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Gamifying Sustainability: Incorporating a gamification approach for more responsible decision-making

Germán Martínez[1]
Isabel Rocabado[1]
Trong Cong Le[1]
Alireza Ansari Vaghef[1]
Keila Alabarca[2]

[1] Leipzig University (Leipzig, Germany)
[2] Invia Group (Leipzig, Germany)

Abstract

In response to the growing need for more responsible decision-making in the tourism sector by consumers and the persistent "attitude-behavior gap," this article presents the development of an innovative project designed to include gamification as part of the online flight booking experience with a sustainability approach. Through the application of a structured gamification approach, based on psychological motivators, the solution integrates mechanics and components to motivate users to make responsible decisions, transforming a transactional process into an engaging and meaningful experience.

Keywords: Attitude-behavior gap, Gamification, Innovation, Online Travel Agencies (OTAs), Sustainable tourism.

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1. INTRODUCTION

The tourism, hospitality, and aviation sectors are currently facing an unprecedented challenge. Following a significant phase of post-pandemic recovery, characterized by pent-up demand and the emergence of new consumer behaviors, such as "bleisure" (Puerta et al., 2023), this industry now faces an unprecedented challenge to overcome mere operational efficiency. Sustainability has become a determining component in purchasing decisions for an increasingly growing segment of customers, who increasingly demand transparency and tangible actions from companies (Gössling, 2023; PriceWaterhouseCoopers [PwC], 2023). In this context, Online Travel Agencies (OTAs) are one of the main digital links in the ecosystem and hold a privileged position to shape traveler behavior. However, OTAs' current efforts to integrate sustainability are often fragmented and insufficient to bring about real change (absence of integration of sustainability elements in the booking process, absence of filtering options in the booking process with flight sustainability information, among others).

It seems that the main challenge currently facing the sector is not the lack of environmental awareness, but the persistent difference between consumers' intentions and their effective actions, a widely studied behavior known as the "attitude-behavior gap" (Colombo et al., 2023; Juvan & Dolnicar, 2014). Many organizations focus on presenting data as CO_2 emissions, which, while it may be a necessary step, this mere reporting approach has proven insufficient to close the behavioral gap. Consequently, an innovation process is necessary to go beyond information and focus on motivation. This approach translates not only into showcasing the sustainable option but also developing it to be the most attractive, rewarding, and easy to choose, applying principles of behavioral economics to "nudge" consumers toward more responsible choices (Thaler & Sunstein, 2021).

This article presents the development of a project aimed at addressing this gap by designing and developing a gamified online flight booking experience with a focus on sustainability. It details how the integration of dynamics, mechanics, and components of gamification can transform a merely transactional process into an interactive and purposeful experience. The intended result is a conceptual solution, validated through visual prototypes (mockups), which not only aims to educate travelers but also intrinsically motivates them to make more conscious decisions. The article includes a theoretical framework that underpins the proposal and the solution, the analysis of the context and existing practices, the design, development, and visual validation of the gamified solution, and reflections on the implications for the Company and the tourism industry in general.

2. THEORETICAL FRAMEWORK

2.1. Sustainability, gamification, and innovation

The business demands of this century have defined a new imperative that seems inescapable: the incorporation and integration of sustainability as a fundamental part of business strategies. The declaration of the 2030 Agenda and its 17 Sustainable Development Goals (SDGs) (United Nations, 2015) has gone beyond the context of public policies in countries to be a reference framework for innovation processes and long-term value creation in the private sector (Sachs et al., 2019). Today, companies are no longer only evaluated on their financial performance, but also on their environmental, social, and governance (ESG) impact, integral components that can determine their legitimacy, resilience, and sustainability in the eyes of their stakeholders (including customers) in the long term. In economic sectors and industries such as tourism and aviation, this challenge is particularly complex. In particular, SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action) demand a substantial change that can go far beyond operational efficiency, requiring consumer participation in reducing environmental impact with negative consequences (Scott et al., 2016).

However, a gap has been identified between consumers' environmental awareness and their actual purchasing attitudes and behaviors; this gap is known as "the attitude-behavior gap" (Colombo et al., 2023; Fu, 2025; Juvan & Dolnicar, 2014). For companies in this sector, overcoming this inertia requires developing strategies that are not only limited to informing,

but that motivate and, even more importantly, facilitate responsible decision-making. At a point where customer experience becomes fundamental with the intervention of innovation, the architecture of decisions, influenced by behavioral economics, establishes that it is possible to "nudge" consumers towards choices without limiting their freedom, by adequately designing the environment and context in which these decisions are made (Thaler & Sunstein, 2021). In this sense, innovation must be aimed at creating a digital ecosystem that makes more responsible decision-making an attractive and rewarding option.

Gamification, understood as the application of game elements and mechanics in non-playful environments (Hamari & Tuunanen, 2014; Werbach & Hunter, 2012; Wood & Reiners, 2014), emerges as a method and tool of behavioral innovation with enormous potential (Deterding et al., 2011). These types of strategies base their effectiveness on solid psychological constructs, particularly the application of the Self-Determination Theory, which determines that when the needs for autonomy, competence, and social relationships are satisfied, intrinsic motivation is boosted (Ryan & Deci, 2017). For example, by integrating game mechanics and components such as point systems, badges for responsible decisions, progress boards, comparison, and community building, the shopping experience is transformed into a more interactive and meaningful process. Such an approach takes the fundamental human motivators to incentivize more responsible (pro-environmental) behavior changes voluntarily and persistently (Mora et al., 2015).

The success of applying gamification in business and non-recreational environments to influence specific behaviors has been demonstrated. For example, in education, platforms such as Duolingo make use of badges, streaks, leagues, among other components and mechanisms to promote daily learning. In other areas, such as health and wellness, applications such as Nike Run or Fitbit use challenges and rewards to motivate physical activity and changes in healthy behaviors (Hamari et al., 2016). Other specific examples in the field of sustainability include the gamified social comparison of energy consumption in homes with other neighboring households (Opower Utility Company), to generate consumption reductions (Allcott, 2011). These, like other success stories in different sectors, support the hypothesis that gamification can become an innovative tool to transform sustainability from an abstract and complex concept to an individual, tangible purpose with a certain social status.

2.2. Related work on sustainability apps

The benchmarking of gamified sustainability-focused Apps conducted for this project provided valuable insights into gamification strategies that effectively create long-term user engagement and behavior change. Elements studied on this benchmarking were adapted to the solution for this project.

For example, according to our research, AWorld, developed with the United Nations, incorporates quizzes, e-learning, daily missions, and an impact dashboard to encourage continuous interaction.

Other features, such as streak tracking, leaderboards, badges, and educational content, give a sense of accomplishment, rewarding both knowledge acquisition and sustainable actions. The next one, GreenApes, created in collaboration with Greenpeace, underlines community-building through a social feed where users share sustainable practices. The platform integrates avatar creation, levels as progress journeys, and a rewards system allowing point redemption for discounts, eco-friendly products, and intrinsic rewards (such as collaboration on initiatives). The combination of personalization, social influence, and tangible benefits demonstrates how digital environments can motivate repeated sustainable behaviors. JouleBug focuses on habit formation, combining interactive leaderboards, environmental impact dashboards, and community posts. Its visual summaries of users' environmental impact make progress tangible, while the social interaction fosters peer encouragement. FairTrip, meanwhile, promotes responsible tourism by providing information on ethical businesses and destinations, supported by interactive maps and transparent sustainability criteria.

A cross-analysis of these apps reveals common success factors: clear goal-oriented focus, measurable progress indicators, community engagement, progressive learning, and a balance between extrinsic rewards (discounts, products) and intrinsic motivation (social recognition, personal impact tracking, support to sustainable initiatives) (Koivisto & Hamari, 2019).

3. CONTEXT OF THE DESCRIBED RESEARCH/ PRACTICE

3.1. Current online travel agencies' sustainability practices

To identify an effective solution for gamifying sustainability, a three-step process was followed. Benchmarking was approved to be an effective way for an organization to improve its performance by comparing its services and processes with its competitors in the market (Camp, 1989; Min & Min, 2015). First, a benchmarking analysis of major flight booking platforms was conducted to understand the level of integration of sustainability into the booking process. A MacBook Air was used to perform simulations (logged out) on Google Chrome from June 17 until July 16, 2025, with a simulated short-distance one-way flight from Berlin (BER) to Vienna (VIE) and a long-distance one-way flight from Berlin (BER) to Hongkong (HKG), both with the travel date of November 1, 2025. Platforms were assessed against a rubric that featured emissions visible, CO_2 filter/sort, Eco-labels, Tooltips/explanations, Incentives/feedback, and Educational content. The language of the websites was mostly in English, except for Fluege.de in German, since the website is only available in German. Second, climate action applications were examined to understand how features and mechanisms keep users engaged and motivated when they use the applications. Finally, a gamified engagement loop for Online Travel Agencies (OTAs) was proposed to raise awareness about sustainability for users during the flight booking process.

Table 1. *OTA Sustainability Features*

OTA	Emissions visible	CO_2 filter/ sort	Eco-labels/ badges	Tooltips/ explanations	Incentives/ feedback	Educational content
Google Flights	✓	✓	✓	✓	✗	✗
Skyscanner	✓	✓	✓ (low visibility)	✗	✗	✗
Expedia	✓ (details only)	✗	✓ (limited)	✗	✗	✓ (newsletter)
Booking.com	✗ (flights)	✗	✗	✗	✗	✓ (accommodation)
Check24	✗	✗	✗	✗	✗	✗

Notes. ✓: present; ✗: absent.

The benchmarking indicated that sustainability integration in OTAs is fragmented, with notable gaps between corporate climate commitments and features of the booking process to sustainability. OTAs' websites and mobile applications function as user interfaces during the process of booking travel-related products such as flights, cruises, holiday packages, hotel rooms, and so on (Talwar et al., 2020). These OTAs represent common digital spaces for the implementation of nudges (Adkisson, 2008; Stüben & Cantoni, 2024). Green nudges on OTAs proved to motivate people to be more aware of sustainability (Enste & Potthoff, 2021). As of June 2025, when the investigation was conducted, Google Flights and Skyscanner were the best at showing these features: Emissions visible CO_2, filter/sort, Eco-labels/badges. (see Table 1). Other major platforms, including Booking.com and Expedia Group, had introduced emissions data or "Below Average CO_2" labels, yet the lack of filtering options prevented users from being fully informed about the sustainability options when they made the flight purchase.

3.2. The company and the service

The tourism and aviation industry has experienced a complex crisis following the COVID-19 pandemic and transitioned to a robust recovery phase. Known for a phenomenon known as "revenge tourism," especially airlines, which racked up historic losses, have now returned to an unprecedented level of profitability driven by pent-up demand (International Air Transport Association [IATA], 2023). However, this recovery is fragile and generally uneven. While leisure levels are surpassing 2019 levels in many regions, in particular, the recovery of business travel continues to show slower behavior, with airlines facing challenges related to high fuel costs, high debt, and labor shortages (Deloitte Development LLC, 2025; Siriphot et al., 2023; Tufft et al., 2024; UN Tourism, 2024).

In parallel to the financial recovery and the transformation in consumer behavior and expectations, companies in the industry have been forced to innovate in an agile manner. Sustainability is no longer just a differential approach or a niche to exploit, to now become a purchasing decision factor for an increasingly large segment of consumers (Gössling, 2023; PwC, 2023). The sector is undergoing intensive digitalization, with user preferences towards seamless travel experiences, with less contact and managed almost entirely through mobile devices, which has driven the adoption of new technologies such as artificial intelligence for the hyper-personalization of the offers of companies in the sector (Sigala, 2020; Skift & Amazon Web Services (AWS), 2023). In response to this, new travel patterns have emerged such as "bleisure", which is defined as the combination of business and leisure and a greater demand for flexibility in bookings (Puerta et al., 2023), and companies in the sector are adjusting their value proposition, not only as transport or accommodation providers, but as integrators of memorable, personalized and increasingly responsible travel experiences (Capgemini ESG policy, 2025).

In this sense, the Company faced both a challenge and a significant opportunity: how to address the paradigm of the gap between what consumers say and their real behaviors (Colombo et al., 2023; Fu, 2025; Juvan & Dolnicar, 2014), by guiding consumers toward more responsible choices, considering the Triple Bottom Line (TBL) approach defined by the organization. After extensive research, analysis, and work from the Company, a potential solution seemed to emerge: gamification of the user experience, including sustainability mechanics. Gamification seemed to respond to the needs, expectations, and concerns of the organization and seemed to cover, from various approaches, what the organization was looking for in terms of its sustainability strategy and current trends. From this point, three approaches were defined to guide the development of the gamification project: gamification of the experience with a sustainability approach, an impact calculator, and Twins destinations. The approaches that would later be integrated into the same solution.

4. MAIN RESULTS AND REFLECTIONS

4.1. Results regarding achievement of project objectives

The project solution demonstrates a clear alignment with the Company's strategic objectives of increasing

sustainability awareness, influencing booking behavior to more responsible and conscious choices. These objectives are based on the company's Triple Bottom Line (TBL) approach, which balances environmental ("Planet"), social ("People"), and economic ("Profit") impact. The project pursues transforming complicated indicators into tangible, motivating actions for travelers.

From an environmental perspective, the solution introduces indicators such as booking flights with fewer CO_2 emissions than the average for a route or traveling during off-peak seasons. Social objectives are addressed by rewarding travel choices that support local communities or preserve cultural heritage, while the economic impact is supported by incentives for booking destinations with high small-business participation or lower tourism seasonality. The solution's success lies in combining dynamics, mechanics, and components already mentioned in the theoretical framework, with the TBL indicators.

The gamification design for this project is based on a structural framework of three interconnected levels: dynamics, mechanics, and components (Deterding et al., 2011; Werbach & Hunter, 2012; Wood & Reiners, 2014). At the most abstract level, dynamics act as the motivational drivers — such as intrinsic motivation to make a positive impact, curiosity, and social competence — that set the emotional context to foster sustainable behavior. In turn, mechanics are the rules and processes that materialize these dynamics into concrete actions, through achievements (badges for low-emission reserves), challenges, and feedback systems that transform abstract sustainability goals into tangible and achievable steps (Werbach & Hunter, 2012). Finally, the components constitute the interface and the elements with which the user interacts directly (Deterding et al., 2011; Werbach & Hunter, 2012; Wood & Reiners, 2014), including a points system, a "Digital Passport" to collect achievements, both extrinsic (discounts) and purpose (donations) rewards, and an interactive map to promote alternative destinations with positive impact.

A key aspect of the project's development was the creation of interactive mockups using a digital design platform. This tool enabled the project team to visually prototype the gamified components and integrate them into the Company's existing booking interface. The mockups illustrated, for example, how the CO_2 comparison tool could appear alongside flight options, how badges would be displayed in the user's account dashboard as a "passport", and how leaderboards could be integrated. They also visualized the "Passport" concept, with the points and stamps collector, which could then be redeemed for extrinsic rewards (discounts, all-inclusive trips, or eco-friendly products) or intrinsic rewards (donations to aligned causes). These prototypes were essential for demonstrating that sustainability features could be seamlessly incorporated into the platform without interfering with the user experience.

Table 2. *Components of Self-Determination Theory (SDT) and specific TBL results*

Component	SDT Need(s)	Linked TBL Indicator(s)
Points & Badges	Competence	CO_2 below the route average (environmental)
Leaderboard/ Community	Relatedness	Support for local communities (social)
"Digital Passport"	Autonomy & Competence	Off-peak travel, reduction of seasonality (economic)

Transitioning from concept to evidence requires validation beyond mockups. A proposed A/B testing plan would evaluate booking flows with and without gamified sustainability features. Metrics such as task completion, booking time, and percentage of low-emission choices would provide empirical evidence of whether gamification increases responsible decisions without harming usability.

The design includes three levels: dynamics (intrinsic motivation to make a positive impact), mechanics (challenges, feedback, achievements), and components (points, badges, leaderboards, and a "Digital Passport"). These elements transform abstract sustainability goals into clear, rewarding actions for users. Table 2 illustrates the connections between components of Self-Determination Theory (SDT) and specific TBL results related to psychological requirements.

Overall, the results show that the proposed gamification strategy not only meets the predefined objectives

but also offers a scalable and adaptable model. The use of mockups proved an accomplishment in connecting conceptual ideas and practical implementation, giving both the project team and the Company a visual understanding of how the gamified experience could function in real-world applications. By combining evidence-based design principles with visually validated prototypes, the project lays a strong foundation for a future implementation phase that aligns user motivation with corporate sustainability commitments.

4.2. Implications for the industry and the company

Adopting the proposed gamification strategy could place the Company in a stronger position within the highly competitive online travel agency market. In a place where most platforms compete mainly on price and scheduling, offering interactive features that surround sustainability in the booking process creates a clear point of differentiation. This approach can appeal not only to travelers who are motivated by environmental concerns but also to users who value engaging and personalized experiences. In addition, according to the research carried out and the information obtained from the benchmarking process, this strategy could be a pioneer for the OTA sector.

For the Company, the strategy provides a way to bring its Triple Bottom Line sustainability commitments and combine its three objectives directly into one solution implemented in the booking journey. It also opens the door to partnerships with eco-certified airlines, new and less crowded destinations, and NGOs, strengthening brand credibility. Linking rewards to verifiable outcomes, such as measurable CO_2 reductions or tangible contributions to local communities, could help build user trust while minimizing the risk of greenwashing. At an industry level, this type of initiative reflects a shift from simple transparency toward design approaches that actively influence travel decisions.

4.3. Reflections, challenges, and opportunities

The project offers clear potential, but its success will depend on how it is implemented and maintained over time. One of the main reflections from the project is that integrating sustainability into the booking journey requires more than simply providing information; it demands tools, technical infrastructure, and a dedicated team that actively guides and motivates users without disrupting their booking experience. Ensuring the accuracy and credibility of sustainability data is essential. Any indicators used, such as CO_2 emissions or local communities' support, must be assisted by independent verification to avoid greenwashing and maintain user trust. Another challenge lies in balancing extrinsic rewards, like discounts or marketplace products, with intrinsic rewards, such as personal satisfaction or community recognition. Without this balance, user engagement could drop once external incentives are removed.

Privacy and ethics are required considerations: only necessary data (e.g., emissions-related choices) should be tracked, and carbon assessments must be provided with clear methodological transparency. Engagement in social features such as leaderboards must be exclusively opt-in, ensuring that users retain control over their data and visibility.

On the other hand, the opportunity lies in the modular design of the solution. The Company could start with core features and basic badges, then expand to community challenges, leaderboards, and suggestions for alternative destinations. In the long term, the model could be extended beyond flights to include sustainable accommodation and low-impact transportation options, creating a holistic travel ecosystem. An important aspect is related to the measurement of the performance of the experience at the time of its launch, where metrics based on the TBL approach can include KPIs such as the Adoption Rate of Gamified Functionalities, Engagement with Specific Speakers, Challenge Completion Rate, and Responsible Choice Rate OR Interaction and Booking Rate of "Twin Destinations".

5. CONCLUSION

The development of this project demonstrates that gamification, understood as a behavioral innovation tool, can offer a viable and scalable solution to address the "attitude-behavior gap" in the tourism and

hospitality sector (Colombo et al., 2023; Juvan & Dolnicar, 2014). Transforming the complexes of sustainability indicators of the TBL approach into a strategy and structure of dynamics, mechanics, and interactive components, the gamification solution converts consumer decision-making from a passive act to a more active and rewarding experience. This scheme transcends the simple provision of basic information, which has so far proven to be insufficient, to become a kind of responsible decision-making mechanism that actively encourages environmental behaviors through the satisfaction of intrinsic motivations (Ryan & Deci, 2017).

On the other hand, the development of the project highlights the importance of developing this type of collaborative process between industry and academia. The combination of these two groups of knowledge, on the one hand, the Company (real context, technical infrastructure, business objectives) and, on the other hand, academia (methodology, theoretical frameworks), increases the probability of developing successful projects and mitigating potential risks. This co-creation model, framed within the scheme of the Triple Helix of Innovation (Etzkowitz & Leydesdorff, 2000), is central to developing initiatives that can become commercially viable and scientifically sound.

The project offers both a conceptual framework and clear pathways for execution enabling the transformation from design into actionable measures necessary to convert the gamification concept into quantifiable outcomes. The following recommendations highlight the priority goals for OTAs aiming to implement sustainability aspects in their booking process:

Establish CO_2 sorting and filtering as default-visible options in the booking process for promoting sustainable decisions.

Develop a Minimum Viable Product "Digital Passport" featuring points and badges to evaluate user engagement. These MVPs should include interesting and recognizable landmarks, such as the Brandenburg Gate in Berlin.

Partner with trusted and certified third parties for emissions verification to ensure credibility, transparency, and user confidence.

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