

Urban tourists' receptivity to ecogamification: A technology, environment, and entertainment-based typology

Viviane Da Silva Souza ^{1*} and Susana Regina Bacelar de Vasconcelos Marques ²

¹ University of Aveiro, Portugal; Email: vivianedessouza@gmail.com

² GOVCOPP, ISCA-University of Aveiro, University of Aveiro, Portugal; Email: susana.vasconcelos@ua.pt

*Corresponding author

Abstract

This research explores the relationship between technology, entertainment, and the environment to understand urban tourists' receptivity to ecogamified transport and mobility apps. Rather than providing conclusive solutions, this study follows an exploratory approach to establish relevant grounds for tourist clusters regarding their potential receptivity to ecogamification, an area that is still under explored. This study follows a segmentation approach, using a self-administered online questionnaire. The data, stemming from 572 adult respondents who have travelled to urban destinations in the past 3 years, were analysed through a combination of non-hierarchical and hierarchical cluster analyses. The results reveal four clusters of urban tourists with different types of potential receptivity to ecogamification: "Mobi Wholeheartedly"; "Mobi Whatever"; "Mobi Profiter"; and "Mobi Utilitarian". This study adds to current research by adopting new segmentation approaches and more open assumptions concerning the potential receptivity to (eco)gamification. It also provides fresh evidence regarding tourist receptivity typologies and the existence of differences (and overlaps) among these types of tourists. It explores how that receptivity might occur based on the intersection between technology, entertainment and the environment. It examines the implications of tourist segments in ecogamification strategies, providing overall useful insights to destination management organizations, destination marketers and game designers.

Keywords: Smart tourism, Ecogamification, Sustainability, Mobility, Transport, Clusters

Citation: Da Silva Souza, V. and Bacelar de Vasconcelos Marques, S. R. (2024). Urban tourists' receptivity to ecogamification: A technology, environment, and entertainment-based typology. *European Journal of Tourism Research*, 37, 3707. <https://doi.org/10.54055/ejtr.v37i.3300>.



© 2024 The Author(s)

This work is licensed under the Creative Commons Attribution 4.0 International (CC BY 4.0). To view a copy of this license, visit <https://creativecommons.org/licenses/by/4.0/>

1. Introduction

Tourism destinations, especially urban ones, are facing sustainability challenges, so they have resorted to smart tourism as an ally for sustainable development (Yoo *et al.*, 2017). The development of a smart tourism destination based on information and communication technology (ICT), a robust infrastructure and an intelligent business ecosystem can provide efficient results, especially on sustainability (Yoo *et al.*, 2017; Gretzel *et al.*, 2015). Connecting emerging pervasive technologies and ICTs can contribute to reduce the damage caused by tourism and maximize its positive effects (Yoo *et al.*, 2017; Touray & Jung, 2010), which can be identified by managing urban tourists and tourist attractions, helping to limit the number of visitors to certain attractions, managing the flow to protect sensitive areas (Ribes & Baidal, 2018). Urban mobility is considered one of the main problems in large cities (Kazhamiakin *et al.*, 2015). It is simultaneously a very important asset for smart cities, but also onerous, making it difficult to implement innovative policies and solutions that encourage sustainable behaviour by citizens (Kazhamiakin *et al.*, 2015). Despite the existing challenges regarding mobility and transport in large cities, interesting initiatives that aim to promote smart and sustainable mobility in urban destinations are identified, as car and bike sharing. Many apps use persuasive technology to attract and engage tourists. However, since post-modern tourists present contradictory values and behaviours, it is difficult to characterize their needs and preferences (D'Urso *et al.*, 2016) which, consequently, hinders the process of developing suitable tools for specific tourists and their needs.

Literature on smart urban tourism (e.g., Mehraliyev *et al.*, 2020, Femenia-Serra & Neuhofer, 2019, Encalada, 2017, Yoo *et al.*, 2017), and ecogamification (e.g., Aguiar-Castillo *et al.*, 2019, Negruşa *et al.*, 2015) has gained considerable attention from scholars and practitioners. Research studies on these fields have made important advances in the last years, but there are still several gaps to be addressed. In the context of smart tourism literature, Mehraliyev *et al.* (2020) point out a lack of understanding regarding the following questions: Which tourism segments prefer / do not prefer smart tourism? What do they prefer and to what degree? Which aspects of smart tourism are the most / least preferred? Through an examination of the types of tourists who are more and less receptive to ecogamified apps, this study contributes with some answers, suggesting that understanding different types and levels of receptivity to ecogamification can help to understand different types and levels of receptivity to smart tourism.

There are few studies that focus on meaningful (eco)gamification (e.g., Aebli, 2019, Xu *et al.*, 2017), an important perspective for a deeper understanding of individuals' values and needs, anchored in the fundamentals of human-centric design, as detailed by Aebli (2019). Most studies focus on the "user" or the "gamer", however, to explore the receptivity to ecogamification in urban travel contexts, a broader and more hybrid approach is needed, one that focus on the "tourist", whether he/she is, technically, a user or a non-user, a gamer or a non-gamer (Souza & Marques, 2022). The logic for going beyond technical definitions towards a more hybrid and more meaningful approach is in line with Ashworth and Page (2011), who challenge the assumption that all tourists in cities are, in any meaningful sense, urban tourists. The economic, social, cultural, behavioural and motivational differences between tourist and residents are not clear. As argued by the authors, tourists and residents make use of much of the same urban facilities, including transport and mobility facilities. Considering this interactive creolisation and social convergence between local and tourist use of the city (Ashworth, 2003; Ashworth & Page, 2011) technical definitions such as user or tourist, day tripper and resident become inadequate and somehow irrelevant.

Following that rationale, this research explores the relationship with technology, entertainment, and the environment to perceive different types of urban tourists' receptivity to ecogamified transport and mobility apps. Rather than providing conclusive or final solutions, this study follows an exploratory approach as to better understand the bases for clustering tourists in terms of their potential receptivity

to ecogamification, an area that is still under explored. The objectives are threefold: (1) to develop tourist receptivity typologies based on their relationship with technology, the environment and entertainment; (2) to identify the existence of differences (and overlaps) among these tourist types; (3) to examine the implications of these tourist segments on ecogamification strategies.

With those objectives in mind, the present study intends to contribute to the intersection between gamification and tourism literature through new segmentation approaches to smart tourism/urban tourists/urban destinations and more open (and less artificial) assumptions concerning the potential receptivity to (eco)gamification. In that sense, this research might also provide relevant insights to destination management organizations, destination marketers and game designers.

2. Theoretical background

2.1 (Eco)gamification: Exploring Motivations and Game Elements

Gamification, a contemporary concept rooted in ancient cultural foundations (Albornoz, 2009), employs game elements to engage and motivate individuals across various historical periods and societal sectors. Even before the term "gamification" emerged, some North American companies had embraced game thinking approaches to enhance customer engagement and loyalty (Werbach & Hunter, 2012).

Towards the end of the 20th century, game mechanics started to integrate online functionalities, with Richard Allan Bartle playing a prominent role in the development of the online multiplayer games industry (Werbach & Hunter, 2012). While not as successful in popularizing the concept, Nike Pelling is regarded as "the father of gamification" in its modern sense. However, it was in 2010 that gamification gained significant recognition in both business and academic circles, attracting the attention of designers keen on exploring and harnessing the potential of video games.

The concept of gamification in academic literature was initially defined in 2011 and has since undergone various interpretations. The most widely accepted definition characterizes it as the "use of game design elements in non-game contexts" (Deterding *et al.*, 2011, p. 2). Over time, this concept has found extensive application in studies related to gamification in the context of tourism.

The expanding presence of gamification in travel experiences is evident (Xu *et al.*, 2015; Negruşa *et al.*, 2015). Numerous examples demonstrate this trend, including social media games promoting tourist destinations like Ireland Town (2023) and initiatives like Play London With Mr. Bean (2023) aimed at resisting overtourism. Additionally, there are apps that foster social responsibility and engagement with host communities, such as the Hotel Prinz Luitpold-Ba in Baviera, Germany (Weber, 2014). Moreover, applications like the URBAN-WASTE H2020 EU project's 'WasteApp' (Aguar-Castillo *et al.*, 2018) sensitize tourists about responsible infrastructure use and recycling practices. These examples not only underscore the growth of gamification but also highlight its receptiveness and potential for further expansion, particularly in the realm of ecogamification (Souza, Marques & Veríssimo, 2020).

In the context of sustainability, gamification extends to ecogamification, characterized by the use of "game mechanics and experience design to engage and motivate individuals to achieve the environmental awareness goals" (Yen, 2015, p.1). This approach can target the demand for goods and services in tourism, particularly transportation to attractions, and aim to drive travel behavior change by influencing activities requiring transportation (Yen *et al.*, 2019). Moreover, ecogamification can encourage sustainable behavior, providing support to tourists interested in adopting eco-friendly behaviour while travelling.

Most studies on (eco)gamification draw on the Self-Determination Theory proposed by Ryan and Deci (2000), which involves the extrinsic and intrinsic motivations of individuals. On the one hand, intrinsic motivation involves individuals engaging in activities voluntarily, driven by the desire of fun and enjoyment. On the other hand, extrinsic motivation entails individuals engaging in activities with the aim of achieving external rewards or tangible outcomes (Deci and Ryan, 2015).

Bravo *et al.*, (2021) investigate the effects of gamification on psychological needs, motivation, and user-generated content creation intention. Their findings demonstrate that engagement with gamified elements increases psychological need satisfaction and controlled motivation. Moreover, a positive impact on autonomous motivation is observed when individuals feel a sense of mastery and purpose. Notably, the study highlights that only autonomous motivation significantly influences users' propensity to generate content on the review platform, underscoring gamification's potential to enhance intrinsic motivation and facilitate user-generated content creation.

Tondello *et al.* (2017) underscore the significance of a meticulously structured conceptual framework for devising game elements customized for gamification contexts, while also factoring in users' authentic preferences. The framework encompasses three core motivational categories: individual, external, and social motivations. Under individual motivations, aspects such as immersion and progression are highlighted, with suggested game elements including mystery boxes, themes, and progress feedback. External motivations encompass tailored incentives and rewards, with game elements like points, certificates, and challenges. Social motivations revolve around social interactions and relatedness, with proposed game elements such as leaderboards, social competitions, and knowledge sharing. This comprehensive framework can be pragmatically employed by considering users' profiles and preferences, either through behavioural observations or direct inquiries.

Some persuasion mechanisms, such as rewards, are considered the basis for developing ecogamified technologies (Hamari *et al.*, 2012). The game elements reinforce individuals' motivation, creating competition between players (Aguiar-Castillo *et al.*, 2019). Thus, users' extrinsic motivations are contingent on rewards. Regarding intrinsic motivations, the user is motivated to carry out the activity itself, regardless of earning rewards or reaching goals. Some studies suggest that the secret to successful gamification lies in the thoughtful use of both types of motivation. Zichermann (2011) affirms that the use of tangible and intangible incentives is also relevant and appropriate, while others (Bock & Kim, 2002) identify rewards as having a negative effect on users' performance by generating a subjective punishing effect, considering the user is only rewarded after achieving a certain level of performance. Simultaneously, some argue that users pay more attention to activities with points, rewards and status, and that these incentives generate an atmosphere of action, where competition and reward maintain people interested and addicted (Law *et al.*, 2011).

Torres-Toukoumidis *et al.* (2022), in their study on gamification in ecology-oriented mobile apps, explore the purposes, game elements and dynamics of gamified mobile apps in environmental sustainability. Based on a review of the most downloaded mobile apps the authors observe that, instead of bringing a more educational approach, those apps bring an informative and a more general approach to environmental sustainability. Regarding game elements, the apps focus on levels, achievements, and missions (rather than on points) and in terms of mechanics, the attention goes to challenges, progression, and feedback. The authors also demonstrate that ecogamification is anchored on intrinsic motivations, fun and game dynamics, directed at emotions and narratives.

2.2 Destination Sustainability, Mobility and Transportation

Sustainability is defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs (United Nations, 1987). In discussions on sustainable development, tourism is acknowledged as an activity offering economic development opportunities and environmental protection (Lindberg *et al.*, 1997). However, tourism also brings inherent negative impacts in environmental, social, and economic aspects, especially in urban tourism contexts. These impacts encompass rising property prices, goods, and services (Kleeman, 2001; Mason, 2008), gentrification (Silva *et al.*, 2021), urban congestion, threats to cultural identity (García *et al.*, 2015), pollution, loss of natural landscapes, reduction of open spaces, destruction of flora and fauna, and water scarcity (Kleeman, 2001). The environmental concerns arising from tourism are becoming increasingly visible and alarming (Pan & Liu, 2018).

Urban tourist destinations often exhibit undesirable behaviours that affect environmental quality, such as excessive production of non-biodegradable waste, vandalism of monuments, and other forms of degradation commonly associated with tourists. Costa *et al.* (2015) propose that this environmental degradation may result from tourists' limited awareness of their role in promoting sustainable tourism. On the positive side, consumer and tourist behaviours have shown shifts over time, leading to a demand for more sustainable products and services (Adongo *et al.*, 2018). Marin *et al.* (2009) suggest that this change in tourist behaviour is a natural trend and may lead to a progressive shift in consumption patterns, favouring brands or companies that cater to the desires and needs of these more sustainability-oriented tourists.

Optimistically, some studies have pointed to positive impacts regarding the use of more sustainable transport in tourism and suggest that by 2035 CO₂ emissions from tourist transport may have a major reduction if tourists opt for more sustainable transport in destinations (Cavallaro *et al.*, 2021). Such results have motivated the tourism sector to continue efforts towards sustainability, combining information technologies to strengthen and support more sustainable tourism (Gössling, 2017).

Compared with other sectors, the use of ecogamification in the transport sector is in progress and has shown successful results when compared to applications that have not used the tool (Yen *et al.*, 2019). For instance, besides its functional purpose, the ecogamified mobility and transport apps, also intend to increase user motivation, to improve overall experience and engagement, to reinforce or change behaviour and to persuade. It distinguishes itself from classical non-ecogamified apps because the focus is not only on the functional features of the app, which the user may use to go from a place to another, for example, but also on different contexts such as use of sustainable transport in work trips (Buningh *et al.*, 2014), thus increasing the awareness of citizens, and promoting their mobility and transport behaviour change (Kessler *et al.*, 2015). This apps also automatically tracks transportation modes and CO₂ emissions (Jylhä *et al.*, 2013); promoting bike commuting challenge among companies (Millonig *et al.*, 2016); the use of public transportation by tourists (Cardoso *et al.*, 2019); and providing an urban accessibility mapping system (Prandi *et al.*, 2015).

Cellina *et al.*, (2019) anchored in the recommendations of Froehlich (2015) and Anagnostopoulou *et al.* (2016) for persuasive gamified systems, provide practical suggestions for effective persuasive applications in the context of sustainable mobility. This type of app should contain automated information on the routes travelled and modes of transport. Also, it should provide opportunities for setting goals, facilitating the customization and dynamism by the user. In addition, feedback is needed to make the application visually more intuitive and easier to use. Finally, there is a coherent system of

rewards or punishments in which tangible rewards can be contemplated both at the individual and community level.

2.3 Smart Tourism Destinations and Smart Urban Tourism

In the realm of smart cities, two prevailing perspectives have emerged. Mora *et al.* (2017) suggest that one stance regards a smart city as an interconnected urban landscape, leveraging technology and data management to optimize efficiency in its functioning. On the contrary, other researchers, including Caragliu *et al.* (2011) and Giffinger *et al.* (2007), embrace a broader outlook, viewing the smart city as a holistic urban space encompassing various dimensions like accessibility, governance, sustainability, as well as human and social capital.

Smart tourism destinations and smart urban tourism are distinct concepts. The former employs innovative technologies and data-driven strategies to enhance the tourist experience, optimize destination management, and promote sustainability. This integration utilizes advanced digital infrastructure, IoT devices, artificial intelligence, and big data analytics, enabling personalized services, real-time information, and seamless connectivity for tourists (Gretzel *et al.*, 2015; Buhalis & Amaranggana, 2015). Smart tourism destinations boast developed technological infrastructure, fostering sustainable development in tourist areas through enhanced visitor interaction, integration with the environment, improved tourist experiences, awareness of local services and products, and enhancement of residents' quality of life (López de Ávila, 2015). These factors drive the competitiveness of urban destinations and tourist satisfaction, with a strong emphasis on long-term sustainability (Buhalis & Amaranggana, 2013).

On the other hand, smart urban tourism capitalizes on smart city principles and technologies to elevate tourist experiences within urban environments. This approach integrates digital technologies to enhance mobility, accessibility, safety, and overall visitor satisfaction. Initiatives in smart urban tourism encompass smart transportation systems, information kiosks, mobile applications, and other digital tools, optimizing the urban tourism experience while promoting sustainable development (Aguilo-Perez *et al.*, 2017; Maltese & Zamparini, 2020).

The most recent literature extends the concept of "wise" tourism destinations beyond the scope of smart tourism cities, as discussed by Coca-Stefaniak (2021). This new perspective gives particular attention to increasing inequalities between host communities and visitors, well-being (e.g., slow tourism and slow cities), resilience and health (e.g., digital detox). A post-smart approach to managing and marketing tourist cities requires reevaluating existing tourism and urban policies to address broader sustainability issues, calling for a more holistic, network-based approach to intelligence, involving whole regions.

Even though smart destinations offer countless opportunities, there is still some disbelief in how they can contribute to achieve sustainability (Yoo *et al.*, 2017), which is a complex mission with obstacles and little practical progress, since tourism is in continuous expansion (Ribes & Baidal, 2018). Such skepticism comes from theoretical and practical responses in terms of sustainable development, which do not necessarily emerge from serious management processes, but rather from an over-simplification of how technology can be applied. These responses are also called "technological solutionism" (Ribes & Baidal, 2018), which can create more challenges than opportunities to achieve true sustainable development in destinations.

2.4 Receptivity to Ecogamification: Framework for Segmenting Urban Tourists

Studies on the segmentation of tourists in terms of their potential receptivity to (eco)gamification are still limited, making this study distinct in that regard. As noted by Parapanos and Michopoulou, (2022, 2023), more research is needed on target differentiation, emphasizing its impact on the effectiveness of gamification, both as an engaging mechanism and as a powerful marketing tool.

Aebli (2019) explored tourists' motivations for engaging with gamified technology while on holiday, showing tourists get involved with gamified technology, establishing a connection and attributing meaning to it. The author concludes that "in the pleasure vacation context, gamified technology works well because the vacation context holds similar characteristics of "play" and social dynamics as games in general, which can be stimulated with gamified technology" (2019, p. 13). Thus, this study is framed within the philosophy of significant ecogamification, differentiating it from most studies focussing on the "user" or "gamer", rather than on the "tourist" (Souza & Marques, 2022). This broader and more hybrid approach opens up opportunities to explore the potential receptivity to ecogamification while travelling, as it explores tourists' characteristics, preferences and needs not only in terms of technology, but also in terms of entertainment and environmental behaviour. Moreover, this research takes into consideration that post-modern tourists display contradictory behaviours (e.g., people who consume both McDonald's at the airport and vegan food while staying at an eco-hotel at the destination) (D'Urso *et al.*, 2016). These contrasting behaviour and values add complexity to research and raise segmentation challenges.

Several studies have either developed typologies or segmented urban tourists and game users, reflecting the need to understand their behaviours, preferences, and attitudes. Travel motivations, sociodemographic aspects, trip planning, loyalty and satisfaction (Pulido-Fernández *et al.*, 2017; Valls Giménez *et al.*, 2019; Moeller *et al.*, 2011; Bergin-Seers & Mair, 2009) commonly guide the segmentation of urban tourists. Regarding the segmentation/typology of game users, the criteria are related to motivation factors and type of gamification elements such as points, rewards, challenges and ranking, player personality types and traits, game culture and game mentality heuristics (Marczewski, 2016; Ferro *et al.*, 2013; Kallio *et al.*, 2011). Literature on game user typologies is vast, focussing by definition, on gamers. However, as underlined by Tondello *et al.* (2017, p. 129), "it is not clear if users experience game elements embedded in apps similarly to how players experience them in games". Following this line of reasoning, there may also be non-gamers who may be receptive to gamified apps. These possibilities are being addressed in the tourism and hospitality literature, with a focus on the differences and similarities between tourists and gamers (e.g., Parapanos & Michopoulou, 2023; Parapanos & Michopoulou, 2022; Xu, Tian, Buhalis, Weber & Zhang, 2015). Their findings suggest that there are differences but also ambiguities and overlaps.

Considering a hybrid approach that goes beyond technical definitions and artificial distinctions, this research explores relevant bases for clustering tourists in terms of their potential receptivity to ecogamification. More specifically, it explores travel motivations, the relationship with technology, entertainment, and the environment to perceive different types of urban tourists' receptivity to ecogamified apps, with a focus on transport and mobility.

Travel environmental behaviours

According to literature, everyday environmental behaviour can be extended to the travel context (Dolnicar & Grun, 2009; Dolnicar & Leisch, 2008; Barr *et al.*, 2010). Dolnicar and Leisch (2008) studied the relation between environmental behaviour at home and on holiday, concluding that both are related. Additionally, Dolnicar and Grun (2009) suggest that the relation between context/environment

does not change the environmental behaviour of certain groups of tourists. However, other groups display lower involvement in environmental behaviour while on holidays, suggesting tourists' behaviour is not standard when dealing with complex issues such as sustainability. In urban tourism, Miller *et al.* (2015) consider five categories: habitual behaviour, environmental attitudes, facilities available, the need to take a break from environmental duties, and the sense of social responsibility. The authors examine tourists' pro-environmental behaviours and demonstrate that existing habits influence environmental urban behaviours. This study considers this criterion to examine the receptivity of urban tourists to ecogamification in the context of transport and mobility.

Technology Acceptance of Transport and Mobility Apps

The Technology Acceptance Model (TAM) indicates a set of determinants for technology acceptance that explain users' behaviour (Davis *et al.*, 1989). Davis (1985, p. 26) conceptualizes these criteria as follows:

- Perceived usefulness: 'the degree to which an individual believes that using a particular system will increase their use-performance relationship';
- Perceived ease of use: 'the degree to which an individual believes that using a particular system would be free of physical and mental effort';
- Perceived enjoyment: 'the extent to which the activity of using the computer is perceived to be enjoyable, apart from any performance consequences that may be anticipated' (Davis *et al.* 1992, p. 1113).

Aguiar-Castillo *et al.* (2019) examine whether an ecogamified app can be successful in promoting recycling in urban tourist destinations and argue that tourists can be receptive to a type of technology if they notice its perceived usefulness and ease of use. Another example of a relevant empirical study in the field is that of Yoo *et al.* (2017). The authors analysed what influences the adoption of smart tourism apps, and concluded that perceived enjoyment has a significant influence on the intention to use gamified services. Their study presents consistent results within the scope of gamified smart tourism apps. However, it disregards urban tourists' different characteristics, needs, values, interests, attitudes, and behaviours towards sustainability (Souza & Marques, 2022). Chung and Koo (2015) studied the use of social media in the search for travel information, showing that users of new digital media, who are potentially interested in travel information, are directly influenced by enjoyment while using social media during the trip.

Behaviour and attitude towards entertainment

Entertainment can be defined as situations or activities where the individual is in a state of contentment (Zillmann & Bryant, 1994). It can be achieved through different types of entertainment (e.g., watching TV/movies, and playing sports) (Brock & Livingston, 2004). As Pine and Gilmore (1999) explain, some types of entertainment are more passive, meaning the individual is further away from the experience (watching a movie), whereas others are more active (e.g., rafting or gambling in a casino), that is, the individual is attracted to the experience (Mehmetoglu & Engen, 2011). Although different individuals are attracted to different types of entertainment, it remains unclear whether people who enjoy technology-based entertainment (e.g., in a home context) will have similar preferences while travelling (Hughes & Benn, 1997). It would be interesting to know which type of entertainment the individual is more inclined to integrate into their routine, to understand to what extent their behavior influences their travel entertainment preferences, if at all.

The media, the internet, and video games can be enjoyed anywhere (Luo *et al.*, 2020), and they are capable of providing behavioral changes through playful experiences (Aebli, 2019). Therefore, tourism has used these devices to its advantage (Yoo *et al.*, 2017). In that context, Cardoso *et al.* (2019) aimed to

engage users and persuade them to use (more) sustainable means of transport in destinations by using a playful mobile app with environment-related content and games scenarios for tourists who often prefer to rent a car or use private transportation. The results show it can motivate tourists to use greener forms of mobility in destinations.

Brock and Livingston (2004) explicitly addressed the importance of entertainment. Considering that the need for entertainment is particular and changes according to each person, they developed a study to understand the individual need for entertainment, based on 3 factors: entertainment drive (motivation toward entertainment), entertainment utility (attitudes toward the general utility of entertainment) and entertainment passivity (preference for passivity in entertainment). Their conclusion is that “not only individuals may differ in their need for entertainment but that measurement of such differences will provide a more nuanced and more correct understanding of the implications of this need” (Brock & Livingston, 2004, p. 272).

Despite the centrality of entertainment to society, Bates and Ferri (2010, p.1) underline that, “(...) academia has treated the subject in a disjointed, scattershot, sometimes condescending fashion, for a variety of reasons”. Similarly, studies on tourists’ need for entertainment are surprisingly absent in the tourism context. Although entertainment, enjoyment, and playfulness are much present in tourism and gamification literature, their role is mostly implicit, diluted, or secondary. To understand the potential receptivity of urban tourists to ecogamification, this study brings entertainment, and the need of entertainment (Brock & Livingston, 2004), into light.

Travel motivations

Tourists visit cities for many reasons, such as escaping, self-exploration, relaxation, prestige, regression, visiting family and friends, social interaction and what can be considered two cultural motives (novelty and education) (Crompton, 1979). Knowing tourists’ travel motivations is the first step to understand tourists’ individual feelings about their experiences in the destination, “since motivations are generally considered a force that precedes behaviour. It is central to better understanding their experiences” (Aebli, 2019, p. 2). Travel motivations are major driving forces for tourists’ behaviour, for their decision-making processes while travelling, and for assessing satisfaction with the experience (Snepenger *et al.*, 2006). Some tourists look for fun, leisure, meeting other tourists and socializing, while others want to relax at a resort and live new, memorable experiences. Different travel motivations are identified among different profiles of urban tourists, as shown by Dean and Suhartanto (2019) in a study involving 369 tourists visiting five creative tourist attractions in Indonesia. It examined the behavioural intention to reexperience, perceived value, satisfaction, and push and pull motivations. Results show that push and pull motivations affect visitors’ intentions to retry a certain tourist attraction, and push motivations intensified the intention when there is perceived value and quality in the experience. To explain variances in motivation, Shawn and Wu (2006) delineated the travel motivations of Taiwanese seniors and identified important variables, from which five are push motivations: ‘ego-enhancement’, ‘self-esteem’, ‘knowledge-seeking’, ‘relaxation’, and ‘socialization’. For more mature audiences, ‘knowledge-seeking’ was considered the most important factor.

However, given the importance of travel motivations to understand tourists’ preferences, there are not enough studies on smart tourism that link travel motivations to gamification. Aebli (2019) explored tourists’ motives for engaging with gamified technology during a pleasure holiday and discovered that using gamification as a resource contributes to achieve motivational goals and to promote interaction while travelling. This rationale might be useful to understand the potential receptivity of urban tourists to ecogamification.

The following framework (see Figure 1) represents the exploratory purpose and the research proposition that travel motivations, relationship with technology, environment and entertainment are relevant bases for clustering and classifying tourists in terms of their potential receptivity to ecogamified apps. More specifically, it also integrates the main research objectives and intended contributions: to develop tourist receptivity typologies, to identify the existence of differences (and overlaps) among them and to examine their implications on ecogamification strategies (e.g. game elements, game mechanics, game design, rewards).

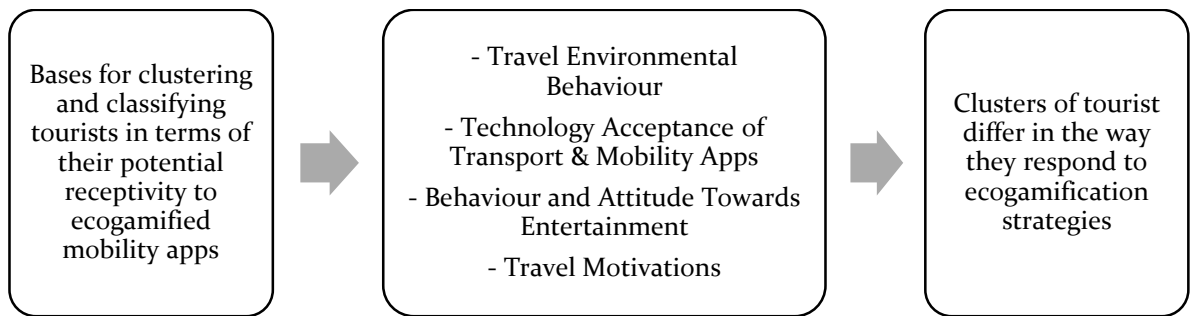


Figure 1. Theoretical framework

3. Methods

This study follows an exploratory approach, considering that segmentation concerning receptivity to (eco)gamification is still an under-researched problem. Exploratory segmentation studies are very common in the literature, including segmentation studies in tourism (e.g., Hong & Jang, 2004; Keng & Cheng, 1999), providing new perspectives on an issue, rather than final explanations and conclusive solutions.

Focussing on urban tourists, online self-administered questionnaires were applied to perceive different types of potential receptivity to ecogamification. This study used non-probability sampling, in which individuals do not have the same chances of being selected within the sample (Smith & Albaum, 2012). A convenience sampling technique was also used, allowing the researcher to control the representativeness of the sample, which is common in exploratory studies (Greener, 2008; Smith & Albaum, 2012) and exploratory segmentation studies in tourism (Keng & Cheng, 1999). Since there was a vast universe of respondents on the internet, specific criteria were applied: urban tourists over 18 who traveled to urban destinations in the past 3 years. Researchers used different social media platforms such as LinkedIn, Facebook groups, Discord, and WhatsApp to reach a diverse range of respondents, that goes beyond technical definitions of gamers/nongamers or users/nonusers. The data collection process went through two calibration phases, consisting of an informal and formal pre-tests. While in the former respondents provided feedback leading to adjustments in the questionnaire language and the elimination of potential errors, the latter focused on the final version of the questionnaire, involving 15 actual urban tourists to ensure its language was accessible and clear. Data collection took place from December 2020 to February 2021, and a total of 572 responses were considered for this study.

The questionnaire was divided into six sections. Section I includes the travel motivations criterion and its variables. Questions were based on Shawn and Wu's work (2006), where respondents are asked about ego-enhancement, self-esteem, knowledge-seeking, relaxation and socialization. The 21 push items of travel motivation were rated using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Section II includes travel environmental behaviours. Questions were based on Miller *et al.* (2015), with respondents being asked about: environmental actions, holiday break from environmental duties and tourist social responsibility. The travel environmental behaviour items were structured using 5-point Likert scales, ranging from 1 (strongly disagree) to 5 (strongly agree). Section III includes technology acceptance of transport and mobility apps, focused on the Technology Acceptance Model and its respective variables. Questions were based on the work of Chung and Koo (2015) and Davis and Venkatesh (1996), with respondents being asked about: perceived usefulness, perceived ease of use and perceived enjoyment, and indicated, on a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Section IV includes the use and non-use of green mobility and transport apps and types of rewards (intrinsic and extrinsic). Questions captured information through selection and multiple-choice levels. The items regarding travellers' preferences for green mobility and transport app were based on Anagnostopoulou *et al.* (2018), according to which some of the apps (e.g., Viaggia Roveretgato, EcoTrips, Green Commuter) have ecogamification features and are considered mobility and transport ecogamified apps, and items regarding types of rewards (Kisurina, 2017). Section V includes behaviour towards different types of entertainment and attitude/need for entertainment. Using a Likert-type scale ranging from 1 (never) to 5 (always), respondents indicated how often they use different forms of entertainment, having also ranked their need for entertainment. Regarding attitudes/need for entertainment, five questions taken from Brock and Livingston (2004) were used. In this section questions were mostly adapted and built on grey literature to reflect different sources of entertainment and active and passive forms of entertainment.

Section VI includes respondents' sociodemographic profile. Respondents were asked about gender, education, nationality, employment status, professional activity, and age. The complete questionnaire is available online ([Questionnaire here](#)).

Dolnicar's (2008, 2020) suggestions are followed as to conduct an efficient segmentation. Data analysis used the Scientific Package for Social Scientist (SPSS 20.0), so data were subjected to different analyses and methods, namely: descriptive analyses, ANOVA, Hierarchical and Non-Hierarchical Cluster Analysis and K-means Cluster Analysis. The score of the previous dimensions, for each case of the sample, was performed by calculating the average of the items that constitute them.

4. Results

The total sample was 572. 59.3% of the sample are female and 40.2% are male. 49.1% of respondents are between 26 and 35 years old. Overall, the respondents can be described as relatively educated urban tourists. 45.1% have an undergraduate degree, and 25.2% have a master's degree. 55.4% are from Brazil and 22.9% from Portugal. 65.4% are employed and 15.7% self-employed. 24.5% are technology professionals, 15.7% service personnel and salespeople and 10.1% specialists (intellectual and scientific professions). 62.6% have never used any green mobility/transport app and 37.5% have used some kind of global or local green mobility and transport app. 51.9% are interested in extrinsic rewards (vouchers, gifts, discounts) and 48.1% in intrinsic (acknowledgement, social recognition) (Appendix A).

4.1. Clusters' identification

To help understand and distinguish the variables used in the clustering and profiling processes, this study adopted the standard terms used by segmentation studies (see Table 1).

Concerning segmentation variables, the following were part of the exploratory clustering process:

- 1: Travel Motivations

- a. Ego Enhancement
- b. Self Esteem
- c. Knowledge Seeking
- d. Relaxation
- e. Socialization
 - 2: Environmental Behaviour on Holiday
 - a. Environmental Actions
 - b. Holiday Break from Environmental Duties
 - c. Tourist Social Responsibility
 - 3: Technology Acceptance of Transport and Mobility Apps
 - a. Usefulness
 - b. Ease of Use
 - c. Enjoyment
 - 4: Behaviour for Different Types of Entertainment and Attitude/Need of Entertainment
 - a. Type of Entertainment
 - b. Need for Entertainment

Throughout the exploratory process of identifying the clusters, the F -value of ANOVA was 55,703, 160,424, 309,688 and 152,055 for the four criteria, i.e., travel motivation, environmental behaviour on holiday, technology acceptance of transport and mobility apps and attitude and behaviour towards entertainment, respectively. Thus, the technology acceptance of transport and mobility apps criteria play a more important role in identifying the final clusters compared to others. Travel motivation did not prove to be a relevant criterion, so it was removed from the cluster analysis. Despite this removal, this criterion was considered as a background variable to profile clusters.

Table 1. *Standard terms used to understand and distinguish the variables*

Terms	Meaning
Segmentation variables	Responsible for grouping tourists into segments
Background variables	Profile clusters regarding types of rewards (intrinsic/extrinsic) and use/non-use of green mobility and transport app
Sociodemographic variables	Profile clusters regarding gender, age, employment status, level of education and professional occupation

Source: Adapted from Juvan *et al.* (2016)

There are some extreme outliers (asterisks) and several moderate outliers (circles). These univariate outliers are potential candidates to be excluded from the analysis as they weaken the robust identification of the number of clusters. However, the existence of multivariate outliers is confirmed by calculating the distance of Mahalanobis (Stevens, 2002; Tabachnick & Fidell, 2007). The Mahalanobis distance for each case in the sample referenced by the ID variable with the respective upper tail probability in the *chi-square* distribution with 8 degrees of freedom. Thus, multivariate outliers are observed in the first 7 lines, using the usual criterion of identifying outliers for probabilities below 0.001 and these cases will be excluded in the cluster analysis.

After preparing the database from previous sections, the sample segments were identified and defined through Cluster Analysis (statistical technique). Two exploratory clustering techniques were used in SPSS. First, a hierarchical grouping of cases was performed using “*Hierarchical Cluster Analysis*”, where each observation belonging to a particular cluster is similar to all observations in that cluster, but different from observations in others (Köhn & Hubert, 2015; Maroco, 2007). It groups cases that are closer within the observed criteria, while trying to move cases that are further from each other to

different clusters. The number of clusters is not predetermined, since the method must be free from initial assumptions. To identify the number of clusters, *Ward's* method was used (Mojena, 2014) to minimize the variance within the created groups and using the “*Euclidean distance square*” measure to determine the distances between cases. Several configurations and methods available in the SPSS software were explored and used to obtain the optimal number of clusters (between-groups linkage, within-groups linkage, nearest neighbour, furthest neighbour, centroid clustering, median clustering, and *Ward's* method). The following dendrograms were obtained. In Figure 2, the dendrogram obtained points to a structure of 4 clusters.

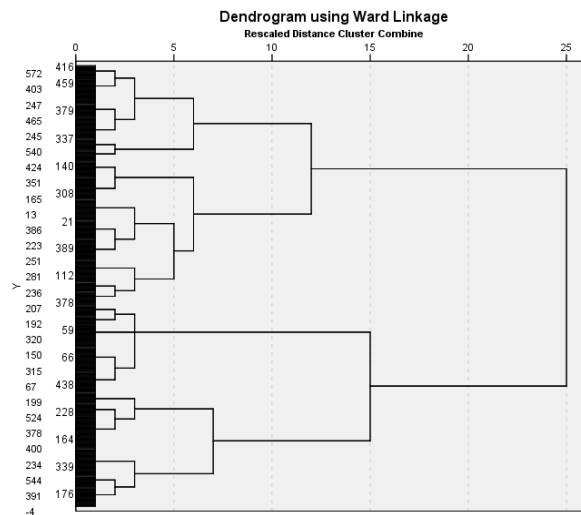


Figure 2. Dendrogram using Ward Linkage

Although subjective, the evaluation of the number of clusters to be retained must consider the distance obtained between clusters and the R-squared criterion for calculating the proportion of variance explained by the model (Pestana & Gageiro, 2014). Table 2 shows these indices calculated for the various solutions with the number of clusters from 2 to 8. The value of the R-squared increases with the number of clusters, as expected, but it significantly decreases at a certain point (ΔR -squared) (Table 2).

Table 2. Distance between Clusters and R-squared

Nº of Clusters	R-squared	ΔR -squared	Distance between clusters
2	21%		615.629
3	33%	12%	475.264
4	42%	9%	408.954
5	48%	6%	347.550
6	53%	5%	312.595
7	56%	3%	287.895
8	58%	2%	268.887

Figure 3 presents these values. The increase in R-squared decreases from 4 clusters. Using this criterion, 4 clusters were retained as a final solution.

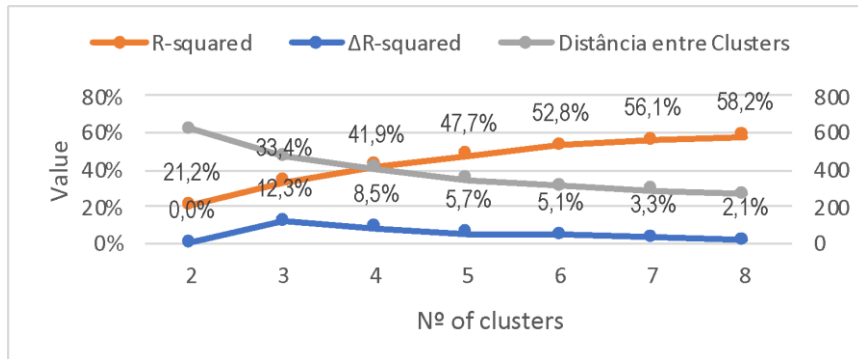


Figure 3. Graphic: distance between clusters and R-squared

After choosing the 4 clusters solutions, the “*K-means Cluster Analysis*” method was used to classify the cases observed in the respective clusters and analyse how significant the difference between the clusters was (Wishart, 2014). Table 3 shows the results:

Table 3. ANOVA (F-value)

ANOVA	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Environmental Actions	26.624	3	0.321	561	82.972	0.000
Vacation Break from Environmental Duties	49.061	3	0.546	561	89.784	0.000
Tourist Social Responsibility	95.127	3	0.366	561	259.869	0.000
Usefulness	28.539	3	0.272	561	104.765	0.000
Ease of Use	43.829	3	0.476	561	92.128	0.000
Enjoyment	57.484	3	0.475	561	120.95	0.000
Type of Entertainment	5.944	3	0.293	561	20.253	0.000
Need for Entertainment	37.136	3	0.469	561	79.217	0.000

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

11 iterations were enough to find the final centres of the clusters in each criterion. From the ANOVA and final centres of the clusters, the variable that contributes the most to the definition of clusters is Tourist Social Responsibility (greatest F-value) and the one that contributes the least is Type of entertainment. Although the segmentation variable Type of Entertainment has a low (*F-value*), its value remains statistically significant ($p < 0.001$). The variable was verified in detail with the *Kruskal-Wallis* test to confirm differences among clusters by items. Result shows that even with a lower *p value* in some items, the significance is evident in all items (see Table 4).

Table 4. Kruskal-Wallis test to confirm differences among clusters by items

	Total sample	Cluster 1	Cluster 2	Cluster 3	Cluster 4		
Segmentation variables	N=565	N=177	N=105	N=144	N=139	Kruskal-Wallis	p-value
<i>Environmental actions</i>							
Switch lights off when not in use	4.62	4.94	4.43	4.75	4.21	86 576	<0.001
Use air conditioners moderately rather than to extreme temperatures	4.22	4.53	4.13	4.40	3.71	55 520	<0.001
Save water	4.29	4.65	4.08	4.56	3.72	99 791	<0.001
Recycle paper products	3.55	3.90	3.48	4.03	2.64	91 803	<0.001
Recycle plastic, glass	3.57	3.86	3.55	4.03	2.71	76 932	<0.001
Buy organic food products	2.74	2.82	2.80	3.15	2.17	48 663	<0.001
Manage selection, quantity and timing of food purchases to reduce waste	4.22	4.56	4.05	4.37	3.78	62 350	<0.001
Walk and/or cycle where possible	3.53	3.80	3.32	3.85	3.03	38 503	<0.001
Use public transport where possible	3.62	3.79	3.31	3.94	3.32	22 491	<0.001
Encourage (or support) others to be environmentally friendly	3.77	4.14	3.56	4.28	2.94	116 638	<0.001
<i>Vacation break from environmental duties</i>							
The facilities and infrastructure make it difficult to act in an environmentally responsible way	3.19	2.67	3.34	3.71	3.20	68 214	<0.001
It is difficult for a visitor to behave in an environmentally responsible way	2.73	1.86	3.29	3.10	3.04	121 319	<0.001
When I am on holidays, I give myself a break from being strictly careful about the environmental effects of my activities	2.23	1.35	2.54	2.39	2.95	161 325	<0.001
<i>Tourist social responsibility</i>							
I am responsible for my environmental behaviour even if my choices are limited as a tourist	4.16	4.68	4.03	4.53	3.23	196 803	<0.001
I continue to be very vigilant about the impact of my behaviour on the environment even when visiting another city	3.84	4.58	3.48	4.47	2.54	299 188	<0.001
<i>Usefulness</i>							
Using transport and mobility applications facilitates my mobility while traveling	4.60	4.84	3.79	4.83	4.67	127 827	<0.001
Using the transport and mobility applications allows me to get to know more places in the city I am visiting	4.52	4.69	3.63	4.81	4.68	141 858	<0.001
The use of transport and mobility applications increases the effectiveness of finding tourist attractions	4.55	4.71	3.83	4.78	4.66	108 834	<0.001
Transport and mobility applications are useful when traveling	4.64	4.84	3.84	4.87	4.76	147 828	<0.001
<i>Ease of use</i>							
Using transport and mobility applications doesn't require much mental effort	4.01	4.05	3.03	4.44	4.24	118 068	<0.001
Transport and mobility applications are easy to use	4.14	4.26	3.15	4.58	4.28	155 084	<0.001
The transport and mobility applications are intuitive and allow me to use them however I want	3.88	3.84	2.99	4.40	4.09	134 917	<0.001
<i>Enjoyment</i>							
It is an interesting experience to have several transport and mobility options in applications while traveling	4.47	4.64	3.63	4.80	4.57	134 374	<0.001
I have fun using transport and mobility apps	3.33	3.14	2.34	4.21	3.41	159 506	<0.001
It's interesting to search for new transport and mobility applications when I'm traveling	3.53	3.49	2.46	4.47	3.42	162 495	<0.001
It is worth the effort to search for new transport and mobility applications when I'm traveling	3.76	3.66	2.94	4.62	3.63	153 077	<0.001
<i>Type of entertainment</i>							
I use the Internet for social or personal interests	4.67	4.78	4.38	4.77	4.64	30 915	<.001
I watch television (TV, computer, mobile phone)	4.04	4.08	3.65	4.32	4.01	18 807	<.001
I read newspapers (printed, online)	3.42	3.37	3.37	3.71	3.22	11 413	0,010
I listen to music (Computer, mobile phone, Ipad, Ipad)	4.38	4.38	4.19	4.63	4.27	19 225	<.001
I read books (physical books, online e-book)	3.71	3.64	3.70	4.06	3.43	21 987	<.001
I read magazines (printed, online)	2.76	2.60	2.61	3.30	2.51	31 861	<.001
I go to the movies	3.27	3.15	3.13	3.65	3.16	18 547	<.001

	Total sample	Cluster 1	Cluster 2	Cluster 3	Cluster 4		
Segmentation variables	N=565	N=177	N=105	N=144	N=139	Kruskal- Wallis	p-value
I play video games (PC, console, cellphone, online)	2.51	2.25	2.24	2.87	2.68	17 177	<.001
I listen to the radio	2.98	2.99	2.96	3.24	2.72	10 149	0,017
I practice sports	3.20	3.19	3.25	3.47	2.91	14 278	0,003
I watch series and movies (TV, Computer, cellphone, Ipad)	4.24	4.32	3.97	4.42	4.14	11 153	0,011
<i>Need for entertainment</i>							
When traveling, I get very bored unless there is something entertaining to do	2.09	1.58	1.90	2.80	2.17	69 787	<0.001
I need some entertainment time each and every day	3.28	2.84	2.81	4.03	3.41	87 574	<0.001
I am always on the lookout for new forms of entertainment	3.47	3.04	2.90	4.24	3.65	106 546	<0.001
I like to take an active role in my entertainment activities	3.64	3.31	3.20	4.25	3.74	84 765	<0.001
I am very selective about how I spend my free time	3.63	3.41	3.30	4.21	3.54	53 416	<0.001

To assess whether the differences between cluster centres in each criterion are significant, the *post hoc de Tukey* test was used (Table 5). The differences were significant in all variables. In some, the averages are positioned in different columns (subsets), indicating that the average differences are significant.

Regarding technology acceptance of transport and mobility apps there are differences and similarities between clusters. In the perceived usefulness of mobility and transport app in clusters 1, 3 and 4, there are notable levels of agreement (above 4.69 in all items in a Likert-type scale from 1 'strongly disagree' to 5 'strongly agree'). Cluster 2 was more neutral (3.77). Regarding the perceived ease of use when using mobility and transport app, clusters 3 presents higher values (4.47). Clusters 1 and 4 are grouped with very similar values (4.20) and cluster 2 is more neutral (3.05). Regarding perceived enjoyment while using mobility and transport app, cluster 2 presents low (2.84) perceived enjoyment, whereas cluster 3 presents high (4.52). Clusters 1 and 4 present a neutral (3.75) perceived enjoyment in using mobility and transport app.

Regarding environmental behaviour while travelling and its respective variables, the differences between the clusters are apparent in the environmental actions and tourists' social responsibility variables. Cluster 4 differs from cluster 2 and clusters 1 and 3, which are similar. Clusters 1 and 3 have similar scores on environmental actions, but on holiday break from environmental duties, only cluster 1 differs from clusters 2, 3 and 4. Thus, respondents from cluster 1 encompass more urban tourists who practice environmental actions on holiday (e.g., recycling, using public transport, saving water and energy) and do not change their behaviour when travelling. However, clusters 2 and 4 are more neutral in terms of travel environmental behaviours. In tourist social responsibility, respondents from clusters 3 agree with cluster 1, who tend to be responsible for their environmental behaviour even with limited options at the destination, remaining strict about the impact of their environmental behaviour. Discrepantly, cluster 4 has a moderately low score (2.88) when compared to other clusters. Cluster 2 is neutral.

In what concerns behaviour regarding different types of entertainment and attitudes/need of entertainment, there are differences between the clusters, with cluster 4 differing from cluster 3 and clusters 1 and 2 (similar scores). In type of entertainment, cluster 3 differs from 1, 2 and 4 (similar scores). Clusters 1, 2 and 4 have similar averages (3.42) in terms of type of entertainment (e.g., using the internet for social/personal interests, listening to music, reading books, watching series /movies). Regarding the attitude/need for entertainment, clusters 1 and 2 have lower scores (2.83). Some respondents disagree with the notion that they feel bored when travelling (they wouldn't always seek new forms of entertainment). In relation to other clusters, cluster 4 is more neutral, and cluster 3 has the moderately high score (3.90) with more need for entertainment than other clusters.

Table 5. *Significance degree of segmentation variables*

Segmentation variable	Cluster	Number of cases N	Subset for alfa = 0.5		
			1	2	3
<i>Perceived usefulness</i>	2	105	3.7714		
	4	139		4.6924	
	1	177		4.7712	
	3	144		4.8264	
	Sig.		1.000	0.148	
<i>Perceived ease of use</i>	2	105	3.0571		
	1	177		4.0508	
	4	139		4.2014	
	3	144			4.4722
	Sig.		1.000	0.273	1.000
<i>Perceived enjoyment</i>	2	105	2.8429		
	1	177		3.7316	
	4	139		3.7590	
	3	144			4.5243
	Sig.		1.000	0.988	1.000
<i>Environmental actions</i>	4	139	3.2230		
	2	105		3.6714	
	1	177			4.0977
	3	144			4.1361
	Sig.		1.000	1.000	0.944
<i>Vacation break from environmental duties</i>	1	177	1.9623		
	2	105		3.0571	
	4	139		3.0624	
	3	144		3.0671	
	Sig.		1.000	1.000	
<i>Tourists' social responsibility</i>	4	139	2.6649		
	2	105		3.7524	
	3	144			4.5035
	1	177			4.5271
	Sig.		1.000	1.000	0.331
<i>Type of entertainment</i>	2	105	3.4043		
	4	139	3.4277		
	1	177	3.5234		
	3	144		3.8561	
	Sig.		1.267	1.000	
<i>Need for entertainment</i>	2	105	2.8229		
	1	177	2.8350		
	4	139		3.3022	
	3	144			3.9056
	Sig.		0.99	1.000	1.000

Means for group in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 136.462

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed

Based on the results, the clusters were summarized:

Cluster 1: Mobi Wholeheartedly (31.3%), given their full commitment to environmental travel behaviour

The largest cluster exhibits high perceived value in terms of utility and moderately high perceived value in terms of mobility and transport app ease of use. These participants find the apps easy to use, not requiring much mental effort, and useful in helping them explore more places in the city while travelling. Given its perceived value in relation to enjoyment in mobility and transport app, this cluster presents neutral scores, that is, they are neither low nor high regarding the 'fun' elements in this type of app.

This cluster of participants is more concerned with environmental sustainability when travelling considering its high level of tourist social responsibility. While travelling, respondents continue to be very vigilant about the impact of their behaviour on the environment. It presents the second-highest level of environmental actions by using public transport, recycling, walking, saving energy and water. This is the only group to not take a break from strict environmental-friendly behaviour, being very aware of the effects of their activities on holiday.

Regarding the type of entertainment, these urban tourists are interested in using the internet for social/personal interests, watching television, series/movies, and listening to music in different devices (TV, computer, iPad, and mobile phone). Despite showing interest in digital entertainment, respondents do not show much interest in playing video games, nor listening to the radio and reading magazines, and seem to enjoy reading newspapers and books, going to the movies, and practicing sports. Need for entertainment: the cluster presents moderately low scores in relation to the need for entertainment, that is, respondents do not feel bored during the trip, even without entertainment. It also expresses a moderately low need to find new forms of entertainment. There is a lack of selectiveness on how to spend free time.

Cluster 2: Mobi Whatever (18.5%), considering their neutral responses regarding most of the measures

The smallest cluster presents a neutral perceived value in terms of utility and ease of use for mobility and transport app. In other words, this cluster does not show much expression for the fact that this type of app is easy to use and facilitates mobility while travelling. Moderately low levels of perceived enjoyment value, (tend not to appreciate 'enjoyment' mechanisms in this type of app).

While on holiday, this cluster of respondents maintains a neutral stance towards environmental issues. They do not express interest in engaging in environmental actions while traveling, e.g., using public transport, recycling, walking, saving energy and water). Also, they are neutral concerning the impact of their behaviour on the environment, being occasionally concerned about the environmental effects of their activities on holiday.

In terms of the type of entertainment, while on holiday, respondents in this cluster favour the use of the internet for social/ personal interests and listen to music in different devices (computer, iPad, and mobile phone), displaying a low interest in playing video games, listening to the radio, and reading magazines (they occasionally watch television, series/movies, read books, go to the movies, and practice sports). This cluster is, therefore, similar to cluster 1, revealing a moderately low need for entertainment while travelling, seeking new forms of entertainment and selectivity about how to spend free time.

Cluster 3: Mobi Profiter (25.4%) given their openness to explore and enjoy all the experiences around them.

In this cluster, respondents display a high level of perceived value in terms of usefulness, ease of use and enjoyment for mobility & transport app, finding this kind of app easy, useful, and fun to use, allowing them to get know more places in the city while visiting.

Environmental behaviour in this context is akin to that of cluster 1, which involves tourists actively engaging in environmental responsible actions. These actions encompass using public transport, practicing recycling, walking, saving energy and water. This cluster suggests that, despite realizing their responsibility and the impact of their behavior on the environment, respondents, sometimes take a break from this behaviour when travelling. So, their behaviour is not as consistent as cluster 1.

These tourists favour a wider range entertainment alternative (e.g., using the internet for social/personal interests, listening to music, watching television, series/movies and reading books) when compared to other clusters. It is, however, similar to clusters 1 and 2 when it comes to the lack of interest in playing video games (only occasionally listening to the radio, reading magazines/newspaper, going to the movies, and practicing sports). Concerning the need for entertainment, respondents in this cluster get very bored unless there is something entertaining to do on holiday (need for finding new forms of entertainment and more selectiveness about how to spend free time).

Cluster 4: Mobi Utilitarian (24.6%) given their high score in the perceived usefulness variable and low and neutral scores in others

In this cluster the Technology Acceptance of Transport and Mobility Apps is similar to cluster 1 (high perceived value in terms of utility and moderately high perceived value in app's ease of use). Tourists find this kind of app useful and easy to use (it allows them to get to know more places while visiting cities) and neither like nor dislike fun mechanisms (enjoyment in mobility and transport app).

From the four clusters, this cluster presents less concern with environment sustainability. The scores regarding their answers concerning environmental action, social responsibility and consistency between home/travel behaviour are low/neutral.

Regarding entertainment, the cluster prefers using the internet for social/personal interests, listening to music, watching television, series/movies, showing lesser interest in listening to the radio, reading magazines, practicing sports, and playing video games. It presents a neutral need for entertainment (neither bored nor happy without entertainment during the trip, displaying a neutral behaviour when looking for new forms of entertainment and selecting how to spend their free time). Figure 4 summarizes the clusters, detailed in this section.

4.2 Clusters profiling

Background variables (the use and non-use of green transport and mobility apps, types of rewards and travel motivations) and sociodemographic variables (gender, age, level of education, professional occupation, and employment status) were used to identify differences and similarities between groups (see Appendix B). 37.7% of respondents use green mobility and transport apps (most respondents do not, 62.3%). However, clusters differ as followed: In cluster 3: respondents are divided equally between those who use and do not use green mobility and transport apps. In cluster 2 you find the highest

number of non-users of apps (68.6%) and in cluster 4, second highest number of users (34.5%), followed by cluster 1 (33.9%).

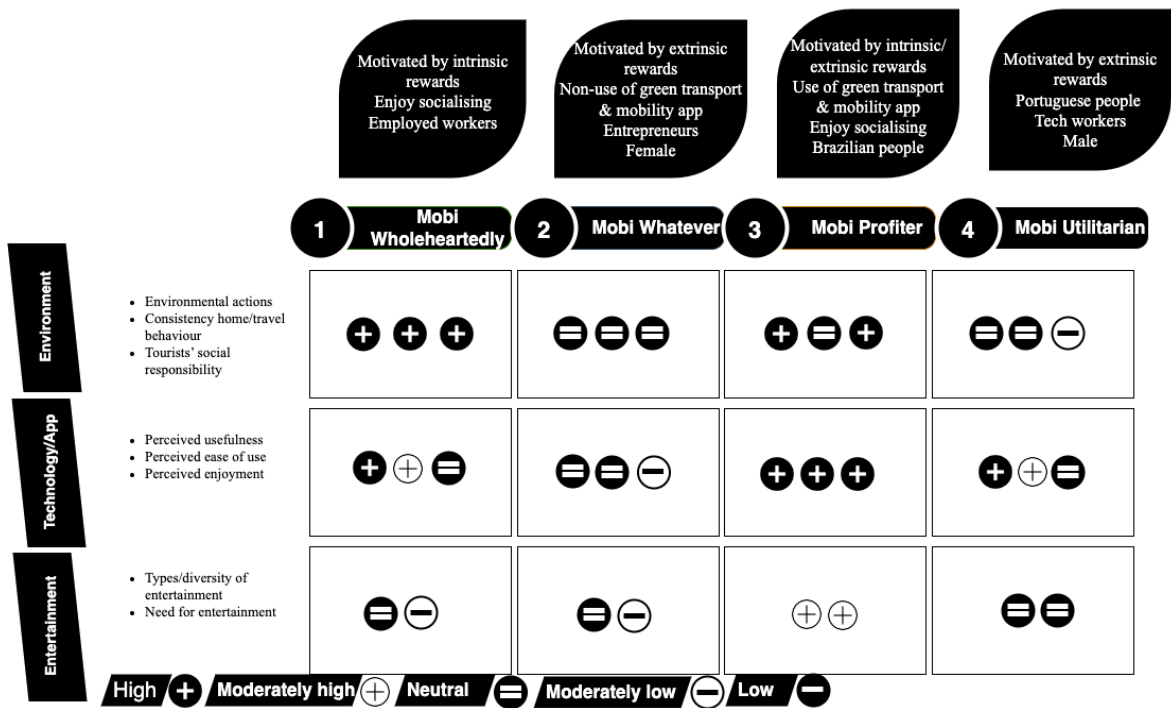


Figure 4. Distinctive features of each cluster

Regarding types of rewards for using green mobility and transport app on holiday, 51.7% respondents prefer extrinsic rewards (e.g., vouchers, discount, gifts) and (48.3%) intrinsic (e.g., acknowledgements and social recognition). Clusters differ as follows: Cluster 4 has the largest interest in extrinsic rewards (57.6%), followed by cluster 2 (50.5%). In cluster 1, tourists prefer intrinsic rewards (50.8%) and in cluster 3 they are equally divided.

Regarding travel motivation to visit urban destinations (see Appendix C), ego enhancement and knowledge seeking present high scores, averages (> 4). Respondents from all clusters enjoy talking about their experience after travelling, considering it to be important to experience different cultures and lifestyles. Relaxation, on the other hand, assumes the lowest average (< 3). In the context of urban tourism, tourists do not appreciate slowing down or doing nothing. Compared to the others, clusters 1 and 3's averages (> 3) are more motivated by socialisation than clusters 2 and 4's averages (< 3). Clusters 1 and 3 enjoy socializing, aiming to meeting new people and spending time with family and friends on a trip. Regarding self-esteem, all clusters have neutral means (intervals from [3.14 to 3.66]). When choosing a destination to travel to, the tourists are indifferent towards luxury, good food, or a comfortable or fashionable place to stay.

All clusters present a higher percentage of female respondents. Cluster 2 has the highest (66%). Respondents from all clusters have advanced educational levels, but cluster 3 has the most graduates (47.2%), in cluster 4 you find the highest number of master's degrees holders (31.7%), and, in, cluster 2, PhD's (14.3%). Cluster 3 presented a higher percentage of Brazilians (62.5%), whereas cluster 4 included more Portuguese (24.5%). Regarding employment status, cluster 1 has a high number of employed respondents (61%). Cluster 2 shows the largest number of entrepreneurs (19.2%). Cluster 4 had more

tech sector workers (39.3%) and cluster 2 includes specialists from intellectual and scientific professions (21.4%). Clusters are composed of adults: Cluster 4 has the highest percentage of people aged 26-35 (54.7%) and cluster 2 36-45 (32.4%).

5. Discussion and implications

Clustering urban tourists in segments contributed to understanding different types of receptivity to ecogamified mobility and transport app since it helps buyers and providers of ecogamification services, such as public sector tourism organizations and institutions (e.g., governmental agencies, local authorities, visitor information centres), Destination Marketing Organizations (DMOs), private sector tourism organizations (e.g., hospitality, mobility and transport services, tour operators) and tech and gamification companies specialised in developing effective and customized strategies to attract and engage urban tourists.

Mobi Wholeheartedly: considers that mobility and transport apps are easy to use and useful to find places while travelling. However, this cluster does not care about elements of enjoyment in this type of app, meaning providers of ecogamification services should focus on intuitive app flow, offering more forms of mobility and transport to different tourist attractions, not overly emphasising enjoyment elements. This group is concerned about their environmental footprint while on holiday, so DMOs should consider mechanisms that promote and reinforce sustainable behaviours (e.g., suggesting green transport options at the destination, presenting tourist attractions based on the tourist's current location to reduce long journeys, suggesting the amount of CO₂ emissions that can be reduced by opting for greener transport). All these examples can be implemented in ecogamified applications with transformative engagement through a ludic learning system (edutainment) approach to promote sustainable attitudes and behaviors. The idea is to entertain while educating. The results showed respondents' interest in using the internet for social / personal interests, watching television, watching series/movies, and listening to music, with a low need to seek new forms of entertainment on holiday. Although this cluster is not too inclined to pursue new forms of entertainment while travelling, strategies that involve dynamic game elements related to emotions and narratives might attract this kind of tourist (e.g., elements to evoke tourists' emotions through narratives, whether through sounds or visual resources, e.g., videos with high-impact storytelling about the experience of using mini electric cars in the historic centre of the city with different stages to create a sense of curiosity in the tourist). It expresses interest in using green mobility and transport apps, sensitiveness to this type of app, potentially getting easily involved with this kind of tool on holiday. DMOs can focus on marketing efforts to reach this audience through ecogamified apps focusing on mobility and transport. These tourists are motivated by intrinsic rewards for green transport and mobility choices (intrinsic rewards as a simple "thank you" or social recognition). Also, altruism mechanisms should be considered in ecogamified apps (Tondello *et al*, 2017) (e.g., knowledge sharing, voting mechanisms, exploratory tasks, creativity tools, meaningful choices) to help them to effectively engage with apps. "Word-of-mouth" is present in this cluster: tourists share experiences lived in destinations, which might be relevant for tourism agents who can produce impactful experiences through ecogamified apps to be shared with other travellers. They also want to socialise, and do not rest while on holiday (game elements that focus on social mechanisms should be considered for ecogamified apps, e.g., social comparison or pressure, leaderboards, social competition, social networks, social status, guilds or teams, inviting friend and social discovery), as suggested by Tondello *et al* (2017).

Mobi Whatever is neutral towards "easy to use and utility of mobility and transport apps" and does not seem to really care about elements of enjoyment in apps. Providers of ecogamification services should find a balance when presenting elements of usefulness, fluidity, and fun in ecogamified mobility and

transport apps to avoid excessive or insufficient features. These tourists do not care much about environmental actions on holiday, which signals the importance of raising awareness towards greener mobility and transport apps behaviours. Respecting their behaviour may be a smart strategy, not forcing sudden changes. Instead, sociodemographic specificities can be used to guide subtle engagement. Most people in the cluster are female and entrepreneurs. As a result, ecogamification strategies that push for entrepreneurial skills such as creativity and determination (e.g., achieving goals by using sustainable transport and creating alternative routes to less explored tourist attractions in destinations) should be reinforced. Moreover, a simple, objective, and low-interactivity app can be effective to engage this particular target. Tourists are interested in using the internet for social/personal interests and listening to music. There is, therefore, a low need to find new forms of entertainment on holiday, as they seem not to really care about new forms of entertainment while travelling. However, they are attracted to digital entertainment. Buyers and providers of ecogamification services can focus on mobility and transport apps with social media to share tourists' achievements. Overall, tourists did not use green mobility and transport apps. However, if using such services, they are motivated by extrinsic rewards for green transport and mobility choices, such as gifts, discounts, and vouchers. In-app rewards may also be attractive, so DMO's should focus on structured reward mechanisms based on the use of green transport and mobility (e.g., the more tourists use transport with less CO₂ emissions, or the more they travel on foot, the more discounts in accommodations or restaurants they will receive). These tourists do not seem to really be interested in socializing while travelling, meaning tourism institutions and tech providers might need to emphasize individual motivations to attract them through immersion and progression, in which game elements are prioritized (e.g., mystery box, easter eggs, theme, narrative or story, levels or progression, meaning or purpose, progress feedback and learning) (Tondello *et al*, 2017).

Mobi Profitters consider mobility and transport apps easy to use and useful to help finding places to visit, perceiving a lot of enjoyment in such apps. DMOs should emphasize these features in ecogamified mobility and transport apps, focusing on excellent fluidity, usefulness during the trip and increased playful mechanisms. Despite displaying positive environmental behaviours, these tourists sometimes take a break from being strictly careful with the effects of their activities on their surroundings, suggesting that travel contexts may distract this audience from their environmental responsibilities at the destination. DMOs should focus on constantly reminding them of environmental responsibilities at the destination. Moreover, ecogamification applied to mobility and transport apps can be a good ally in this process by using push notification engines. However, boring messages must be avoided (e.g., generic and non-personalized messages). Push notifications are welcome, especially because they can stimulate tourists' engagement through ecogamification (e.g., the city is being raided by *Mobi Profits*. Choose the tourist attraction closest to you and earn 10 coins to save 1% of the planet's CO₂). The cluster demonstrates a preference for a wider variety of entertainment options and a moderately high need for entertainment while traveling. This result suggests that this cluster is very joyful, and this may reflect the fact that it is mostly composed by Brazilians who are culturally a joyful and fun-loving people. Therefore, it makes sense that gamification providers consider game elements in mobility and transport apps, combining external and social motivations to promote new and fun experiences (e.g., challenges, avatars, points, virtual economy, badges/achievements, certificates, collections, rewards/prizes, social comparison, leaderboards, social competition, social networks) (Tondello *et al.*, 2017). These tourists are equally divided between those who use or do not use green mobility and transport apps, and their preference for intrinsic and extrinsic rewards. DMOs must follow mixed strategies to implement reward systems, as well as other attraction mechanisms promoting the use of mobility and transport apps (e.g., through vouchers, while also displaying a big thank you note for choosing greener transport options). Respondents promote "word-of-mouth", want to socialise, and do not want to rest while on holiday, so the same strategies suggested to *Mobi Wholeheartedly* should be considered in this case.

Table 6. Summary: Clusters and Strategies

Clusters and Strategies
Mobi Wholeheartedly • Design mobility and transport apps with purpose of use and easier to use • Creating transformative engagement through ludic learning system (edutainment) to promote sustainable attitudes and behaviours (e.g., suggesting green transport options at the destination by using meaningful choices) • Focusing on games elements dynamics based on emotions, narratives and relationships (e.g., social networks, fantasy and discovery) • Develop recognition systems with appropriate intrinsic rewards (e.g., a simple “thank you” / social recognition)
Mobi Whatever • Ensure the mobility and transport apps focus is the purpose to use and fluidity instead of fun elements • Attract the tourists attention by participatory activities that push for entrepreneurial skills such as challenges and determination (e.g., levels or progression) • Consider NOT focusing on play-based gamification elements • Develop recognition systems with appropriate intrinsic rewards (e.g., the more they use transport with less CO₂ emissions, and if they travel more on foot, the more discounts in accommodations or restaurants)
Mobi Profiter • Design mobility and transport apps focused on fluidity, usefulness and excellent playfulness mechanisms • Attract the tourists attention and promote sustainable attitudes and behaviours on destination through play-based ecogamification elements (avatars, social competition, virtual economy and collections) • Ensure the ecogamified system is focused on create connections between tourists (e.g., social networks/ status) • Develop recognition systems with a balance of extrinsic/intrinsic rewards (e.g., providing vouchers while also displaying a big thank you note for choosing greener transport options)
Mobi Utilitarian • Ensure the mobility and transport apps focus is the purpose to use and fluidity instead of fun elements • Promote the sustainable attitude and behaviour through feedback system with appropriate external motivations (e.g., badges or achievements, certificates, collection, rewards, or prizes) • Consider tourists capabilities with technologies and engage this kind of profile with different ecogamified features (e.g., crosses augmented reality, artificial intelligence, and gamification) • Carefully structure the fun game elements on the apps

Mobi Utilitarian considers that mobility and transport apps are easy to use and useful to help finding places while travelling. However, this cluster does not care about elements of enjoyment in these apps,

similarly to *Mobi Wholeheartedly*, (the same strategy could be applied for both groups). It does not show concerns with environmental actions on holidays, which means DMOs should emphasize strategies based on their sociodemographic profile (highest percentage of Portuguese, more people who work in the technology sector, and a larger percentage of male). To reach this audience, ecogamified apps need to offer elaborated technological apparatus that crosscuts augmented reality, artificial intelligence, and gamification. Also, the appropriate game elements would have to be well-developed (given the group's technical knowledge). These tourists are interested in 1) using the internet for social/personal interests, watching television, watching series/movies, and listening to music, having a neutral need for entertainment (they are neither bored, nor happy without it during the trip). This interest is almost the same in the cluster *Mobi Wholeheartedly*, so the same strategy could be applied to both 2) using green mobility and transport app and 3) resorting to extrinsic rewards for green transport and mobility choices as gifts, discounts, and vouchers; 4) potential interest in ecogamified apps in the context of transport and mobility (buyers and providers of ecogamification services can invest in game elements focused on external motivations) (Tondello et. al, 2017), namely incentive (badges or achievements, certificates, collection, rewards, or prizes, unlockable or rare content and quests), and risk/reward (access, lotteries or games of chance, boss battles and challenges) aiming at engaging them. This cluster is not motivated by socialization nor rest while on holiday. Tourism institutions and tech providers can focus on individual motivations (immersion and progression) that prioritize game elements (e.g., mystery box, easter eggs, theme, narrative or story, levels or progression, meaning or purpose, progress feedback and learning) (Tondello et al, 2017).

6. Conclusions and future research

Understanding what makes urban tourists receptive to ecogamification in the context of transport and mobility applications is not only practically interesting but also theoretically relevant. This study is innovative in that it adds to current research intersections between gamification and tourism, through new segmentation approaches and more open (and less artificial) assumptions concerning the potential receptivity to (eco)gamification. More specifically, it provides fresh evidence to develop tourist receptivity typologies and identifies the existence of differences (and overlaps) among these tourist types. Furthermore, it moves beyond levels of receptivity, also exploring how that receptivity might happen. In contrast to previous research, mostly focused on technology acceptance and its impact on the intention to use smart tourism applications, this study explores the intersection between technology, entertainment and the environment and its relevance for segmentation studies in (smart) tourism.

Another contribution is related to travel motivations, which are seen, in previous studies, as an impactful variable to understand tourists' destination preferences and experiences. However, this research suggests that travel motivations might not be that relevant for receptivity to ecogamification in urban contexts. A possible explanation lies on the interactive creolization, social convergence and motivational similarities between tourists and residents (Ashworth, 2003; Ashworth & Page, 2011).

This research also examines the implications of tourist segments in ecogamification strategies, providing useful insights to tourism organizations, tourism agents (public and private), destination management organizations, destination marketers and game designers. The results provide a ground for more customized strategies and ways of improving the tourist experience at the destination, suggesting that ecogamified mobility and transport apps are much more than a technological device. In the context of smart and urban tourism this is particularly important. Destination marketers, urban planners and game designers have to truly collaborate to maximize the combination between technological advancements, tourist experiences, sustainability and smart cities development.

Simultaneously, we take the argument of D'Urso *et al* (2016, p.297) very seriously: "in postmodern tourism, the experiences of each tourist could not be summarized only through a unique perspective, but multiple and disjointed perspectives are necessary". In line with this argument, we are not suggesting that there are clear boundaries between the four clusters, we reject deterministic classifications, and we are totally aware of the vagueness and fragmentation of postmodern tourists (D'Urso *et al*, 2016). Therefore, to provide realistic and useful managerial recommendations, it is important to interpret them as a multidimensional and holistic framework, with overlaps and contradictions.

The limitations of this study suggest future research directions. It will be necessary to overcome the ambiguity and subjectivity of Likert type scales, unclear segmentation, through a combination of vague numbers and fuzzy clustering algorithms, as this is believed to provide more comprehensive implications (D'Urso, 2007; D'Urso *et al.*, 2016).

Concerning the sampling strategy, future work could use probabilistic sampling. Also, the sample centered essentially on two countries, which potentially limits its applicability to other realities. Researchers are encouraged to use cross-cultural samples to compare typologies. Regarding data collection methods, future studies may innovate by using gamified data collection instruments (focused on real ecogamified prototypes to capture live impressions from tourists) instead of the static, and more stereotyped, online questionnaire.

The concept of receptivity to (eco)gamification is still imprecise, lacking a clearer definition. It should be noted that developing a scale to measure receptivity to ecogamification was not within the scope of this study's objectives. This research is primarily exploratory in nature, laying the groundwork for future studies that can provide more conclusive findings. Further research is needed to conceptualize and operationalize that construct, deepening the relationship between ecogamification and smart tourism. From this study, profiles with a playful vein emerged, such as the Profiter cluster with a high number of Brazilians, which are traditionally considered as cheerful and hedonic people. Therefore, we suggest that future research considers cultural elements to better understand tourists' preferences and behaviors. Finally, future research may extend this approach by examining other relevant criteria, including psychographic (personality traits and lifestyle), game elements, types of ecogamified mobility and transport apps and the purpose of use (e.g., to avoid traffic, replace private with public transportation, and to find alternatives and more sustainable forms of travel), towards more meaningful classifications and typologies.

Appendix A.**Sample Characteristics**

Variable	Frequency(N)	Percent (%)
Gender (n = 572)		
Female	339	59,3
Male	230	40,2
Other	3	0,5
Age (n = 572)		
18-25	63	11,0
26-35	281	49,1
36-45	153	26,7
46-55	52	9,1
56-75	23	4,0
Level of education (n = 572)		
Elementary school	7	1,2
High school	92	16,1
Undergraduate	258	45,1
Postgraduate	24	4,2
Master's degree	144	25,2
P.h.D/Post P.h.D	47	8,2
Nationality (n = 572)		
Brazil	317	55,4
Portugal	131	22,9
Spain	42	7,3
England	28	4,9
Chile	7	1,2
United States	7	1,2
Cuba	4	0,7
Italy	4	0,7
Other countries	32	5,6
Professional occupation (n = 572)		
Technological professionals	140	24,5
Service personnel and sellers	90	15,7
Specialists in intellectual and scientific professions	58	10,1
Technicians and intermediate level professionals	55	9,6
Senior managers and managers	36	6,3
Administrative staff and similar	33	5,8
Entrepreneurial professionals	17	3,0
Others	19	3,4
Missing	124	21,7
Employment status (n = 572)		
Employed	374	65,4
Selfemployed	90	15,7
Student	74	12,9
Unemployed	27	4,7
Retired	6	1,0
Missing	1	0,2
Use and non-use of greentransport & mobility applications (n = 572)		
Use of green transport & mobility app	224	37,5
Never used any green mobility & transport app	358	62,6
Types of rewards (n = 572)		
Extrinsic reward (e.g., vouchers, gifts, discounts)	297	51,9
Intrinsic rewards (e.g., thanks, social recognition)	275	48,1

Appendix B.*Crosstabulation of the background and sociodemographic variables*

Use and non-use of green transport & mobility applications	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Total
Non-use of green transport & mobility applications	117 (66.1%)	72 (68.6%)	72 (50%)	91 (65.5%)	352 (62.3%)
Use green transport & mobility applications	60 (33.9%)	33 (31.4%)	72 (50%)	48 (34.5%)	213 (37.7%)
Total	177 (100%)	105 (100%)	144 (100%)	139 (100%)	565 (100%)
Types of rewards	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Total
Extrinsic rewards (vouchers, gifts, discounts)	87 (49.2%)	53 (50.5%)	72 (50%)	80 (57.6%)	292 (51.7%)
Intrinsic rewards (thanks and social recognition)	90 (50.8%)	52 (49.5%)	72 (50%)	59 (42.4%)	273 (48.3%)
Total	177 (100%)	105 (100%)	144 (100%)	139 (100%)	565 (100%)
Gender	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Total
Female	115 (65%)	68 (66%)	82 (56.9%)	71 (51.4%)	336 (59.8%)
Male	62 (35%)	35 (34%)	62 (43.1%)	67 (48.6%)	226 (42.2%)
Total	177 (100%)	103 (100%)	144 (100%)	138 (100%)	562 (100%)
Level of education	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Total
Elementary school	2 (1.1%)	2 (1.9)	3 (2.1)	0 (0%)	7 (1.2%)
High school	25 (14.1%)	13 (12.4%)	35 (24.3%)	19 (13.7)	92 (16.3%)
Undergraduate	76 (42.9%)	48 (45.7%)	68 (47.2%)	61 (43.9%)	253 (44.8%)
Post-graduated	12 (6.8%)	2 (1.9%)	5 (3.5%)	5 (3.6%)	24 (4.2%)
Master's degree	50 (28.2%)	25 (23.8%)	24 (16.7%)	44 (31.7)	143 (25.3%)
P.h.D/Post P.h.D	12 (6.8%)	15 (14.3%)	9 (6.3%)	10 (7.2%)	46 (8.1%)
Employment status	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Total
Unemployed	12 (6.8%)	3 (2.9%)	8 (5.6%)	3 (2.2%)	26 (4.6%)
Student	28 (15.8%)	11 (10.6%)	20 (13.9%)	13 (9.4%)	72 (12.8%)
Retired	1 (0.6%)	3 (2.9%)	2 (1.4%)	0 (0.0%)	6 (1.1%)
Employed	108 (61%)	67 (64.4%)	92 (63.9%)	103 (74.1%)	370 (65.6%)
Selfemployed	28 (15.8%)	20 (19.2%)	22 (15.3%)	20 (14.4%)	90 (16%)
Total	177 (100%)	104 (100%)	144 (100%)	139 (100%)	564 (100%)
Professional occupation	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Total

Farmers and workers in agriculture and fisheries	0 (0.0%)	1 (1.2%)	0 (0.0%)	0 (0.0%)	1 (0.2%)
Specialists in intellectual and scientific professions	15 (10.7%)	18 (21.4%)	8 (7.8%)	16 (13.7%)	57 (12.8%)
Facility and machinery workers	1 (0.7%)	1 (1.2%)	0 (0.0%)	2 (1.7%)	4 (0.9%)
Administrative staff	13 (9.3%)	6 (7.1%)	7 (6.8%)	7 (6.0%)	33 (7.4%)
Service personnel and sellers	33 (23.6%)	17 (20.2%)	24 (23.3%)	16 (13.7%)	90 (20.3%)
Technological professionals	36 (25.7%)	22 (26.2%)	35 (34%)	46 (39.3%)	139 (31.3%)
Entrepreneurial professionals	3 (2.1%)	1 (1.2%)	7 (6.8%)	6 (5.1%)	17 (3.8%)
Senior managers and managers	15 (10.7%)	4 (4.8%)	6 (5.8%)	10 (8.5%)	35 (7.9%)
Intermediate level technicians and professionals	21 (15%)	11 (13.1%)	11 (10.7%)	12 (10.3%)	55 (12.4%)
Unskilled workers	3 (2.1%)	3 (3.6%)	5 (4.9%)	2 (1.7%)	13 (2.9%)
Total	140 (100%)	84 (100%)	103 (100%)	177 (100%)	444 (100%)
Age	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Total
18-25	17 (9.6%)	6 (5.7%)	21 (14.6%)	17 (12.2%)	61 (10.8%)
26-35	89 (50.3%)	54 (51.4%)	60 (41.7%)	76 (54.7%)	279 (49.4%)
36-45	42 (23.7%)	34 (32.4%)	43 (29.9%)	33 (23.7%)	152 (26.9%)
46-55	19 (10.7%)	7 (6.7%)	15 (10.4%)	10 (7.2%)	51 (9%)
56-75	10 (5.6%)	4 (3.8%)	5 (3.5%)	3 (2.2%)	22 (3.9%)
Total	177 (100%)	105 (100%)	144 (100%)	139 (100%)	565 (100%)

Appendix C.*Travel motivations background variables*

Descriptive Statistics		Cluster Number of Case			
		1	2	3	4
Ego Enhancement	N	117	105	144	139
	Minimum	2.50	2.00	3.00	2.50
	Maximum	5.00	5.00	5.00	5.00
	Mean	4.5381	4.1881	4.6267	4.4245
	Std.	0.52049	0.66124	0.44936	0.54727
	Deviation				
Self Steem	N	117	105	144	139
	Minimum	1.00	1.75	2.00	2.50
	Maximum	5.00	4.50	5.00	5.00
	Mean	3.2571	3.1405	3.6684	4.3345
	Std.	0.71976	0.70534	0.72651	0.71926
	Deviation				
Knowledge Seeking	N	117	105	144	139
	Minimum	3.00	2.83	2.33	2.50
	Maximum	5.00	5.00	5.00	5.00
	Mean	4.5612	4.3825	4.6100	4.3345
	Std.	0.4472	0.59688	0.45255	0.53255
	Deviation				
Relaxation	N	117	105	144	139
	Minimum	1.00	1.00	1.00	1.00
	Maximum	5.00	4.50	5.00	5.00
	Mean	2.4463	2.6762	2.9826	2.6691
	Std.	0.84230	0.72218	1.02787	0.95136
	Deviation				
Socialization	N	117	105	144	139
	Minimum	1.33	1.00	1.00	1.00
	Maximum	5.00	5.00	5.00	5.00
	Mean	3.0829	2.9778	3.6389	2.9856
	Std.	0.71291	0.75711	0.77600	0.73652
	Deviation				
Valid N (listwise)	N	117	105	144	139

References

- Aebli, A. (2019). Tourists' motives for gamified technology use. *Annals of Tourism Research*, 78(July), 102753. <https://doi.org/10.1016/j.annals.2019.102753>
- Aguiar-Castillo, L., Clavijo-Rodriguez, A., De Saa-Perez, P., & Perez-Jimenez, R. (2019). Gamification as an approach to promote tourist recycling behavior. *Sustainability (Switzerland)*, 11(8), 1–18. <https://doi.org/10.3390/su1082201>
- Aguilo-Perez, E., Alzua-Sorzabal, A., & Avello, M. (2017). Enhancing tourist satisfaction through a smart urban tourism app: The case of the city of Zaragoza. *Information Technology & Tourism*, 17(1), 1–21.

- Adongo, C. A., Taale, F., & Adam, I. (2018). Tourists' values and empathic attitude toward sustainable development in tourism. *Ecological Economics*, 150, 251–263. <https://doi.org/10.1016/j.ecolecon.2018.04.013>
- Anagnostopoulou, E., Bothos, E., Magoutas, B., Schrammel, J., & Mentzas, G. (2018). Persuasive technologies for sustainable mobility: State of the art and emerging trends. *Sustainability (Switzerland)*, 10(7), 1–22. <https://doi.org/10.3390/su10072128>
- Albornoz, S. G. (2009). Jogo e trabalho: do homo ludens, de Johann Huizinga, ao ócio criativo, de Domenico De Masi. *Cadernos de Psicologia Social Do Trabalho*, 12(1), 75–92. http://pepsic.bvsalud.org/scielo.php?pid=S1516-37172009000100007&script=sci_arttext%5Cnhttp://pepsic.bvsalud.org/pdf/cpst/v12n1/ao7v12n1.pdf
- Ashworth, G., & Page, S. J. (2011). Urban tourism research: Recent progress and current paradoxes. *Tourism management*, 32(1), 1–15. <https://doi.org/10.1016/j.tourman.2010.02.002>
- Ashworth, G. J. (2003). Urban tourism: still an imbalance in attention? In C. Cooper (Ed.), *Classic reviews in tourism* (pp. 143–163) Clevedon: Channel View
- Bates, S., & Ferri, A. J. (2010). What's Entertainment? Notes Toward a Definition. *Studies in Popular Culture*, 33(1), 1–20. <http://www.jstor.org/stable/23416316>
- Bergin-Seers, S., & Mair, J. (2009). Emerging Green Tourists in Australia: Their Behaviours and Attitudes. *Tourism and Hospitality Research*, 9(2), 109–119. <https://doi.org/10.1057/thr.2009.5>
- Bravo, Catalán, S., & Pina, J. M. (2021). Gamification in tourism and hospitality review platforms: How to R.A.M.P. up users' motivation to create content. *International Journal of Hospitality Management*, 99, 103064–. <https://doi.org/10.1016/j.ijhm.2021.103064>
- Bock, G. W., & Kim, Y. G. (2002). Breaking the Myths of Rewards: An Exploratory Study of Attitudes about Knowledge Sharing. *Information Resources Management Journal*, 15(2), 14–21. <https://doi.org/10.4018/irmj.2002040102>
- Brock, T. C., & Livingston, S. D. (2004). The Need for Entertainment Scale. In L. J. Shrum (Ed.), *The psychology of entertainment media: Blurring the lines between entertainment and persuasion* (p. 255–274). Lawrence Erlbaum Associates Publishers. <https://doi.org/10.4324/9780203828588>
- Buningh, S., Martijnse-Hartikka, R., Christiaenso, J., Buningrenske, S., & ojan Christiaens, M.-H. (2014). Mobi-modal shift through gamification. *Transport Research Arena*, 2, 2–8. <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.941.6166&rep=rep1&type=pdf>
- Buhalis, D., & Amaranggana, A. (2013). Smart Tourism Destinations. *Information and Communication Technologies in Tourism*, 553–564. <https://doi.org/10.1007/978-3-319-03973-2>
- Cardoso, B., Ribeiro, M., Prandi, C., & Nunes, N. (2019). When gamification meets sustainability: A pervasive approach to foster sustainable mobility in Madeira. *Proceedings of the Annual International Conference on Mobile Computing and Networking, MOBICOM*, 3–8. <https://doi.org/10.1145/3349622.3355449>
- Caragliu, A., Del Bo, C. & Nijkamp, P. (2011) Smart Cities in Europe, *Journal of Urban Technology*, 18:2, 65–82, <https://doi.org/10.1080/10630732.2011.601117>
- Cavallaro, F., Irranca Galati, O., & Nocera, S. (2021). Climate change impacts and tourism mobility: A destination-based approach for coastal areas. *International Journal of Sustainable Transportation*, 15(6), 456–473. <https://doi.org/10.1080/15568318.2020.1762951>
- Cellina, F., Bucher, D., Simão, J. V., Rudel, R., & Raubal, M. (2019). Beyond limitations of current behaviour change apps for sustainable mobility: Insights from a user-centered design and evaluation process. *Sustainability*, 11(8). <https://doi.org/10.3390/su11082281>
- Chung, N., & Koo, C. (2015). The use of social media in travel information search. *Telematics and Informatics*, 32(2), 215–229. <https://doi.org/10.1016/j.tele.2014.08.005>
- Costa, C. S. R., Santos, J. G., & Aguiar, E. C. (2015). Sustentabilidade e o comportamento do turista: uma discussão à luz da Psicologia Ambiental. *Revista de Administração Da UFSM*, 8, 35–49. <https://doi.org/10.5902/1983465916393>

- Coca-Stefaniak, J.A. (2021). Beyond smart tourism cities – towards a new generation of “wise” tourism destinations. *Journal of Tourism Futures*, Vol. 7 No. 2, pp. 251-258. <https://doi.org/10.1108/JTF-11-2019-0130>
- Crompton, J. (1979). Motivations of pleasure vacations. *Annals of Tourism Research*, 6(4): 408-424. [https://doi.org/10.1016/0160-7383\(79\)90004-5](https://doi.org/10.1016/0160-7383(79)90004-5)
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*, 35(8), 982-1003. <https://doi.org/10.1287/mnsc.35.8.982>
- Davis, E.D., Bagozzi, R.P. and Warshaw, P.R "Extrinsic (1992). "Extrinsic and intrinsic motivation to use computers in the workplace, and intrinsic motivation to use computers in the workplace," *Journal of Applied Social Psychology*, 24(14), 1111-1132.
- Deterding, S. (2011). Situated motivational affordances of game elements: A conceptual model. Hans Bredow Institute for Media Research, 7-12. https://www.researchgate.net/publication/303084050_Situated_motivational_affordances_of_game_elements_A_conceptual_model
- Dean, D., & Suhartanto, D. (2019). The formation of visitor behavioral intention to creative tourism : the role of push – Pull motivation. *Asia Pacific Journal of Tourism Research*, 24(5), 393-403. <https://doi.org/10.1080/10941665.2019.1572631>
- D’Urso, P., Disegna, M., Massari, R., & Osti, L. (2016). Fuzzy segmentation of postmodern tourists. *Tourism Management*, 55, 297-308. <https://doi.org/10.1016/j.tourman.2016.03.018>
- D’Urso, P., De Giovanni, L., Disegna, M., Massari, R., & Vitale, V. (2021). A Tourist Segmentation Based on Motivation, Satisfaction and Prior Knowledge with a Socio-Economic Profiling: A Clustering Approach with Mixed Information. *Social Indicators Research*, 154(1), 335-360. <https://doi.org/10.1007/s11205-020-02537-y>
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*, 35(8), 982-1003. <https://doi.org/10.1287/mnsc.35.8.982>
- Davis, F., & Venkatesh, V. (1996). A critical assessment of potential measurement biases in the technology acceptance model: three experiments. *International Journal of Human-Computer Studies*, 45(1), 19-45. <https://doi.org/10.1006/ijhc.1996.0040>
- Davis, E.D., Bagozzi, R.P. and Warshaw, P.R (1992). "Extrinsic and intrinsic motivation to use computers in the workplace, and intrinsic motivation to use computers in the workplace," *Journal of Applied Social Psychology*, 24(14), 1111-1132. <https://doi.org/10.1111/j.1559-1816.1992.tb00945.x>
- Dolnicar, S., & Grun, B. (2009). Environmentally friendly behavior - can heterogeneity among individuals and contexts / environments be harvested for improved sustainable management ? *Environment & Behavior*, 41(5), 693-714. <https://doi.org/10.1177/0013916508319448>
- Dolnicar, S., & Leisch, F. (2008). An Investigation of Tourists’ Patterns of Obligation to Protect the Environment. *Journal of Travel Research*, 46(4), 381-391. <https://doi.org/10.1177/0047287507308330>
- Encalada, L. (2017). Identifying Tourist Places of Interest Based on Digital Imprints : Towards a Sustainable Smart City. *Sustainability*, 9, 2-19. <https://doi.org/10.3390/su9122317>
- Ferro, L. S., Walz, S. P., & Greuter, S. (2013). Towards personalized, gamified systems. Proceedings of The 9th Australasian Conference on Interactive Entertainment Matters of Life and Death - IE ’13, 1-6. <https://doi.org/10.1145/2513002.2513024>
- Femenia-Serra, F., & Neuhofer, B. (2019). Smart tourism experiences: Conceptualisation, key dimensions and research agenda. *Investigaciones Regionales*, 2019(42), 129-150.
- Froehlich, J. E. (2015). Gamifying green: gamification and environmental sustainability. In *The Gameful World: Approaches* (pp. 563-596). <https://ieeexplore.ieee.org/document/7040536>

- Giffinger, R., Fertner, C., Kramar, H., & Meijers, E. (2007). Smart Cities Ranking of European Medium-Sized Cities (p. 11). Vienna, UT: Centre of Regional Science.
- Gretzel, U.; Werthner, H.; Koo, C.; Lamsfus, C. Conceptual foundations for understanding smart tourism ecosystems. *Comput. Hum. Behav.* 2015, 50, 558–563.
- Greener, S. (2008). Business Research Methods. In *Accenture* (1st ed., p. 356). <https://doi.org/10.1016/j.chb.2015.03.043>
- Gössling, S. (2017). Tourism, information technologies and sustainability: an exploratory review. *Journal of Sustainable Tourism*, 25(7), 1024–1041. <https://doi.org/10.1080/09669582.2015.1122017>
- Hamari, J., Huotari, K., & Tolvanen, J. (2012). Gamification and Economics. Property of the MIT Press for Proofreading, Indexing, and Promotional Purposes Only Juho, 140–161.
- Hong, S. K., & Jang, H. (2004). Segmentation of early casino markets: an exploratory study. *Tourism Management*, 25(6), 801–805
- Hughes, H. L., & Benn, D. (1997). Entertainment in tourism: A study of visitors to Blackpool. *Managing Leisure*, 2(2), 110–126. <https://doi.org/10.1080/136067197376239>
- Jylhä, A., Nurmi, P., Sirén, M., Hemminki, S., & Jacucci, G. (2013). Matkahupi: A persuasive mobile application for sustainable mobility. UbiComp 2013 Adjunct - Adjunct Publication of the 2013 ACM Conference on Ubiquitous Computing, 227–230. <https://doi.org/10.1145/2494091.2494164>
- Juvan, E., & Dolnicar, S. (2016). Measuring environmentally sustainable tourist behaviour. *Annals of Tourism Research*, 59, 30–44. <https://doi.org/10.1016/j.annals.2016.03.006>
- Kallio, K. P., Mäyrä, F., & Kaipainen, K. (2011). At least nine ways to play: approaching gamer mentalities. *Games & Culture*, 353, 327–353. <https://doi.org/10.1177/1555412010391089>
- Keng, K. A., & Cheng, J. L. L. (1999). Determining Tourist Role Typologies: An Exploratory Study of Singapore Vacationers. *Journal of Travel Research*, 37(4), 382–390. <https://doi.org/10.1177/004728759903700408>
- Kessler, F. B., Kessler, F. B., Kazhamiakin, R., Marconi, A., Perillo, M., Pistore, M., Valetto, G., Avesani, F., & Perri, N. (2015). Using Gamification to Incentivize Sustainable Urban Mobility Using Gamification to Incentivize Sustainable Urban Mobility. 1st IEEE International Smart Cities Conference, OCTOBER, 1–6.
- Kleeman, G. (2001). The Impacts of Tourism. *Geography Bulletin*, 33, 66–69.
- Kisurina, A. (2017). Gamifying Sustainability: Motivating Pro-Environmental Behaviour Change Through Gamification. Case of Joulebug. LUT School of Business and Management.
- Köhn, H.-F. and Hubert, L.J. (2015). Hierarchical Cluster Analysis. In Wiley StatsRef: *Statistics Reference Online* (eds N. Balakrishnan, T. Colton, B. Everitt, W. Piegorsch, F. Ruggeri and J.L. Teugels). <https://doi.org/10.1002/9781118445112.stat02449.pub2>
- Law, F. L., Kasirun, Z. M., & Gan, C. K. (2011). Gamification towards sustainable mobile application. 2011 5th Malaysian Conference in Software Engineering, MySEC 2011, 2, 349–353. <https://doi.org/10.1109/MySEC.2011.6140696>
- Lindberg, K., McCool, S., & Stankey, G. (1997). Rethinking Carrying Capacity. *Annals of Tourism Research*, 24(2), 461–465. [https://doi.org/10.1016/S0160-7383\(97\)80018-7](https://doi.org/10.1016/S0160-7383(97)80018-7)
- Lopez de Avila, A., (2015). Smart destinations: XXI century tourism. In Presented at the ENTER2015 conference on information and communication technologies in tourism, Lugano, Switzerland, February 4–6.
- Luo, J. M., Lam, C. F., & Fan, D. X. F. (2020). The development of measurement scale for entertainment tourism experience: a case study in Macau. *Current Issues in Tourism*, 23(7), 852–866. <https://doi.org/10.1080/13683500.2018.1556251>
- Maltese, I., & Zamparini, A. (2020). Smart Tourism Destinations and the Role of Ecosystems. In *Handbook of Research on Smart Tourism Destination Development and Marketing* (pp. 171–195). IGI Global.

- Marczewski, A. (2016). Gamification, Game Thinking and Motivational Design. In *Even Ninja Monkeys Like to Play: Unicorn Edition*. Independently Published (p. 346).
- Marin, L., Ruiz, S., & Rubio, A. (2009). The role of identity salience in the effects of corporate social responsibility on consumer behavior. *Journal of Business Ethics*, 84, p. 65–78. <http://doi.org/10.1007/s10551-008-9673-8>
- Mason, P. (2008). *Tourism impacts, planning and management* (2nd ed.). Butterworth Heinemann.
- Maroco, J. (2007). *Análise Estatística: com utilização do SPSS*. 3ª ed. Lisboa: Sílabo.
- Mehmetoglu, M., & Engen, M. (2011). Pine and Gilmore's Concept of Experience Economy and Its Dimensions: An Empirical Examination in Tourism. *Journal of Quality Assurance in Hospitality & Tourism*, 12(4), 237–255. <https://doi.org/10.1080/1528008X.2011.541847>
- Mehraliyev, F., Chan, I. C. C., Choi, Y., Koseoglu, M. A., & Law, R. (2020). A state-of-the-art review of smart tourism research. *Journal of Travel and Tourism Marketing*, 37(1), 78–91. <https://doi.org/10.1080/10548408.2020.1712309>
- Miller, D., Merrilees, B., Coghlan, A., Miller, D., Merrilees, B., & Coghlan, A. (2015). Sustainable urban tourism: understanding and developing visitor pro-environmental behaviours. *Journal of Sustainable Tourism*, 23(1), 26–46. <https://doi.org/10.1080/09669582.2014.912219>
- Millonig, A., & Mitgutsch, K. (2014). Playful Mobility Choices: Motivating informed mobility decision making by applying game mechanics. *ICST Transactions on Ambient Systems*, 1(4), 1–6. <https://doi.org/10.4108/amsys.1.4.e3>
- Moeller, T., Dolnicar, S., & Leisch, F. (2011). The sustainability – profitability trade-off in tourism: can it be overcome? *Journal of Sustainable Tourism*, 19(2), 155–169. <https://doi.org/10.1080/09669582.2010.518762>
- Mojena, R. (2014). Ward's Clustering Algorithm. In *Wiley StatsRef: Statistics Reference Online* (eds N. Balakrishnan, T. Colton, B. Everitt, W. Piegorsch, F. Ruggeri and J.L. Teugels).
- Mora, L., Bolici, R. & Deakin, M. (2017) The First Two Decades of Smart-City Research: A Bibliometric Analysis, *Journal of Urban Technology*, 24:1, 3-27. <https://doi.org/10.1080/10630732.2017.1285123>
- Negrușă, A. L., Toader, V., Sofică, A., Tutunea, M. F., & Rus, R. V. (2015). Exploring gamification techniques and applications for sustainable tourism. *Sustainability (Switzerland)*, 7(8), 11160–11189. <https://doi.org/10.3390/su70811160>
- Parapanos, D. & Michopoulou, E. (2023) Innovative Mobile Technology in Hotels and the Use of Gamification, *Tourism Planning & Development*, 20:2, 162-187. <https://doi.org/10.1080/21568316.2022.2107563>
- Parapanos, D. & Michopoulou, E. (2022). How to Design Hotel Gamified Applications Effectively: Understanding the Motives of Users as Hotel Visitors. In: Stienmetz, J.L., Ferrer-Rosell, B., Massimo, D. (eds) *Information and Communication Technologies in Tourism 2022*. ENTER 2022. Springer, Cham. https://doi.org/10.1007/978-3-030-94751-4_43
- Pan, Y., & Liu, J. (2018). Antecedents for College Students' Environmentally Responsible Behavior: Implications for Collective Impact and Sustainable Tourism. *Sustainability*, 10, 2–14. <https://doi.org/10.3390/su10062024>
- Pestana, M. & Gageiro, J. (2014). *Análise de dados para ciências sociais: a complementaridade do SPSS*, Lisboa: Sílabo.
- Prandi, C., Nisi, V., Salomoni, P., & Nunes, N. J. (2015). From gamification to pervasive game in mapping urban accessibility. *CHIItaly 2015*, 126–129. <http://dx.doi.org/10.1145/2808435.2808449>.
- Pulido-Fernández, J.I., Cárdenas-García, P.J. and Carrillo-Hidalgo, I. (2017), "Explaining tourism expenditure based on trip characteristics in emerging urban-cultural destinations", *Tourism Review*, Vol. 72 No. 1, pp. 68-86. <https://doi.org/10.1108/TR-09-2016-0040>

- Ribes, J. F., & Baidal, J. (2018). Smart sustainability: A new perspective in the sustainable tourism debate. *Journal of Regional Research*, 42, 151–170. <https://investigacionesregionales.org/wp-content/uploads/sites/3/2019/01/09-PERLES.pdf>
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55, 68–78.
- Deci, E.L. and Ryan, R.M. (2015) Self-Determination Theory. *International Encyclopedia of the Social & Behavioral Sciences*, 91, 486–491. <https://doi.org/10.1016/B978-0-08-097086-8.26036-4>
- Silva, A., Sousa, B., Brandão, F. (2021). Turismo urbano e sustentabilidade social: uma reflexão para o futuro. *Revista Turismo & Desenvolvimento*, 36(1), 427–435. <https://doi.org/10.34624/rtd.vii36.8193>
- Shawn, S., & Wu, C. E. (2006). Seniors' travel motivation and the influential factors : An examination of Taiwanese seniors. *Tourism Management*, 27, 306–316. <https://doi.org/10.1016/j.tourman.2004.11.006>
- Smith, S. M., & Albaumb, G. S. (2012). Basic Marketing Research : Volume 1 Handbook for Research Professionals (Vol. 1).
- Snepenger, D., King, J., Marshall, E., & Uysal, M. (2006). Modeling Iso-Ahola's motivation theory in the tourism context. *Journal of Travel Research*, 45(2), 140–149. <https://doi.org/10.1177/0047287506291592>
- Stevens, J. (2002). Applied Multivariate Statistics for the Social Sciences (4th Ed.). Mahwah NJ: Erlbaum.
- Souza, V. S., Marques, S. R. B. de V., & Verissimo, M. (2020). How can gamification contribute to achieve SDGs?: Exploring the opportunities and challenges of ecogamification for tourism. *Journal of Hospitality and Tourism Technology*. <https://doi.org/10.1108/JHTT-05-2019-0081>
- Souza, V., Marques, S. (2022). Factors influencing urban tourists' receptivity to ecogamified applications: A study on transports and mobility. *International Journal of Tourism Cities*. <https://doi.org/10.1108/IJTC-08-2021-0165>
- Tabachnick, B.G., & Fidell, L.S. (2007). Using Multivariate Statistics (5th Ed.). Boston: Pearson Education.
- Tondello, G. F., Mora, A., & Nacke, L. E. (2017). Elements of Gameful Design Emerging from User Preferences. Proceedings of the Annual Symposium on Computer-Human Interaction in Play - CHI PLAY '17, 129–142. <https://doi.org/10.1145/3116595.3116627>
- Torres-Toukoudidis, A.; León, D.V.; De-Santis, A.; López-López, P.C. Gamification in Ecology-Oriented Mobile Applications—Typologies and Purposes. *Societies* 2022, 12, 42. <https://doi.org/10.3390/soc12020042>
- Touray, K., Jung, T. (2010). Exploratory Study on Contributions of ICTs to Sustainable Tourism Development in Manchester. In: Gretzel, U., Law, R., Fuchs, M. (eds) Information and Communication Technologies in Tourism 2010. Springer, Vienna. https://doi.org/10.1007/978-3-211-99407-8_41
- United Nation (1987). Brundtland Report Our Common Future. United Nation, p.427. <https://ambiente.files.wordpress.com/2011/03/brundtland-report-our-common-future.pdf>
- Valls Giménez, J. F., Pipoli, G., Rita, P., & Labairu-Trenchs, I. (2019). Tourist profiles and attitudes: a comparison between cities in a different phase of the life cycle. *International Journal of Tourism Cities*, 6(4), 731–748. <https://doi.org/10.1108/IJTC-02-2019-0030>
- Yen, M. (2015). Eco-gamification: Game Changer for Sustainable Real Estate. <http://green-perspective.blogspot.fi/2015/09/eco-gamification-game-changerfor.html>
- Yen, B. T. H., Mulley, C., & Burke, M. (2019). Gamification in transport interventions: Another way to improve travel behavioural change. *Cities*, 85(January 2018), 140–149. <https://doi.org/10.1016/j.cities.2018.09.002>
- Yoo, C., Kwon, S., Na, H., & Chang, B. (2017). Factors Affecting the Adoption of Gamified Smart Tourism Applications: An Integrative Approach. *Sustainability*, 9, 1–21. <https://doi.org/10.3390/su9122162>

- Weber, J. (2014). Gaming and Gamification in Tourism: 10 Ways to Make Tourism More Playful. Best Practice Report. Digital Tourism Think Tank, 4–14. <https://thinkdigital.travel/wp-content/uploads/2014/05/Gamification-in-Tourism-Best-Practice.pdf>
- Werbach, K., & Hunter, D. (2012). *For the Win: How Game Thinking Can Revolutionize Your Business*. Wharton School Press.
- Wishart, D. (2014). k -means Analysis. In Wiley StatsRef: Statistics Reference Online (eds N. Balakrishnan, T. Colton, B. Everitt, W. Piegorsch, F. Ruggeri and J.L. Teugels)
- Xu, Tian, F., Buhalis, D., Weber, J., & Zhang, H. (2016). Tourists as Mobile Gamers: Gamification for Tourism Marketing. *Journal of Travel & Tourism Marketing*, 33(8), 1124–1142. <https://doi.org/10.1080/10548408.2015.1093999>
- Zillmann, D., & Bryant, J. (1994). Entertainment as media effect. In J. Bryant & D. Zillmann (Eds.), *Media effects: Advances in theory and research* (pp. 437–461). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Zichermann, G. & Cunningham, C. (2011), *Gamification by Design: Implementing Game Mechanics in Web and Mobile Apps*. Canada: O'Reilly Media, Inc.

Received: 25/05/2023

Revised: 12/09/2023

Accepted: 01/10/2023

Coordinating editor: Marko Perić