A boundary objects view of Entrepreneurial Ecosystems in tourism

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ABSTRACT

This paper uses boundary objects theory to advance a novel conceptualization of Entrepreneurial Ecosystems (EEs) in tourism and address gaps in our understanding of the environments within which physical and virtual elements of EEs interact, change and expand over time. An extensive literature review of select information science and organizational strategy literature is used to identify key characteristics of tourism EEs and situate the concept within a 'tourism as system' perspective. The resultant models demonstrate that tourism EEs represent an *expanding meso-level experience space* made up of actors engaged in multiple types of activities, complemented by an ever-expanding set of interactions, and driven by a variety of entrepreneurial behaviors and technological innovations. Theoretical implications suggest that future research should employ dynamic measurement approaches to understanding and measuring EE performance vis-a-vis the disruptive impact of digital technology. Practical implications for governments, communities, and global tourism organizations include the need for governance systems to expand opportunities for current EE players while encouraging the entry of new players through the creation of new tourism ventures.

1. Introduction

Recent conceptualizations of entrepreneurial ecosystems (EEs), broadly defined as a community comprising actors and their activities of production and service, have roots in ecological biology, regional development, or closely related fields of systems, networks and actors. Traditionally, EEs are viewed as somewhat static combinations of social, political, economic, and cultural elements (Spigel, 2017) for which entrepreneurship is regarded as both an output and an input (Acs, Stam, and Audretsch, 2017) of the system. However, the nature of EEs is changing, in part driven by societal trends, and in part by advances in digital technology (Boes, Buhalis, & Inversini, 2016). There is a need to better understand how each of these impacts an EE, and the impact these factors have on the interaction between ecosystem elements, in order for those involved in the EE to better anticipate changes and exploit them to offer enhanced tourist experiences. Both of these social and technological drivers can change the roles of players within a destination, reducing the relative importance of physical ('concrete') infrastructure, and increasing the importance of providing enhanced ('abstract') experiences; that often extend beyond current physical activities, and expand over time to include the experience before, during, and subsequent to the visit to a destination. Importantly, these changes often stimulate entrepreneurial outcomes, as they address gaps in the

current market or offer new levels and types of services which are novel.

There is a lack of understanding of the role of social context and digital technology in the expansion of tourism experiences and the growth of entrepreneurial opportunities. This is evidenced in two ways. First, there is incomplete knowledge of how digital technology impacts and interacts with other elements of the EE and whether technology represents an externality or active participant within the EE. Secondly, our understanding of the EE is fragmented, given the varying nomenclature used to conceptualize the EE for tourism as 'digital entrepreneurial ecosystem', 'digital business ecosystem', 'innovation ecosystem' or 'smart ecosystem' (Baggio & Del Chiappa, 2013; Boes et al., 2016; Gretzel, Werthner, Koo, & Lamsfus, 2015). Within business networks concepts which prioritize the nature of relationships between individuals (e.g., Granovetter (1985) and Burt (2005) social networks) and systems thinking which views systems as parts (e.g., Bosch (2013) elements—individuals, groups, businesses and their interactions), has emerged a need to understand convergencies and contrasts of entrepreneurial ecosystems with other theories of start-up, entrepreneurship, and innovation (Daniel et al., 2018). For these reasons, this current work is both needed and important.

In this paper, we focus on the disruptive impact of digital technology, given the impact these rapidly evolving technologies have on

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the expansion of tourism experiences and the growth of entrepreneurial opportunities. It is important to note that our focus on the impact of digital technologies does not limit the impact of these technologies to virtual components of the tourism experience, rather in many cases these digital technologies make it easier to: access physical resources (i.e. *Expedia*); allow new entrepreneurial players to offer competitive physical services (i.e. *Uber*), customize existing physical experiences (i.e. *ToursbyLocals*), share physical experiences with remote friends (i.e. *Instagram*), create new physical experiences (i.e. *Lime*). Further, as Prahalad and Ramaswamy (2003) observe these technologies can facilitate value creation through co-creation activities, such as sharing prior experiences with others (i.e. *TripAdvisor*) or offering unique activities where tourists and local share experiences (i.e. *AirBnB*, *Eat-With*). It is this expansion of EE to include both the physical and virtual space, extending from before a visit to after one, that we define as the *Experience Space*. We develop a dynamic model of the EE in tourism, to help us explain the impact of technological, social, cultural, and institutional elements on the development of the EE.

This paper contributes to the literature on the development of EE in tourism by using boundary objects theory that classifies "actions and things" within systems. Boundary objects are representational forms—things or theories—which act as anchors or bridges however temporary, in linking knowledge and creating nomenclature for understanding phenomena across communities of knowledge or practice. Given the inherent difficulties in depicting social worlds in the dynamic tourism context, we build on the boundary objects viewpoint to articulate the importance of studying the *Experience Space*—abstract and concrete—of the EE. By expanding the traditional EE concept beyond participant (host and visitors), spatial (geographic) and temporal (arrival to departure) limits, we expand the interactions within an EE to include multiple interactions and activities that can be experienced by hosts and tourists, where the nature of such interactions is partly a function of the existing ecosystem, the availability of digital technology, and the presence of local entrepreneurial players who will take risks to offer new experiences. We build on key themes and concepts from the literature to establish a foundation of current views of EEs, then develop a more dynamic model of this expanded Experience Space to better understand how technological changes will evolve to create new value for tourists (and hosts) and encourage the development of new entrepreneurial ventures and players.

The remainder of the paper is structured as follows. In section 2, we theoretically situate this paper within information systems and organization strategy, and identify four key themes upon which existing EE concepts in tourism have been traditionally established. In section 3, we use boundary objects theory to introduce a dynamic EE model and further depict expansion in time, location, players, and the technology interactions among them. We conclude in section 4, by offering some theoretical and practical insights into how the various local players and new interaction opportunities (innovative experiences) will be made available to tourists, along with the implications for entrepreneurial and other stakeholder outcomes.

2. Key themes from literature

2.1. Entrepreneurial ecosystems

Roundy, Bradshaw, and Brochman (2018) define an entrepreneurial (or entrepreneurship) ecosystem as "a self-organized, adaptive, and geographically bounded community of complex agents operating at multiple, aggregated levels, whose nonlinear interactions result in the patterns of activities through which new ventures form and dissolve over time" (2018, p. 5). They are dynamic, local social, institutional, and cultural processes and actors that encourage and enhance new firm formation and growth (Malecki, 2018). EEs are similar to clusters and industrial districts in that entities including large firms, universities, financial firms, and public organizations that support new and growing

firms (Brown & Mason, 2017) and co-exist for shared goals and outcomes. According to Pitelis (2012), "an important reason why clusters emerge is [due to] the capabilities of entrepreneurial management to orchestrate market and ecosystem co-creation" (2012, p.1360); while Spilling (1996) argues entrepreneurial ecosystems make up "a complexity and diversity of actors, roles and environmental factors" (1996, p.91). The latter further ascribes to the EE a varying collective of "actors and activities", "players and ingredients", "institutions and interactions", and "elements and environments" that exist as a system-level construct.

2.2. Boundary objects

Since its introduction by Star and colleagues (Star, 1989; Leigh Star, 2010; Star & Griesemer, 1989), the concept of boundary objects has been widely used in education and research collaboration scholarship to capture the possibility of how users engage in cooperative scientific work in the absence of consensus. The concept originates from science and technology studies which seek to understand systemic properties of a "collective" by drawing an analogy with a biotic ecosystem. Boundary objects are defined as *representational forms*—things or theories that can be shared between different communities, with each holding its own understanding of the representation. This quality of representational form explains the cooperative tasks of social worlds sharing the same space but different perspectives (e.g., hosts, visitors, entrepreneurs, intrapreneurs, governments, researchers, and local residents connected to an experience space).

By explaining the nature of cooperative scientific work in the absence of consensus, boundary objects are both abstract and concrete that is, they are adaptable to different viewpoints and robust enough to maintain identity across different social worlds. The view argues that when things travel across different communities of practice, they are constructed differently in different sites to meet the needs and goals of the local situation. So, a local brewery may occupy the experience space as an everyday unit of economic development employing and serving locals; and at the same time represents a host attraction to visitors and tourists. Similarly, a local resident exists as an ordinary 'empty-nester' and taxpayer in local community and culture; and at the same time represents a host lodging facility to tourists by virtue of being listed on *AirBnb*.

Boundary objects have the quality of a typology of *coincident boundaries* where work in different sites and with different perspectives can be conducted autonomously while cooperating parties share a common referent. *(Interestingly, the importation and use of the entrepreneurial ecosystem concept from ecological biology to tourism is itself representative of boundary objects as concept-in-use!)* Drawing on the work of amateurs, professionals, administrators, and others connected to the Museum of Vertebrate Zoology at the University of California, Berkeley, Star and Griesemer (1989) use the example of maps of California created by amateur collectors and by professional biologists. While the maps appear similar, amateur collectors' maps resemble traditional roadmaps emphasizing campsites, trails, and places to collect. On the other hand, biologists' maps share the same geopolitical outline of the state, but comprise highly abstract, ecologically based series of shaded areas representing "life zones", an ecological concept.

This difference in representation is directed by the different perspectives of groups of hosts and guests in their motivation to use and interact with others in the experience space. For the hotel or restaurant operator, their perspective of the EE may be represented as a means of satisfying guest experiences for economic gain. For the guest, their perspective of the EE may be represented as a means of accessing play and/or learning experiences for hedonic or other pleasure. For the local resident, their perspective of the EE could be *either* host *or* guest depending on, for example, if they are an *AirBnB* operator or local taxi provider; or if they are themselves guests of local community-based attraction (i.e., 'domestic tourist'). These varying levels and types of

uses and interactions within the experience space are conceptualized as concrete (physical/human-to-human use and interactions) and abstract (virtual/digital technology-based use and interactions). The ability of the EE to assume different representations for different groups, enabled and enhanced by underlying digital technology, gives it the inherent quality of a boundary object; giving it capacity for something Star refers to as *interpretative flexibility*. Interpretative flexibility is the ability of boundary objects to facilitate understanding and autonomy among interdependent elements across different social worlds, and is an important premise upon which the tourism EE concept in this paper is premised.

2.3. Situating the current work

The concept of entrepreneurial ecosystems (EE) in tourism, while garnering significant scholarly attention (e.g., Baggio & Del Chiappa, 2013; Boes et al., 2016; Gretzel et al., 2015), has yet to achieve consensus around digital technologies vis-à-vis the ever-changing 'social worlds' of players simultaneously acting as producers and consumers. Baggio and Del Chiappa (2013) draw attention to the Digital Business Ecosystem (DBE) concept, with emphasis on the structural characteristics related to the tourism destination. This work is however limited first by its conceptualization of the ecosystem as existing within the geographically spatial confines of the tourism destination and secondly, by its singular focus on the structural composition of the ecosystem with limited attention placed on explaining behavioral characteristics. Similarly, Boes et al., (2016) consider the "collective whole" of the smart tourism destination as an ecosystem predicated on service-dominant (S-D) logic and smartness which furthers the ecosystems concept in socio-technical terms. However, to the extent that the authors fail to address internal and external forces, the study falls short in its ability to explain the dynamic nature of EEs in terms of their ability to motivate player interactions and change while keeping the ecosystem in balance. Perhaps the most promising conceptualization towards representing the entrepreneurial ecosystem in tourism is put forward by Gretzel et al. (2015) in their conceptualization of the smart tourism ecosystem (STE), a "smart technology-supported interaction space" undergirded by a digital ecosystem of data flows and smart technology (2015, p.561). Unaddressed however is the dynamic nature of the ecosystem, often caused by externally developed technological innovations, moderated by local culture, society, and the environment that influence the interactions between the players in the EE and the activities the tourists can experience.

Another perspective on the EE which we believe has important implications for its development is the aspect of resilience. While resilience has previously been applied to describe how destinations respond to physical disasters (Hystad & Keller, 2008), and how the tourism industry recovers after extraneous shocks (Ndlovu & Heath, 2011), there is little written about technological resilience in EE and how players can better prepare for technological disruption to both mitigate the impact on existing organizations, and to respond to the opportunities created. There are also knowledge gaps surrounding performance measurements of EEs. As Spigel (2017) argues, simply measuring rates of entrepreneurship is insufficient, given the seeming absence of linkages between entrepreneurship and economic performance. EEs are defined by the connections between the attributes which produce them and the benefit they provide to entrepreneurs (Spigel, 2017). Taken together, there is a need to improve our conceptual understanding of EEs in tourism, particularly as it relates to spatial and temporal characteristics; resilience; and the valuable role which digital technologies play across the multiple social worlds existing within the EE. Fig. 1 provides a graphic representation of where the current work is theoretically situated in an attempt to resolve some of the above conceptual issues.

Traditionally, EE theorizing has been culled from select organizational strategy (OS) and information science (IS) concepts. OS concepts of EEs relate broadly to entrepreneurial innovation, collaboration networks, and interdependence while IS concepts of EEs relate to technology systems, self-organized cooperation, infrastructure, and institutions. We distill these concepts into four key themes for tourism: 1) tourism as sector-specific, sub-ecosystem; 2) players as non-hierarchical collaborators; 3) socio-technical interactions; and 4) entrepreneurial opportunities.

Tourism as sector-specific, sub-ecosystem. The tourism EE describes roles and relationship of traditional players within a destination in order to identify how they will be impacted by an increasingly technology-driven environment. In general, elements of the EE include large and small tourism businesses (often diverse in nature, and with a complex mix of MSMEs); government and quasi-governmental public entities; not-for-profits, and civil society. Government develops appropriate policies to regulate and encourage technology adoption, innovation and serial entrepreneurship creating a policy space within the EE. This space is navigated by local and non-local businesses in response to international technological disruptors like *AirBnb* and *Uber*. For example, *Uber's* rideshare service creates large numbers of entrepreneurial drivers, that directly compete with traditional modes of transportation such as local taxis (Rayle, Shaheen, Chan, Dai, & Cervero, 2014). Similarly, *AirBnB* raised licensing and tax questions as they opened up hundreds of new accommodation options from entrepreneurial hosts (Law, 2009). The tourism as a system perspective argues that the interaction of disruptive technologies, the response of local entrepreneurs and the reaction of institutional policy makers has an important impact on innovating visitor experiences.

Players as non-hierarchical collaborators. An important EE characteristic is the presence of loosely coupled players with shared goals (Boley & Chang, 2007). Their behaviors are goal-directed, meaning they choose to collaborate for added value to tourist experiences from which they benefit. Spigel (2017) argues that EEs are marked by a form of relational governance and lack a clear power hierarchy or formalized enforcement methods that could impede informal interactions between forms. This EE view agrees with the perspective of hub orchestrators within innovation networks (Dhanaraj & Parkhe, 2006; Milwood & Roehl, 2018), where the roles of DMOs and CVBs for example, are contingent on the extent to which knowledge sharing and collaborative behaviors are driven by shared technology resources versus shared markets. Embedded in non-hierarchical collaboration is interdependence among players and 'loosely coupled' (Orton & Weick, 1990) relations in the network. Strategy scholars (e.g., Adner, 2006; Adner & Kapoor, 2010; Iansiti & Levien, 2004) argue that ecosystem partners need to be brought into 'alignment' in order for a value proposition to materialize in the marketplace (Acs et al., 2017) juxtaposes orchestration where a central hub encourages collaboration through reputation and influence, rather than through power and control of destination resources.

Socio-technical interactions. Socio-technical interactions in the EE describe the environment of human involvement with and performance of, various technologies such as broadband, sharing technology, Internet of Things (IoT), artificial intelligence (AI), location-based technology, data analytics, virtual reality and social media platforms. Socio-technical interactions embody the shared entrepreneurial climate among players, and is an important enabler of knowledge spillovers, self-organizing, and goal-oriented relations within the EE. No single technology is privileged over another. According to Malecki (2018), "An entrepreneurial ecosystem is not likely to be tied to a single technology or industry; rather the successful ones appear to have entrepreneurial dynamism that transcends industries and individual technologies." (2018, p.110). Within hospitality, it is predicted that by 2020, 85% of customer interactions will be managed without a human (Corrente, Greco, Nicotra, Romano, & Schillaci, 2019). This has important implications for customer-to-customer (C2C) and peer-to-peer (P2P) interactions within the entrepreneurial ecosystem. *Pokémon Go* for example, creates user-centric, experiences based on augmented
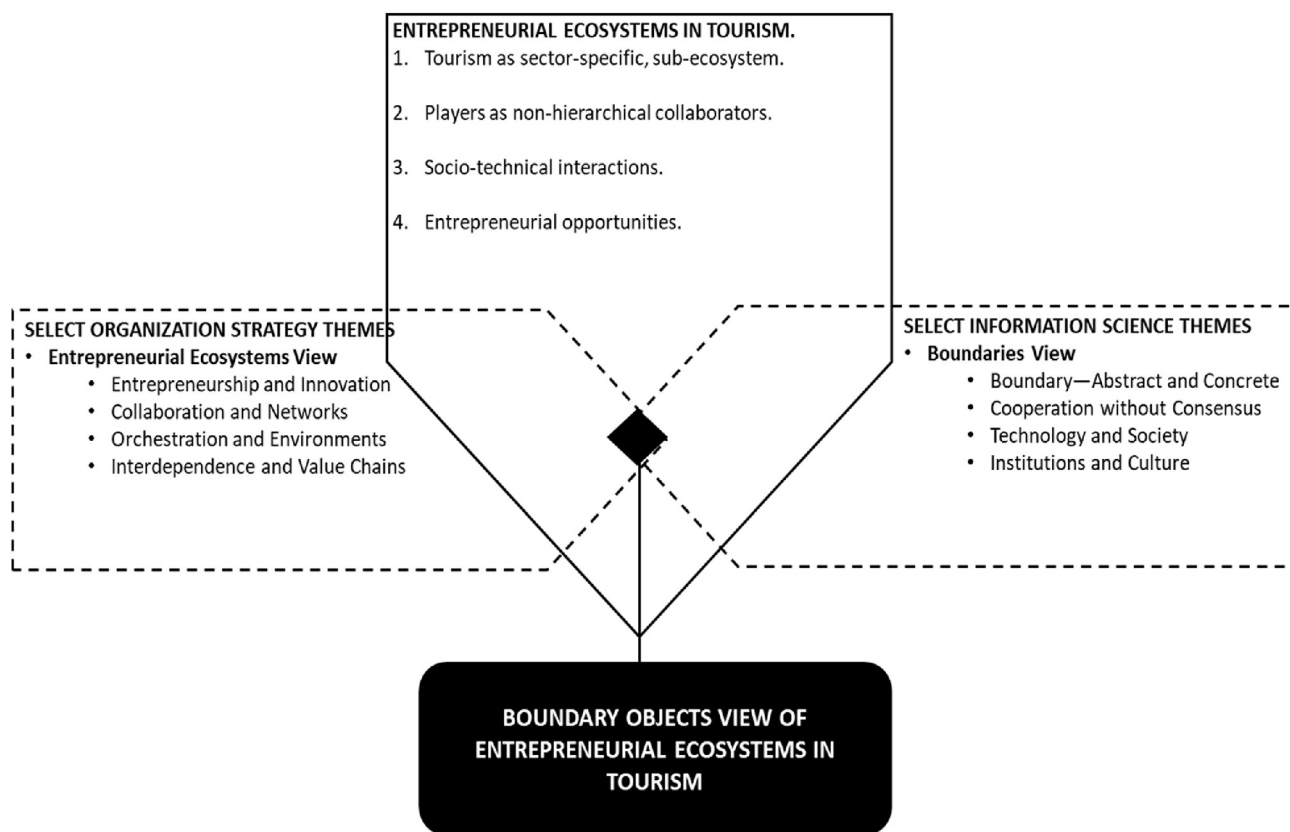
ENTREPRENEURIAL ECOSYSTEMS IN TOURISM.
1. Tourism as sector-specific, sub-ecosystem.

2. Players as non-hierarchical collaborators.

3. Socio-technical interactions.

4. Entrepreneurial opportunities.

SELECT ORGANIZATION STRATEGY THEMES
- **Entrepreneurial Ecosystems View**
  - Entrepreneurship and Innovation
  - Collaboration and Networks
  - Orchestration and Environments
  - Interdependence and Value Chains

SELECT INFORMATION SCIENCE THEMES
- **Boundaries View**
  - Boundary—Abstract and Concrete
  - Cooperation without Consensus
  - Technology and Society
  - Institutions and Culture

BOUNDARY OBJECTS VIEW OF ENTREPRENEURIAL ECOSYSTEMS IN TOURISM

Fig. 1. Situating the current work: Key themes and concepts.

reality platforms. As users interact with these technologies, they create unique experiences which increases their individual enjoyment and provide vicarious enjoyment to non-users by enticing involvement and participation. Table 1 provides generic and specific tourism examples of 'added value' technologies.

Entrepreneurial opportunities. Entrepreneurial opportunities flow from the serial introduction and development of new ideas (including technologies), processes, and business models which accrue value to EE players. In the case of technology, especially disruptive technology that offers new types of experience, or challenges the traditional boundaries between organizations (in some case filling them and in others removing them), entrepreneurs, unencumbered by the constraints of existing organization, are ideally placed to challenge the status quo and relatively quickly exploit the innovations. In many cases, tourism innovations can be transformed into sustainable ventures empowered by local players, other equally important innovations stimulate entrepreneurial endeavours in distant locations, while others create ecosystems that include local entrepreneurs and distant entrepreneurs (i.e. *Uber, AirBnB*). This implies key roles for local organizations, government, and non-local players, in enhancing the Experience Space in as EEs, facilitated by education and knowledge transfer, openness and culture, absorptive capacity, shared values and competitive pressures (Khalifa, 2016). Fostering local entrepreneurial ventures, requires many of the same factors, enhanced by a civic culture and that "a distinct regional entrepreneurial culture is supported by a high degree of civic mindedness" (Malecki, 2018, p. 9) that in communities such as San Diego and Waterloo sustain community and regional development, fostered by a network of local players (e.g., philanthropists, angels, mentors) who support local early stage entrepreneurs by contributing pro-bono time, wisdom and mentoring.

In the above paragraphs, we have situated the current work within four key themes forged from organizational strategy and information science concepts. In the following section, we introduce *a boundary*

objects view of the entrepreneurial ecosystem premised on these four themes, and theoretically situated within the black diamond at the center of Fig. 1.

3. A boundary objects view of entrepreneurial ecosystems in tourism

3.1. A meso-level experience space

The boundary objects view of the entrepreneurial ecosystem conceptualizes an experience space that includes both virtual and physical components within which intermediated and disintermediated interactions (Table 1) occur between players. As we show in Fig. 2, the boundary objects view removes some of the spatial and temporal limits placed on the EE by traditional scholarship. We do this by removing some of the traditional 'boundaries' (for example an Uber driver may transport locals to work as part of the host infrastructure; may offer services directly to tourists; or may engage another service provider - such as a guide). This suggests a more complex and fluid model and mix of players (i.e., hosts, consumers, and the technology boundaries within and across which they operate). The focus of Fig. 2 is therefore of a hypothesized centre—a 'meso-level' (above micro-level and below macro-level) experience space of interactions and activities influenced by technology boundary objects, and producing and reproducing entrepreneurial opportunities within and across permeable boundaries. Given our focus on the impact of new technologies in creating new experiences, integrating experiences between hosts and breaking down the barriers between hosts and guests, the proposed boundary objects view of the ecosystem captures interactions that are above the micro-level (individual) interaction space, and below the macro-level (aggregated) interaction space. Within this experience space, four types of interactions can occur within and across different groups and social worlds. We propose that it is the underlying role of technology,

Table 1
Generic and tourism examples of 'added value' technologies.

Added value	Underlying Digital Technology	Generic Example	Tourism-related Example
Boundary Intermediary	Blockchain	Blockchain creates shared secure ledgers which allow independent companies to access shared confidential data, for e.g., on flight capacities, so that excess inventory can be optimized.	Platforms such as *Avinoc* are creating integrated and permissionless base data layer for decentralized, transparent and worldwide coordination of business flights within the general aviation industry, to achieve optimal utilization and reduce costs significantly. https:///www.avinoc.com
	Wireless/smartphone technologies	Mobile applications allow users (guests) to share real time information with each other, about locations, venues and facilities, thereby creating a shared experience.	*WhatsApp* and similar wireless social media platforms are widespread applications used by tourists and hosts to keep connected pre-, in-, and post-tourism experience.
	Customer Relationship Management (CRM) systems	Allows the integration and management of a tourist experience so that all of those in a destination interacting with a customer, are aware of specific customer requirements.	*Four Seasons Hotels* has always been at the forefront of customer service. Their CRM system is designed to make sure that all staff (and others) dealing with a specific customer have required personal information. https://wearedevelopment.net/2012/03/14/crm-in-the-tourism-industry-the-case-of-four-seasons-hotels/
Boundary Disintermediary	Web-based platforms	Web-based platforms allow individual users to directly interact with individual hosts, removing the need for a middle man and the shift to a 'brandless' ecosystem.	*AirBnB* is the classic case for disintermediation and is already having a widespread impact. Other related services are emerging such as *VizEat*, where guests can book dinner with local hosts. Digital Social Innovation Report by DSI4EU (2018) cites disintermediation for hotel bookings in a study of a group of Italian online buyers. https://www.eatwith.com/
	Supply chain integration	Integrated software solutions, with added functionality, allow management to track organizational performance and interact directly with key suppliers, enhancing efficiency and improving cost effectiveness.	Comprehensive software solutions are available 'off-the-shelf' to help manage tourist attractions. They allow managers to track revenues and expenses, ensure budgets are managed, and approval processes streamlined. https://prerogative.co.uk/industries/travel-tourism-software/
	Mobile payments and e-commerce	Direct, peer-to-peer payments facilitate financial transactions between parties, enabling guests to directly interact with hosts.	Increasingly guests can pay hosts through non-traditional means, using computer-based encryption technology such as *PayPal*, or NFC-enabled wireless technology such as *WeChat Pay*. https://www.nfcworld.com/2017/07/04/353759/edinburgh-tattoo-accept-wechat-pay/
	Near field communication (NFC)	NFC allows guests to interact with hosts in a personalized and location-specific manner, offering customized solutions to be delivered by hosts to guests	Location-based geo-mobile application developed for cidery routes, links cidery owners and guests. Facilitates location-based service provision and smart advertising. Cloutier, Renard, Arcand, and Laviolette (2016)
	Robots	Robots (and to some extent drones) are finding increasing applications in the service industries, to provide enhanced customer experiences, while reducing host labor costs.	*Henna Hotel* is recognized as the world's first robot-staffed hotel, with robots being used at the front desk, at customer information points, and for storage purposes; making use of voice, facial recognition, and AI technology. https://www.revfine.com/robots-travel-industry/
	Virtual Reality (VR)	Immersive 3D virtual reality is being used to enhance experiences while guests are enjoying them, and also to promote locations and events in a radically different manner.	Virtual reality is increasingly being used to enhance tourism marketing. YouVisit provide virtual tours of hotels and destinations online. https://www.youvisit.com/
	Chatbots, Artificial Intelligence and Smart TVs	These platforms are being used to enhance interactions between guests and hosts, reducing costs and increasing customer satisfaction	Hotels are increasingly using AI powered chatbots, e.g., *LivePerson,* to enhance guest experiences and provide rapid access to guest services. https://www.liveperson.com/solutions/travel/

depicted as wide double-sided arrows, which leads to disintermediated and intermediated exchanges within and across different social worlds within the entrepreneurial ecosystem. In the following paragraphs, we elaborate on these interactions, as depicted in Fig. 2.

3.1.1. Experience space interactions enabled by technology disintermediaries

3.1.1.1. Guest X, host Y interactions. The top left of Fig. 2 depicts Guest X, Host Y interactions in the experience space enabled by technology disintermediaries. This form of customer-to-business (C2B) interaction is enabled by technologies such as web-based platforms, NFC and VR systems (Table 1).Such technologies facilitate direct or disintermediated interactions between types of Guest X (e.g., excursionists, business travelers, DIY explorers) and types of Host Y (e.g., entrepreneurial lodging, attractions, dining and DMOs) players in the entrepreneurial ecosystem. Examples of such technologies in practice include *AirBnB, VizEat*, and geo-mobile applications such as provided by *VisitHouston* for immersive destination experiences. Here, Guest X, Host Y engagement represents a type of boundaryless

interaction between guests and hosts within the EE's meso-level experience space.

3.1.1.2. Host X, host Y interactions. The top right of Fig. 2 depicts Host X, Host Y interactions in the experience space enabled by technology disintermediaries. This form of business-to-business (B2B) interaction is enabled by technologies such as blockchain, CRM systems, shared web platforms and databases (Table 1). Such technologies facilitate direct or disintermediated interactions between types of Host X (e.g., governments, universities, financial institutions and policy planners) and types of Host Y players in the entrepreneurial ecosystem. Examples of such technologies in practice include *Avinoc* and the mobile application linking cideries along a cider tours route in the Monteregie region of Quebec, Canada. Here, Host X, Host Y engagement represents a type of boundaryless interaction between hosts and other supply-side providers within the EE's meso-level experience space.
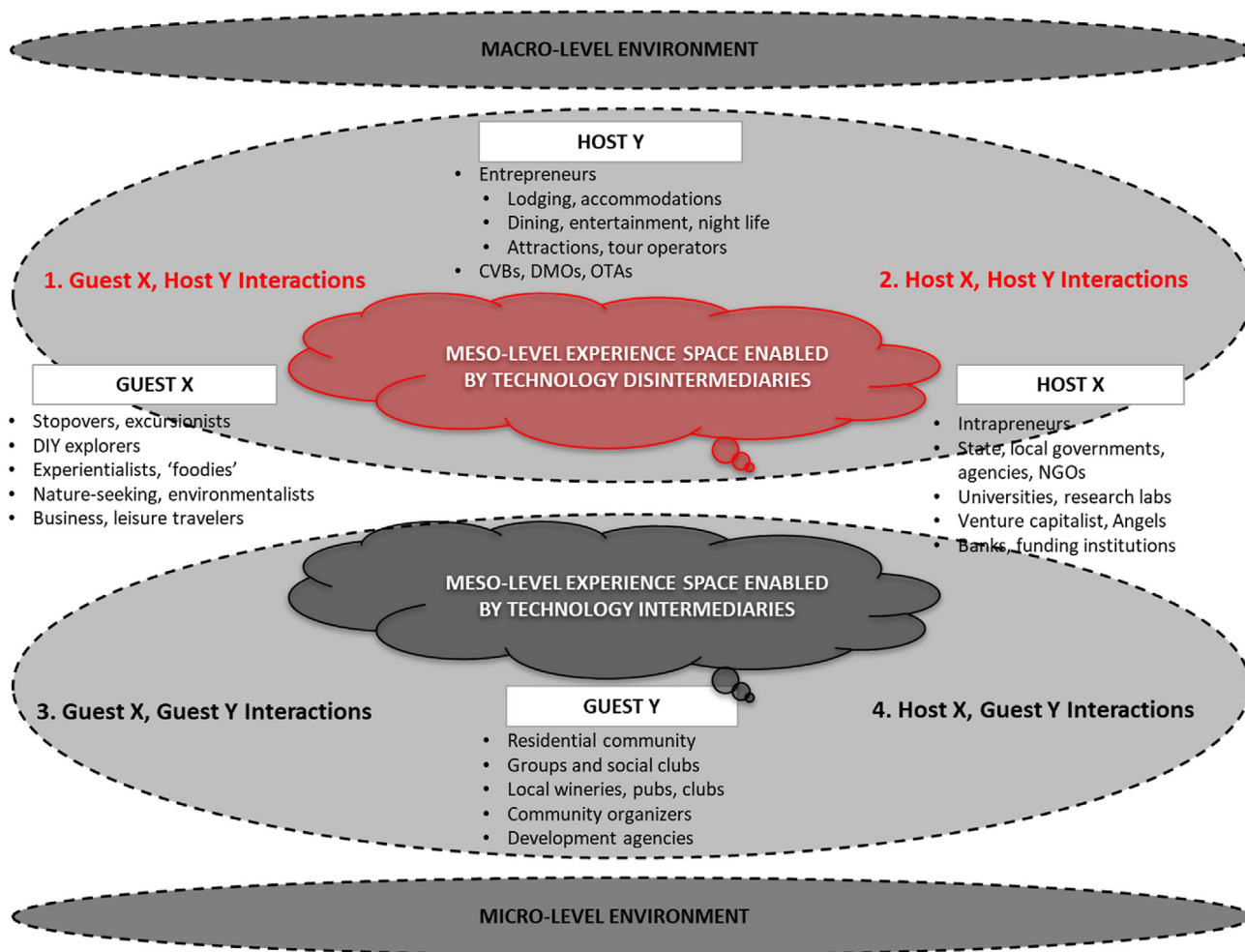
Fig. 2. A boundary objects view of entrepreneurial ecosystems for tourism.

3.1.2. Experience space interactions enabled by technology intermediaries
3.1.2.1. Guest X, guest Y interactions. The lower left of Fig. 2 depicts Guest X, Guest Y interactions in the experience space enabled by technology intermediaries. This form of customer-to-customer (C2C) interaction is enabled by technologies such as wireless/smartphones, mobile applications, and social networking platforms (Table 1). Such technologies facilitate indirect or intermediated interactions between types of Guest X and Guest Y (e.g., local residents, social clubs, community organizations) players in the entrepreneurial ecosystem. Examples of such technologies in practice include *WhatsApp, Instagram* and *Snapchat.* Within this space, Guest X, Guest Y engagement represents a type of expanding boundary interaction space between current guests within the destination and current and potential guests and visitors to the destination. This space may also include intermediated interactions between guests and local residents within the EE. Visitors and locals can represent demand-side elements of the EE and influence entrepreneurial innovation through these types of interactions which arise from co-creation efforts and experiences. Sharing of guest experiences for example, through user generated content (UGC) is today ranked among the top influencers for brands. These types of intermediated interactions which accrue from intermediated technology engagement increase and expand the number of entrepreneurial opportunities within the EE as hosts seek new means of enhancing local and non-local guest experiences.

3.1.2.2. Host X, guest Y interactions. The lower right of Fig. 2 depicts Host X and Guest Y interactions in the experience space enabled by technology intermediaries. This form of business-to-customer (B2C)

interaction is enabled by technologies such as wireless/mobile technologies, generative digital platforms, mobile applications, near-field communications, and CRM systems (Table 1). Such technologies facilitate indirect or intermediated interactions between types of Host X and Guest Y players in the ecosystem. Examples of such technologies in practice include *WhatsApp* and 3-1-1 two-way system of communication between the city government of New York and its residents. Within this space, Host X, Guest Y engagement represents a type of intermediated interaction between hosts and guests which give rise to social entrepreneurship and innovation. Other examples include crowd sourcing and financial technology platforms which produce the annual *Opera on the Mall* in historic Independence Square, Philadelphia, USA. The crowdfunded event, which draws thousands of visitors, links locals and non-locals with open-air opera performances.

4. Expanding the model for tourism

To capture the inherent dynamic view of the EE, catalyzed by the rapid deployment of disruptive technologies, which offer new experiences, and encourage new entrants, we offer an expanded EE model. Leveraging our profound understanding of the implications of the deployment of novel digital technologies, which stimulate entrepreneurial activities (often deploying new business models), our model expands the experience space to include additional interactions and activities offered in three important dimensions: time, players, locations (Fig. 3).

Expansion in time. There is already a body of work that expands the tourist experience, from a finite model *during* the visit, to include the
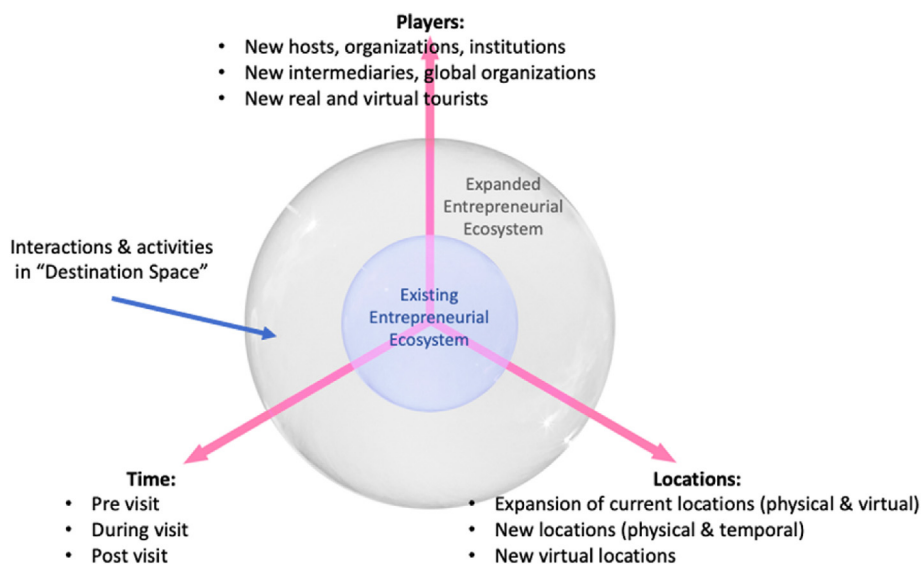
Fig. 3. Expanding the boundary objects view of entrepreneurial ecosystems for tourism.

time *pre*-arrival at the destination, and the time *post*-departure. While physical activities pre and post the 'actual vacation' have always been part of the experience, the introduction of digital technologies is having a significant impact on the type of activities and possible interactions that can *expand* the experience space. Pre-arrival: Visitors often search for information online before a visit (e.g., virtual tours, historical information, relevant events) to help prepare for and personalize their in-destination experience, to both make decision choices about what to do while at the destination, and to enhance the overall vacation experience. During-visit: visitors can enhance their at-destination experience, by sharing it with family and friends at home, or through meeting tourists and hosts while at the destination. Post-visit: tourists can share their experience with family/friends and provide direct feedback to host organizations, and recommendations to unknown future travelers. Indeed, online communities can influence future potential tourists' choice of destination and activities, encourage future physical interactions, and enable long term relationships between tourists and hosts.

Expansion of physical location. While the technology described above allows virtual interactions (sometimes experienced from a remote location), the introduction of new, digitally enabled technologies can increase the attractiveness of previously unattractive locations in the region in three ways: 1) encouraging access to previously inaccessible or remote locations by providing technologies that make it easier to reach these inaccessible locations (such as, electric bikes), encouraging tourists to visit less well known locations (for example, by providing real time incentives or information to make them attractive), and by enhancing the tourist real-time experience at a less attractive location (for example, by enhancing the experience with virtual reality), increasing tourist traffic to new locations; 2) enabling tourists to use real time video to share location specific activities with others at the destination (for example friends at the resort to encourage them to join the activity), or with family in a remote location (for example to share their experience virtually), to expand the physical space to distant locations; and 3) allowing new hosts and service providers (previously not viewed as being part of the EE) to become hosts or offer new services, enhancing the visitor experience through offering services at additional locations.

Expansion in players. The expansion of time and place described above, combined with the availability of new disintermediation and intermediation technologies, allows new players (tourists, hosts, intermediaries, organizations, governments) to participate in the Experience Space and join the EE. We identify three types of players who can expand this space. Firstly, existing tourists and hosts can use social media

and virtual presence to encourage more tourists to visit the destination, increasing the size and range of experiences available within the EE. Secondly, new digital capabilities can increase the number of options for tourists, and may increase the affordability of certain experiences and interactions (some of which might be offered by new service providers or hosts creating new entrepreneurs at the destination (in a sense, every new Uber driver, or AirBnB host is an entrepreneur). Thirdly, global technology companies can remotely offer new services and experiences at a destination that enhance the local tourist experience, and increase the number of players in the EE.

4.1. Potential negative impact of disruptive technologies on EE

While this discussion highlights some of the benefits of technology in expanding the EE, enhancing the tourist experience and creating new entrepreneurial opportunities, there are many areas where the adoption of such technologies can have intended and unintended negative consequences. We highlight a few of these, specifically related to place and players. In the first case, new technologies might increase the number of tourists at a destination (especially visiting one location at a specific time). At the trivial level this can cause crowding and inconvenience and overuse of public infrastructure, while at the more strategic level, visitors can cause environmental damage to ecologically significant locations. Technologies can also increase physical challenges at a location, for example there are issues with rental scooters littering communities, or encouraging unprepared visitors to ride and get into accidents - neither of which is insignificant. Technology adoption can also strain local technological ecosystems, such as increased power and cellular demand above existing levels.

Digital technologies can also render some services unnecessary, for example the need for certain intermediary services such as booking tour guides or taxis, can be eliminated, while poorly ranked or inefficient small ventures can be driven out of business by larger, and more efficient suppliers (sometimes offshore). In addition to considering these negative factors which are a logical extension of our model, there are other negative aspects of implementing digital technologies within an EE that are beyond the scope of this paper, but should be mentioned for completeness: privacy concerns, social justice, cybersecurity and sustainability.

5. Implications and conclusions

In this paper we introduce and expand the boundary objects view of

entrepreneurial ecosystems in tourism, grounded in consensus forged between theories of information science and organizational strategy. Four key themes support the resulting model: tourism as sector-specific, sub-system; players as non-hierarchical collaborators; socio-technical interactions; and entrepreneurial opportunities. We propose the tourism EE as an experience space, which includes physical and virtual components, with no set form or formation and an absence of spatial and temporal limits. This significantly expands the traditional view of EEs in tourism. We assume an EE for tourism with the interpretative flexibility character of boundary objects, able to facilitate autonomous interaction with and use of resources within and across social worlds; achieve cooperation without consensus; and unify digital technology with social, cultural, and institutional elements within the EE.

5.1. Practical implications

The practical implications of this dynamic model for stakeholders within a specific ecosystem, and specifically the impact of new technologies on the interactions possible within an Experience Space; as well as the impact on current and future (especially entrepreneurial) players, will be the subject of much future discussion. Our focus on technological innovations and their impact on a specific EE is challenging, in part because technological innovations do not occur in isolation, rather they are a function of the interrelationship between various technology and non-technology boundary objects and social worlds within the EE. Importantly, major drivers of their impact are often a function of external factors such as technological advances and changes in the global tourism environment that have little to do with the EE directly. Our paper is written to provide the reader a dynamic model to both guide future research and to inform those directly involved in practice (whether as a player in an EE, or a policymaker). As such, we offer a few real-life examples of the practical implications of the evolution of the dynamic EE for five subsets of players.

Governments, economic development agencies, tourism offices. At the strategic level, these organizations play a central role in guiding the development of the "experience space" and the activities offered. They must proactively balance the needs and expectations of the identified groups of players and potential players (tourists, host experience organizations, host intermediary organizations, and technology ventures), which will have an important impact on the success of the EE as a whole. At the tactical level, these organizations recognize the competitive global landscape under which they operate and need to find ways to balance the need to enhance the tourist experience and attract more tourists, with the need to manage the local community in a way that enhances the local community. This requires a deliberate approach to nurturing the evolution of the EE, and the adoption of new technologies (and the resulting services) than just 'laissez faire'. These organizations need to prepare their communities to offer such services (to ensure their competitive position against other destinations) but also anticipate the structural and social changes that might arise as a consequence of deploying innovative technologies to offer new tourist experiences. . A real-life example includes the recent move by Visit Houston to embrace augmented reality to enhance the visitor experience. Through their Technology Development arm, they gathered all flat data (e.g., city attractions, eateries, hotels, etc.) from their content management system and created an immersive experience where visitors are now able to open the app on their smart phone and pan their phones over activated locations in the real world. On a more conservative note, these organizations must also be conscious of the disruptive impact of the deployment of new technologies on the community, balancing the pressure to maintain the status quo and meet the expectations of existing organizations with the need to allow new companies, hosts and experiences to emerge that might disrupt current players or activities.

Communities and organizations can build *technological resilience* to enable them to better respond to such exogenous technological disruption, by building a more resilient ecosystem that can go beyond responding to these externally generated challenges, but by developing the capacity to proactively respond to both anticipate their impact on existing hosts and experiences, and through facilitating the co-creation of new organizations (and experiences) than link often externally developed technology innovation, to new levels and types of local experience. Keys to developing this technological resilience include the establishment of: support structures and resources to facilitate changes in roles and services, education to prepare people for disruption (both in terms of taking advantage of it, and for retraining to learn new skills) and enhanced communications between stakeholders to ensure that current structures and processes are flexible enough to respond to the challenges and changes we have identified. It is also important to recognize that disruption and innovation can challenge local values and culture (for example attitude to risk taking), building resilience in an EE will require attention being paid to this issue - although it is likely that how this cultural issue manifests, and can be modified, is unique to each EE.

Tourists. Current tourists will look for novel activities that will enhance their experience at one location, causing them to choose one specific destination or resort over another, driving the expansion of the "experience space" and transforming the EE. The impact of these tourists is magnified by their active role on social media informing existing and potential tourists about their experiences. Increasingly, potential tourists are informed by "crowd sourced" online content, rather than traditional information provided by governments and resorts, when making decisions about their choice of destinations, resorts and activities. In many cases, potential tourists will be viewing a destination at the meso-level, based on a subset of all the experiences from a destination, rather than based on information from a single player or the destination as a whole, especially when the information is customised to meet their own preferences. The situation is further complicated by the blurring roles of hosts and tourists, as they co-create experiences together, and hosts use services previously designed for tourists. An example includes the summer social innovation experiment, *Opera on the Mall* in Philadelphia's Independence Park. Locals and tourists co-create the free, open-air opera performance as an 'under the stars' picnic. This is enabled by non-traditional tourism players such as crowd funders, city food trucks, and financial institutions.

Host organizations offering an (existing or new) experience. Existing organizations will increasingly face competition from a variety of sources: existing local competitors, local new market entrants (entrepreneurs), and from remote organizations who offer: a similar experience in another location. These companies will need to learn how to react to this increasingly competitive landscape and competition from new sources (for example hotels now compete with AirBnB). In addition, these organizations will need to use technology (or other means) to augment and enhance their visitor experience, which might require deploying novel technologies and offering new types of guest experience. Changing the nature of how they compete can be challenging for such organizations, who have not developed the skills or tools to succeed in this more dynamic and volatile environment. It is the fixedness of existing organizations that often create opportunities for entrepreneurs, who can more easily pivot their offerings, to provide In many cases new types and levels of experience that disrupt the current market (in fact many existing organizations will succeed by partnering with these new ventures). Challenges for existing companies can represent opportunities for new entrepreneurial companies who can offer new services and experiences previously not available.

Existing (and new) intermediary organizations. Existing intermediary organizations are very susceptible to disruption from new organizations and new technologies, given that most of their role is putting together hosts and tourists. Given the costs (and lack of transparency of such organizations, new technology solutions or business models that offer alternate, more cost-effective and more transparent solutions can often replace the current intermediation role. Given the original mission of the intermediary, and their value proposition and infrastructure, it is

often difficult for them to respond to opportunities that arise from new technologies, as they can challenge the need for their organization to even exist. Organizations that play the role of intermediaries, must proactively undertake external scans, on technology developments and trends in their industry, as well as be alert to the creation of new organizations designed to disrupt their business. These organizations must choose one of three alternatives: partner with disruptive organizations or technologies, enhance their current services by adding more value or expanding their scope of supply, or recognize that their existing business model may no longer be relevant. Scanning the external environment, and finding new ways to add value, may be challenging for these organizations as it requires a skillset they have not previously required. Challenges for existing companies can represent opportunities for new entrepreneurial intermediaries who can offer more cost-effective solutions that offer enhanced value and additional experiences to tourists.

Global technology organizations. The expansion of the Software As a Service (SAS) deployment model allows global technology companies to leverage their technology infrastructure and new business models to create local value for an EE. While some of these organizations exist only as virtual services (and may in fact remove the need for local service providers), the biggest impact is likely to come from the use of a disruptive software platform, new technology, or new business model that enables the EE to develop and offer new experiences for tourists. This creates a multitude of opportunities for existing hosts and local entrepreneurs who can deploy the technology locally. In addition, the implementation of these platforms and technologies can create multiple local implementation issues (from simple issues such as functionality, and usability, to more complex issues such as safety and licensing). Working with a global technology platform can allow existing hosts to bolster their business, and create a fast track for local tourism entrepreneurs and hosts to deploy new solutions offer new experiences within an EE. A real-life example, tied to the notion of destination resilience, is GlobalData's partnership with Pharmaceutical technology to create Coronavirus [COVID-19] Social Media Dashboard. This enables tracking and analysis of Twitter's influencer activity on the spread of the virus and is used by a number of destinations including Malaysia, China, and the United States.

5.2. Theoretical implications

We highlight three important implications for theory emerging from the expanded boundary objects view of entrepreneurial ecosystems put forward in this paper. First, this paper builds on current EE work in tourism (Baggio & Del Chiappa, 2013; Boes et al., 2016; Gretzel et al., 2015) by capturing 'the collective" of supply-side and demand-side elements in the tourism EE. We further this work by capturing the interactions among these elements without the spatial and temporal constraints imposed by previous theorizing. We are able to do this by invoking the concept of boundary objects, referring to technology and non-technology elements as representational forms, effectively allowing them to navigate across boundaries and social worlds without losing meaning or identity and within the socio-technical realities of tourism today. Second, this paper highlights the critical importance of understanding socio-technical realities and the role for technology between social worlds. The BO view of entrepreneurial ecosystems for tourism captures interactions among entrepreneurial players, technology innovation, new experiences, and the wider ecosystem, in a more meaningful way. This provides a more accurate depiction of the dynamic nature of the ecosystem in response to external social and technical developments. Finally, the model allows for evolutionary dynamism by ascribing the quality of expansion of time, location, and players in the EE.

5.3. Limitations and future directions

As with any model or framework, there are limitations which can create an impetus for future work. There is a need to formulate and test hypotheses based on the boundary objects view of the tourism EE. In addition to testing and deploying the proposed model, we identify four areas for future research. First, our conceptual framework helps us anticipate ways to build EE resilience (education, infrastructure and policies designed to enhance adoption of new technologies and models, plus a greater acceptance of risk and failure in the ecosystem). Our boundary objects viewpoint lends a methodological bridge to further evolutionary and change research on EEs, for example by conducting a multi-level analysis of the impact of technology-based interactions on entrepreneurial outcomes at the macro-level of analysis. A second area for research direction relates to better understanding the impact of technological (and business model) evolution on entrepreneurship ecosystems. This might involve the use of survival analysis techniques to measure the time taken for entrepreneurial startups to emerge, evolve, survive (or die) within the ecosystem; and might extend to qualitative inquiries on the technological factors which contribute to the survival or death of these new organizations (and technologies) within the ecosystem. Third, there is the area of tourism policy research, which seeks to inform how policies can enhance the development of an EE. Specifically, there are many policy implications from this model which need further analysis: skills development requirements, legislation around disruption (impact on existing players and new entrants), and the long term development of the labour force, as new technologies (such as robots, artificial intelligence, bots, drone technology, autonomous vehicles, virtual reality, blockchain) change the nature of work, and the boundaries between organizations in an EE. A fourth direction employing mixed methods research analysis is to better understand the extent to which entrepreneurial ecosystems create opportunities and barriers for women and minority entrepreneurs given the new opportunities empowered by technological innovation. In addition to the need to build EE theory and establish a nomological framework for EEs, future directions should incorporate empirical studies of tourism EEs to better understand the concept-in-use and its evolution over time. Methodological considerations could include a theory elaboration approach (horizontal or vertical). Given that measuring the performance of EEs is more than simply gauging rates of entrepreneurship, evolutionary perspectives should include studies of changes in the EE based on attitudes to entrepreneurship and response to start-up failures. The use of ecological measurements for boundary objects (Turnhout, 2009) or the use of dynamic capabilities as key performance indicators of EEs is an opportunity for future empirical work. This could be another promising direction for performance studies, given the fluid nature of the EE and the absence of spatial and temporal limits. Finally, there is the need to understand if there are systems of EEs (multi-level, multi-structured systems). Taken together, these research directions promise vast and meaningful potential for the study of entrepreneurial ecosystems in tourism.

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