Industry 4.0, Circular Economy, and Tourism

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Abstract

This research is situated at the intersection between industry 4.0, circular economy and tourism, in an attempt to observe the fourth industrial revolution at the service of the application of circular economy principles in the tourism industry. This approach has gained importance due to the COVID-19 pandemic, which has accelerated fundamental dynamics of change linked to business digitization and environmental sustainability. Within the theoretical framework delimited by the aforementioned intersection, the 'goCircular Radar' project, launched by 'TheCircularLab', from Ecoembes (Spain), has been taken as an empirical reference. Among the 165 startups in the circular economy sector, special attention has been paid to those that are oriented, or have a potential application, to tourism. The activities they carry out are described, with particular attention to the technologies they use and their contribution to circularity.

Keywords : Tourism 4.0, Circular Tourism, Startups

1. Introduction

The interest in applying the principles of the circular economy to tourism is certainly recent and is taking place in an environment of technological disruption that can be framed in what is known as the 'revolution 4.0'. In this context, it is clear that new technologies are essential to advance towards a new model of circular tourism, as a path towards environmental sustainability. In the words of Gaztelumendi et al. [2019, 73]: "The circular economy and the technological revolution are intrinsically linked and are inseparable phenomena".

As Ostojic [2016] points out, the fourth industrial revolution is characterised by the confluence of three major factors: the technological advances of 'industry 4.0'; the change of the economic model from a linear model, based on 'make-use-dispose', towards a circular, sustainable and responsible one; and the need to effectively address the threat of climate change. In turn, the main characteristic of 'industry 4.0', says the aforementioned author, is the interconnection of processes, products and services through the massive and intensive use of mobile Internet, sensors and artificial intelligence, allowing the optimisation of energy efficiency, reliability and the availability of products and services across different industries.

Consequently, this paper is situated at the intersection between 'industry 4.0', the circular economy and tourism, with the aim of demonstrating how the technological developments of the fourth industrial revolution are driving the application of the principles of the circular economy, as a branch of the science of sustainability [Geissdoerfer et al., 2017], in the tourism sector. This approach applied to the tourism industry has gained prominence as a consequence of the COVID-19 pandemic, which has accelerated fundamental change dynamics mainly linked to digitalisation and environmental sustainability.

To this end, within the theoretical framework delimited by the aforementioned intersection, set out in the following section, a series of experiences is presented based on the 'goCircular Radar' project, recently launched by Ecoembes' 'TheCircularLab', in Spain. As of 30 September 2021, 165 startups in the circular economy sector have been participating in the project, with special attention paid to those that are oriented, or have a potential application, to the tourism industry. The activities carried out by these startups are described, with particular attention to the technologies they use and their contribution to circularity.

Specifically, after the aforementioned theoretical framework, a description is given of the startups in the circular economy sector in Spain. Next, some examples of real or potential application to tourism are shown, after which the conclusions reached are set out.

2. Literature Review

Tourism 4.0 is the manifestation of the fourth industrial revolution, or 'industry 4.0', in the tourism sector.

The generic term 'industry 4.0' is used to technologically qualify organisations' value chains, referring to the ability to integrate complex machines and devices with networked sensors and software. While there is no unanimous definition of this concept, the term 'industry 4.0' often encompasses modern automation systems, data exchanges and technologies that address digital transfor-

mation, with the ability to transform existing business models in many sectors [Sari, 2018], including tourism. As Lu [2017] points out, two key factors emerge in the fourth industrial revolution: integration and interoperability, i.e., the ability of two systems to understand each other and use each other's functionality to exchange data and share information and knowledge.

On this basis, 'tourism 4.0' is defined [Pencarelli, 2020, 457] "as the new tourism value ecosystem based on the high-tech service production paradigm and characterised by the same six common principles of 'industry 4.0': (a) interoperability, guaranteed by the standardisation of communication codes; (b) virtualisation, through which cybernetic systems can control physical processes; (c) decentralisation, in which each computer or technological device has autonomous decision making capability even within centrally-controlled procedures; (d) real-time data collection and analysis capability; (e) service orientation, towards customers both internal and external to organisations; (f) modularity, which allows flexible adaptation to changes through the substitution and/or expansion of individual modules".

In short, it is clear that the advent of the fourth industrial revolution, the development of technological devices and the Internet are having a profound impact on the tourism industry. In the era of 'tourism 4.0', the digital revolution is changing the behaviour of tourists, businesses and destinations, projecting them towards a 'smart' perspective. As Pencarelli [2020, 459] argues, "digitalisation has significantly changed the travel and tourism industry, transforming it into a 'smart' sector; in other words, an innovative and technologically advanced sector that is fully im-

mersed in the paradigm of industry 4.0".

Indeed, 'tourism 4.0' has led to a new management paradigm known as 'smart tourism', which, on the basis of an advanced digital space, makes possible the application of a data-intensive logic of all kinds for problem analysis and decision-making in order to improve the tourist experience and the quality of life of residents in host communities, with the values of innovation and sustainability as guides [Vargas-Sánchez, 2016].

On the one hand, therefore, the concepts of 'tourism 4.0' and 'smart tourism', as shapers of this industry [Vargas-Sánchez and Saltos, 2019], revolve around new digital technologies, as a technical platform that allows the convergence of both. But, on the other hand, there are some characteristics that differentiate them. Thus, while 'tourism 4.0' refers mainly to the hardware and software requirements of technologies, 'smart tourism' refers to an innovation-oriented use of the Internet and Information and Communication Technologies (ICTs), aimed at combining technological, human and management resources in search of economic, social and environmental sustainability. 'Smart tourism' implies, for example, "paying particular attention to sustainable mobility, social cohesion, protection of people's privacy, and optimization of waste management as well as water and energy consumption in tourist locations" [Pencarelli, 2020, 460]. This character of smartness serves as a link to the other key topic in this work: the circular economy (circularity in the tourism economy). The figure below (No. 1) aims to show the relationship between all these concepts.

The circular economy, as an alternative to the unsustainable linear model to which we are heirs, could be defined as one in which

the value of products, materials and resources are kept in the economy for as long as possible, minimising the generation of waste. This requires the creation of circular and smart ecosystems [Perfetto and Vargas-Sánchez, 2018] through collaboration between companies and other agents, even from different sectors [Vargas-Sánchez, 2020c]. To this end, Ritchie and Freed [2021] talk about the 6Rs of circularity: Reject (say no to what is not needed), Reduce (use fewer inputs or use them for longer), Remanufacture (extend the useful life of products), Reuse (find other uses for them), Recycle (give materials a new life) and Rot (return them to the earth).
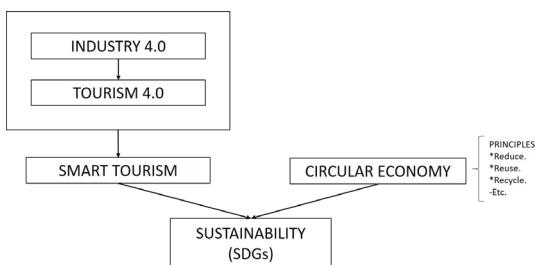
〈Figure 1〉 Theoretical Framework

Consequently, the circular economy redefines growth patterns, gradually decoupling economic activity from the consumption of finite resources and removing waste from the system. It is thus recognised as a sustainable growth strategy [Ellen MacArthur Foundation, 2015] and a key response in the necessary evolution/transformation of companies towards sustainable business models [Bocken and Short, 2021]. However, authors such as Sørensen et al. [2020] highlight the difficulty of the transition towards a circular perspective in tourism, a consequence of the large number of actors involved and the hedonistic consumption model that characterises this activity.

In terms of the transition towards a circular economy model and its application to the tourism industry, the technological revolution referred to (or 4.0) is a key contributor to deepening the application of circular economy principles to tourism. Thus, Mazilescu [2019], in his overview of how emerging technologies can underpin the development of tourism and travel, states that the dematerialisation of the economy will be accelerated through a transition to a circular economy favoured by the new industrial revolution. In the same vein, Gaztelumendi et al. [2019] state that it is in this paradigm of technological revolution that the circular economy applied to tourism has been born.

For Ramos and Brito [2020], the technological development of 'tourism 4.0' and the circular economy must go hand in hand in order, from the point of view of environmental sustainability, to advance in the fulfilment of the Sustainable Development Goals of the 2030 Agenda of the United Nations Organisation, such as Nos. 11 (sustainable cities and communities), 12 (responsible consumption and production), 13 (climate action), 14 (life below water) and 15 (life on land). In this sense, Pan et al. [2018] present the case of the 'Green Island' in Taiwan, understanding the circular economy as a restorative and regenerative economy, whose design is oriented towards maintaining as much as possible the use of resources, as well as their value, throughout their life cycle; therefore, minimising waste and converting them into valuable products.

Along these lines, Pencarelli [2020] considers that, in the near future, it will not be possible for tourism ecosystems and territories to take only digital innovations into account, rather they will have to include smart tourism

perspectives such as sustainability, the circular economy, quality of life and social value.

However, although smart tourism and the circular economy intuitively interconnect, as they both focus on sustainable value creation, their mutual implications have not been sufficiently investigated [Del Vecchio et al., 2021]. Positioning themselves in this gap, these authors, through the case of Ecobnb (https://ecobnb.com), present how these two paradigms (smartness and circularity) are inextricably intertwined to achieve greater levels of sustainability (economic, social and environmental) in the field of tourism, helping to understand that, in effect, these are two fundamental lenses when it comes to managing complexity and driving tourism companies and destinations towards innovation in business models and sustainable value creation processes. The aforementioned integration is proposed as the way to overcome the obsolescence of traditional management models in tourism companies and destinations, considering smart tourism and the circular economy as key levers to drive a paradigm shift in this sector [Del Vecchio et al., 2021].

Ultimately, being smart also means being sustainable: the label of smart tourism cannot be attributed without a sustainability record to back it up. Likewise, a company or a destination cannot be considered competitive today unless it develops in a sustainable manner, for which the circular economy is a seemingly inevitable path [Vargas-Sánchez, 2018, 2021].

3. Startups in the Circular Economy Sector in Spain

To approach the map of startups related to the circular economy in Spain, we will take as a reference the compilation available within

the 'goCircular Radar' project of 'TheCircularLab', promoted by Ecoembes.

Ecoembes is a non-profit business-based organisation, created in 1996 and located in Madrid, whose mission is to provide society with a collective response from economic agents to environmental issues related to the consumption of household packaged products, achieving compliance with the objectives set by law, with the greatest efficiency in the use of the company's resources. Among its initiatives is 'TheCircularLab' (https://www.thecircularlab.com/en/), which, born in 2017 and based in the city of Logroño, is defined as an open innovation centre specialised in the circular economy, which focuses its activity on the study, testing and development of best practices in the field of packaging and its subsequent recycling. To this end, it addresses all phases of the life cycle of packaging: from its conception, through eco-design, to its reintroduction into the consumer cycle through new products.

TheCircularLab launched the 'goCircular Radar' project in 2021, conceived as an open innovation community for startups and entrepreneurs in the circular economy sector. This community aims to bring together startups that, related to the circular economy, have a clear focus on innovation. The requirements are threefold: to be established and be less than 10 years old; to have a high level of innovation in their products or business model; and to offer a portfolio of solutions or products that can contribute to the circular economy (https://radar.thecircularlab.com/).[1]

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1) However, there are older cases (albeit very few) in their database and the link between some of their records and the circular economy is doubtful or not evident (sometimes the circular economy and sustainability seem to be confused). As for the level of innovation, its measurement is difficult, if not subjective.

Although the startups included in 'goCircular Radar' are almost all national, their geographical scope is not limited to Spain. Specifically, of the 165 companies registered at the end of September 2021, 151 are Spanish; the remaining 14 registrations are mainly distributed between the Netherlands (5) and the United Kingdom (3).

At the regional level, the Autonomous Communities that dominate are the Community of Madrid (41), Catalonia (33) and the Community of Valencia (20), followed by Andalusia (14).

Most of them were set up from 2017 onwards (one hundred in total, i.e., 60.6%), with 2020 being the year with the highest number of registrations (35, 21.2%). The oldest are from 2009 (1) and 2010 (1).

The main areas of activity are manufacturing (one third, 33.3%) and technology development (23.0%). Between them, they account for more than half of the registered startups (see ⟨Table 1⟩).

⟨Table 1⟩ Main Areas of Activity

	Frequency	Percentage
Consulting	19	11.5
Distribution and logistics	2	1.2
Financing	1	0.6
Industrial services	4	2.4
Manufacturing	55	33.3
Online store	17	10.3
Other activities	21	12.7
Retail	7	4.2
Technology development	38	23.0
Training	1	0.6
Total	165	100.0

Source: own elaboration.

In terms of the stage of the value chain in which they operate, their distribution is fairly balanced, namely, in order of importance: re-

cycling and second life (38.2%), eco-design, new materials and manufacturing (32.1%), as well as consumption and general public (29.7%).

Finally, the electronics and ICT value chain is the most frequented (13.9%), although the dispersion is large in this respect. More details in ⟨Table 2⟩.

⟨Table 2⟩ Value Chain

	Frequency	Percentage
Building and construction	9	5.5
Electronics and ICTs	23	13.9
Others	68	41.2
Packaging	16	9.7
Plastics	15	9.1
Textile	15	9.1
Vehicles and batteries	1	0.6
Water, food and nutrients	18	10.9
Total	165	100.0

Source: own elaboration.

A case that clearly exemplifies the convergence between industry 4.0 and the circular economy is that of Interitem S.L., a technology company founded in 2015 and based in Gandía (Valencia). As can be seen on its website (https://qrtracing.com/), its main activity consists of the development and commercialisation of software based on solutions for moving towards a circular economy model in industry 4.0. Specifically, they have a patented system, called QRtracing, which, by reading QR codes, allows the integral and geo-located control and traceability of packaging, containers and other industrial assets in real time. The data collected is processed through a dynamic cloud platform accessible from any device connected to the Internet. Apart from other functionalities, from the point of view of circularity, it allows the status

and location of each asset to be known in order to facilitate its reuse, avoiding possible cross-contamination, or the management of its recycling.

It is also worth mentioning RDNest S.L., a technology-based startup owned by the University of Valladolid and whose activity began in January 2017. It is located in the Castilian-Leonese capital (Valladolid). They define their main activity as the development of hardware and software solutions in the field of the Internet of Things, Industry 4.0 and Artificial Intelligence with an application in circular economy projects (among others). Waste management is part of its sectorial solutions, through container filling sensors, calculation of optimal collection routes, and tools for task planning support. There are also those linked to events, providing information on the flow of people in theme parks and shopping centres, the location of children in large facilities, as well as venue information and visitor guidance. More information can be found on its website (https://rdnest.com).

Others such as Orbisk, although of Dutch origin, will be mentioned below, with reference to some elements of their business models.

4. Some examples of potential application to tourism

Among all the startups registered in 'goCircular Radar', we extract some of them whose activities are oriented, or have a potential application, to the tourism sector. These are reflected in ⟨Table 3⟩.

Their respective main activities are summarised below:

(1) Economía Circular Canarias (https://economiacircularcanarias.com/) offers: training in the circular economy and sustainability (accommodations, restaurants, artisans, companies in general); circular economy projects in different areas such as gastronomy, sustainable tourism, sustainable mobility,

⟨Table 3⟩ Startups with Solutions Potentially Applicable to Tourism Companies and Destinations

Name (alphabetical order)	Value chain	Stage in the chain	Main area of activity
(1) Economía Circular Canarias	Others	Consumption and general public	Training
(2) Orbisk	Water, food and nutrients	Consumption and general public	Technology development
(3) Sloowy	Others	Eco-design, new materials and manufacturing	Technology development
(4) Sorbos	Water, food and nutrients	Consumption and general public	Manufacturing
(5) Sostenibles Network	Water, food and nutrients	Consumption and general public	Online store
(6) Souji	Others	Recycling and second life	Manufacturing
(7) Sunny-tots	Others	Recycling and second life	Retail
(8) Yo aprovecho	Water, food and nutrients	Consumption and general public	Other activities

Source: own elaboration.

the circular economy for companies in general; consultancy for public administrations and private companies as a service that advises on the implementation of circular actions; directories of the circular economy and sustainability organisations; disseminating the latest news on the circular economy in Europe, Spain and the Canary Islands.

(2) The Dutch company Orbisk (https://www.orbisk.com) claims to have developed the world's first fully automated food waste monitor. The waste bin of hospitality units (e.g., Eurostars hotel chain), catering companies, etc., is equipped with a scale and a smart camera. The camera runs an Artificial Intelligence (AI) algorithm for image recognition that identifies ingredients, recording what and how much food is wasted, as well as when and why. This information can be used to find and optimise inefficiencies in the food supply process. Through an action-oriented dashboard, it helps to balance portions, optimise storage and plan more efficiently. This will result in significant economic value due to savings in purchasing, personnel and waste disposal, as well as utility costs. In this way, food waste can be avoided, estimating an annual saving of more than 4,000 kilos of food waste for a medium-sized restaurant, valued at between €20,000 and €60,000, which would result in a net margin improvement of up to 4%.

(3) Sloowy (http://sloowy.com/) is based on 'BeachSharing', a digital model in which the customer only pays for the minutes they use, avoiding the need to go loaded to the beach and reducing the environmental impact on the coastline. The company installs its bases at the main access points to the beach and the customer only has to pick up their chair and/or umbrella via an app.

(4) According to the company, Sorbos (https://www.wearesorbos.com) manufactures the first edible and aromatic straws on the market.

(5) Sostenibles Network (www.marketsostenibles.es) offers an online marketplace of small sustainable producers for direct sales to the end customer and the HORECA channel. It works with national producers and artisans carefully selected for their good practices in sustainability. Within their network, they have started to identify SMEs in the agri-food sector that are applying circular economy approaches.

(6) Souji (https://souji.es/) is an innovative liquid that, when mixed with used cooking oil in the correct proportions and shaken for 1 minute, transforms it into an environmentally friendly and pleasant smelling multi-purpose detergent. Without caustic soda or any handling risks, the customer does the mixing. Its function is to promote the recycling and reuse of waste oil from the point of origin, whether private homes or catering establishments, thus promoting the circular economy.

(7) Sunny-tots (https://www.sunny-tots.com/) gives a second life to consumer products by renting out family equipment for travellers (pushchairs, highchairs, travel cots, etc.).

⟨Table 4⟩ Technologies 4.0 at the Service of Circular Economy Objectives

Startups	Technologies 4.0	Circular Economy Objectives
Orbisk	AI algorithm for image recognition	Reducing food waste (*)
Sloowy	Mobile App	Reuse of beach chairs and umbrellas through a sharing economy model
Sostenibles Network	E-commerce	Environmental regeneration through direct sales of sustainable products to the end consumer (**)
Sunny-tots	Web	Re-use of children's products for travellers (by rental, delivery and collection)
Yo aprovecho	Mobile App	Reducing food waste

See: (*) https://www.youtube.com/watch?v=bxdT6Xr0gTo&t=65s
    (**) https://www.youtube.com/watch?v=zlfINwK8jpA
Source: own elaboration.

(8) Yo aprovecho (https://yoaprovecho. com) is a free mobile app that sells surplus food from catering and food businesses. These are products in perfect condition that, due to their best-before date, cannot be sold the following day. These foods are offered for sale at reduced prices on the app. This avoids waste and reduces greenhouse gas emissions, while at the same time boosting purchases in local businesses.

In addition, let us look a little more closely at those companies with a stronger technological component (⟨Table 4⟩).

5. Conclusions

As Centobelli et al. [2020] point out, research at the intersection between the circular economy and digital innovation has highlighted how key enabling technologies of industry 4.0 can be useful to accelerate some circular economy objectives and enhance sustainable competitiveness and smart growth. However, how companies can practically apply these technologies to achieve specific circular economy objectives remains a research question to be explored, with a marked lack of empirical evidence at the level of, for example, their impact on business models [Vargas-Sánchez, 2020a].

Focusing on the startups related to the circular economy that are most closely linked to technological development and tourism, the preliminary conclusion is that the use of the most innovative technologies is at an early stage, still focused, with some exceptions, on mobile apps and e-commerce solutions. The potential for growth in the application of technologies 4.0, therefore, remains very large.

In terms of its use for the implementation of circular economy principles in the tourism sector, the reduction of food waste has emerged as the most focused objective so far. However, it is pertinent to note that the technological factor is not the only one to be considered in achieving this. As Chawla et al. [2021] point out, factors such as the business model and brand strategy must also be taken into account, as they directly determine operational routines and staff behaviour in this area.

Business models based on the product-as-a-service concept (pay-as-you-go or

rental) are also spreading in the tourism sector, with the idea of facilitating travellers' journeys while promoting the reuse or second life of products that do not need to be purchased or brought to the destination. In this respect, it is relevant to consider the steps proposed by Ritchie and Freed [2021] to develop a circular business structure, namely: identify possible material loops (inventory material flows in the organisation and identify those that can be optimised); consider innovative business models (circular sourcing, resource recovery, product life extension, sharing platforms, product as a service); involve employees and other stakeholders (brainstorm with employees, establish links with the local community, involve customers, etc.); develop a message (create a narrative for your circular economy strategy to engage more stakeholders); test and learn (compare and improve).

Finally, some notes on the limitations of this study and future lines of research that could be opened. It is clear that its merely descriptive and static nature confines its contributions to the presentation of a snapshot. Observing its evolution over time would be necessary to detect trends. In addition, complementing the quantitative description with qualitative approaches would favour the understanding of the opportunities and challenges that the convergence between industry 4.0 and the circular economy are representing for the tourism sector, as well as explain how they are being addressed, in line with the research agenda proposed by Vargas-Sánchez [2020b].

References

 [1] Bocken, N. M. P. and Short, S. W., "Unsustainable business models – Recognising and resolving institutionalised social and environmental harm", Journal of Cleaner Production, Vol. 312, 2021, 127828.

 [2] Centobelli, P., Cerchione, R., Chiaroni, D., Del Vecchio, P., and Urbinati, A., "Designing business models in circular economy: A systematic literature review and research agenda", Business Strategy and the Environment, Vol. 29, 2020, pp. 1734-1749.

 [3] Chawla, G., Lugosi, P., and Hawkins, R., "Food Waste Drivers in Corporate Luxury Hotels: Competing Perceptions and Priorities across the Service Cycle", Tourism and Hospitality, Vol. 2, 2021, pp. 302-318.

 [4] Del Vecchio, P., Malandugno, C., Passiante, G., and Sakka, G., "Circular economy business model for smart tourism: The case of Ecobnb", EuroMed Journal of Business, Forthcoming, 2021.

 [5] Ellen MacArthur Foundation, Growth Within: A Circular Economy Vision for a Competitive Europe, Ellen MacArthur Foundation, 2015.

 [6] Gaztelumendi, I., Tarí, A., and Mora, D., Informe sobre economía circular aplicada al turismo, Segittur, 2019.

 [7] Geissdoerfer, M., Savaget, P., Bocken, N. M., and Hultink, E. J., "The circular economy – A new sustainability paradigm?", Journal of Cleaner Production, Vol. 143, 2017, pp. 757-768.

 [8] Lu, Y., "Industry 4.0: A survey on technologies, applications and open research issues", Journal of Industrial Information Integration, Vol. 6, 2017, pp. 1-10.

 [9] Mazilescu, V., "Tourism and travel can effectively benefit from technologies as-

sociated with Industry 4.0", XXth International Conference "Risk in Contemporary Economy", Galati, Romania, 2019.

[10] Ostojic, P., "Industria 4.0, Economía Circulary la Cuarta Revolución Industrial", May 13, 2016. Retrieve from https://www.petarostojic.cl/industria-40-economia-circular-cuarta-revolucion-industrial/ (accessed October 5, 2021).

[11] Pan, S.-Y., Gao, M., Kim, H., Shah, K. J., Pei, S.-L., and Chiang, P.-C., "Advances and challenges in sustainable tourism toward a green economy", Science of the Total Environment, Vol. 635, 2018, pp. 452-469.

[12] Pencarelli, T., "The digital revolution in the travel and tourism industry", Information Technology & Tourism, Vol. 22, 2020, pp. 455-476.

[13] Perfetto, M. C. and Vargas-Sánchez, A., "Towards a Smart Tourism Business Ecosystem based on Industrial Heritage: Research perspectives from the mining region of Rio Tinto, Spain", Journal of Heritage Tourism, Vol. 13, No. 6, 2018, pp. 528-549

[14] Ramos, C. M. Q. and Brito, I. S., "The Effects of Industry 4.0 in Tourism and Hospitality and Future Trends in Portugal", in Hassan, A. and A. Sharma (Eds.), The Emerald Handbook of ICT in Tourism and Hospitality, Emerald Publishing Limited, 2020, pp. 367-378.

[15] Ritchie, K. J. and Freed, E. C., Circular Economy for Dummies, Hoboken, John Wiley & Sons, 2021.

[16] Sari, E. B., "Reflections of industry 4.0 to management of service enterprises: smart hotels", International Journal of Contemporary Tourism Research, Vol. 2, No. 2, 2018, pp. 33-40.

[17] Sørensen, F., Bærenholdt, J. O., and Greve, K. A. G. M., "Circular economy tourist practices", Current Issues in Tourism, Vol. 23, No 22, 2020, pp. 2762-2765.

[18] Vargas Sánchez, A., "Opportunities and Challenges of Circular Economy for the Tourism Industry", in Baporikar, N. (Ed.), Handbook of Research on Entrepreneurship Development and Opportunities in Circular Economy, IGI Global, 2020a, pp. 106-124.

[19] Vargas-Sánchez, A., "Tourism Circular Economy: Proposal for a Research Agenda", in Serrano-Rodrigues, S., Almeida, P.J. and N.M. Castaheira-Almeida (Eds.), Mapping, Managing, and Crafting Sustainable Business Strategies for the Circular Economy, IGI Global, 2020b, pp. 1-10.

[20] Vargas-Sánchez, A. and Saltos, A. E., "Smartness and social networks as shapers of the tourism industry. What is being done in Academia in this intersection?", Worldwide Hospitality and Tourism Themes, Vol. 11, No. 6, 2019, pp. 748-759.

[21] Vargas-Sánchez, A., "Exploring the concept of Smart Tourist Destination", Enlightening Tourism. A Pathmaking Journal, Vol. 6, No. 2, 2016, pp. 178-196.

[22] Vargas-Sánchez, A., "Simbiosis industrial en destinos turísticos", Economía Industrial, No. 418, 2020c, pp. 109-118.

[23] Vargas-Sánchez, A., "The new face of the tourism industry under a circular economy", Journal of Tourism Futures, Vol. 7, No. 2, 2021, pp. 203-208.

[24] Vargas-Sánchez, A., "The unavoidable disruption of the circular economy in tourism", Worldwide Hospitality and Tourism Themes, Vol. 10, No. 6, 2018, pp. 652-661.

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