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Conceptual foundations for understanding smart tourism ecosystems

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ABSTRACT

Using digital ecosystems and smart business networks as conceptual building blocks, this paper defines, describes and illustrates the idea of a smart tourism ecosystem (STE). It further draws on conceptualizations of smart technologies, smart cities and smart tourism to envision new ways in which value is created, exchanged and consumed in the STE. Technologies essential to the functioning of an STE are described and it is argued that data emerging from these technologies are the driver for new business models, interaction paradigms and even new species. Critical questions regarding the need for regulatory intervention and innovative research are raised.

Ecosystems are generally defined as communities of interacting organisms and their environments (TheFreeDictionary, 2015), and are typically described as complex networks formed because of resource interdependencies. McCormack (2011) explains that ecosystems, like other kinds of systems, are comprised of elements, interconnections and a function/purpose, but are special types of systems in that their elements are intelligent, autonomous, adaptive agents that often form communities and also because of the way they adapt to elements being added or removed. Boley and Chang (2007) list four critical elements of ecosystems: (1) interaction/engagement; (2) balance; (3) loosely coupled actors with shared goals; and, (4) self-organization. This means that in ecosystems individual agents or groups of agents proactively form symbiotic relationships to increase individual benefits and to achieve shared goals; that local interactions determine the global behavior or state of the system; and, that balance is needed to prevent system collapse. The relationships and interdependencies ensure that resources are consumed effectively and sustainably. Considering ecosystems in their entirety rather than centering on specific actors/elements allows for more holistic perspectives, recognizes that small changes can have substantial effects, encourages a focus on complex relationships, emphasizes dynamic change, and acknowledges the importance of the physical environment or infrastructure that supports the system.

Applied to the business world, the term "ecosystem" is used to describe the relationships among economic entities (producers, distributors, consumers, government agencies, etc.) that, through competition and/or cooperation, facilitate the creation and distribution of a product or service (Investopedia, 2015). There is a general understanding that the environment in which these entities operate, i.e. in and through which they produce, exchange and consume value, is rapidly changing and requires their relationships to co-evolve. Moore (1993) stressed that such an economic community often faces the arrival of new species, which requires realignment and redefinition of the relationships that underpin the system. While such new species can emerge out of nowhere through genetic mutations, it is more often the environmental changes that cause or at least facilitate dramatic shifts in power over resources.

Hwang (2014) sees these dynamics in the ecosystem and its openness as the main characteristics that distinguish it from other, more static and managed forms of business networks such as industrial districts or clusters. Also, it means that instead of planning and managing, the focus with business ecosystems is on establishing the environmental conditions under which their elements can thrive and on making engagement not only possible but easy. Recognizing the ecosystem's embeddedness in communities and larger society and creating shared value that simultaneously enhances business competitiveness and advances economic and social conditions have been identified by Porter and Kramer (2011) as fundamental for unleashing innovation and for sustaining productivity in these business ecosystems.

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From a technical point of view, the ecosystem metaphor has been used to describe so-called digital ecosystems, which are characterized by open, flexible, demand-driven, interactive networked architecture and collaborative environments (Boley & Chang, 2007). Bajarin (2011: n.p.) defines the digital ecosystem as a "complex of a community of digital devices and their environment functioning as a whole" and describes it as being comprised of different hardware, software and services. Digital ecosystems are therefore focused on interactions among technological agents (devices, databases, programs, etc.) and respective information flows and form the infrastructure for digital business ecosystems. Technological advances that enable system interoperability and dynamic information exchange are critical for establishing the interconnectedness fundamental to the ecosystem idea. Semantic technology, for instance, is important for facilitating the interactions among different information system units within the digital ecosystem.

Technologies such as cloud computing and SOA (service oriented computing) make both services and data "moveable" and contribute to the openness of the ecosystem. Intelligent agents ensure that autonomy is introduced into the system and evolutionary computing principles (Eiben & Smith, 2003) directly mimic ecosystem dynamics. While the technical literature emphasizes connectivity among technologies, in practice these digital ecosystems are socio-technical systems (Bostrom & Heinen, 1977). Karakas (2009), for instance, emphasizes connectivity and convergence as defining aspects of Web 2.0 technology in facilitating an ecosystem in which creativity, community and collaboration are encouraged. Werthner (2003) describes such a digital ecosystem in the context of tourism as an "intelligent" tourism system supporting autonomous networked "nodes" with dynamic network configurations in heterogeneous and distributed environments. He further characterizes it as supporting flexible communication, enabling information access anywhere anytime, encompassing entire consumer life cycles and all business phases, and spanning across different businesses and users. Products and services are dynamically assembled (bundled) by businesses and users alike, creating new markets and value-enhanced experiences. Importantly, an intelligent tourism system is built on trust, scalability, and openness with respect to participants and services.

The idea of a touristic ecosystem is nothing new as the production of these touristic experiences has always required extensive coordination and collaboration among different industry players and government agencies (Mill & Morrison, 2002). How loosely coupled these agents typically are can be exemplified by the difficulty in defining what players actually belong to the tourism industry and in measuring the economic value contributed by tourism. The extensive reliance on digital infrastructure of such tourism systems has also been long acknowledged (Sheldon, 1997). The both disruptive and creative power of technological innovation within tourism ecosystems has been discussed for both Web 1.0 (Werthner & Klein, 1999) and Web 2.0 (Benckendorff, Sheldon, & Fesenmaier, 2014). Information and communication technologies have been essential in tourism ecosystems for connecting the different players that add value to the experience. Werthner and Klein (1999) illustrated the fundamental technology-supported tourism value chain and its components (Fig. 1), with the Internet making it possible to completely circumvent traditional distribution channels.

A special characteristic of a tourism ecosystem is the immense number of microorganisms (small or micro, often family owned and/or owner operated businesses). It is also often geographically defined but usually requires connections and interactions beyond the core area. Indeed, the term "destination" practically refers to a tourism-based ecosystem. Destinations overlap with other ecosystems (e.g. residential) and have connections to their feeder markets. Further, tourism businesses are often embedded in complex franchise systems or chains and tourism distribution channels involve a multitude of actors residing at the destination, the origin markets or somewhere completely different, which can make it difficult to delineate the system boundaries. Tourism ecosystems are also especially dynamic and on a global scale have witnessed the emergence of several completely new species within just the last ten years, with online travel agencies such as Booking.com and Expedia, Google Flights, TripAdvisor (Sigala, 2015) and AirBnB being prominent examples. Changes are also occurring on the consumer side as new technologies change consumer behaviors, increase market transparency and facilitate social commerce. Tourism consumers have always been recognized as active contributors to the experience but are now formally conceptualized as value co-creators within tourism ecosystems (Vargo & Lusch, 2008). As such, Fig. 1 clearly shows a past generic tourism ecosystem based on the technology landscape at the turn of the millennium and it becomes very clear that it fails to mirror the complexities, nuances and blurred lines of contemporary tourism systems.

"Smart" is often applied as a prefix to technological terms to indicate special capabilities, intelligence and/or connectivity, as in smart phone or smart card. Computer Hope (n.d.) defines it as technology that functions without little or no human intervention. Oxforddictionaries.com (n.d.) also refers to smart in the context of technology as meaning capable of independent action. However, not all smart technology necessarily reaches such high levels of autonomy. Derzko (2006) identifies six aspects or levels of smartness for technology: (1) Adapting: modifying behavior to fit the environment; (2) Sensing: bringing awareness to everyday things; (3) Inferring: drawing conclusions from rules and observations; (4) Learning: using experience to improve performance; (5) Anticipating: thinking and reasoning about what to do next; (6) Self-organizing: self-generating and self-sustaining at the cellular or nano-technology level. Similarly, Debnath et al. (2014) describe the capabilities of a smart system as involving the basic functions of sensing, processing, controlling and communicating and the advanced levels of predicting, healing and preventing. "Smart" has also been introduced to the realm of business. Van Heck and Vervest (2007), in their discussion of Smart Business Networks, define smart as being just enough, not necessarily optimal (for all players). In essence, it is enough that – connected by a joint infrastructure – different entities follow as long as needed and necessary, the same objective and business logic. The important driver of such a smart business network is basic infrastructure that enables a quick connect and disconnect, or "pick, plug and play" approach.

Smart is increasingly also used to signify resource optimization through the use of advanced technologies (Gretzel, Koo, Sigala & Xiang, 2015b). Höjer and Wangel (2015) argue that it is not so much the individual technological advances but rather the interconnection, synchronization and concerted use of different technologies that constitutes smartness. The concept has been prominently applied to urban areas and summarized under the term "smart cities". A smart city then is a city that uses advanced information and communication technology (ICT) to optimize resource production and consumption.

Piro et al. (2014:169) define smart city as "an urban environment which, supported by pervasive ICT systems, is able to offer advanced and innovative services to citizens in order to improve the overall quality of their life". According to Harrison et al. (2010), a smart city connects its physical infrastructure with its ICT, social and business infrastructures to leverage the collective intelligence of the city. A healthy digital ecosystem that includes information-centric ICT platforms, sensor networks and wireless communication systems forms the fundamental base for such integration and data exchange (Piro et al., 2014). Proper