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An Evaluation of the Importance of Smart Tourism Tools in the Riobamba Canton, Ecuador

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Abstract: The use of the state-of-art information and communication technology has been found to enhance the effectiveness and sustainability of the tourism industry and many countries have chosen to implement smart tourism tools as a strategy to adapt to the continuously changing profile of tourists. While there are many tools which could be implemented for such endeavors, the evaluation of the tourist preferences in relation to their use and importance needs to be done so as to ensure at least the sustainability of investments and of the local development strategies. The Chimborazo Fauna Reserve (canton of Riobamba, Ecuador) was selected for the application of a questionnaire survey to evaluate the importance of 38 smart tourism tools based on the experience of Ecuadorian and international tourists with them. The survey considered more than 700 respondents and 500 valid questionnaires were retained for analysis which was done mainly by developing distributions of the relative frequencies of ratings given on a 5-point Likert scale and by a correspondence analysis at the level of two subsamples: national and international tourists. There were obvious differences between these two groups in terms of importance placed on the smart tourism tools. The first difference was that the Ecuadorian tourists found less utility in the smart tools as compared to the international tourists. The second difference was that the best rated tools in terms of importance were different among the two groups, with the international tourists placing, for instance, more importance on safety-related tools. Correspondence analysis has shown the similarities of profiles and data association, being a useful tool of associating the ratings to the evaluated tools. The knowledge gained by the survey may be helpful in supporting the development of local tourist strategies, providing at the same time valuable data to support preference comparisons with other tourist destinations and countries.

Keywords: smart tools; sustainable tourism; Ecuador; importance; survey; statistics; differences

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1. Introduction

Tourism is an important component in the development processes of many countries [1,2], and it is a key driver of economic growth, inclusive development and sustainability worldwide [3]. As an industry, tourism contributes significantly to the countries' foreign exchange reserves and provides direct and indirect job opportunities to a broad segment of the population [4]. Its multiple links with the rest of the economic activities favors the creation of productive chains, since it requires a great variety of goods and services [5]; however, it can have environmental impacts and cause social and territorial differentiation, among other problems [6]. The World Tourism Organization asserts that sustainable tourism should include economic, sociocultural and environmental aspects for all types of tourism [7]. In this context, many of the research on sustainable cities and

tourism has proposed that the future of cities and tourist development should take a sustainable approach [8], and scholars have developed sustainability indicators for different contexts and industries [9]. The sustainable tourism indicators [10] can help assessing the impacts and taking actions to improve the tourism industry [11]. In addition, developing and using sustainability indicators allow managers to monitor and assess the sustainability of a tourist destination [12].

The rapid development of the tourism industry can boost the economy of the local tourist destinations [13]. Many countries in the world (e.g., Canada, China, Thailand and Turkey) have given priority to the development of the tourism industry and regard it as a vital part of the national economy [14]. In South America, countries such as Colombia, Ecuador and Peru have developed tourist activities which are mainly related to the presence of the Andes Mountains and of the Amazon region [15]. In particular, Ecuador holds many landscape- and culture-based opportunities to develop its tourism industry. The Coast, Andes, Amazon and Insular Regions provide tourism opportunities related to the sun and beach, ecotourism, agrotourism, ethno-tourism and community-based tourism [16], while the country is characterized by its huge natural and cultural diversity, which makes it an important tourist destination worldwide [17]. The above-mentioned context has enabled the development of several tourist activities in the country. Currently, about 35% of Ecuadorians purchase products or services over the Internet, tourism services being one of the categories with the highest consumption [18]. The province of Chimborazo hosts many tourist attractions belonging to the natural and sociocultural categories and attracts a considerable number of national and international tourists year after year [19]. Within the province, the Riobamba Canton is known to hold tourist attractions with a lot of potential and the Development Plan of Riobamba "20–30" indicates that the cantonal government seeks to use the latest technologies to enhance the attendance to these attractions in the next 10 years [20]. In addition, the digital technological revolution highlights the importance of investing in the most appropriate state-of-art technologies [21] to become a smart tourism destination, which is an aspiration for any competitive city; however, this development path is not easy; on the contrary, it is very complex and demanding [22].

In recent decades, information technology has gained a lot of momentum in shaping the sustainability of tourism, even as a tool for evaluation. In this context, it is important to mention that the tourists have become more demanding and informed, and they have discovered new ways of searching for information [23]. It has been found that these changes have shaped a digital tourist [24], so the traditional tourism industry is in urgent need of digital technologies for cost reduction and efficiency enhancement [25]. In addition, the COVID-19 outbreak and periods of lockdown modified not only the ways in which tourists search for destination information [8], but also heightened the need for digital tools that allow for monitoring the flow of consumers and citizens [26]. As such, technology, as an interaction point between tourists and destinations, could be a key aspect of the recovery of tourism sector [27].

The emergence of smart tourism destinations has been influenced by technology, whereas the visitors have become smart visitors [28]. In addition, the innovation in the tourism sector is linked to the use of information and communication technologies [29]. E-tools can seemingly facilitate new forms of knowledge sharing and communication [30], as they can be used to gather detailed place-based information and citizen and expert knowledge and to facilitate dialogue between a variety of stakeholders [31]. Recently, studies on smart tourism suggested that technology is the key to improve a destinations' competitiveness [32], while the use of smart technologies has been found to be important in a complete tourist experience, starting from trip planning and ending with tourists staying at a given destination [33]. Accordingly, changing the tourist attractions into "smarter" ones has been seen as a way of improvement, since the design of tourism experiences and the way that they are delivered and consumed have profoundly changed [34].

In the context of an increasingly globalized and competitive market, it is up to the management of tourist destinations to develop innovative and sustainable strategies to

ensure the best possible results over time. On the one hand, the implementation of the smart city model in tourist towns to sustain their transition to smart destinations implies an unavoidable commitment and support from various sectors [35]. On the other hand, it is to be expected that some tourists will find utility only in a part of the technology that can characterize a smart city, seeking during their vacations, rather, ways to disconnect from it. In many successful examples, adaptation to the requirements of an increasingly informed and demanding consumer has led to a transformation in the processes or in the tourist products offered. A constant evaluation of the utility and importance of these digital tools is therefore required as a means of adaptation to business changes and to gain awareness on the emergence of new business niches. Accordingly, data are needed to support decisions on development so as to find the balance between capital investments and the actual or forecasted tourist needs in relation to smart technology.

The aim of this study was to evaluate the global importance of smart tourism tools as a means to gain information on decision making in the tourism industry of the Riobamba Canton. In this sense, the first objective of this study was to evaluate the importance given by the tourists on a set of smart tourism tools based on their previous experience with them. Based on the knowledge gained from the tourists, the second objective of the study was to formulate recommendations for potential solutions in the field of e-tourism, which could be introduced by the local government in the Riobamba Canton, as part of the activities initiated in 2020 for the development of the Smart City concept described in its Development Plan "20–30".

2. Materials and Methods

2.1. Study Area

Data collection activities were carried out in the proximity of Riobamba City, which is the capital of the Riobamba Canton and of the Province of Chimborazo (Figure 1), namely in the Chimborazo Fauna Reserve. The Riobamba Canton is one of the 221 cantons of Ecuador and is located in the center of the Inter-Andean region of the country [36]. Riobamba has five urban parishes, namely, Veloz, Velasco, Maldonado, Lizarzaburu and Yaruquies, and 11 rural parishes, namely, Licán, Calpi, San Juan, Cubíjíes, Quimiag, Cacha, San Luis, Punín, Licto, Flores and Pungalá [37]. The Riobamba Canton has a population of 225,741 inhabitants, which makes it the thirteenth most populated canton in the country [37].

Some of the Riobamba Canton's territory is located in protected areas such as the Chimborazo Fauna Reserve and the Sangay National Park, and the Chimborazo and the El Altar volcanos are among its main tourist attractions [38]. The main economic activities of the Riobamba Canton are agriculture, commerce, livestock, tourism and industry [20]. The climate in the Riobamba Canton is generally cold with variations of wet and dry periods [39]; still, the maximum daily temperature can reach up to 25 to 27 °C [35].

The reason for choosing the Chimborazo Fauna Reserve as a location for data collection was related to the object of the study which was the tourist cohort attending to the area. Chimborazo Fauna Reserve is one of the 62 protected areas of Ecuador's National System of Protected Areas featuring the Chimborazo volcano [40]. The mountain is characterized by an altitude of 6268 m.a.s.l., and it is the most visited and highly-rated tourist attraction by the locals and by the national and foreign tourists in the Chimborazo Fauna Reserve [41,42]. According to the latest available data, 127,853 tourists attended the Chimborazo Fauna Reserve in 2017, out of which 83% were nationals and 17% were foreigners [43].

2.2. Survey

The research was based on a questionnaire administered to two groups of tourists: national and foreign tourists who visited the Riobamba Canton over three months (April to June 2021). To estimate the sample size, a probabilistic formula was used at a confidence level of 95%, having as its input the number of tourists that visited the Chimborazo Fauna Reserve on the above-described categories (national and international). Following the use

of probabilistic formula, the required number of questionnaires was set at 415 and 85 for national and foreign tourists, respectively. The original questionnaire was designed in five sections to describe the sociodemographic features of the respondents, factors affecting their choice of destination, their previous experience with smart tourism tools, as well as to visually rate the most important tourist attractions in the Riobamba Canton.

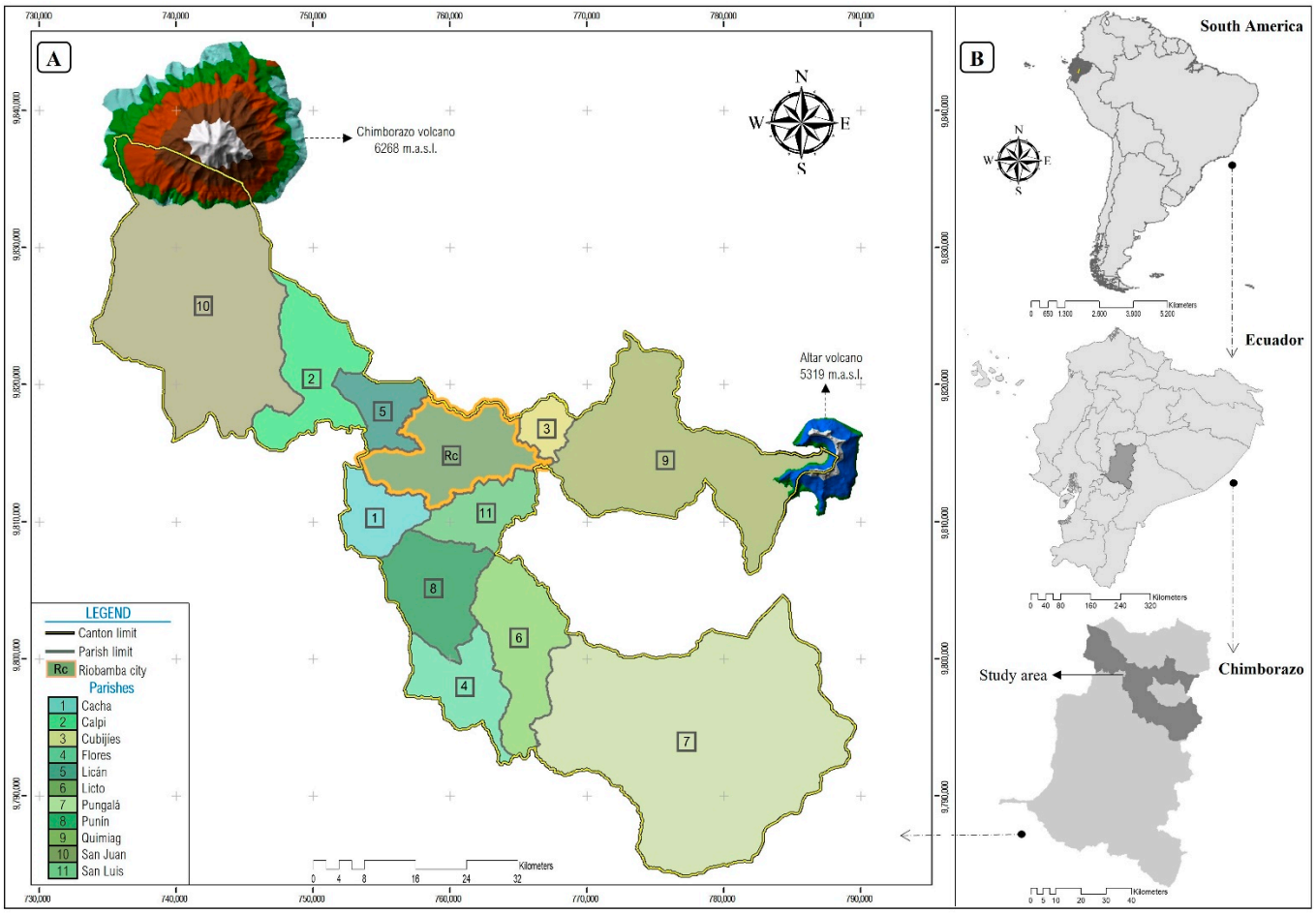


Figure 1. Location of the study area in South America and Ecuador.

For the purpose of this study, only the sociodemographic data and the experience with the smart tourism tools were retained for the analysis. Accordingly, the first part of the questionnaire contained sociodemographic data described by variables such as gender, ethnicity, provenance (place of origin), age, profession, marital status and education level. The questionnaire section characterizing the experience of the respondents with smart tourism tools was adapted based on the synthesis of smart tourism tools described by Wang et al. [34], who built and used for evaluation a list of 38 smart tools. The list of tools used in the questionnaire is given in the Table A1 along with the abbreviations used to analyze the data. In relation to the smart tourism tools, the respondents were asked to rate their importance based on their previous personal and family experiences, on a 5-point Likert scale (1 to 5), where 1 stood for "not important at all" and 5 stood for "very important".

Before starting the field data collection activity, the questionnaire was checked for consistency, then it was tested and refined by the team of the RETOUR research project working at the Escuela Superior Politécnica de Chimborazo, Ecuador. The final version of the questionnaire was printed in English and Spanish and then it was administrated in the field. The questionnaire was administrated by a face-to-face approach, and the questions and the meaning of the smart tools were explained to the respondents in detail. The

data collection activity included the administration of all the questionnaire to more than 700 respondents until reaching the computed sample of 500 fully filled-in questionnaires, of which 415 for national and 85 for international tourists. Field data collection activity lasted for three months, from April to June 2021, and it was conducted by a team of 15 field researchers. Incomplete questionnaires (ca. 200) were disregarded from the analysis part of the study.

2.3. Analysis

The data on sociodemographics were collected by the use of traditional methods, and therefore the analytical part of that data has followed the development of basic descriptive statistics such as the absolute and relative frequencies of the respondents on sociodemographic items and features. The data on the importance of smart tourism tools, on the other hand, were collected by using a Likert scale. Therefore, they were purely categorical. Two types of analytical procedures were applied to it, namely, the development of relative frequencies on responses (1 to 5 on the Likert scale) for each smart tourism tool and for each subsample of respondents (national and international tourists), which were complemented by similar statistics developed to account for potential differences given by the native language, gender, age, education level and marital status. In addition, a correspondence analysis was performed on the data belonging to the sample of tourists (N = 500), subsample of national tourists (N = 415) and subsample of international tourists (N = 85).

Correspondence analysis is an exploratory statistical technique which works well with one- or multi-way tabulated frequencies of categorical data [44], with the aim of reducing data dimensionality to a number of (most commonly used) two dimensions while preserving the explanation of most of the variance contained in a dataset. Frequency data contained in a contingency table are usually plotted in two dimensions to represent the profiles of the rows and columns; those row or column points which are grouped together indicate similar or close profiles of the data. Therefore, the method can be used to describe the association between the categories of the same variable. This property was used in this study to describe the association and similarity of ratings given by the respondents on the Likert scale (1 to 5) in relation to the smart tourism tools under evaluation. To be able to run the correspondence analysis, the data were prepared in the form of contingency tables that had, as rows, the frequency data on responses of 1, 2, 3, 4 and 5, respectively, and as columns, the tourist smart tools. Three contingency tables were prepared and used in the same way, namely, a contingency table for the tourist sample, a contingency table for the national tourists' subsample and a contingency table for the international tourists' subsample. Another property of the correspondence analysis is that it is a non-parametric technique based on the use of the χ^2 statistic, which is the weighted Euclidian distance that can be used to evaluate the closeness of the data points on a biplot, with the main aim to explain most inertia or variance in the least number of dimensions [44]. Typically, the representation of data is shown in the form of symmetric plots [45].

Data processing was done in Microsoft Excel, which was also used for a part of the data analysis tasks such as computing and plotting the relative frequencies of responses on tourist cohorts and smart tourism tools. Correspondence analysis was performed in R Studio by the use of the Factoshiny library. The choice and use of the Factoshiny library were based on the visual functionalities provided by running the analysis in a Shiny app. It enables graphical visualization and function changes, so as to build more customized graphs, as well as summary data export in the form of text files.

3. Results

3.1. Sociodemographic Data

Table 1 shows a breakdown of the main sociodemographic data as surveyed by this study. There was a relative balance between the male and female respondents which accounted for ca. 50% each in the tourist sample. Most of the respondents (ca. 82%)

belonged to the Metis ethnic group, and half of the respondents were local people. A number of 85 respondents were foreign tourists coming from the American continent and from other parts of the world. Most of the respondents have declared to be aged under 40 years old (ca. 69%) and to have completed the bachelor level of education (69%); most of them (ca. 47%) declared to be single. The dominant monthly income, as declared by respondents, was in between USD 401 and 1086 dollars.

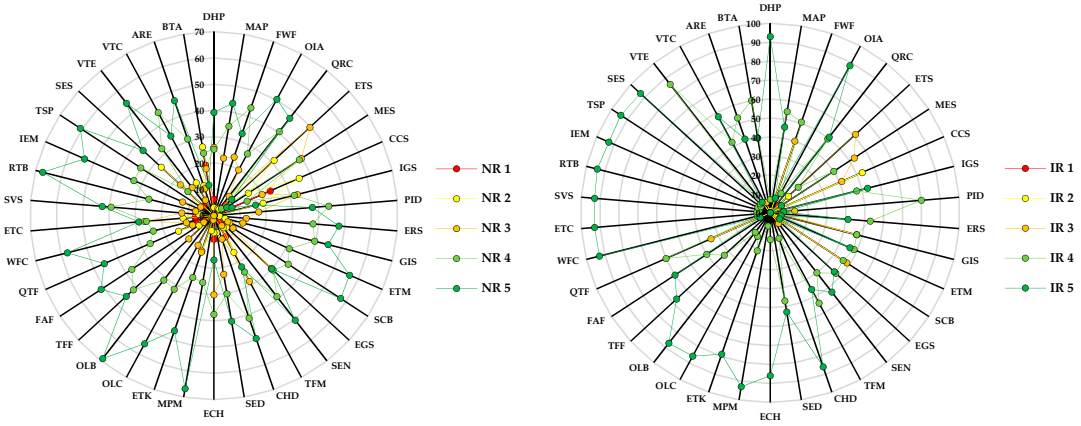
Table 1. Sociodemographic description of the sample taken into study.

Feature	Item	Total	
		N	%
Gender	Male	246	49.20
	Female	254	50.80
Ethnic group	Afro-American	9	1.80
	Caucasian	42	8.40
	Indigenous	41	8.20
	Metis	408	81.60
Provenance	Local	254	50.80
	National	161	32.20
	South American	43	8.60
	North American	33	6.60
	Other	9	1.80
Age	≤30 years old	193	38.60
	31–40 years old	154	30.80
	41–50 years old	97	19.40
	51–60 years old	46	9.20
	>60 years old	10	2.00
Level of education	Primary	2	0.40
	Secondary	46	9.20
	Highschool	107	21.40
	Bachelor or more	345	69.00
Marital status	Single	237	47.40
	Married	194	38.80
	Divorced	34	6.80
	Common law	13	2.60
	Widow (er)	22	4.40
Level of monthly income	USD ≤ 400	170	34.00
	USD 401–1086	207	41.40
	USD 1087–2172	90	18.00
	USD 2172–3258	7	1.40
	USD 3259–4344	6	1.20
	USD > 4344	20	4.00

3.2. Importance of Smart Tourism Tools

Figure 2 shows the results of the relative frequencies of scores attributed by the respondents to each of the 38 evaluated tourist smart tools. Figure 2a plots the results for the national tourist respondents, while Figure 2b plots the results for the international tourist respondents. As shown, there were evident differences in ratings. By considering the five-point ratings on the Likert scale, international tourists, for instance, placed more importance on tools such as the SES (smart emergency response system), TSP (traffic safety protection), IEM (intelligent environment monitoring), RTB (real-time traffic broadcast), SVS (smart vehicle scheduling), WFC (weather forecast), DHP (destination homepage) and MPM (mobile payment). Five-point responses were given by more than 90% of the international tourists for these tools; an important share of the international tourists (more than 60%) have also rated other tools as being highly important (five points) such as the FAF (festival-activity forecast), TFF (tourist-flow forecast), OLB (online booking), OLC

(online coupons), ETK (electronic-ticketing system), ECH (e-complaint handling), CHD (crowd handling) and OIA (online information access).



(**a**) (**b**)

Figure 2. Relative frequencies of ratings on smart tourism tools for the national (**a**) and international (**b**) tourists. Legend: N—national, I—international, R—rating, 1 to 5—value of the rating; The abbreviations of smart tourism tools shown on the radar charts are explained in Table A1.

At the opposite side, as evaluated by the national tourists, tools such as the RTB (real-time traffic broadcast), OLB (online booking) and MPM (mobile payment) received the most five-point answers (more than 70% of the respondents). As a baseline, the smart tourism tools seemed to be more important for the international tourists compared to the national ones. In addition, tools such as the BTA (blog of tourist attractions), ARE (augmented reality), VTC (virtual travel community), QTF (queuing-time forecast), QRC (quick response code), ETS (electronic touchscreen), MES (messaging services), IGS (intelligent guide system), SED (smart education), TFM (tourist flow monitoring), SEN (smart environment), EGS (electronic-entrance guard system), GIS (guiding information system), ERS (e-tourism recommendation system), MAP (mobile application) and FWF (free Wi-Fi) were poorly rated as unimportant by both groups of respondents. In addition to these, the national tourists have given poor ratings for the PID (personal itinerary design) and ECH (e-complaint handling) tools, while the international tourists have given poor ratings to the SCB (smart card band) and ETM (e-tour maps) tools.

In relation to the native language (Figure A1), the relative frequencies of responses on the importance of smart tourism tools have shown a distribution which was similar to that of the two tourist subsamples (Figure 2). In both cases the differences were obvious and statistically significant (*t*-test, $p < 0.05$, $\alpha = 0.05$, full data not shown herein), confirming rather the effect that tourist subsample had on the relative frequencies of ratings. In contrast, the data shown in Figures A2 and A3 indicate rather similar profiles in responses given by male and female tourists and in those coming from different age groups. In the case of age groups, the main observation was that while the rating profiles showed a similar trend in terms of smart tourism tools, there were some differences in the magnitude of ratings measured by the distribution of relative frequencies. For comparison, Figures A4 and A5 show a breakdown of the data on education level categories and marital status.

3.3. Data Association and Similarity by the Correspondence Analysis

The results of the correspondence analysis are given at the three data aggregation levels (tourist sample, national tourists subsample and international tourists subsample) in Figure 3, in the form of symmetric plots. Additional information which may help in evaluating the associations and similarity of data as results of the correspondence analysis are given in Figure A6 (cos2—quality of representation on the factor map) and A7

(contribution values to the definition of dimensions). In addition, Table 2 shows the main statistics of the correspondence analyses at these three levels. The results of the χ^2 tests (not shown herein, $p = 0$) have indicated that there was a strong association (link) between the rows and the columns, irrespective of the case taken into analysis. While four (national and international tourists subsamples) and nine (tourist sample) dimensions were output to explain 100% of the variance (data not shown herein), in all three cases, a solution with two dimensions has been kept because its use has explained ca. 70 to 87% of the variance (Table 2), a situation which stands for a good dimension reduction as indicated by the literature [46].

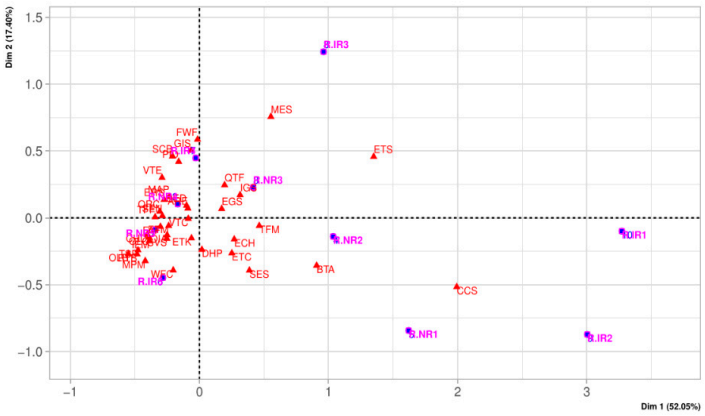
Table 2. Statistics of the correspondence analysis.

Analysis Level	Dimensions	Eigen Values	Explained Variance [%]	Cumulated Variance [%]
Tourist sample	Dimension 1	0.261	52.05	52.05
	Dimension 2	0.087	17.40	69.45
National tourists subsample	Dimension 1	0.257	68.49	68.49
	Dimension 2	0.066	17.55	86.04
International tourists subsample	Dimension 1	0.633	56.71	56.71
	Dimension 2	0.334	29.88	86.59

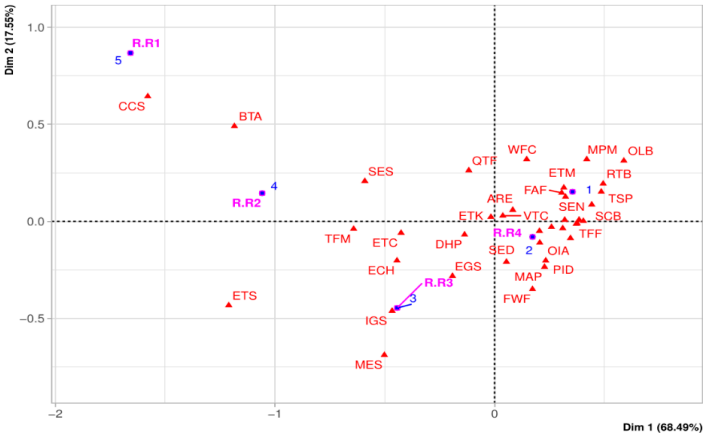
Figure 3a shows the global pattern in data when using the tourist sample for the correspondence analysis. Row profiles are represented by the blue squares and column profiles are represented by the red triangles. Almost 70% of the variance was explained by the two-dimensional solution. A general observation is that ratings of one, two and three points were rather dissimilar among the two subsamples (national and international tourists) while ratings of four and five points were closer together and therefore more associated (similar profiles). A better interpretation of the data may be done by analyzing the results shown in Figure 3b,c. In Figure 3b, for instance, which shows the global data pattern for the national tourists, it can be seen that ratings of one and two points were generally associated with CCS (call center service), BTA (blogs of tourist attractions) and SES (smart emergency response system) tools, but they had rather dissimilar profiles in responses. Neutral ratings (three points) were more associated to TFM (tourist flow monitoring), ETC (electronic toll collection), ECH (e-complaint handling), DHP (destination homepage), EGS (electronic-entrance guard system), IGS (intelligent guide system) and MES (messaging systems) tools, while the ratings of four and five points were associated with the rest of the tools, which were clustered around these ratings.

Obvious differences were found in the case of the international tourists' subsample (Figure 3c). While the explained variance was quite the same as for the national tourists' subsample for a solution with two dimensions (Table 2), ratings of one and two points were mostly associated with the CCS (call-center service) tool, sharing a rather similar profile, and ratings of three points were mostly associated with tools such as the SCB (smart card band), MES (messaging systems), GIS (guiding information system) and FWF (free Wi-Fi). However, ratings of four and five points were associated with the rest of the smart tourism tools. These results, as well as the results from the national tourists, were consistent with the data shown in Figure 2. However, the utility of the correspondence analysis was that it mapped the data in a lower-dimensional space, which enabled the visualization of data association and similarity. As an example, the distances between the column profiles may be useful in evaluating the data similarity of the tourist smart tools under evaluation, helping to see which profiles and to what extent they were similar. As such, in the case of the international tourists' subsample, the CCS (call-center service) tool stood apart in terms of similarity and it was poorly rated as important. ETK (electronic ticketing system), FAF

(festival-activity forecast), TFF (tourist flow forecast) tools, on the other hand, were found to have similar profiles among the international tourists' subsample and were among those better rated. The quality of representation on the factor map, measured by the squared cosine (cos2), and the contribution of values to the definition of dimensions (ctr) are plotted in Figures A6 and A7. The squared cosine, for instance, measures the degree of association between rows and columns on a particular axis, taking values between 0 and 1.



(**a**)



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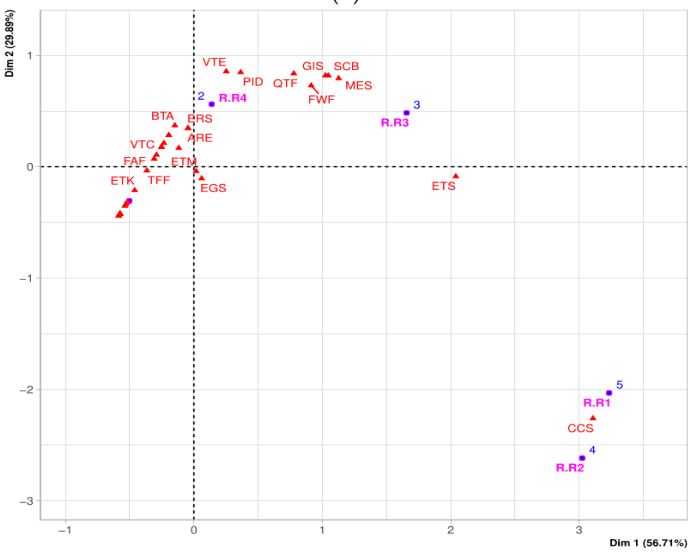

(**c**)

Figure 3. Results of the correspondence analysis performed at the sample level (**a**), national tourists

subsample level (**b**) and international tourists subsample level (**c**). Legend: R.IR—rating, international tourists; R.NR—rating, national tourists; R.R—rating; 1 to 5—values of ratings. The abbreviations of the smart tourism tools are given in Table A1.

4. Discussion

The development of smart tourism has become popular in recent years [34] due to the emergence of new market segments where the need to use digital tools has gained a lot of importance [47]. In relation to the above-mentioned, this study evaluated the importance given by the tourists to the smart tourism tools based on their previous personal and family experiences, indicating that, in general, the smart tourism tools are important for tourists. However, the degree of importance as well as the importance placed on given tools has led to the formalization of at least two separate groups, namely national and international tourists. Depending on their needs, tourists employ a wide range of e-tools, such as websites, travel blogs, recommendation systems, virtual communities or mobile technologies, to facilitate their leisure activities [48]. In this context, a study carried out by Buhalis and Law [23] indicates that the tourist demands in the information age are related to the search for preferences and personal travel schedules, time valuing and with less willingness to wait or endure delays and to search for travel-related information on the Internet. In addition, the tourists are sharing their travel experiences by electronic word of mouth (e-WOM), through the Internet of Things (IoT) and social network services (SNS), which can prove crucial in the realm of virtual shared experiences [49]. Related to these recent findings, this study brings empirical evidence that the Ecuadorian tourists found less utility in the smart tools as compared to the international tourists. For instance, the national tourists placed more importance on the RTB (real time traffic broadcast), OLB (online booking) and MPM (mobile payment), while the international tourists have shown preferences mainly for SES (smart emergency response system), TSP (traffic safety protection), IEM (intelligent environment monitoring), RTB (real-time traffic broadcast), SVS (Smart vehicle scheduling), WFC (Weather forecast), DHP (Destination homepage) and MPM (Mobile payment). These differences in the given importance can probably be attributed to the fact that in Ecuador, and particularly in the city of Riobamba, these types of smart tools have not yet been implemented and which are perhaps already very common in other countries. However, there might be some commonalities among different tourist groups, namely the development and use of digital applications with the purpose of providing promptly all the necessary information for planning the whole trip with an emphasis on staying at the tourist destination [47].

Many parts of the world increasingly recognize smart tourism as a strategy for sustainable environments [50]. The study carried out by Shen et al. [51] explored the influence of smart technologies on tourists in prospective phase (pre-visit), active phase (on-site, the visit itself) and reflective phase (post-visit). Their results indicate that the influence of smart technologies was significant in all three phases. A second study by Gajdosik [33] about the complete tourist experience indicates that the use of smart technologies is significant before the trip and during the stay in the destination. In addition, a study by Ali and Frew [52] evaluated the information and communication technology (ICT) tools that tourists use as ranked in their order of importance: destination management systems, intelligent transport systems, environment management information systems, location-based services, global positioning systems, geographical information systems, community informatics, carbon calculators, virtual tourism and computer simulation. Their results emphasize the importance of smart technologies in tourist activities. Our study did not evaluate the smart tourism tools by phases; however, it confirms the results of these previous studies and indicate that many smart tourism tools are important for respondents in their holidays judged as a general context.

An obvious benefit of using the correspondence analysis to evaluate the ratings of the tourists was that it plotted the data in a lower-dimensional space, allowing us to make interpretations on data association and similarity. The solution including both cohorts of

tourists and their ratings has indicated a similarity in the four- to five-point ratings, placing most of the smart tools around these ratings. However, a direct association between the row and column profiles is difficult and unrecommended to make on a symmetric plot [45]. Therefore, these associations could be seen as being rather indicative and informative. The plots developed separately for the national and international tourists have proven a lower (indicative) association of the ratings of one and two points with the evaluated tourist smart tools. In addition, the placement of the column profiles on the symmetric plots was different when comparing the national and international tourists and their column profiles. For the international tourists, the column profiles seemed to be grouped closer to the plot origin, therefore indicating that most of the evaluated tools were closer in frequency to the average column profile. Accordingly, the ratings of 1 and 2 were located far apart from origin if compared to the national tourist group, therefore they were different from the average row profile. For the same tourist cohort, the results of the correspondence analysis indicated a higher similarity of the column profiles as opposed to the national tourist cohort. These results are consistent with the frequencies given in Figure 2 and show the data association and similarity in a better way, allowing also for a better interpretation.

The Chimborazo volcano is the most frequented tourist attraction in the Chimborazo Fauna Reserve [41,42], while the Altar volcano is the most frequented one in the Sangay National Park [53] by national and foreign tourists. Based on the results of this study, we believe that local governments of Chimborazo province should join forces to develop, promote and implement smarts tourism tools related mainly to the safety, e-tolls and mobile payment as first priorities for these tourist attractions. Acknowledging that the implementation of the smart tourism tools could be expensive, a priority is needed in their deployment, and with proper planning, they could be implemented to other tourist attractions in the Riobamba canton in the next years. While some technology may be costly, many options have reasonable prices, and the range of available choices is broad enough to be feasible for any local government [54]. In addition, it is worth mentioning that mobile applications are tools that after their implementation usually require little financial input, apart from the costs of maintenance and further development [55]. Very few similar studies were found in the international literature, although many studies have been found to deal with smart tourism and smart tourism tools [8,19,21,23,25,29,34,47,48] and there is a fact that such studies are lacking in Ecuador. For this reason, it is recommended to find innovative ways of increasing the frequency of collecting relevant tourist data so that the local tourist industry can be more connected to the requirements of the tourists, making it able to update its offerings on smart and sustainable tourist products, an approach that could be helpful since a successful implementation of smart tourism destinations has the potential of attracting foreign direct investment, thus ensuring sustainable development [56]. The consumption, use of technology and the behavior and preferences of tourists are constantly evolving, which represents one of the most important challenges that tourism activity must face in the Riobamba Canton in the midst of the digital age. With the active participation of all tourism stakeholders, the implementation of smart tourism tools can be promoted to adjust to the growing demand.

The tourism must be sustainable in its environmental, economic and sociocultural dimensions [57], and information and communication technology (ICT) has been found to be an ideal contributor to sustainable tourism [58]. For instance, a study carried out by Zejda and Zelenka [59] concluded that ICT has been promoted as a tool enhancing information sharing and user participation, which may be used to gain community inputs and to support the collaboration among stakeholders, aiding in this way the development of sustainable tourism. Another study by Ahvenniemi [60] mentioned that the use of smart tools can improve the human and social welfare and the economic variables. Our research confirms the above-mentioned findings in an indirect way by showing that the use of smart tools in nowadays of a great importance for tourist activities, even though there were differences between national and international tourist groups and between the types of tools rated to be the most important.

As with any other study on the topic, this study may be characterized as having some limitations. The first limitation is that no detailed statistical comparison tests were implemented to check possible significant differences between the respondents as an effect of their belonging to given sociodemographic groups, while similar studies have shown that significant differences may be in question at least as an effect of the gender, occupation and level of income [41]. Excepting those cases in which a visual inspection of the data has raised the question on significant differences (i.e., native language, tourist subsample), this step was omitted due to the fact that the data dimensionality was quite high (31 sociodemographic items by 38 evaluated tools). However, we believe that the main data distribution was properly explored by the relative frequencies of the two tourist subsamples and by the correspondence analysis (more than 70% of the variance explained). Another potential issue is that related to the structure of attendees to the Chimborazo Fauna Reserve during the field data collection activity which might have biased to some extent the results reported herein. However, little control could be exercised by the research team to overcome this outcome since it was the effect of the pandemic restrictions set at the international level; still, the respondents belonging to the international group were located in most parts of the world. Given the restrictions, the dominance of local tourists in the sample (ca. 50%) was practically impossible to avoid and we acknowledge that this subsample could have had a different perspective and understanding over the importance of the evaluated smart tourism tools. To mitigate this, every possible action was taken by the field research team during data collection such as providing clear and detailed explanations for each evaluated tool via face-to-face interviews.

5. Conclusions

This research provides evidence on the fact that there are differences in terms of importance of smart tourism tools, as evaluated by different tourist cohorts (nationals and internationals, from an Ecuadorian perspective) in relation to their leisure time. The first difference was that the Ecuadorian tourists found less usefulness in smart tools compared to international tourists. The second difference was that international tourists found utility in given categories of smart tools which did not had the same relevance for national tourists. A good example here is that the international tourists rated the importance of tourism tools related to the safety and security of destinations consistently better. Based on these outcomes, it is evident that some priority should be given to the development and implementation of the smart tourism tools in the area of study. At least the development scenarios and plans of the area of study need to be adapted by considering the preferences of tourists, but similar evaluations might be needed at the international level to balance the development measures with the tourist demand. Accordingly, evaluations such as those included in this study may produce useful data for local planning and development, while the utility of evaluations and data may be relevant for many other countries and regions. On the one hand, in relation to local tourism planning and development, similar studies could provide useful data for association with the basic profiles of tourists attending a given destination, which then can be used, by extrapolation, to evaluate the options for the development and implementation of smart tourist tools; the data reported herein, on the other hand, can serve, at the least, for making comparisons with other tourist destinations which share similar or contrasting features, assuming that similar data would be available for the latter. As a measure to characterize in more detail the differences in ratings while preserving the typical sociodemographic structure of the tourists in a given area, further studies should implement more detailed statistical tests and some more advanced control strategies over the samples and individuals taken into study.

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Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Each respondent was informed in detail about the objectives of the study and how the data will be used. Each responded agreed verbally to participate in the study under an anonymity clause.

Data Availability Statement: All the data supporting this study may be made available on the request of the first and seconds authors of the study.

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Conflicts of Interest: The authors declare no conflict of interest.

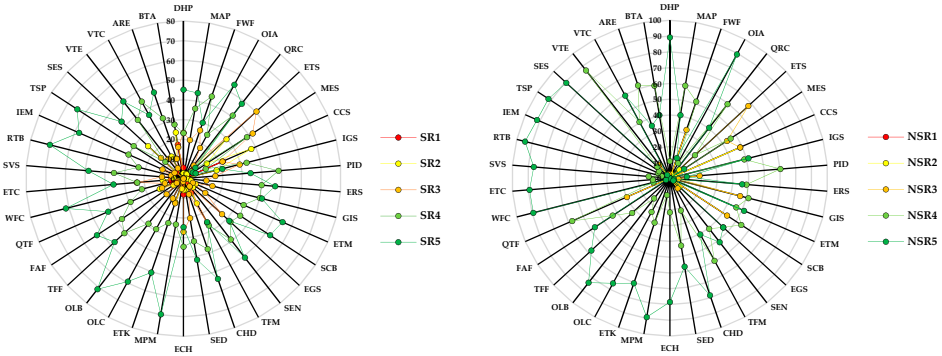
Appendix A

Table A1. Smart tourism tools. Source: adapted from [34]. Note: the questionnaire contained an adaptation of the description given in [34].

Smart Tourism Tools	Abbreviation Used in This Study
Destination homepage	DHP
Mobile application	MAP
Free Wi-Fi	FWF
Online information access	OIA
Quick response code	QRC
Electronic touchscreen	ETS
Short-messaging service and multi-media messaging service	MES
Call-service center	CCS
Intelligent-guide system	IGS
Personal itinerary design	PID
E-tourism recommendation system	ERS
Guiding information service	GIS
E-tour map	ETM
Smart card (band)	SCB
Electronic-entrance guard system	EGS
Smart environment	SEN
Tourist-flow monitoring	TFM
Crowd handling	CHD
Smart education	SED
E-complaint handling	ECH
Mobile payment	MPM
Electronic-ticketing system	ETK

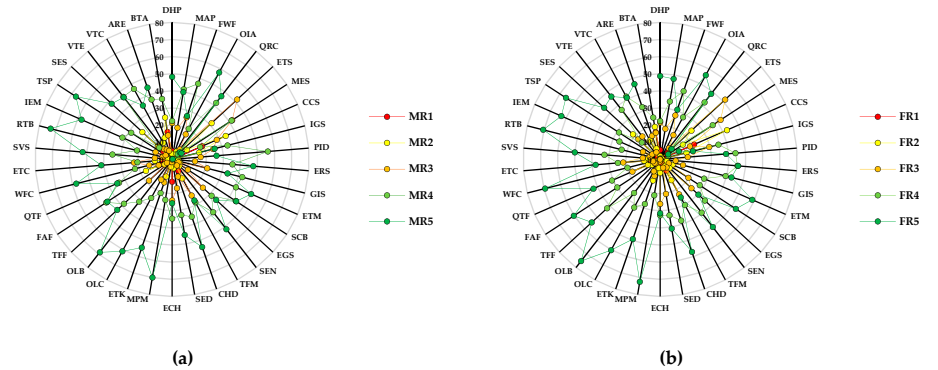
Table A1. *Cont.*

Smart Tourism Tools	Abbreviation Used in This Study
Online coupons	OLC
Online booking	OLB
Tourist-flow forecast	TFF
Festival-activity forecast	FAF
Queuing-time forecast	QTF
Weather forecast	WFC
Electronic toll collection	ETC
Smart vehicle scheduling	SVS
Real-time traffic broadcast	RTB
Intelligent-environment monitoring	IEM
Traffic-safety protection	TSP
Smart emergency response system	SES
Virtual tourism experience	VTE
Virtual travel community	VTC
Augmented reality	ARE
Blogs of tourist attractions	BTA



(**a**) (**b**)

Figure A1. Relative frequencies of ratings on smart tourism tools for Spanish (**a**) and non-Spanish (**b**) speaking tourists. Legend: S—Spanish speaking, NS—non-Spanish speaking, R—rating, 1 to 5—value of the rating; the abbreviations of smart tourism tools shown on the radar charts are explained in Table A1.



(a) **(b)**

Figure A2. Relative frequencies of ratings on smart tourism tools for male (**a**) and female (**b**) tourists. Legend: M—male, F—female, R—rating, 1 to 5—value of the rating; the abbreviations of smart tourism tools shown on the radar charts are explained in Table A1.

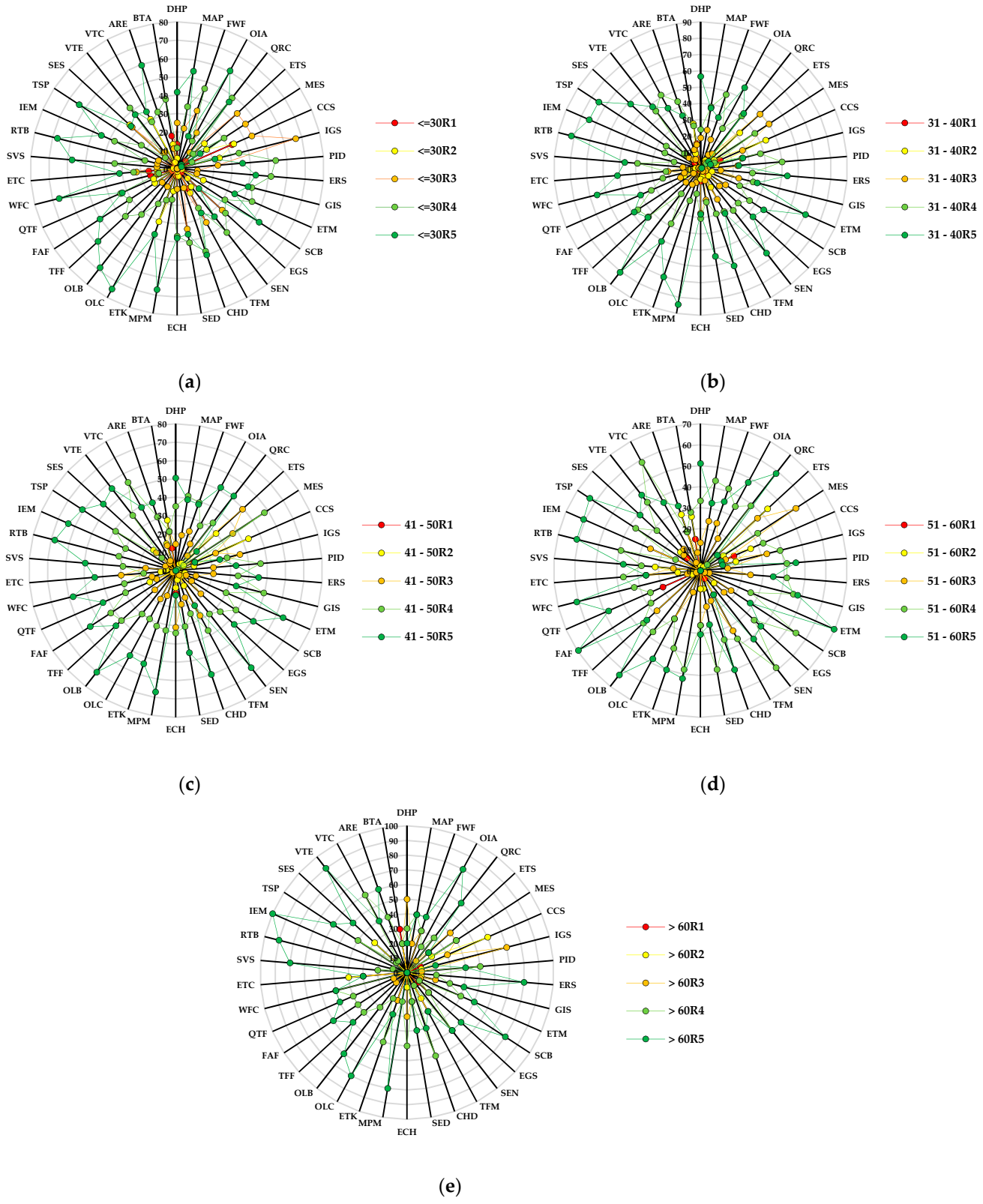


Figure A3. Relative frequencies of ratings on smart tourism tools in relation to the age group: up to 30 years old (**a**), 31 to 40 years old (**b**), 41 to 50 years old (**c**), 51 to 60 years old (**d**) and more than 60 years old (**e**). Legend: R—rating, 1 to 5—value of the rating; the abbreviations of smart tourism tools shown on the radar charts are explained in Table A1.

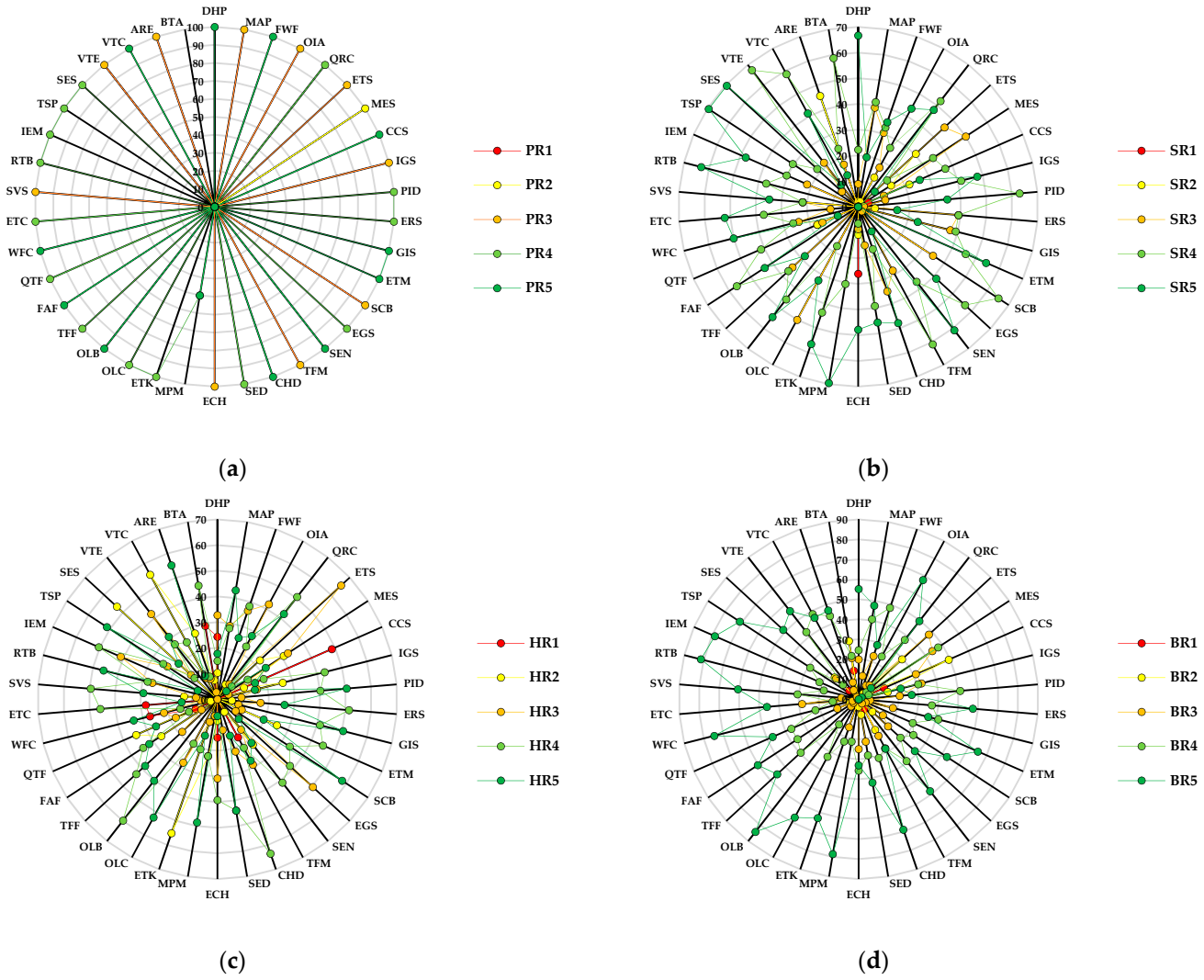


Figure A4. Relative frequencies of ratings on smart tourism tools in relation to level of education: primary (**a**), secondary (**b**), high school (**c**) and bachelor's or more (**d**). Legend: P—primary, S—secondary, H—high school, B—bachelor's or more, R—rating, 1 to 5—value of the rating; the abbreviations of smart tourism tools shown on the radar charts are explained in Table A1.

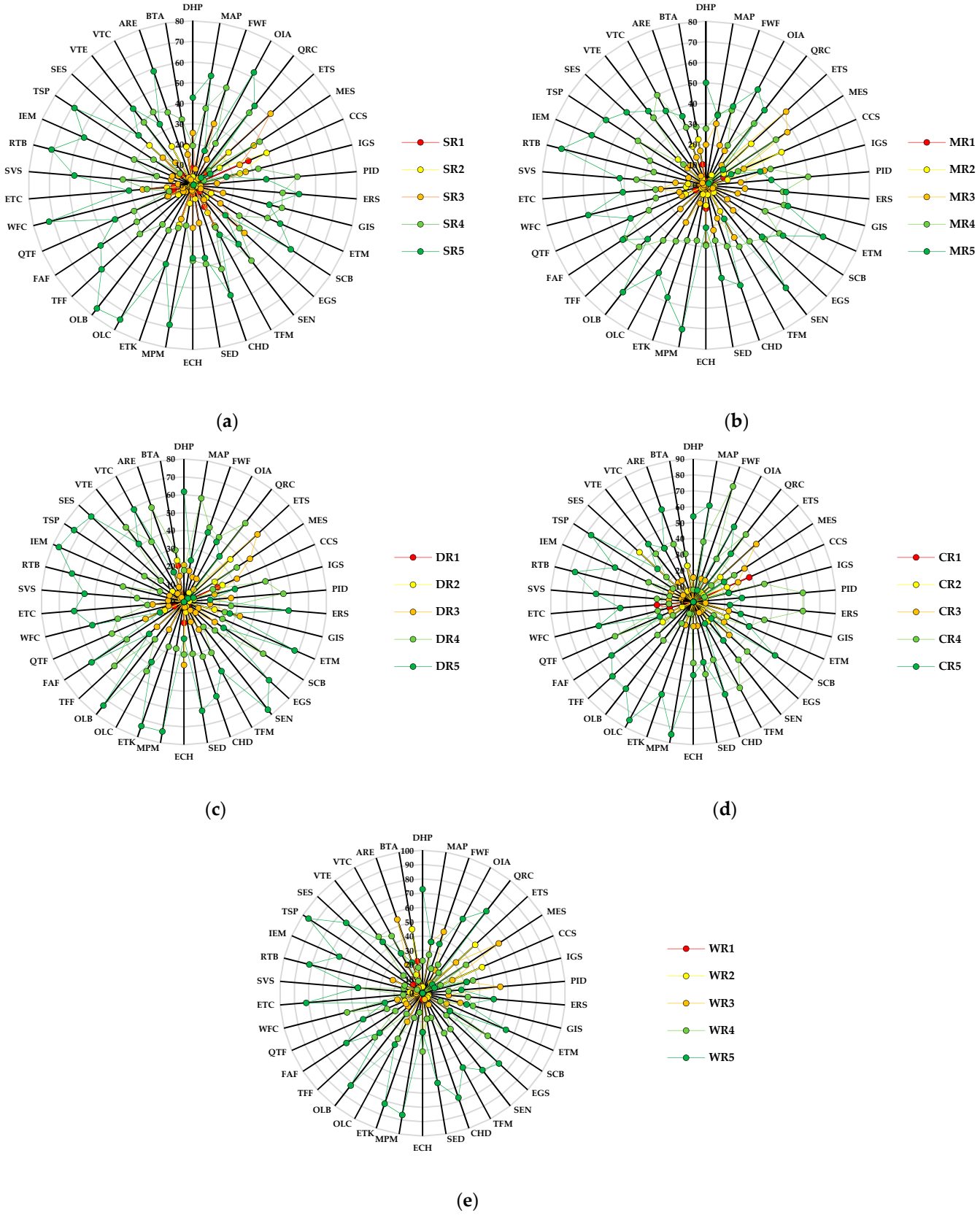


Figure A5. Relative frequencies of ratings on smart tourism tools in relation to marital status: single (**a**), married (**b**), divorced (**c**), common law (**d**) widow(er) (**e**). Legend: S—single, M—married, D—divorced, C—common law, W—widow(er), R—rating, 1 to 5—value of the rating; the abbreviations of smart tourism tools shown on the radar charts are explained in Table A1.

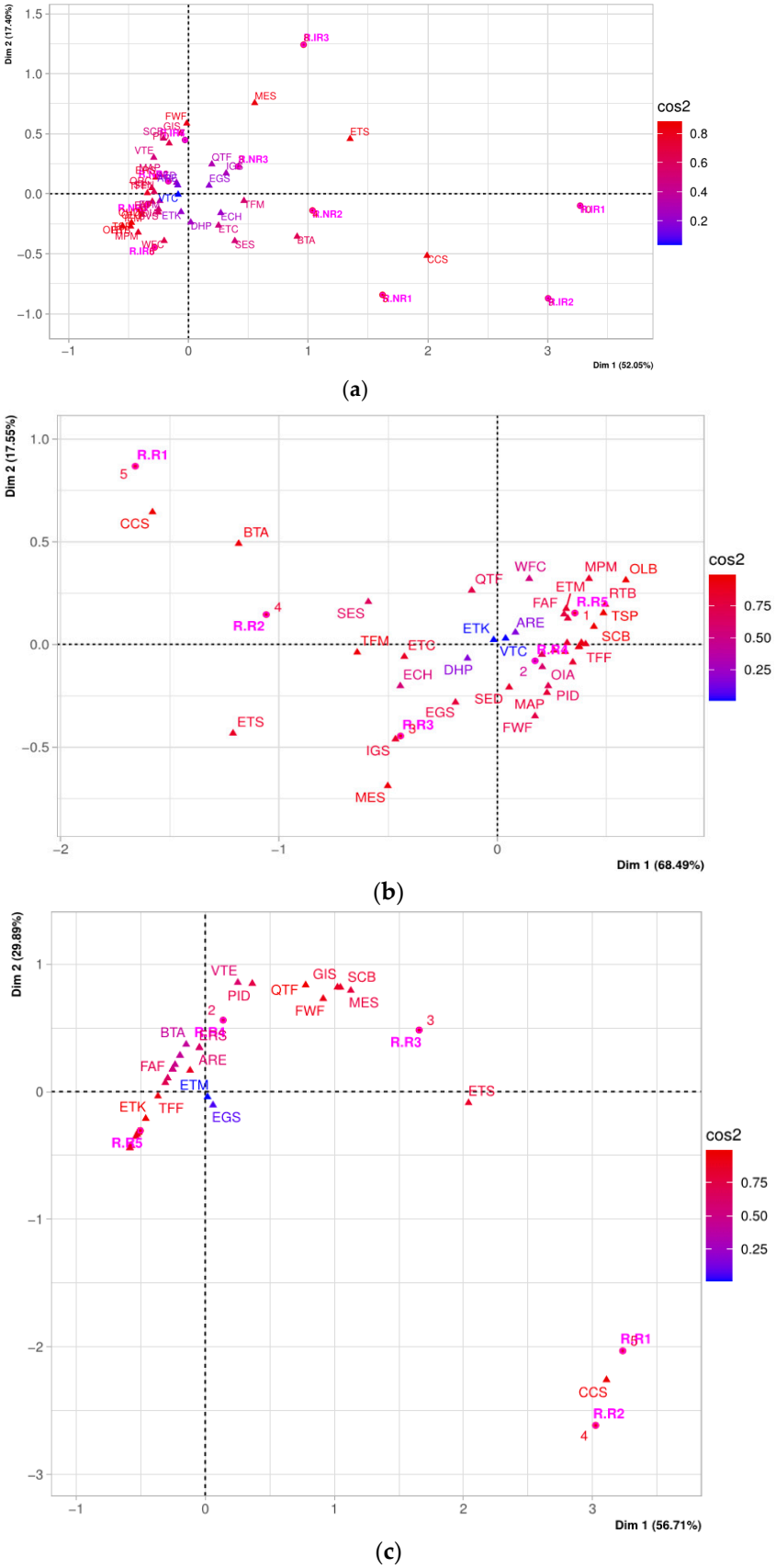
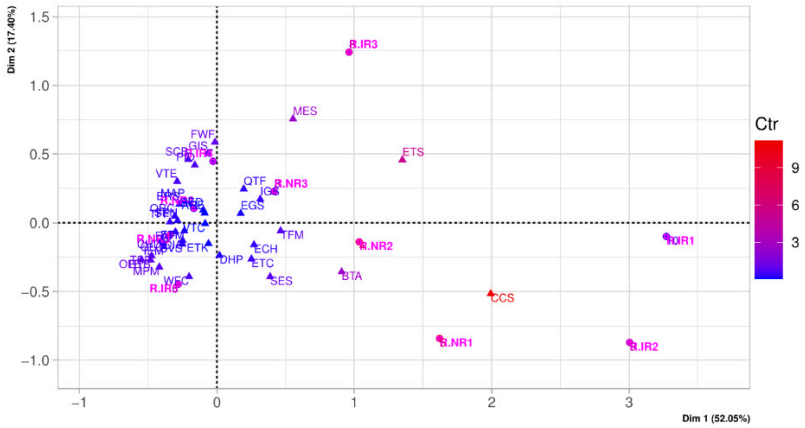
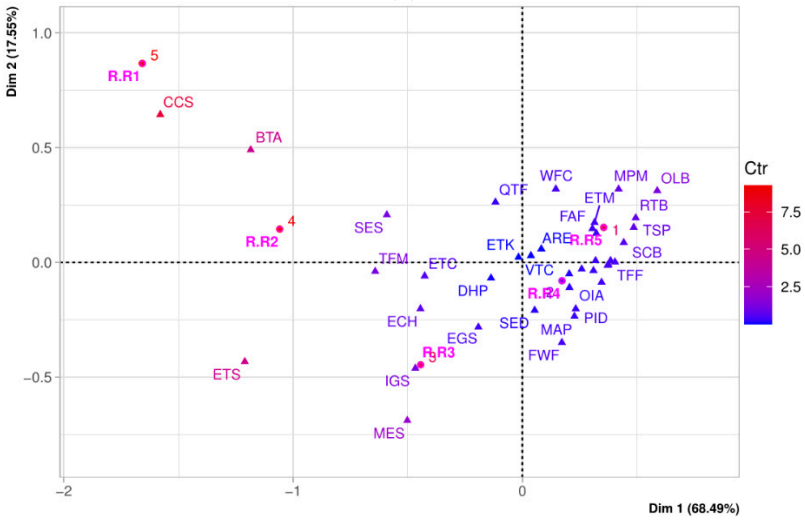


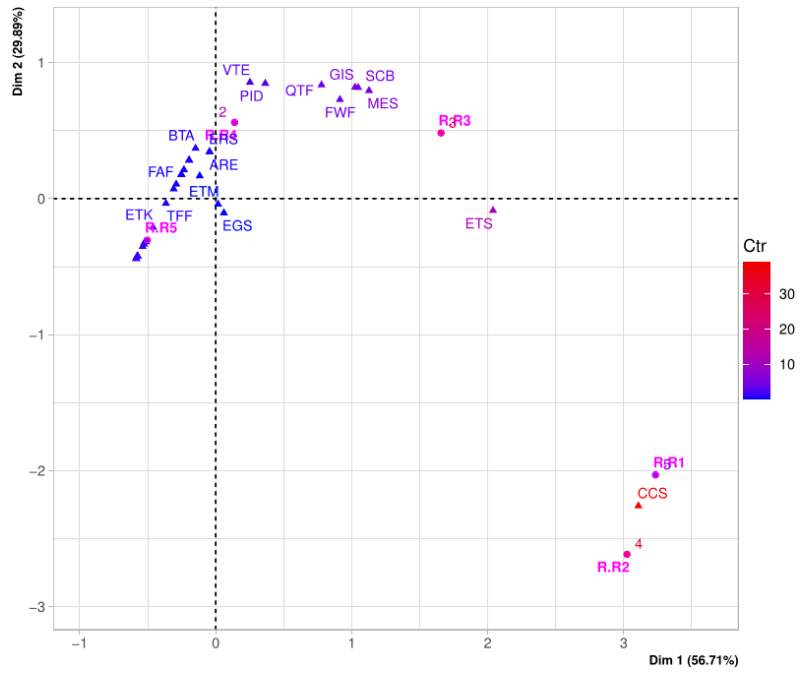
Figure A6. Results of the correspondence analysis labelled by the quality of representation on the factor map (cos2) at the sample level (**a**), national tourists subsample level (**b**) and international tourists subsample level (**c**).



(**a**)



(**b**)



(**c**)

Figure A7. Results of the correspondence analysis labelled by the contributions of values to the definition of dimensions at the sample level (**a**), national tourists subsample level (**b**) and international tourists subsample level (**c**).

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