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Smart specialization and **tourism 4.0** as catalysts of **regional development**: A territorial marketing tool?

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Abstract | Smart specialization strategies emerge as disruptive instruments within territorial cohesion policies aiming to improve regional development. Tourism is seen as a distinctive asset within smart specialization strategies, but the discussion about the sector's role is still scarce. Simultaneously, a new digitalization era is bringing the 4.0 paradigm to the heart of tourism, influencing the way visitors behave, how businesses evolve, and how development strategies are designed. Therefore, this paper aims to explore to what extent can tourism be seen as a priority domain within the smart specialization context, particularly by focusing on the implications for destinations' marketing of the implementation and spread of tourism 4.0. This theoretical paper delves into the literature about the role of smart specialization and tourism 4.0 within regional development working as a basis for territorial marketing policies and recommendations. This study starts by suggesting that efforts still need to be made to address the potentialities of tourism within a smart specialization strategy framework. Despite the lack of clarity in defining tourism 4.0, it seems that technologies might play a decisive role in regional development strategies. Moreover, competitive advantages are expected from the integration of smart specialization strategies as an alternative solution for regional development, tourism as a versatile and diversified sector, and territorial marketing as a booster of territorial brands. The paper expands the knowledge about the role of tourism and the 4.0 paradigm within smart specialization strategies and deepens understanding of its application as a territorial marketing tool.

Keywords | Smart specialization, tourism 4.0, territorial marketing, competitiveness, innovation

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1. Introduction

Research in the area of public policies in the European Union (EU) has intensified over the years. The 2008 economic crisis has triggered a wake-up-call for new and adapted public policies, namely through smart specialization, today a key concept in the reform of EU cohesion policy (Foray, 2014). Nevertheless, smart specialization is growing in importance even in non-EU regions, aiming at understanding its potential for regional development. The concept of smart specialization is often framed as EU-specific terminology, linked to the European cohesion policy as a new place-based approach to innovation. Established under the European Union's Cohesion Policy framework, S3 (Smart Specialisation Strategy) is an innovative framework aiming to develop regional competitive advantages based on the potentialities and strengths of a region, through the connection of different actors, thus creating distinctive areas of specialization and leveraging the latest technological advancements and research to boost productivity and innovation (Foray et al., 2009). Tourism is one of the sectors benefiting from S3, as it can help regions to improve innovation and sustainability dynamics (Benner, 2020). This can include investing in new tourism infrastructure, developing new tourism products and services, and/or leveraging new technologies (Bellini et al., 2017). However, despite being commonly addressed as a regional innovation priority, tourism has been almost neglected within the S3 context (Weidenfeld, 2018).

Tourism relies on the interaction and contribution from other economic activities to assure its services, resulting in a direct link with distinct local and regional stakeholders (Romão, 2020a). These relations result in networks that might foster and facilitate innovation dynamics within a destination. In its turn, tourism innovation is highly triggered by the adoption of emerging technologies (Bellini et al., 2017), which impact encompasses changing the way companies and destinations communicate their products and resources (Buhalis, 2020; Ivanov et al., 2019; Jung et al., 2020) and enhancing tourist experiences (Pencarelli, 2020). After the advent of the internet during the early 2000s, the tourism sector is nowadays facing a new digitalization period triggered by the fourth industrial revolution. This revolutionary trend resulted in an emerging paradigm linked to the manufacturing industry –Industry 4.0 (I4.0). The concept early on has awaken the attention of tourism entities and academics, despite the few attempts to understand its implications within the service industries (Mariani & Borghi, 2019). Even though the scarce discussion around the theme, the tourism 4.0 (T4.0) concept emerged, perhaps rushed by the hype created around industry 4.0 (Rodrigues et al., 2022). The fact is that key enabling technologies from I4.0 such as big data, blockchain, internet of things, artificial intelligence, augmented reality, and virtual reality, are increasingly dominating the discussion concerning the present and future of tourism. In this regard, S3 provides the means for the modernization of tourism development strategies through the digital transformation of suppliers so that their products, services, and marketing operations can improve significantly (Bellini et al., 2017; Benner, 2020). However, this digital transformation entails several challenges, particularly for small and medium-sized enterprises (SMEs) (Cornejo-Ortega et al., 2021; Dredge et al., 2018; Lepore & Spigarelli, 2020), which constitute the foundations of the tourism sector, and for regions from different geographies and at distinct economic stages (Barzotto et al., 2020; Pencarelli, 2019). It is then argued that to capture the benefits of I4.0 a collaborative networking approach linking stakeholders from distinct areas is needed (Lepore & Spigarelli, 2020). Thus, anchored on investments in these I4.0 technologies, S3 has the potential to leverage tourism (EC, 2021), creating new opportunities for tourism businesses and visitors alike, beyond favouring destination managers' decision-making.

These potentialities can then be leveraged by

territorial marketing efforts. Territorial marketing contributes to the development of regions capable to address specific needs of diverse stakeholders or targets involved and is a relevant tool in strategic planning and management of regions (Simeon & Buonincontri, 2011). To boost a region's development, territorial marketing plays an important role in attracting, satisfying, and fixing/attaching strategically selected target-groups of visitors, investment/business agents, and ultimately fix populations. This is attained through the definition of the best-possible match between distinct interests, objectives, and challenges perceived by stakeholders, within an existing geographical, economic, institutional, cultural, and social framework of resources and potentialities, and against competing regions, yielding benefits to all target-groups (Kotler et al, 1993). In this context, all elements and features of a territory become valuable assets of place experiences by attracting visitors in the first place (Cawley & Gillmore, 2008; Kastenholz, 2018). Within this scope, the adoption of I4.0 technologies entails several opportunities, contributing to the promotion and development of tourism, for instance by bringing together locals and visitors in the co-creation of value (Carvalho, Kastenholz, & Carneiro, 2021; Giaccone & Bonacini, 2019). This technology-aided process includes product development at the regional level, with more articulated and thereby satisfactory experience opportunities, based on combined endogenous assets to support sustainable regional development (Cawley & Gillmore, 2008; Kastenholz, Carneiro, & Marques, 2012). Hence, leveraging both innovative technologies and regional strengths towards enhancing tourism experiences and promoting a region's unique characteristics to attract potential visitors and investors, synthesizes the relationship between the topics under analysis.

Therefore, based on the inherent potentialities of the tourism and S3 relationship, the main goals of this study are as follows: (1) to identify and discuss the literature emphasizing the tourism sector as a priority within a smart specialization context; (2) to understand the role played by technologies resulting from I4.0 in that process; (3) to explore how the 4.0 paradigm reflected in the tourism sector constitutes a territorial marketing tool within a smart specialization framework. In this regard, this paper has the following structure: it starts by discussing the role of S3 as a regional development policy, followed by the contextualization of the industry 4.0 concept and how is the tourism sector embracing it, and it ends with a brief background about territorial marketing trying to comprehend to what extent can tourism 4.0 be a territorial marketing instrument within a smart specialization context.

2. Smart Specialization Strategy for regional development

The notion of S3 was developed as an academic concept in the mid-to-late 2000s (McCann & Ortega-Argilés, 2014) by the Knowledge for Growth expert team, composed of growth and innovation economists, established by the Research Commissioner Janez Potocnik (Foray, 2014; McCann & Ortega-Argilés, 2015). The idea was introduced in the context of a debate on how European regions could become more attractive to foreign R&D investment (Foray, 2014). The concept can be detailed as follows: smart means to search and focus on a region's strengths; specialization is oriented to the R&D investment in competitive areas; and strategy refers to a joint vision for regional innovation, through a quadruple helix approach, working to implement long-run development strategies supported by EU funds (EC, 2020; Foray et al., 2009). The S3 rely on integrated, place-based economic transformation agendas, starting from the identification of each region's specific features and resources, leading, through participatory processes, to a common vision of a sustaina-

ble future for the territory (Benner, 2017). It is a strategic approach to innovation under the EU's cohesion policy for the period 2014-2020, proposed as an ex-ante conditionality. This means that all Member States and regions must have a well-developed S3 strategy before eligible to financial support from the EU (through Structural Funds) for their planned innovation measures (EC, 2014; Foray et al., 2012).

The strategy seeks to identify knowledge in areas where the regions hold a potential advantage (Foray, 2014; Foray et al., 2012), allowing them to develop and consolidate economic strengths, based on local knowledge and innovation capabilities. Thus, both knowledge and innovation resources are allocated to a limited number of domains, to enhance local capabilities that feed innovation, social and economic development (Laranja et al., 2020). When effective, this rearrangement of regional strengths and resources may turn into a regional competitive advantage (Foray et al., 2012). A key element of this policy is that the design and implementation aimed at changing governance should not rely on traditional central policies. Instead, governance should be combined with a dynamic Entrepreneurial Discovery Process (EDP), where key stakeholders develop a shared vision (Biagi et al., 2020; Laranja et al., 2020), and engage in a continuous, diagnosis-based, discovery process to find the research and innovation domains, in which a region can hope to stand out, playing leading roles in discovering promising areas of future specialization (EC, 2020; Foray et al., 2009; Laranja et al., 2020) (Figure 1).

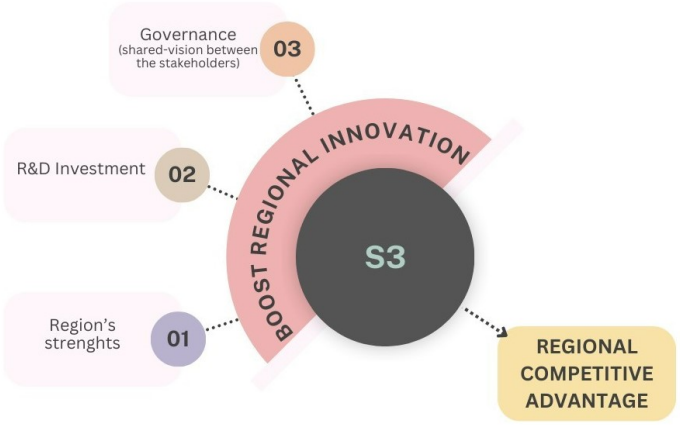

Figure 1 | Smart specialization strategy framework
Source: Own elaboration.

S3 is starting to play a crucial role in how regions are developing their policy-settings, especially in less developed regions (Bailey & De Propris, 2019). Considering there are challenges and limitations of the S3 approach, such as a potential lack of alignment with global trends and the risk of creating narrow, isolated regional economies, Giustolisi et al. (2022) proposes a more outward-looking approach to S3. Accordingly, it might recognize the dynamic nature of the global economy, consider global trends, and encourage regional collaboration and integration with wider networks. Yet, identifying S3 goals for a given region is only a commencement and not a one-off process, but rather an on-going process of policy learning, experimentation, and implementation. For less developed regions, extra-regional collaborations can be beneficial, especially if leading to earlier adoption of new technologies, knowledge exchange and enhanced capabilities triggering new

entrepreneurial opportunities. An outward-looking S3 approach can help regions to identify and capitalize on emerging opportunities and address global challenges, such as climate change and digitalization (Giustolisi et al.,2022), playing a key role in enhancing regions resilience and their ability to take advantage of newly emerging market opportunities (Barzotto et al., 2019).

2.1. Tourism approach within smart specialization strategies and the role of industry 4.0 technologies

The concept of S3 started to gain notoriety within academia at the beginning of 2010s. However, the existing literature is still insufficient, especially associated to tourism (Bellini et al., 2017; Biagi et al., 2020). The true is that the diversity of services that make up a destination's value-chain opens up a great opportunity for tourism to assume a core position in S3 (Weidenfeld, 2018). Being a place-based activity, wherever attractiveness depends on endogenous resources, tourism doubtlessly contributes to the emergence and consolidation of place-based networks within the territory (Lazzeretti et al., 2016; Romão, 2020a; Romão & Nijkamp, 2019). The supply of products and services in a tourism destination demands the involvement of a varied set of economic activities, constituting a decentralized value-chain enabling the creation of different links and interactions within local and regional economic structures (Romão, 2020a, b; Varga et al., 2020). Thus, tourism emerges as an economic activity with the capacity to develop strong intra-sectoral links (Lazzeretti et al., 2016), promoting innovation and sustainability (Benner, 2020). Additionally, innovation in tourism can also benefit from knowledge externalities and spillovers arising from the development of a creative regional economy, where other activities contribute to diversifying regional economy (Bečić and Švarc, 2015; Romão, 2020b; Romão & Nijkamp, 2018; Varga et al., 2020).

For some countries and/or regions, tourism is already a strategic priority. This is the case of Apulia (Italy) (Biagi et al., 2020; Del Vecchio & Passiante, 2017), Poland (Borkowska-Niszcota, 2020; Dabrowska, 2017), Wuhan (China) (Li et al., 2020), and the Regional Units of Aetolia Acarnania, Achaia, and Ilia (Greece) (Liontakis & Vassilopoulou). These studies suggest the development of specific tourism products (e.g., health tourism, rural tourism, fishing tourism) towards regional and community development. For instance, the studies analyzing Polish territories found out that various regions already integrate tourism in their specialization strategy and that favors, on one hand, the emergence and/or maintenance of tourism clusters which, in turn, support regional development due to cooperation, knowledge-share, and investment/financing dynamics (Borkowska-Niszcota, 2020); while, on the other hand, the development of less developed regions can be triggered by S3 based on specific tourism products (e.g., health tourism) with a strong connection with the territorial strengths (e.g., medical science and health industries). In their turn, Li et al. (2020) highlights the relevance of rural tourism as a form of smart specialization for agriculture to leverage less developed regions, specifically targeting a more sustainable livelihood of farming communities. Similarly, Liontakis and Vassilopoulou (2022) focus on fishing tourism to promote the sustainability of maritime resources and to diversify the income sources of fishing communities, while granting opportunities for women, coming generations, and newcomers.

Other studies are more focused on the role played by technologies in leveraging tourism performance and influencing regional sustainability. Little attention has been given to I4.0 so far, despite the related potentialities for regional development, especially within the S3 framework (EC, 2018; Kudrina et al., 2019). Some (e.g., Del Vecchio & Passiante, 2017) advocate that a S3 ba-

sed on tourism can benefit from key-enabling technologies and a modular approach, allowing greater personalization of regional tourist products and services, implementing intelligent systems for monitoring and forecasting tourism demand. In this perspective, Brumen et al. (2016) concluded that Slovenian regions should prioritize technologies in the implementation of S3, specifically due to their positive influence on tourism performance. Giving the fact that tourism companies have demonstrated a low rate of technology implementation, their prioritization in regional development is fundamental, towards the sustainable development of the territory. Similarities can be found in the study conducted by Bhaduri and Pandey (2020). Accordingly, technology was found to have positive impacts on tourism, but indirect negative impacts on environment, as a consequence of increasing tourism inflows. The authors suggest that technological infrastructures should continue to be prioritized within a S3 context in small-island countries to boost and support innovation in areas (e.g., public transportation, energy sources, tourism regulation) that will trigger the emergence of eco-friendly tourism approaches towards economic and environmental sustainability. Thus, regions need to develop dynamic capabilities so that they can cope with technological disruptions, such as I4.0 (Labory & Bianchi, 2021). Accordingly, a region's capacity to effectively adapt to changes in the surrounding environment might foster policy implementation, with positive implications in the case of smart specialization policies. This dynamism, combined with local people's needs and multidisciplinary expertise, is shown in the Finish example by Vaananen et al. (2021). This work developed a framework for a Finish region aiming to identify its specific characteristics, competitive advantages, and key stakeholders. Based on the RIS3, which already encompassed sports and experiences as priorities, the paper presents a framework focusing on the development of three main fields: sports, tourism, and well-being. For its success, digitalization emerges as an enabler of innovative products and businesses, while the relevance of marketing is also highlighted to create and share a brand targeting the excellence of visitor's experience, based on the region's strengths. To integrate smart specialization strategies into the development of tourism, the paper suggests identifying the region's unique strengths and competitive advantages in the fields of sports, physical activity, well-being, tourism, culture, and experiences. By focusing on these strengths, the region can develop a specialized profile that attracts visitors who are interested in these specific offerings. The paper also emphasizes the importance of collaboration between stakeholders to develop sustainable solutions and promote the region's strengths through marketing and a shared brand message.

Hence, the need for a political agenda to introduce smart specialization opportunities into a region could move towards preliminary awareness of the significance of 'smartness' in destination management and the role that tourism can play. Nonetheless, each region is expected to find its niches and to develop tourism strategies according to specific assets and opportunities (Benner, 2020; Del Vecchio & Passiante, 2017). Bearing this in mind, Weidenfeld (2018) suggests the following strategic approaches integrating tourism in S3: diversification across related tourism sectors; a platform and a catalyst for diversification of different sectors and diversification across tourism and other sectors (inter-industry). To complement this approach, the present paper suggests tourism diversification through I4.0.

3. Industry 4.0: overview and the potential impact on tourism

On the path of the former three industrial revolutions, encompassing mechanical, electrical energy, and automatic production developments, a

new paradigm emerged – I4.0 (Lu, 2017; Martins & Costa, 2021). The I4.0 concept is originally from a German governmental initiative to enhance competitiveness in the industrial sector (Kagermann et al., 2013; Oztemel & Gursev, 2020). Anchored on key enabling technologies (e.g., artificial intelligence, big data, blockchain, cyber-physical systems, cloud computing, internet of things) and disruptive innovations introduced in industrial processes (Figure 2), the phenomenon opened the way to the fourth industrial revolution (Frank et al., 2019; Smit et al., 2016). These key enabling technologies are the ones making it possible to differentiate the I4.0 concept from the other industrial phases (Frank et al., 2019). Consequently, the term gained expression and was rapidly adopted outside the German context. There is no universal definition of the term I4.0 (Culot et al., 2020; Lu, 2017), despite several attempts to conceptualize it (e.g., Culot et al., 2020; Ghobakhloo et al., 2021; Kamble et al., 2018; Oztemel & Gursev, 2020). Nonetheless, it implies the interaction between virtual (digital) and real worlds, operating within a system – cyber-physical system (CPS) (Posada et al., 2015). The basis of I4.0 is the adoption of advanced information and communication technologies (ICTs) to guarantee the efficiency and competency of all processes (Xu et al., 2018). This means that all technology and devices, converge into a CPS where information is exchanged autonomously and independently, forming an intelligent value-chain (Posada et al., 2015; Xu et al., 2018). Despite the success of this approach in the industrial panorama, the 4.0 paradigm represents serious challenges to other economic sectors (e.g., Culot et al., 2020; Mariani & Borghi, 2019; Oztemel & Gursev, 2020), specifically the tourism sector (Ivanov et al., 2021).

Nowadays the use of technologies by tourism companies and DMOs goes much further the simple digital platforms (e.g., websites). The abovementioned I4.0 technologies are already proliferating within the sector, increasing businesses' and destinations' competitiveness through the creation of smart environments, where information about the economic, geographic, and social surrounding is constantly being generated and exchanged amongst all stakeholders (Ivanović et al., 2016). However, their real implications still lack further assessment, as they entail several challenges. Nevertheless, it can be argued that tourism has immersed in the I4.0 paradigm through digitalization processes (Pencarelli, 2019), perhaps giving space for the emergence of the tourism 4.0 concept.

The concept lacks significant explaining once, at first sight, the basics of I4.0 cannot be simply transferred to the tourism context, namely because one is related to the production of physical goods, while the other is mostly services-based (Korže, 2019). As a matter of fact, there is no clear definition and, so far, there is no significant debate for its clarification. If T4.0 is an extension of I4.0, the concept can be simply understood as the integration of new technological advances within the sector. Still, the integration of technology within a destination will not add significant value per se. There is a need for destination managers to recognize the complexity of this new smart standard to create value and gain competitive advantage (Borsekova et al., 2017). Additionally, these changes driven by digitalization need to be incorporated from a joint perspective involving tourism suppliers, local/regional managers, visitors, and the local community (Smirnova et al., 2020), so that, based on this synergetic approach, a place achieves sustainable development (Borsekova et al., 2017).

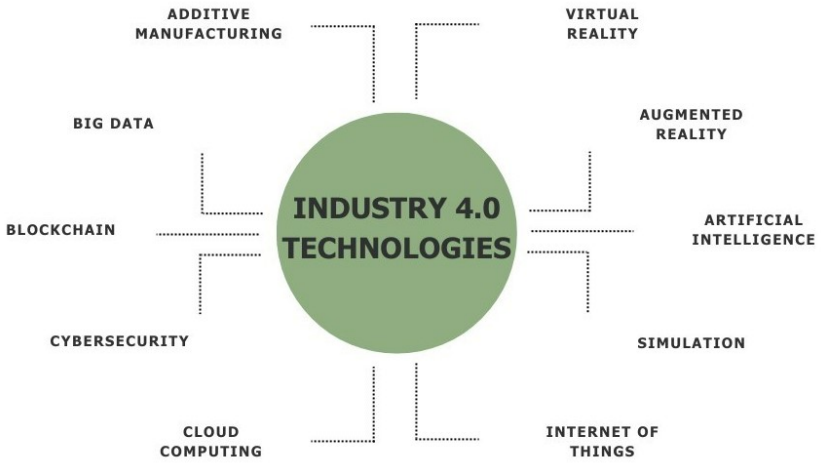

Figure 2 | Industry 4.0 technologies
Own elaboration based on Culot et al. (2020), Frank et al. (2019), Lu (2017) and Smit et al. (2016)

4. Territorial marketing

The role of spatial dimensions of consumption and production is increasingly recognized for a better understanding of market dynamics in many product-domains (Castilhos et al, 2017). Referring to the Service-Dominant Logic (Vargo & Lusch, 2004), Baccarani et al (2019) conceptualized territory as not only an operand resource (upon which an act is performed), but also an operant resource (acting upon other resources), central to co-creating value through anthropological interactions within a physical context. This dynamic co-creation of value will also explain the attractiveness of a territory to its visitors (Kotler et al, 1993), however requiring integration in a wider place-consumption and development framework (Ashworth & Voogd, 1994), which has evolved into sophisticated identity-enhancing strategies over the past decades (Kavaratzis & Ashworth, 2005). Baccarani et al (2019) suggest platform-designing methods – supported by technologies – to stimulate the territory's potential to engage in such value co-creation. In this vein, TM may be understood as a territory's market-oriented attempts to enhance its value co-creation potential, yielding increased overall well-being and effectiveness of the territories' functioning, success, and sustainability.

The essence of place marketing could be defined as "a process whereby local activities are related as closely as possible to the demands of targeted customers. The intention is to maximize the efficient social and economic functioning of the area concerned, in accordance with whatever wider goals have been established" (Ashworth & Voogd 1994, p. 41). Accordingly, TM may be considered an application of general marketing strategy and techniques to places and regions (Ashworth & Voogd, 1994), however recognizing their complexity and specificities. It requires, specifically, the identification of a) a region's diverse target markets (residents, businesses, visitors, other agents) and of b) its competitive advantage (regarding those markets and other competing regions), based on a sound knowledge of the region's central assets (some of which fixed and often distinctly valued by different markets). This knowledge is central to develop successful action yielding an improved market position and to increase the region's social and economic well-being, while maintaining its central value-providing resources. In this context, TM needs to continuously access and analyse a large volume of data (often in distinct formats)

on markets, competing regions, place resources, agents, and investments. It must make the best of existing resources and competences, that add up to allow the above-mentioned co-created regional value, in a more or less effective and efficient manner, desirably aided by coopetition and articulated through well-accepted and dynamic governance structures (Kavaratzis & Ashworth, 2005).

Thereby the territory may achieve its best possible value constellation, reflected in a unique, irreproducible position and territorial brand, highly attractive to the distinct stakeholders (Cross, Plantinga, & Stavins, 2011). This territorial brand is further extensive to other product or service brands within the territory, which should ideally reinforce each other and enhance regional identity, such as in the case of place of origin and of highly valued regional food brands, such as cheeses or wines (Charters & Spielmann, 2014; Fernandez-Ferrin et al, 2020), cultural heritage, festivals or art work located in or associated to certain places (Borlido & Kastenholz, 2023 ; Simeon & Buonincontri, 2011) Each brand or local icon is closely connected to the overarching territorial brand itself, which also occurs in the case of destination brands and respective image, which trigger tourist attraction and attachment (Lee et al., 2013).

These value-enhancing cumulative branding approaches are particularly important when choosing tourism as a strategic development tool, which is sometimes the case in (natural/ cultural heritage-rich) rural territories (Lane & Kastenholz, 2015) that need to make the best of scarce resources and inferior social and economic dynamics. Technology is here as crucial as trust in coopetition and well-articulated and governed network structures, helping both in continuously collecting and analysing relevant data on markets, competitors, and context, and in communicating effectively within the network and with relevant market partners, while tourism 4.0 may assist in developing new products that may enhance regional tourist experiences.

5. Tourism 4.0 within a smart specialization framework: a territorial marketing tool?

The digital transformation in the tourism sector brings challenges to the marketing field (Siaw et al., 2023), since simple brochures or marketing campaigns are now obsolete communication means, in an era of connectivity, user-generated content and dynamic processes of co-creative tourist experiences (Buhalis & Foerste, 2015). In an increasingly competitive panorama, destination marketers need to engage their visitors, before, during and after the trip and improve their destination experience by incorporating smart technologies, possibly enhancing visitor loyalty (Buhalis, 2020; Koo et al., 2016). Therefore, technological competitiveness of a destination depends on the quality of the smart technologies offered and their convenience for tourists adding value to their co-creation experience (Gajdošík & Orelová, 2020).

To promote an effective transition to T4.0 within a S3 approach, territories must make use of all relevant regional resources and stakeholders by establishing networks between actors and resources, (Bečić and Švarc, 2015), particularly in less developed regions (Cawley & Gillmore, 2008; Kastenholz, Carneiro, & Marques, 2012). Within this context, territorial marketing may help gain a competitive position, by understanding a) the market, b) the competitive context and c) the destination's core attributes and players. The required integrated territorial marketing perspective involving all stakeholders in joint product development and market communication (Kotler & Gertner, 2002), needs collaborative action, often involving new, well-administered and participative governance structures, also called Destination Marketing/Management organizations (DMOs) (Lane & Kastenholz, 2015).

Presently, territorial marketing has become part of local and regional governance processes (Borseková et al., 2017), aiming to attract invest-

ment into regional economy and encouraging the emergence of new productive activities (Kotler et al., 1993; Simeon & Buonincountri, 2011). In tourism, the success of territorial marketing lies in the capacity to identify the needs of actual and potential visitors, as well as in the ability to effectively target them through differentiated strategies, designed within a collaborative framework involving all relevant regional actors (Simeon & Buonincountri, 2011), combining resources and actions to enhance the destination's appeal and memorability. Digital technology may be one dimension in this integrated effort. For instance, DMOs may use gamification aiming to enhance the co-creative pre-trip experience, by allowing visitors to explore the destination, its attractions, resources, and services, and create an attractive imaginary in the consumer's mind (Signoretti & Martins, 2017; Buhalis, 2020). Such engaging, dynamic and personalized experiences might be particularly beneficial to businesses and destinations in less developed regions, being an inexpensive and innovative marketing method, possibly increasing loyalty (Signoretti & Martins, 2017; Xu et al., 2017), despite the little evidence concerning consumers' willingness to engage in gamification (Trigo De-la Cuadra et al., 2020).

Considering the complex destination's value-chain, tourism, with its potential to connect with different economic sectors, may play a central role in S3, contributing to the emergence and consolidation of place-based territorial networks (Lazzeretti et al., 2016; Romão, 2020a). Still, a question arises: why had tourism been largely ignored within the European S3 discussion, despite its popularity as a specialization area (e.g., Weidenfeld, 2018)? A way to stimulate policy change, specifically recognizing the potential of tourism in S3, may imply a better understanding of innovation processes, relying on dissemination of knowledge and technological diversification that would help integrate the principles of T4.0 within a S3 framework, enhancing, once again, the sector's position in differentiated regional development approaches (EC, 2014).

The overall role of T4.0 in territorial marketing is still to discover with no studies identified that relate both topics. Instead, some studies evaluate the implications of single projects' adoption of technologies for marketing (e.g., Jung et al., 2020). Tourism marketers are increasingly aware of the added value that T4.0 technologies provide in supporting social tourist experiences, due to their disruptive characteristics (Buhalis et al., 2019). Technologies in services, including tourism, rely on interactions between service providers and customers, while ICTs can be understood as tools for the co-creation of value (Cornejo-Ortega et al., 2021), enabling potential tourists to become familiar with a destination in a pre-trip stage, thus decreasing travel risk (Buhalis et al., 2019). They have, since long, been supporting the tourism industry in developing effective marketing strategies to attract visitors and provide unique experiences at the destination (Buhalis et al., 2019), using key enabling technologies (e.g., autonomous devices or agents, location-based services, virtual and augmented reality) and providing new solutions to the tourism industry.

Accordingly, a destination's competitiveness can be improved if the territories implement effective, smart, and well-articulated, technology-aided, interaction-supportive, and customer-oriented supply systems, using territorial marketing tools. From a territorial perspective, ICTs can play a strategic role within marketing, favouring timely exchange of relevant information and providing contents that will enhance the tourism experience (Buhalis, 2004; Giaccone & Bonacini, 2019). Hence, the adoption of ICTs in territorial marketing should contribute significantly to the development and positioning of places within a competitive market context (Abyre et al., 2018). Thus, the relation smart technologies-territorial marketing, within the tourism context, can be viewed in two ways. On one hand, territorial marketing might help to attract and fix new business models

that, combined with S3, should enhance the development of, particularly less developed territories. On the other, the application of T4.0 technologies within a territorial marketing framework helps to develop more appealing, engaging, co-creative, diversified, and personalized experiences and promotional campaigns, bringing visitors closer to the territory and helping stakeholders collaborate in more effective, interactive continuous and dynamic way.

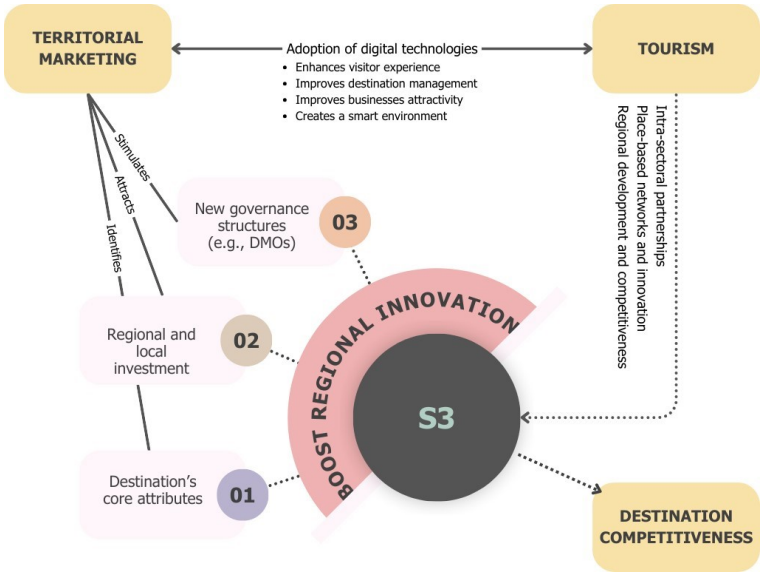

Figure 3 | Tourism 4.0 as a territorial marketing tool within a smart specialization framework
Source: Own elaboration

The continuous digitalization progress unavoidably affects the tourism industry, resulting in new challenges to tourism companies and local/regional managers, namely concerning marketing issues. Thus, one main question arises: which are the main challenges that marketers will face due to the rapid technological evolution and the inherent challenges?

6. Conclusions

The main aim of this theoretical approach was to investigate and discuss if smart specialization as a cohesion policy and the application of 4.0 principles in the tourism sector could work as a territorial marketing tool towards regional development. To this end, the paper delved into the literature surrounding these topics, attempting to find a rationale supporting this assumption. Several gaps can be addressed in this discussion. First, the lack of empirical research concerning the implications of tourism within a S3 framework (e.g., Biagi et al., 2020; Borseková et al., 2017; Romão, 2020a, b). The rapid translation from theory to policy means that the concept itself is still being refined at the same time as policymakers are adopting and implementing it (Kroll, 2015). Second, the concepts of T4.0, smart tourism, and digitalization need further and careful analysis. Despite the countless studies concerning the smart paradigm in the tourism context, very few were able to contribute to this discussion and to differentiate T4.0 from smart tourism, while it may also be questioned, if there is a true need to distinguish both. Third, and despite some research about the challenges of regarding the implementation of the

principles of I4.0 by tourism companies, more in-deep research is needed to truly comprehend the digital literacy of tourism companies and their effective use of I4.0. So, it can be argued that the full potential of T4.0 is still to discover. Moreover, some authors (e.g., Stankov & Gretzel, 2020) are now questioning the impacts of T4.0 technologies on tourist experiences, defending a rather human-centred experience design approach. More studies are needed to examine the impact of new technologies not only from the perspective of the tourist, but also from a multiple-stakeholder viewpoint. From a marketing perspective, it is crucial to know the digital literacy of the target markets to provide them the experiences they value most (with or without technology). The analysis of digital literacy is also crucial within the tourism industry, especially as for the ICT competences of the labour force, largely conditioning the technological development process. Bilotta et al. (2021) revealed that technological skills should be added to academic curricula, particularly by tourism courses, as it will enable students to acquire and develop the fundamental competencies to properly deal with T4.0 technologies, thus overcoming the related challenges. As a recommendation, policymakers could support the development of educational programs to enhance digital literacy within the tourism industry, employing collaborative approaches between the stakeholders (e.g., government entities, education institutions, tourism companies).

Despite the quite obvious implications of both S3 and T4.0 for destination marketing, there is very little evidence supporting this connection, or specifying its conditioning factors and challenges. Thus, a better understanding of the role of ICTs as an effective tool helping operationalize territorial marketing action might contribute to a renewed political agenda integrating all three elements yielding sustainable regional development. Although the potential associated to these disruptive technologies, smaller companies are less likely to accompany the big players of tourism, specifically if located in peripheral areas (Dredge et al., 2018). Lagging regions are often left behind in development processes, and some fear that digital transformation might even contribute to increase the distance between lagging and developed regions subsists. The lack of resources, lower capacity to engage in networks and to obtain funds are argued as some of the reasons contributing to this possibly increasing gap (Muscio & Ciffolilli, 2020). Still, the implementation of S3 driven by tourism may revert this scenario (Biagi et al., 2020; Del Vecchio & Passiante, 2017), due to the sector's versatility and the advantages resulting from a creative and diversified regional economic structure (Romão, 2020b). Thus, financial incentives and network-building opportunities should be reinforced to support lagging regions in adopting T4.0 technologies and participating in S3 initiatives.

Accordingly, competitive advantages may result from the combination of these three concepts. If smart specialization may be considered representative of an EU brand, particularly at a regional scale (Rusko, 2018), a better alignment between S3, T4.0, and strategic territorial planning could benefit regional development, if allied with place branding. As an approach to regional attractiveness, place marketing aims to create a strong position, successfully develop, and 'sell' appealing place-products. Thus, place branding, creates symbolic relationships with the place-brand, which embodies the underlying regional development vision (Oliveira, 2016). An integration of these two approaches, instead of their traditional separation, is worthy of attention. For instance, place marketing and branding have been interpreted as intrinsic elements of public management along with other dimensions such as infrastructures, security, business environment, public-private partnerships, and the integration of the local population (Campelo, 2017), elements that are also incorporated within S3 and I4.0.

The paper also presents some limitations. First, being a theoretical exploration there is small

room for generalizability. The lack of studies delving into these topics makes it difficult to deeply investigate them. Thus, while this paper explored the potential of S3, T4.0, and territorial marketing for regional development, further empirical research is needed. Future studies could employ case studies in specific regions to assess the effectiveness of different S3 approaches for tourism development, specifically within a destination marketing framework. Additionally, research is needed to understand the impact of T4.0 technologies on destination management and tourist experiences and how to bridge the digital divide between developed and lagging regions. Secondly, although recognizing the relevance of territorial marketing to regional development strategies, the incorporation of additional marketing concepts (e.g., digital marketing) would have helped to better understand and even relate the subjects, particularly due to a close relationship with T4.0. Therefore, this poses an interesting path for future analyses.

Within a world where everything seems to be smart, the application of I4.0 principles in a tourism destination, more precisely the effective use of ICT enabling the interconnection of information between all the stakeholders, is seen as an innovative approach to promote differentiated regional development strategies, such as S3. In that way, effective networks can help peripheral regions to develop the proper basis to integrate I4.0 technologies regardless of their economic circumstances (Bailey & De Propris, 2019). Additionally, the implementation of a S3 strategy may help lagging regions to improve their competitive position once it involves a focus on the resources where the territory has (or may have) competitive advantages. On the other hand, and even if tourism companies are not accompanying this digital revolution (T4.0), S3 might contribute to driving companies in that path, through the innovation of their processes, and supported on territorial marketing as an enabler to assess the competitiveness of a territory.

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