis revealed statistically significant evidence of gender differences in at least one of the criteria in both procedure



**Figure 4:** Compositional geometric mean barplot, segmented by gender.  
**Source:** Authors’ own work.

The geometric mean barplot was used to explore gender differences. This is a tool for determining differences between groups, allowing for the visualisation of the distribution of their components within the dataset. Positive bars reflect relative compositional geometric mean values above the overall mean composition, while negative bars represent those below it. Considering the results

shown in Figure 4, gender differences can be observed. In the case of the AHP analysis, the greatest differences are observed in the criteria “Staff & service” and “Cleanliness” (see Figure 4a), while in the case of the BWM, the greatest differences appear in the criteria “Property condition & facilities” and “Eco-friendliness” (see Figure 4b). When considering the environmental aspect, both procedures reflect gender differences, especially the BWM. Thus, it appears that women tend to be more aware than men about the eco-friendly criterion. The finding that females are more sensitive to green travel behaviour is also supported by several studies focusing on tourism and gender. For example, Laroche et al. (2001) pointed out that women are more concerned about the global environment than men, and Han et al., (2009) indicated that women experience greater emotional satisfaction when staying in sustainable accommodations, which makes them more likely to choose hotels with a green image. According to Skanavis and Sakellari (2008), this may be due to women’s higher level of ecological awareness, often influenced by their education. This factor and socialisation also play a key role in their commitment to sustainability. Moreover, as Spirito et al. (2024) highlight that women tend to lead projects that address environmental issues, motivated by the desire to protect natural resources and improve the well-being of their families.

In addition, and given that no previous studies have directly examined the relationship between the criteria weights using compositional analysis, it is interesting to analyse the association between the different criteria and gender. To do that, this work considers the results of the variation matrix, which contains the variances of the logarithms of the ratios between pairs of variables (Table 3). In the context of compositional data, this matrix provides information about how the variables are related to each other in terms of proportionality and relative variability (Ferrer-Rosell et al., 2022). CoDaPack uses a colour classification to provide a visual representation of the relative magnitudes of the variances. The colour shades represent different levels of association between the components. Dark blue indicates a very weak association, light blue a weak association, light red a moderate association and dark red a strong association.

Table 3 contains the variation matrix derived from AHP and BWM by gender. The results indicate that there is a weak relationship (Table 3a) or very weak relationship (Tables 3b, 3c, and 3d) between “Staff & service” and “Amenities” in both procedures. In contrast, the relationship between “Cleanliness” and “Property conditions & facilities” is notably strong, especially among females according to the BWM results (Table 3d). The results are consistent with those published by Hao & Har (2014), whose study shows that women preferred amenities such as cleanliness, bathroom and room style, access to shopping centres and fitness facilities.

**Table 3:** Male and female variation matrices obtained from the AHP and BMW weights.

## a) Male variation matrix AHP.

	Cleanliness	Staff & service	Amenities	Property conditions & facilities	Eco-friendliness
Cleanliness		0.874	0.977	1.640	1.222
Staff & service			0.436	0.820	0.574
Amenities				0.798	0.608
Property conditions & facilities					1.060
Eco-friendliness					

## b) Female variation matrix AHP.

	Cleanliness	Staff & service	Amenities	Property conditions & facilities	Eco-friendliness
Cleanliness		0.914	0.982	1.702	1.030
Staff & service			0.350	0.979	0.619
Amenities				0.946	0.620
Property conditions & facilities					1.025
Eco-friendliness					

## c) Male variation matrix BWM.

	Cleanliness	Staff & service	Amenities	Property conditions & facilities	Eco-friendliness
Cleanliness		0.702	0.703	0.985	1.122
Staff & service			0.471	0.724	0.866
Amenities				0.541	0.827
Property conditions & facilities					1.071
Eco-friendliness					

## d) Female variation matrix BWM.

	Cleanliness	Staff & service	Amenities	Property conditions & facilities	Eco-friendliness
Cleanliness		0.846	0.886	1.260	1.045
Staff & service			0.602	0.807	0.833
Amenities				0.824	0.827
Property conditions & facilities					0.949
Eco-friendliness					

Finally, when considering the environmental aspect in relation to other criteria, a strong relationship between the criteria “Eco-friendliness” and “Cleanliness” is generally observed (Tables 3a, 3c and 3d). These results indicate a positive correlation between the environmental measures adopted by accommodations and their hygiene standards, consistent with the findings of Moise et al. (2018). This suggests that lodgings which prioritize green practices tend to maintain higher levels of cleanliness, reflecting a stronger commitment to sustainability. Furthermore, the moderate relationship between these criteria corresponds with the findings of Aggarwal et al. (2024), Sharma (2024), and Skanavis & Sakellari (2008), among others, who highlighted that hygiene standards are linked to the perception of more sustainable accommodation.

## **6. Concluding remarks**

### *6.1 Theoretical and practical implications*

This paper provides several contributions to the tourism and hospitality literature. From a theoretical perspective, this work aims to determine the travel preferences of Gen Z given the criteria used by the OTAs, because although there are several studies that examine this generation and the OTAs, there is no literature connecting these two issues. Additionally, the environmental awareness of Gen Z is addressed through the criteria used by Expedia, which was the first OTA to introduce environmental aspects into its rating system.

In addition, within the framework of multi-criteria analysis, most papers focus on obtaining weights for the attributes of the accommodation options and generating a ranking of alternatives. However, these studies often fail to explore these weights in depth. For that reason, this contribution presents a new approach based on decision-making procedures and compositional data analysis. This combination allows for a comprehensive analysis of how this generation prioritises certain criteria when selecting accommodation.

Furthermore, this analysis reveals practical implications. Knowing travellers’ preferences helps accommodation options to adapt their offerings to the expectations of potential guests, which can improve their profitability and competitiveness in the marketplace. Similarly, the OTAs can refine their rating systems by focusing on aspects highly valued by young travellers, such as the accommodation’s conditions and facilities. This enables them to effectively segment the market, optimise their offers and personalise the user experience, facilitating their decision-making.

## *6.2 Limitations and future research*

This work contributes to both theory and practice. However, it also has some limitations. Although the sample size used in this contribution is representative and consistent with academic research on Gen Z, future studies could be conducted with individuals from different countries. This would allow a broader and more diverse understanding of the attitudes and behaviours of this generation.

Regarding the analysis of the weights, this paper has obtained the weights of the criteria through the multi-criteria procedures AHP and BMW. In our approach, the estimation of confidence intervals for these weights was not considered. The software used for the analysis, CoDaPack, currently does not allow for their use. It only accepts integer values. However, it would be interesting for future research to incorporate interval weights in this type of analysis.

In addition, this study focuses on the Expedia Group, which has recently introduced environmental dimensions on its website. However, as mentioned above, there is growing concern about environmental sustainability and many accommodation options are taking steps to improve this aspect. In this regard, some OTAs allow accommodation options to display their third-party sustainability-related certifications, such as Green Key Global, European Ecolabel or Leadership in Energy and Environmental Design (LEED), among others. It is still early to evaluate the impact that environmental aspects may have on the evaluation criteria of OTAs. Nevertheless, it would be interesting for future research to expand this analysis to OTAs that include these certifications.

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## Appendix

Table A.1: An overview of the OTAs based on the criteria and overall scores displayed on their websites.

OTA	Displays an overall score for individual reviewers	Display an overall score for each accommodation	Criteria displayed with the overall score of each accommodation	Scale and procedure to calculate the overall score of each accommodation
Agoda	X	X	Location, cleanliness, service, value for money, room comfort and quality, facilities	Scale 1-10. Arithmetic mean of scores given to each criterion
Airbnb	X	X	Cleanliness, accuracy, check-in, communication, location, value	Scale 1-5. Arithmetic mean of the overall scores given by individual reviewers
Booking.com	X	X	Staff, facilities, cleanliness, comfort, value for money, location, free WiFi	Scale 1-10. Arithmetic mean of the overall scores given by individual reviewers
Expedia	X	X	Cleanliness, staff and service, amenities, property conditions and facilities, eco-friendliness	Scale 1-10. Arithmetic mean of the overall scores given by individual reviewers
HRS	Depends on website version	X	Friendliness of the staff, how willing were staff to help?, room configuration, size of room, cleanliness, sleep comfort, atmosphere at the hotel, quality of breakfast, sanitary equipment, restaurant quality, value for money	Scale 1-10. Arithmetic mean of the overall scores given by individual reviewers
Trip.com	X	X	Location, cleanliness, amenities, service	Scale 1-5. Arithmetic mean of scores given to each criterion