

Digital Innovation and Sustainability Practices in Tourism: An Overview



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Abstract This article seeks to develop a theoretically oriented reflection on sustainability digital innovations within the context of tourism and the potentials of this relationship. To this end, a literature review analysis was chosen for the collection, selection and critical evaluation of the literature on this topic. The authors assert that there is an ongoing process of evolutionary sustainability practices in tourism, indicating a theoretical approach rather than specific actions. The significant progress on the acceptance of the basic principles of sustainability from businesses and individuals still lacks the application of the appropriate instruments in the tourism industry so as to maximize the efficiency and successful development of sustainable digital innovations.

Keywords Sustainability practices · Tourism sustainability · Digital innovation · Tourism development

JEL Classifications Z30 · Z32 · Q01 · Q56 · O33

1 Introduction

With digital technologies, organizations have adopted innovative approaches to tackling societal challenges. These technologies help address grand challenges like climate change and promote sustainable development. They are generally referred to as digital sustainability activities. Digital sustainability can drive empirical advances in entrepreneurship, innovation and has the potential to positively impact society (George G. et al, 2020).

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Many large companies have created corporate social responsibility departments to generate social outputs, but they still separate these activities from their core processes. A smaller subset of companies are trying to integrate pro-social choices into their core strategies, processes and practices. By detecting the emergence of STE in practices, they initiate modifications in goal setting that focus on reducing environmental impact and going “green”. A few and more ambitious sustainable entrepreneurs deliberately pursue net positive environmental impacts. As sustainable entrepreneurs reshape capital structures and corporate cultures, they are creating a growing population of organizations for which the pursuit of sustainability has become a core economic opportunity (George G. et al, 2020).

There are many substantial challenges to the application of the principles of sustainable development in tourism. Some of them include the nature of the tourism product, the fragmented way in which critical decisions are made in tourism and the different, often conflicting interests of those involved in tourism development. This article examines the application of sustainable practices in the tourism industry with a theoretical presentation of development strategies and a focus on sustainable approaches in practice.

2 Literature Review

2.1 Digital Innovation in Tourism

Digital technologies have revolutionized the tourism industry by bringing major and remarkable changes to tourism businesses, products, experiences, business ecosystems and destinations. Digitization has not only transformed the producers, but also the consumers of traditional tourism, with the emergence of new roles, relationships and references. The variety and volume of tourism products have increased, and consequently, the functionality, the speed of financial transactions and the feedback have also increased. Digitalization in tourism not only leads to creativity and innovation, but also facilitates an increased customization of visitors’ experiences, which enhances their satisfaction. Digitalization contributes to the configuration of new destinations, new business models and business ecosystems which open up new roles for consumers, producers and DMOs (Dredge, et al., 2019). The journey from traditional operators to a smart destination is long, although coordinated efforts to promote an innovative digital culture can ensure the competitiveness of destinations, as shown in detail in the following figure.



“The journey towards digitalization in Tourism”. Source: Adapted from Dredge, D, et al. (2019).

Due to the progress in digitalization, the tourism sector has undergone a remarkable change and has affected the economic efficiency of the industry. The presence of factors influencing consumers and economic growth is proven, as are the economic benefits associated with the development and use of digitalization (Filipiak et al, 2020). Some of the implementations that could support the empowerment of tourism operators are the below forms of digital innovation usage:

- Internet of things: A key promoter of tourism has been the development of network capabilities. The increase of broadband infrastructures that allow users to access multimedia content in real time is a determining factor for the quantity and quality of information that can be presented on the Internet. This fact is particularly important in the tourism market, as the choice of a specific destination is directly related to the quality of information available to the potential customer (Filipiak et al, 2020). The existence of images and detailed information on a web site plays a crucial role in the customer’s view of the quality of a product. IoT connects various devices online and can have a major impact in cost-effectiveness of daily operations (Ivan, 2020).
- Recognition technology: A second dimension in the field of networks is related to security and personal data protection technologies. The progress that has been made in this area ensures to a very high degree the security of transactions that also play a key role in e-business. One of the technological trends that are being studied for use in the tourism industry to provide smoother biometric authentication is fingerprints or face scans (Ivan, 2020).
Finally, the integration of systems is an important technological factor that influences the development of tourism entrepreneurship. At the same time, services that create new value by coordinating data across industries and platforms remain a work in progress.
- Big data: In the hospitality industry, big data helps operators offer a more personalized experience, suggest attractive alternatives, evaluate performance and make

data-based analysis for business purposes. Interoperability includes both data and IT and telecommunications' applications, which provides for the creation of an environment, transparent to the technology used and a shared data and process environment. New programming trends that improve the reliability and performance of the software improve the price/performance ratio and its ability to carry out extremely complex applications.

- Artificial intelligence (AI): Through AI analysis and service automation, operators can improve performance, make more accurate predictions about consumer needs create predictions and reduce costs. AI offers advanced data, computing capabilities, ample storage and super-fast speed, enabling analysis like capacity expectations, online and fast customer service and augmentation of the process of collaboration, so it can become more memorable for customers and increase the service-delivery competencies for firms (Solakis et al, 2022). A wide range of applications are available in the market, general and specialized, which solve the issue of internal and external communications of a company with business partners and customers, but also issues of data management and distribution and trade (Filipiak et al, 2020).
- Augmented reality (AR): When promoting is required, AR technology plays an important role. The tourism product is often becoming more credible and satisfactory, with virtual tours and testers offered.

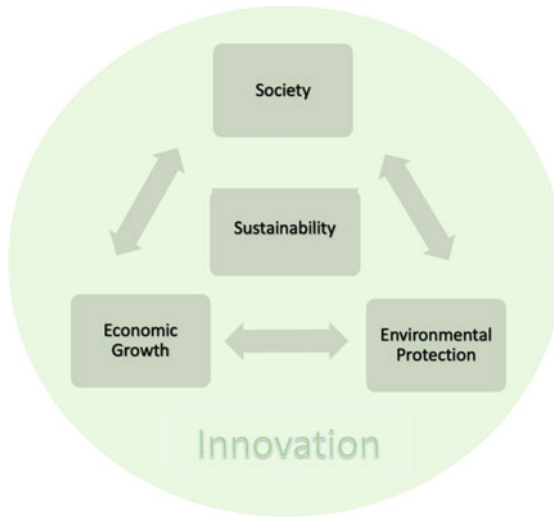
The indicators related to the resources on which the development of tourism is based are many and important. In a first stage of evaluating indicators for sustainable tourism development, it is required to identify these resources, in order to understand their importance both to tourists and residents, businesses and local authorities (Kozirakis, 2014). Sustainability is becoming an increasingly critical requirement for multinational companies that have often been identified as primary contributors to unsustainable practices in environment and society. According to the Carbon Majors Report (CDP, 2017), more than 70% of the world greenhouse gas emissions since 1988 come from just 100 companies. International tourist arrivals are constantly increasing by 25 million worldwide in 1950, to 527 million in 1995 and 1.32 billion in 2017. It is expected to reach 1.8 billion by 2030 (UNWTO, 2016). The number of cars on the streets exceeded 1 billion in 2010. In 2014, there were 1.2 billion and will be 2 billion by 2035 (Green Car Reports, 2014). Investments in sustainable education and infrastructure are now paramount as employers and employees must be trained for environmental responsible choices. Therefore, an identification and assessment are made, for environmental, economic, social and cultural indicators in tourism, to evaluate their positive or negative effects related to biodiversity, air, noise, water, waste generation, energy use and cultural heritage. These impacts create a set of indicators for monitoring situations in tourist areas and drawing up strategic plans for protection, impact control and sustainability practices (Kozirakis, 2014).

2.2 *Digital Innovation and Sustainability*

This golden age of digital innovation provides an unprecedented opportunity in the field of sustainability. The world's attention is focused on technology and innovation, presenting an opportunity to review and redesign processes and digital technologies that can benefit the planet's well-being. The current pandemic highlighted the importance of digitization and digital transformation and accelerated digital transformation across all sectors. The importance of digital innovation for organizations is great in the context of sustainability. While one main objective of digitalization is to create economic value, sustainable business models empowered by digital technologies also set sights on higher ecological and social value (Bähr & Fliaster, 2022). Without the digital transformation of businesses, the economic and environmental challenges of the future cannot be met in a sustainable way. The role of digital innovation is central to achieving long-term economic growth, reducing unemployment, improving the quality of life, providing wider access to public services and reducing costs in many sectors of the economy. Thus, the challenges of digitalization and sustainability transitions are likely to be strategically relevant and particularly decisive for the vast majority of industry sectors.

Sustainability and business digitalization topics are burgeoning, and recent studies are increasingly addressing digital sustainability. Digital sustainability can be defined as the activities that aim at achieving the goals of sustainable development through a creative use of digital technologies (Yousaf et al, 2021). Sustainable innovation is a process where sustainability considerations, environmental, social and financial, are integrated into the equation. This applies to products, services, technologies, as well as to new business models. The reference to the concept of sustainability as a key element that guides innovation refers to the relevance of these dimensions in the innovation process. The economic dimension of sustainability, for instance, is related to the profit component, the economic growth, the efficient use of resources and the viability of businesses. The environmental dimension focuses on combating pollution and the efficient and prudent use of natural resources. The social dimension concerns issues such as equal opportunities, justice in the distribution and equality. The concern and combination of all the above results to a smart, sustainable and inclusive growth (Ferreira & Serpa, 2018).

In the below figure, the analysis of the relationship between these dimensions is shown, creating a systemic relationship between innovation and sustainable development (Ferreira & Serpa, 2018). This intersection of the elements emphasizes that social sustainability is related with economic sustainability with a socio-innovative lace that includes community equity and economic growth, while the relation between the economy and the environment creates a concept of eco-innovation. The social dimension indicates that the focus of innovation is not the technology in itself but rather the need to find solutions that are more effective, sustainable and ethically adequate.



Source: Adapted from Ferreira & Serpa (2018). *Sustainability tripod within the context of innovation.*

Organizations can play an important role in how the global industrial system manages the great challenges of sustainable innovation (Yousaf et al, 2021). There should be a replacement of fossil energy with renewable energy systems, enabled in particular, by technological innovations. An example of such technologies is virtual power plants (VPPs), who virtually integrate several distributed power-generating, power-storing and power-consuming units to allow aggregation and remote control of individual units with alternative digital technologies (Bähr & Fliaster, 2022). A study made by Bähr & Fliaster in the context of business strategies and the environment in 2022 concluded that the perception of primary sustainable changes in businesses comprises the following three aspects: Firstly, the erosion of the traditional core business can come as a result from changes in the competitive landscape, stemming from the decentralization of energy production. Secondly, the technological advancements are expanding in importance, with the emergence of artificial intelligence, cloud-based services, big data, etc. These digital technologies enable the automation of processes. Similarly, the management of minor decentralized power-generating units necessitates more digital technology implementation. Thus, the existing infrastructure either enables or limits the opportunities. Thirdly, there seems to be a high societal awareness and acceptance of current transitions. At the same time, the transitions are dependent on regulations due to their imperfect and fast-changing nature.

Another strong example of innovative sustainable technologies is the Innovative Optical and Wireless Network (IOWN), an initiative infrastructure, built around photonic technology for high capacity, low latency and low power consumption (NTT, 2022). With core technological infrastructures, they offer an environmental sustainability value to society with the following ways (NTT, 2022):

- Sourcing information from sensors and devices, the manage urban assets creating digital spaces, offices, commercial venues and residential places to optimize usage, based on preferences and predictive movements of people.
- Predicting environmental disasters with real-time understanding of environmental activity. The habilitation of more precise weather simulations and predictions facilitates the environmental conservation and advanced preparation to mitigate natural disasters. Using satellites and meteorological sensor devices to acquire detailed data, diversified energy networks, including lightning power generation and space solar generation, a chance for flexibility against environmental change is given to society. As more future disasters loom, preparation and better management of energy consumption are essential.
- Work is being done to manage nuclear fusion and optimize the operation of nuclear fusion reactors, while experimental results show that it allows computers to transmit vast amounts of information in extremely low time.
- With supply and demand control and forecasting technologies, a better energy distribution network is created, with greater precision and use of renewable sources.

Sustainable digital innovation helps to apply the latest digital technology to achieve creative solutions that will address long-term social, economic and environmental issues. It is a combination of digitized technologies and the digitized management system for business process innovation in a sustainable way. The transition process presupposes the confrontation of ambiguous, uncertain and extremely complex challenges. It also involves the introduction of significant changes in the established sociotechnical systems, in order to give priority to a more environmentally friendly production and consumption. These changes depend to a large extent on technology, institutions and the social sphere (Bähr & Fliaster, 2022). To meet the goals of sustainability, there must be a commitment to digital innovation in a more complex way, that is, by developing whole business models focused on this specific goal.

2.3 Sustainable Tourism Practices

Tourism should take into account its current and future economic, social and environmental impacts, while addressing the needs of visitors, industries and host communities. Sustainable tourism development guidelines and practices are applicable to all forms of tourism and all types of destinations. Sustainability principles refer to the environmental, economic and sociocultural balance that must be established between tourism development and actions to guarantee long-term sustainability (Unwto &

Unep, 2005). In order to be able to approach and apply the principles of sustainable tourism in practice, we have to formulate and categorize a set of specific directions—guidelines for practical application. Kozirakis in his research on environmentally sustainable tourism development in 2014 identified the following key factors to indicate sustainable tourism:

- Pressure: number of tourists visiting the location.
- Use intensity: intensity of use during peak periods.
- Social implications: ratio between tourists and residents.
- Development control: existence of official controls for the development of the space and the intensity of its use.
- Waste management: percentage of wastewater in the treated area.
- Programming procedure: existence of an organized regional plan.
- Critical ecosystems: number of rare or endangered species.
- Consumers' satisfaction: levels of visitors' satisfaction (based on research).
- Local residents' satisfaction: levels of locals' satisfaction (based on research).
- Tourism contribution in the local economy: proportion of total economic activity resulting from tourism.
- Bearing capacity: the ability of the area to receive different sizes of tourists.
- Space pressure: impact level in the area's elements due to tourism.
- Attractiveness: quality measure of those elements that make the area attractive in tourism.

As seen above, the indicators are plenty and relate to a variety of tourist destinations. They assess the pressure and the effects that tourism causes on the environment and the society, the limits of the carrying capacity, the attractiveness of the destination, the satisfaction of the tourists and the locals, which clearly show the dimension of sustainable development for which relevant controls should be made (Kozirakis, 2014). The use of indicators' evaluation frameworks helps to understand all the dimensions and sources of relevant problems in the sustainable development processes and serves as a refocus to minimize any negative impacts that may arise as the result of tourism activities.

Some of the sustainable tourism practices include the following actions (Unwto & Unep, 2005):

- The optimal use of environmental resources by maintaining necessary ecological processes and contributing to the preservation of biodiversity, avoiding any form of natural degradation or exploitation.
- Equally important is the respect for the authenticity of the host destinations, preserving the cultural heritage, values and tradition. In this, cross-cultural understanding and tolerance are essential.
- The fair distribution of employment and income opportunities in the host communities contributes to ensuring the viability and competitiveness of tourism destinations and enterprises, sustainable and long-term economic functions, as well as poverty alleviation.

- Achieving sustainable tourism requires continuous monitoring of impacts, introducing the necessary preventive and corrective measures whenever necessary. To ensure broad participation and consensus building, it requires organization and strong political leadership.
- Finally, sustainable tourism should maintain a high level of tourist satisfaction, while increasing their awareness of sustainability issues and promoting sustainable tourism practices.

3 Methodology

The methodology used for the present paper is a narrative literature review, summarizing and synthesizing the literature found with a critical analysis. By presenting a comprehensive background of the literature within the interested topic, theoretical and conceptual frameworks were developed, with the objective of systematizing the relation between digital innovation, sustainability and tourism. All the presented information were gathered from official scientific databases such as Google Scholar or Scopus. The data were collected from credible articles, journals, books and scientific websites of relevance. The criteria in order to select the literature information were the relevance to topic and the publishing date. The review concerns an initial critical reading driven by the main research question: How is digital innovation employed, in addressing environmental sustainability?

The critical analysis of the articles is already discussed in the literature review section.

4 Conclusion

Sustainable tourism is not a particular form of tourism but a philosophy and a set of guidelines that can be used as a framework for the development of all types of tourism, regardless of size or type (Waligo et al., 2013). There is an urgent need to begin describing what actions a responsible tourist must take, increase the levels of awareness and enhance pro-environmental behavior. The recognition of the urgent need to redefine the tourism–environment relationship has led to it being one of the main policy issues nowadays. Sustainable is designed to combine the interests of all the parties involved. The host habitats and communities, the tourists and the industry itself. The aim is both at the protection of the tourism industry and the protection of the cultural and natural resources of an area (Tsartas et al, 2010).

This paper presented a review for the implementation of practical tools and means, their practical application and even beyond that, a concept of a proactive rather than a recovery action plan. Through digitalization, society must see how paths to sustainable development can be made. New technological tools incorporating and facilitating sustainability plans should be developed from governments and tourism

industry enterprises. There must be a strong commitment to linking digitalization to these goals, and a common policy must be put in place to support sustainable development (Filipiak et al, 2020). Digitalization offers multiple opportunities to access new markets, develop new roles and configurations and evolve new travel products and services.

Companies frame new digital technologies, promote business digitalization and contribute to sustainability transitions beyond their organizational boundaries. Although promising technologies exist to face environmental sustainability challenges, failing to address most of the challenge makes the application of the technologies unsustainable (Kwame et al, 2022). Particularly, different technology frames lead to different value propositions and contributions to sustainability transitions. The impact of technology on humans and the planet must be positive, encouraging progress in a way that does not harm or imply any kind of injustice. The concept of sustainable development occupies a prominent place in the political agenda, and the aim is to transform it into a functional set of policy goals and measures. With all the above parameters in mind, not only can we largely cover the behaviors of the stakeholders, but it is possible to predict possible reactions, resulting in the reconsideration and adoption of the most appropriate development option regarding the environment and so the implementation of a win–win situation.

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