Journal of Hospitality and Tourism Management 45 (2020) 319–329

Contents lists available at ScienceDirect

Journal of Hospitality and Tourism Management

journal homepage: www.elsevier.com/locate/jhtm

Entrepreneurial ecosystems in smart cities for tourism development: From stakeholder perceptions to regional tourism policy implications

Sarah Eichelberger[a], Mike Peters[a], Birgit Pikkemaat[a,*], Chung-Shing Chan[b]

[a] Department of Strategic Management, Marketing and Tourism, SME and Tourism, University of Innsbruck, Karl-Rahner-Platz 3, 6020, Innsbruck, Austria
[b] Department of Geography and Resource Management, The Chinese University of Hong Kong, Sha Tin, N.T, Hong Kong

ARTICLE INFO

Keywords:
Smart city attributes
Entrepreneurial activity
Networks
Tourism destinations
Tourists
Local residents

ABSTRACT

Studies from the field of smart city development show that smart cities attract more people from the nearby countryside along with an increasing number of tourists. While many smart tourism concepts focus solely on the development of technology, people, and institutional logic, the entrepreneurial ecosystem (EES) approach helps to strengthen smart destinations on their way to fostering the development of urban sustainability.

As part of an evaluation of the EES, qualitative interviews (n = 14) with key informants demonstrate the importance of entrepreneurship for the development of smart destinations. To identify the relevant factors for this kind of smart city positioning, the following study aims to explore, test, and analyze smart city aspects among experts in terms of EES, residents, and tourists visiting Innsbruck. The present study uses both face-to-face interviews and surveys to explore initiatives and targets within the city's EES development as perceived by core stakeholders. It applies a questionnaire measuring local residents' and tourists' perceptions of important smart city attributes (n = 336). The data shows that residents believe Innsbruck has the potential to become a smart city. Furthermore, the data confirms that the EES approach benefits from the tourism industry in the region, with tourism found to improve the respective EES elements, consequently leading to enhanced entrepreneurial activity.

1. Introduction

The entrepreneurial ecosystem (EES) approach emphasizes the role of entrepreneurship within economic policy, addressing the importance of entrepreneurs as central players (leaders) in the creation and maintenance of a system (Feld, 2012; Stam, 2015). This approach has seldom been used for tourism research to date. Kline, Hao, Alderman, Kleckley, and Gray (2014) examined EES elements to determine what has the greatest influence on tourism and entrepreneurship. Here it was seen that tourism entrepreneurs foster growth, innovation, and regional development in the tourism industry (e.g. Peters & Pikkemaat, 2008; Pikkemaat, Peters, & Bichler, 2019). The EES and the tourism system both exhibit interactions between their own elements, and the system's exchange with external elements appears to be a core structure (Bieger, 2000; Boes, Buhalis, & Inversini, 2016). Knowledge about the expectations of EES demand is vital for entrepreneurs when exploring opportunities for market expansion and producing an aggregated value creation as described in Stam's (2015) EES model, which provides a divergent productive entrepreneurship view of EES (Cavallo, Ghezzi, & Balocco, 2018).

Smart tourism destination contexts focus on the wise use of information and communication technology (ICT) penetrating into tourist spaces, tourism business, and among tourism stakeholders (Koo, Gretzel, Hunter, & Chung, 2015; Li, Hu, Huang, & Duan, 2017). It is equally important to inject smartness into tourism resource provisions (Buhalis & Amaranggana, 2014) and tourists' experiences (Wang, Park, & Fesenmaier, 2012) with the smart city serving as a platform of development. With this in mind, the connection between smart tourism and smart cities has increasingly become explicit in both academic research and from a practical perspective (Gretzel, Sigala, Xiang, & Koo, 2015; Gretzel, Zhong, & Koo, 2016). This makes the perceptions of residents and tourists one of the important factors driving the outcome of a destination's EES in terms of the multiple aspects of smart cities; these are able to guide entrepreneurship and innovation at the destination itself. The aim of this paper is to identify the importance and performance of distinctive smart city attributes in Innsbruck, Austria based on local and non-local perceptions. These findings shed light on and strengthen the outcome of Innsbruck's smart tourism EES. The results deliver recommendations for tourism policymakers and urban

* Corresponding author.
E-mail addresses: sarah.eichelberger@uibk.ac.at (S. Eichelberger), mike.peters@uibk.ac.at (M. Peters), birgit.pikkemaat@uibk.ac.at (B. Pikkemaat), ccs_johnson@cuhk.edu.hk (C.-S. Chan).

https://doi.org/10.1016/j.jhtm.2020.06.011

planners to consider the attributes that are perceived as most critical by local residents and visitors. They also provide insights for common investment strategies as well as how resource allocation of shared benefits can best be achieved via the right tourism policy strategy.

2. Theoretical background

2.1. The entrepreneurial ecosystem (EES) approach

Following Schumpeter (1965) and his groundbreaking theory on economic development, the concepts of innovation and entrepreneurship are inseperable from the concept of economic growth. A number of researchers agree on the importance of entrepreneurship for economic growth and innovation. Barney (1991) for example demonstrated that innovative organizations greatly differ from non-innovative routine organizations in terms of structure, process, reward systems, and entrepreneurship. The latter was best described as the process by which opportunities to create novel products and services were discovered, evaluated, and exploited for innovation, ultimately creating new values (Shane & Venkataraman, 2000). Sundbo's (2001) strategic innovation theory postulated that the innovativeness of an enterprise was determined by market orientation; comprised of market saturation, customer orientation, networks and internal resources; and whose effectiveness depended solely on managerial skill combining these aspects. Isenberg (2010) discussed the value of entrepreneurship for the transformation of economies, expanding the discussion to a new level including governmental aspects, i.e. governments need to create an ecosystem which strengthens entrepreneurs. In the 1980s and 1990s, entrepreneurship research shifted towards a broader point of view which considered social, economic, and cultural forces in the entrepreneurial process. This was the fundamental conception behind the EES approach (Nijkamp, 2003; Stam & van de Ven, 2018; Steyaert & Katz, 2004). The EES offers a systemic view of entrepreneurship (Cavallo et al., 2018) and has experienced rapidly increasing interest in research within the past years, as shown for example in the 2017 special issue on entrepreneurial ecosystems of the journal *Small Business Economics*. The EES appears to be a very recent concept, still lacking a widely shared definition, even though it is in fact closely connected to the concepts of entrepreneurship and ecosystems.

Entrepreneurial theories have been recognized and frequently discussed in research (e.g. Bull & Willard, 1993; Shane & Venkataraman, 2000; Stam & van de Ven, 2018), making it worthwhile to take a closer look at the concept of an ecosystem before combining them with it. In its original meaning, an ecological system (or ecosystem) is defined as a biotic community, its physical environment, and all the interactions possible in the complex of living and nonliving components (Acs, Stam, Audretsch, & O'Connor, 2017). Adding the entrepreneurial aspect to the concept of an ecosystem, the EES approach can be described as a system where entrepreneurship takes place in a community of interdependent actors, and in which the (social) context in allowing or restricting entrepreneurship plays a central role (Stam & Spigel, 2016). The concept stresses how entrepreneurship is enabled by a comprehensive set of resources and actors which have an important role to play in enabling entrepreneurial actions (Stam, 2014). Regardless of whether innovation, productivity, or employment measures are used, the output of an EES is attractive for regional policymakers and governmental leaders.

Based on Stam and van de Ven (2018), the EES concept and its success depend on its framework and systemic conditions such as networks of entrepreneurs, leadership, finance, talent, knowledge, and support services (see Fig. 1). Together with the framework conditions (formal institution, culture, physical infrastructure, and demand), these systemic conditions are key elements of an EES and determine its outputs and outcomes. The framework conditions empower or restrain human interaction, while the systemic conditions are considered as the heart of the entire EES, as their existence and interaction is of crucial relevance for the ecosystem's success. Stam (2015) introduced a key

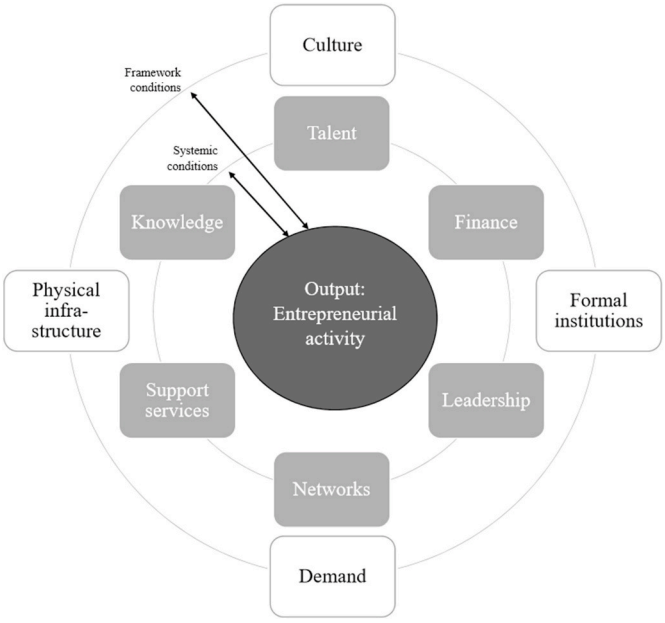

Fig. 1. Elements and output of the EES (adapted from Stam & van de Ven, 2018).

change in EES research by focusing on productive entrepreneurship as an output of the system, making it as wide-ranging and inclusive as possible in the consideration of new ventures, and which impacts the aggregate value creation (Cavallo et al., 2018).

Auerswald and Dani (2017) defined the EES as interactions between institutions and entrepreneurs, operating across industries, and with entrepreneurship at its center. Although the EES is not industry-specific, a wide variety of industries play a role with individual firms operating in the entire system (Cavallo et al., 2018; Stam & Spigel, 2016). The tourism industry is part of the EES, with touristic ecosystems characterized by a large number of players who require coordination and collaboration (Mill & Morrison, 2002). Furthermore, ICTs are crucial in the tourism ecosystem, particularly when it comes to the connection between different players or stakeholders (Gretzel et al., 2015). This structure leads to a smart tourism ecosystem becoming "a tourism system that takes advantages of smart technology in creating, managing and delivering intelligent touristic services/experiences and is characterized by intensive information sharing and value co-creation" (Gretzel et al., 2016, p. 560). According to Boes, Buhalis, and Inversini (2015), with innovation and social capital, entrepreneurship represents a fundamental construct of smartness. Smart destination developments are furthermore enabled by ICT and technology applications, with entrepreneurship mostly empowered by their implementation. This includes the 'Internet of Things' or cloud computing, which should empower an infrastructure for the development of smart tourism destinations (Boes et al., 2015).

Linking the EES to tourism destinations, an analysis of the determinants and success factors of a smart tourism destination makes sense. Small- and medium-sized tourism entrepreneurs are the lifeblood of many tourism destinations, particularly those in rural areas (Kallmuenzer & Peters, 2018; Peters & Kallmuenzer, 2018; Svensson, Nordin, & Flagestad, 2005). The success of many tourism areas is based on the entrepreneurial resources and know-how which are explicitly mentioned in the EES (Kallmuenzer & Peters, 2018).

2.2. Smart tourism destinations

The term smart city was used for the first time in the 1990s. ICT is central to the smart city concept (Albino, Berardi, & Dangelico, 2015). As a new popular term, "smart" describes technological, economic, and

social developments driven by technologies, relying for example on sensors or big data (Gretzel et al., 2015). Smart cities foster technological integration. The smart city concept is comprised of city innovations consisting of technological innovation, managerial, organizational, as well as policy innovation (Nam & Pardo, 2011). As each city has its own unique context, a smart city can be seen as a contextualized interplay of different types of innovation (Nam & Pardo, 2011). Today, cities find themselves handling a range of challenges that require e.g. environmentally friendly solutions, needing to achieve smart alternatives for transportation, land use, as well as "high-quality urban services with long-term positive effects on the economy" (Albino et al., 2015, p. 4).

Technology implementation as well as a focus on sustainable city issues can enrich tourist experiences. On the one hand, the smart city approach has led to the development of smart tourism destinations that have the potential to exploit synergies among technologies, increasing their competitiveness. On the other hand, sustainable cities offer the potential to attract new groups of tourists to a destination (Buhalis & Amaranggana, 2014). Tourism destinations face several challenges arising from changes in consumer demand, and how the environment is influenced by new technologies. Smart city tourism utilizes ICT to generate value-added experiences for tourists and residents, which then enhances competitiveness, supporting tourism development projects via e.g. real-time services and the effective coordination of data (Buhalis & Amaranggana, 2014; Buonincontri & Micera, 2016). Following Boes et al. (2016), ICT development is insufficient on its own for destinations to become smart, which implies the need for the multi-faceted construct of "smartness." This view is also represented by a recent study focusing on the difference between sustainable and smart cities via an analysis of 16 sets of city assessment frameworks (eight smart city and eight urban sustainability frameworks) comprising 958 indicators (Ahvenniemi, Huovila, Pinto-Seppä, & Airaksinen, 2017). Its results showed that smart city frameworks concentrated more on modern technologies and smartness, highlighting social and economic aspects, while urban sustainability frameworks contained significantly more indicators measuring environmental sustainability. Since one main goal of using technologies in smart cities is to enable more sustainable development, it is critical to bridge the gap between smart and sustainable frameworks that might arguably redefine the smart city concept by taking the environmental, economic, or social sustainability aspect into consideration. "Smart" appears to have become a very fuzzy concept, often misused to achieve political goals, or to sell technological solutions (Gretzel et al., 2015).

According to Buhalis and Amaranggana (2014), smart tourism destinations feature the application of technologies in terms of attractions, access, amenities, available packages, and activities. Ancillary services generate positive effects on governance, the environment, mobility, economy, people, and living. In the long run, smart tourism destinations provide value-added experiences for tourists, integrating all stakeholders, and improving the effectiveness of resource management, which ultimately enhances a destination's competitiveness and tourist satisfaction to achieve sustainability and economic growth.

Research on smart tourism has mainly focused on ICT, often neglecting the sustainable aspects of a smart tourism destination. Neither smart entrepreneurial activities nor perceptions of a smart tourism destination by tourists or local people have to date received strong research interest, although many frameworks have in fact been designed to strengthen the inclusion of stakeholders (Buhalis & Amaranggana, 2014; Koo et al., 2015; Li et al., 2017). For instance, Femenia-Serra and Ivars-Baidal (2018) investigated tourists' experiences at smart destinations by highlighting their awareness and willingness to use smart solutions. Further research will however be needed to analyze individual responses to smart destinations. Part of the reason to develop smart tourism destinations is to enhance tourists' and locals' experiences. Put another way, it seems impossible for tourism organizations to develop smart tourism destinations without understanding the needs and preferences of locals and tourists, not to mention their perceived performance of and value placed upon smart city attributes.

2.3. Smart tourism destinations as EES

Developing a smart tourism destination as an ecosystem requires a contribution by leadership (participatory governance, policies and regulations, change management), people (human capital, social capital, knowledge management) and ICT (the 'Internet of Things', ambient technology, interoperability, cloud and edge computing, big/open data). This needs to specifically include vision, patience, strategic management and continuous evaluation and change, as well as the perception of a destination as an ecosystem. All of these elements are essential for a smart tourism destination (Boes et al., 2016). In the literature on tourism ecosystems, the interaction between technology and institutional logic have given birth to the concept of innovation in tourism (Barile, Ciasullo, Troisi, & Sarno, 2017). Gretzel et al. (2015) focused more on the technological aspects, describing smart tourism destinations as an integral part of the smart tourism ecosystem where technology breeds new business models, interaction paradigms, and even new types of tourism businesses. According to Gretzel, Ham, and Koo (2018) smart tourism has the potential to foster sustainability, increase efficiency, and enhance tourists' experiences by focusing on different "layers." For instance, technology as part of the physical structure serves as a base layer, followed by data, business, and experience layers. The interdependent multiple layers need to be considered for the successful implementation of smart tourism initiatives, with a destination management focusing on innovation.

According to Boes et al. (2016), technology systems have the potential to facilitate the integration of resources for value co-creation and consequently enable a sustainable competitive advantage in tourism destinations. Boes et al. (2016) conceptualize the core components of smartness: technology, innovation, social and human capital, and leadership. While ICT is seen as an enabler of smart tourism destinations, it is insufficient on its own to introduce smartness itself. This makes it crucial to comprehend the connections between core components and facilitate synergies between them (Boes et al., 2016). Human capital forms the basis of leadership, innovation, and entrepreneurship. These are enabled and supported by ICT, and in particular ICT infrastructure, as well as technology applications (Boes et al., 2015).

Romão, Kourtit, Neuts, and Nijkamp (2018) expressed the main goal of a sustainable smart city as developing a future city as "a place 4 all." (p. 67) A smart city has potentially different impacts on diverse types of stakeholders, and these impacts may lead to conflicts between locals and non-locals. However, a strong economy with a positive effect on an urban population as well as the diversification of economic activities and cultural interactions can benefit various stakeholders. According to Barile et al. (2017), from a service ecosystem perspective, a tourism system emphasizes the potential relationship between institutional logics and technology. Institutions, intended as social rules, introduced and described by Vargo and Lusch (2011), can shape the use of technology, which can in turn facilitate new institutional logics to constantly adjust the tourism service ecosystem. Furthermore, for the better management of these kinds of institution-technology relationships and an improvement in service efficacy and effectiveness, an ecosystem's actors and their engagement touchpoints need to be conceptualized and contribute to stakeholder selection.

In summary, both the EES approach and the smart tourism destination approach focus on urban sustainable aspects of a region or a city in their frameworks; the overall goal of both is to foster innovation and sustainable growth. While the EES approach strengthens entrepreneurship within the system, the smart city approach focuses on the intelligent use of ICT in the destination. Both are frameworks and normative concepts fostering innovation and growth in regional systems, emphasizing sustainability as well as the demand side of their stakeholders. The viewpoint of tourism stakeholders represents the

industrial or entrepreneurial environment for fostering smart destination development. The perceptions of local (residents) and non-local users (visitors) provide the demand-side perspective of what the smart attributes of the destination environment mean to the users, measured in the form of importance and performance evaluations. The following research questions arise as a result:

1. How do key tourism stakeholders perceive entrepreneurship and elements of the EES in smart cities when it comes to tourism development?
2. How do residents and tourists perceive the attributes of smart cities as important and effective?

3. Empirical study

3.1. Study area, research design and sample

Tyrol, Austria is a well-known and established alpine tourism region, with tourism as a major economic and prosperity factor (Land Tirol, 2015). In 2017 the direct gross tourism output of Tyrol was around €4.5 billion, which is 17.5% of the total gross value added. This comprises about 5.6% of total Austrian GDP. Furthermore, the Tyrol tourism industry employed around 60,000 people in 2017 (Tyrol Werbung, 2018). As a well-known tourism destination, the mountain region of Tyrol is made up of different valleys (Strobl & Peters, 2015). Tourism development in Tyrol focuses on these destinations, offering them as recreational areas that enhance residents' and tourists' quality of life (Land Tirol, 2015).

The present study used the Austrian city of Innsbruck (the largest city in the western part of Austria) as a smart tourism destination to answer the research questions. In May 2018 more than 133,000 people had their principal residence there. In addition, Innsbruck hosts more than 27,000 students (University of Innsbruck, 2018) and is well known as an alpine sport and student city surrounded by mountains of up to 2500 meters. Innsbruck is a popular tourism destination for people from around the world both in winter and summer. It hosted the 1964 and 1976 Winter Olympic Games. In the tourism year 2017 it had a total of 1.64 million overnight stays, offering 8066 beds (Stadt Innsbruck, 2018). In terms of sending markets, Austria has the largest tourism market, with total overnight stays of almost 370,000 guests in 2017 (as a point of comparison, the second largest market is Germany with 266,000 overnight stays in the same year, followed by Italy with 116,400, and the United States with 87,500 overnight stays).

Innsbruck furthermore became a partner of the EU Sinfonia project, as part of which Innsbruck is focusing on becoming a "better living" low-carbon city by, for example, increasing the share of renewables by 20% or achieving up to 50% primary energy savings. This long-term project focuses on smart energy management and innovative solutions for a sustainable city, which is another reason why Innsbruck was selected for this study (Sinfoniasmartcities, 2018).

Stam's framework (2015) serves as an analytical framework for this study, which was organized in two sections. First, semi-structured expert and key stakeholder interviews were conducted between December 4th, 2018 and February 14th, 2019 to better understand the EES in the region. These 14 interviews were used to present information about the EES, the different elements in the system, as well as about entrepreneurship in general in Innsbruck and the surrounding region of Tyrol. The list of individuals interviewed includes successful entrepreneurs, representatives of formal institutions and support organizations, members of start-up and entrepreneur networks, and managers of business incubation facilities. Based on Stam's framework, the authors selected 20 potential experts to be interviewed, contacting them in November 2018. 14 people were interviewed in total (see Table 1), with the interviews lasting an average of 42 min. The best level of application for the EES approach is not yet clear, although Stam (2015) has in fact stated that most of the EES elements can be demarcated on a regional level, e.g. regional labor markets. As a result, the qualitative research approach focuses on Tyrol as an EES. The qualitative data was analyzed following Creswell (2009).

A questionnaire survey was then conducted in the city of Innsbruck. This study used smart attributes derived from the literature for its measures (e.g. Cheng, 2015; Coca-Stefaniak, 2014; Coca-Stefaniak & Carroll, 2015; Cohen, 2015; Dameri & Rosenthal-Sabroux, 2014; Deakin, 2014; ITU, 2014; Qin, Li, & Zhao, 2010), as well as those framed in Cohen's Smart City Wheel (Cohen, 2013) and Dameri's "land-people-infrastructure-government" model (Dameri, 2014). These attributes are discussed in the context of urban development (e.g. Saunders & Baeck, 2015) and tourist destination (e.g. Hunter, Chung, Gretzel, & Koo, 2015).

Both levels of importance and the performance of smart city attributes were rated by local respondents, indicating the perceptions of these attributes. Similarly, the level of importance of the attributes was also rated by inbound visitors. Level of performance however was excluded from the visitor group's survey due to a relatively short period of visits, and an assumed lack of knowledge about the city by visitors. The lower level of understanding of the performance by visitors did not generate meaning or representative information for the importance-performance analysis (IPA).

This study collected data from 199 local residents and 137 tourists from/to Innsbruck, Austria to answer our key questions about the perception of smart cities. The questionnaire was in either German (for locals) or English (for tourists). It had 90 statements and questions in total and was divided into three sections. Parts A and B respectively measured the perceived levels of importance and performance of different smart city aspects, e.g. air quality, quality of universities, waste management, medical care, etc. These 44 attributes were measured on a 7-point Likert scale. Part C collected socio-demographic information about the interviewees. While the local residents completed all three parts of the questionnaire, the tourists skipped part B due to their lack of knowledge and experience about Innsbruck (see above).

Both questionnaires were personally handed out to locals and tourists in the city center and around major attractions in Innsbruck, e.g. the Maria Theresien Street and the Golden Roof. The data was collected in April 2018, with the survey of the locals done using an ipad, and the tourists' survey in paper form. After testing data reliability, the attributes of smart cities were used to carry out an IPA (Martilla & James, 1977) to gain further insight into the conditions of the attributes that inform policy and decision making. The characteristics of both groups of respondents are shown in Tables 2 and 3.

The sample of local residents had an almost even gender distribution; a majority were in the age range of 18–24 years, had secondary or post-secondary education, and included a high percentage of students. The research team encountered difficulties in sampling middle-aged or senior local residents, with only a few being willing to complete the questionnaire on the tablet. And as mentioned, Innsbruck is a well-known university city with more than 27,000 students (University of Innsbruck, 2018). As Klovning, Sandvik, and Hunskaar (2009) demonstrate in their comparison between web-based and paper-based surveys, web-based surveys have the potential to overcome age-related barriers, with an influence of respondents' device preference. On the other hand, Nam and Pardo (2011) argue that digital natives, defined as people born into technologies or people who are familiar with new technologies, benefit more from and perceive smart city developments more strongly. Research does in fact demonstrate that age influences the perceptions and behavior of technology users (Tshiani & Tanner, 2018). For that reason, the local resident sample mostly included people born during the 1980s and 1990s and are therefore considered to be digital natives (Boyd, 2013). As an additional note, there was data missing from the local respondents due to their unwillingness to disclose information to the study.

The visitor sample was also almost equally gendered, albeit with a much higher age range (over 99% were 25 years or older) than the

Table 1
Overview of in-depth interviews.

Interview	Date	Area of Expertise (EES Element)	Duration
1	12/04/18	Networks, leadership	31:25 min
2	12/10/18	Networks, formal institutions	33:59 min
3	12/11/18	Leadership	39:14 min
4	12/12/18	Networks, formal institutions	42:37 min
5	12/14/18	Knowledge, leadership	29:05 min
6	12/17/18	Networks, leadership, physical infrastructure	44:47 min
7	12/18/18	Knowledge, talent	34:28 min
8	12/18/18	Networks, leadership, formal institutions	71:15 min
9	12/19/18	Formal institutions, culture, support services/intermediaries	36:24 min
10	12/20/18	Talent, formal institutions	41:02 min
11	12/20/18	Talent, knowledge, culture	78:20 min
12	01/18/19	Formal institutions, leadership	42:19 min
13	01/22/19	Formal institutions, leadership	24:08 min
14	02/14/19	Formal institutions	42:02 min

Table 2
Sample description of local residents (excluding missing data).

		Frequency	Valid percent (%)
Gender	Male	69	52.3
	Female	63	47.7
	Total	132	100.0
Age	18–24	110	80.3
	25–29	12	8.8
	30–39	11	8.0
	40–49	4	2.9
	50 or above	0	0.0
	Total	137	100.0
Education level	Primary or below	4	2.9
	Secondary or post-secondary	109	79.6
	University or above	23	16.8
	Total	137	100.0
Working status	Employed	37	20.1
	Unemployed	4	2.2
	Retired	4	2.2
	Housewife/ Househusband	3	1.6
	Students	135	73.4
	Others	1	0.01
	Total	184	100.0
Monthly personal income	Below 1100 euros	108	67.5
	1110–2215 euros	32	20.0
	2216–3322 euros	14	8.8
	3323–4430 euros	5	3.1
	4431–5537 euros	1	0.01
	5538 euros or more	0	0.0
	Total	160	100.0

Table 3
Sample description of visitors (excluding missing data).

		Frequency	Valid percent (%)
Gender	Male	53	48.6
	Female	56	51.4
	Total	109	100.0
Age	18–24	1	0.8
	25–29	32	25.2
	30–39	23	18.1
	40–49	22	17.3
	50 or above	49	38.6
	Total	127	100.0
Education level	Primary or below	2	1.6
	Secondary or post-secondary	52	40.6
	University or above	74	57.8
	Total	128	100.0
Working status	Employed	70	53.8
	Unemployed	6	4.6
	Retired	17	13.1
	Housewife/Househusband	16	12.3
	Students	18	13.8
	Others	3	2.3
	Total	130	100.0
Monthly personal income	Below 1100 euros	38	29.9
	1110–2215 euros	33	26.0
	2216–3322 euros	30	23.6
	3323–4430 euros	16	12.6
	4431–5537 euros	3	2.4
	5538 euros or above	7	5.5
	Total	127	100.0

resident sample, a higher education level (over 57% were university graduates), and higher monthly personal incomes. Regarding the purpose of their visit, over 44% were on vacation in Innsbruck, about 9% were on business or were attending meetings, about 15% were visiting friends or relatives, and 8% were in Innsbruck for other reasons. More than 18% had visited Innsbruck more than five times, while over 36% were first-time tourists. For countries of origin, almost 22% of the respondents were from other parts of Austria (excluding Innsbruck and its surrounding regions), over 11% from Asia, about 13% from North America, and over 36% from Europe.

3.2. Findings: in-depth interviews

The results of the qualitative interviews are presented using Stam's (2015) EES approach as a framework to understand the EES elements. These were developed based on the attributes, principles, and pillars of previous research (Feld, 2012; Isenberg, 2010; World Economic Forum, 2013), and are understood as framework and systemic conditions which lead to entrepreneurial activity (Stam, 2015).

First, entrepreneurial networks for Stam (2015) enable an efficient distribution of capital, information, and labor in a system. As the semi-structured interviews demonstrated, Innsbruck and its surrounding region of Tyrol offer various start-up and entrepreneurial networks. The different networks provide opportunities to present ideas and contacts as well as support for start-ups. Furthermore, entrepreneurial networks are seen as positive, enabling synergies and information exchange. One manager of a business incubation facility for example stated:

> "In the past there were a lot of individual initiatives that are now grouped under STARTUP.TIROL, and there are various other initiatives like "the incubator," which is a program together with the university, the *Werkstätte Wattens*, and IECT Hauser. So there are a lot of individual initiatives working to cooperate with each other" (Interviewee 9).

As the next EES element, leadership means that visible leaders with a commitment to the region develop role models and directions as an aspect of the development and maintenance of an ecosystem (Stam,

2015). In this context, the interview partners agreed that the region has successful and committed leaders which support the location as a place to start and grow a business by providing e.g. mentoring or support. One example mentioned was the *Werkstätte Wattens*, a supporting business center that receives support from the Swarovski company (a well-known Austrian fashion, crystal, and jewelry producer):

> "Well, if we look at the *Werkstätte Wattens* for example, where Swarovski already has a great commitment […], yes […] of course everyone is trying to improve the business location […]" (Interviewee 9).

Finance or access to finance is particularly crucial for uncertain entrepreneurial projects and therefore preferably provided by entrepreneurial investors (Stam, 2015). The interviews clearly showed that financing options are the same throughout Austria. A number of experts mentioned that financing in Austria is still carried out through traditional bank financing, mainly because there are very few private investors willing to take risks, as this interview quote shows:

> "With financing options, I think there are still deficits, because other parts of the world are much faster and more willing to take risk […] there is still no culture […] so there are a lot of things missing in the attitude too" (Interviewee 1).

For Stam (2015), the most valuable element of the whole EES is the presence and availability of skilled, diverse workers. The interviews repeatedly showed this skill shortage in particular, with the interviewees defining this as an Austria-wide problem, often highlighting the shortage of IT professionals for start-ups as well as established companies:

> "Some industries are more affected than others, but the skills shortage is a fact. So I wouldn't judge that well […] because there are actually not enough professionals in some areas" (Interviewee 5).

Knowledge is understood as an important driver of entrepreneurial opportunities (Stam, 2015). The interviews revealed in this context that knowledge was evaluated positively, although the research level was for the interviewees something that can be improved continuously.

> "The total research quota, which as far as I know is too low in Austria compared to other countries, could perhaps be developed […]" (Interviewee 9).

A variety of support services have the potential to lower entry barriers for entrepreneurs and may influence innovation time to market (Stam, 2015). The interview partners evaluated the availability of service offerings in Innsbruck very positively. Only specialized services were in their opinion not available in the immediate environment, although they are not difficult to access for example in nearby Munich.

> "There's no lack of tax advisers and lawyers. There are plenty of support services" (Interviewee 3).

For Stam and van de Ven (2018), the formal institution element reflects the efficiency and overall quality of institutions such as regulatory frameworks. The opinions of the interviewees here indicated quite the opposite with this element. Some evaluated the institutions very positively, describing them as the best starting point for young entrepreneurs or start-ups. Others criticized the formal institutions as unhelpful, even describing them as low-quality.

> "The classic contact point is the Chamber of Commerce, which represents the interests and the services […], followed partially by the Federation of Industrialists […] and its members. Then there's the university as contact point for research and development […], then the *Standortagentur Tirol* as a location service provider " (Interviewee 4).

Entrepreneurship culture means having a tolerance for failure and risk, as well as role models and success stories within the entire EES (Stam, 2015; World Economic Forum, 2013). The semi-structured interviews showed that the culture of entrepreneurship is valued positively in Innsbruck and its surrounding regions. A member of an entrepreneurial network described the culture:

> "The public's appreciation could always be better, but it's there, no doubt" (Interviewee 2).

Physical infrastructure facilitates or constraints the interaction between humans in the EES (Stam, 2015). The interview partners here frequently mentioned peripheral regions around Innsbruck, with infrastructure positively assessed overall. For the interview partners, good accessibility is especially enabled through tourism, as this quote shows:

> "We know we have a lot of traffic […] but the accessibility is very good. Even though we have many peripheral regions, we have very good connections […] including the infrastructure, the public connection, the expansion of the roads. We are a tourism area, and these are good even in the farthest-away valley" (Interviewee 4).

Demand is for Stam (2015) the availability and the access to buyers of new services and goods provided by the entrepreneurs. The experts spoke on the subject of demand, especially from a customer perspective. As this quote from a business incubating manager shows:

> "[…] should be in the center of any entrepreneurial activity, first to ask the question […] who is my customer and what does he/she need […] the problem solution I can offer him/her […]" (Interviewee 6).

The interviews furthermore demonstrated that the tourism industry plays a major role in the entire EES in Innsbruck and its surrounding regions. The different EES elements are influenced and shaped by tourism. For example, the interviewees mentioned that tourism in Tyrol enables good infrastructure:

> "[…] accessibility, made possible by tourism, makes every place easily accessible" (Interviewee 3).

In addition, the interviews also demonstrated that the overall entrepreneurial culture is influenced by the tourism industry:

> "[…] the image is actually not bad, because we comparatively have a lot of entrepreneurs in tourism […]" (Interviewee 7).

Regarding the support services:

> "On the other hand, we have a wide range of consulting companies, especially in tourism. Tyrol is in a great position where we have a lot of qualified consultants […]" (Interviewee 9).

3.3. Findings: questionnaire survey

Table 4 shows local resident and visitor ratings of smart city attributes in Innsbruck. The Kurtosis values among the attributes are verified. The results ranged between −0.330 and 7.673 (importance ratings of smart city attributes by local residents), 0.126 and 2.316 (performance ratings of smart city attributes by local residents), and −0.349 and 6.105 (importance ratings of smart city attributes by visitors), which are all considered acceptable for proving normal univariate distribution (Brown, 2006).

Several observations are drawn from the descriptive statistics on the overall pattern. For smart city attributes, the three largest I–P gaps refer to employment opportunities (imp > per = 1.14), quality of government (imp > per = 0.98), and physical safety (imp > per = 0.93); the smallest I–P gaps reflect the quality of local communities (imp > per = 0.15), water supply (imp > per = 0.34), and education opportunities (imp > per = 0.34).

In the local respondent group, the smart city attributes ranged between 4.77 and 6.31 (importance) and 4.08 and 5.89 (performance).

Table 4
Ratings of smart city attributes by local residents and visitors in Innsbruck.

Smart city attributes	Local residents *(n = 199)*				Gap [Rank]	Visitors *(n = 137)*	
	Importance		Performance			Importance	
	Mean [Rank]	S.D.	Mean [Rank]	S.D.		Mean [Rank]	S.D.
1. Smart city leads overall economic development	4.87 [27]	1.493	4.08 [28]	1.227	0.79	5.15	1.452
2. Standard of living	5.36	1.399	4.95	1.167	0.41	5.73	1.285
3. Quality of life	6.25 [3]	1.237	5.54 [3]	1.284	0.71	5.99 [3]	1.107
4. Employment opportunities	5.92	1.315	4.78	1.307	1.14 [1]	5.54	1.295
5. Urban environmental quality	5.66	1.315	5.02	1.287	0.64	5.39	1.352
6. CO_2 emissions as a smart city	5.09	1.561	4.32	1.258	0.77	5.11 [26]	1.449
7. Attitudes of residents towards smart city	4.77 [28]	1.508	4.31	1.256	0.46	5.11 [26]	1.473
8. Education opportunities for residents	5.62	1.409	5.24	1.319	0.38 [26]	5.42	1.383
9. Quality of individual residents	4.97	1.622	4.30 [26]	1.269	0.67	5.22	1.376
10. Quality of local communities	5.10	1.506	4.95	1.179	0.15 [28]	5.07 [27]	1.622
11. Quality of government	5.33	1.426	4.35	1.359	0.98 [2]	5.28	1.452
12. Quality of universities	5.96	1.329	5.28	1.329	0.68	5.57	1.385
13. Quality of business sector	5.77	1.357	5.16	1.136	0.61	5.47	1.319
14. Energy use efficiency in the city	5.28	1.498	4.64	1.118	0.64	5.45	1.346
15. Use of renewable energy	5.28	1.501	4.41	1.113	0.87	5.58	1.317
16. Energy use efficiency of buildings	5.05	1.509	4.28 [27]	1.176	0.77	5.44	1.238
17. Internet and telecommunications connection	5.87	1.334	5.11	1.338	0.76	5.87	1.205
18. General condition of residence	6.11	1.141	5.34	1.193	0.77	5.51	1.276
19. Smart transport services	5.31	1.481	4.44	1.333	0.87	5.41	1.327
20. Smart development of manufacturing sectors	5.09	1.504	4.49	1.236	0.60	5.34	1.487
21. Water supply	6.09	1.212	5.75 [2]	1.372	0.34 [27]	5.96	1.204
22. Overall city governance towards a smart city	5.06	1.396	4.41	1.146	0.65	5.30	1.421
23. Government as smart city initiator	4.90 [26]	1.443	4.31	1.257	0.59	5.31	1.455
24. Provision of public services	5.46	1.344	5.03	1.262	0.43	5.48	1.343
25. Public and private medical care	6.31 [1]	1.260	5.89 [1]	1.323	0.42	6.05 [2]	1.190
26. Consensus among stakeholders	5.29	1.475	4.49	1.303	0.80	5.04 [28]	1.586
27. Social welfare	5.91	1.291	5.43	1.335	0.48	5.98	1.189
28. Physical safety	6.29 [2]	1.235	5.36	1.556	0.93 [3]	6.17 [1]	1.195
Overall average	5.50	1.396	4.85	1.266		5.50	1.347

These values indicate that local people have comparatively more dispersed ratings of smart city attributes than those of visitors. For the visitor group, the ranges of importance level of smart city attributes were 5.04–6.17, which tend to be relatively high compared with locals.

Regarding the ranking of each type of attribute, the top three most important items were the same across the two groups: medical care (M = 6.31/6.05), physical safety (M = 6.29/6.17), and quality of life (M = 6.25/5.99). However, the least important smart city items were different between the two groups. Local residents selected citizen attitudes (M = 4.77), smart economic development (M = 4.87), and government as initiator (M = 4.90), while visitors selected stakeholder consensus (M = 5.04), quality of local communities (M = 5.07), and CO_2 emissions/citizen attitudes (M = 5.11). The three highest performing smart city attributes for locals were medical care (M = 5.89), water supply (M = 5.75), and quality of life (M = 5.54). Smart economic development (M = 4.08), energy use efficiency in buildings (M = 4.28), and quality of residents (M = 4.30) had the lowest performance.

The smart city attributes are plotted on the I–P grid in Fig. 2. The grid lines are based on the overall average values of importance and performance ratings of the local residents. 11 out of 28 attributes (nearly 40%) fall within zone 1, which belong to “keep up the good work” zone. This indicates that these smart city attributes in Innsbruck are being done well. The best-perceived attributes are mainly related to general living conditions, governance, and infrastructure of the city such as “medical care”, “water supply”, “quality of life”, “transport”, and “residence condition”. Another 15 attributes are within zone 3 of “low priority”, which indicates that some attributes such as “economic development”, “citizen attitude”, and governmental initiative” are not considered particularly significant for smart development in Innsbruck. More importantly, three attributes, including “public services”, “standard of living”, and “quality of community” are in zone 2 (“concentrate here”), and should be focused on more extensively for continued smart city development. The quality of individual residents or a certain stakeholder group specifically refers to their understanding and ability to accept and utilize smart infrastructure and facilities in the city. Finally, “employment opportunities” are the only attribute rated as “possible overkill” in zone 4.

4. Discussion

The EES consists of framework and systemic conditions leading to entrepreneurial activity output. The various components or elements interact with each other and enable productive entrepreneurship. Systemic conditions are networks, intermediaries, talent, knowledge, leadership, and finance (Stam, 2015). Stam (2015) also defined framework conditions as formal institutions, culture, physical infrastructure, and demand. Some of these conditions in Innsbruck found by analyzing expert interviews are consistent with the results of the local I–P analysis.

From the I–P analysis in Fig. 2, it's seen that relatively more attributes reflecting the quality and conditions of residence in Innsbruck perform well, whereas “intangible” factors that are relevant to the urban governance are not prioritized by residents. The relatively more important attributes contributing to smartness in Innsbruck relate to quality of community in Innsbruck (which requires a smart group of local users for ICT and other relevant infrastructure and facilities), standard of living (which may be interpreted as the rise in cost of living in a smart city), and public services (which may reveal the need for smarter public service provision by the municipal government).

When it comes to the “intangibles”, the societal quality and entrepreneurship of the tourism industry and businesses also received positive comments from the expert interviewees. They highlighted the strengths of support services and the entrepreneurial culture and networks for start-up businesses, which all allow synergic development and information exchange. These smart attributes were also reflected

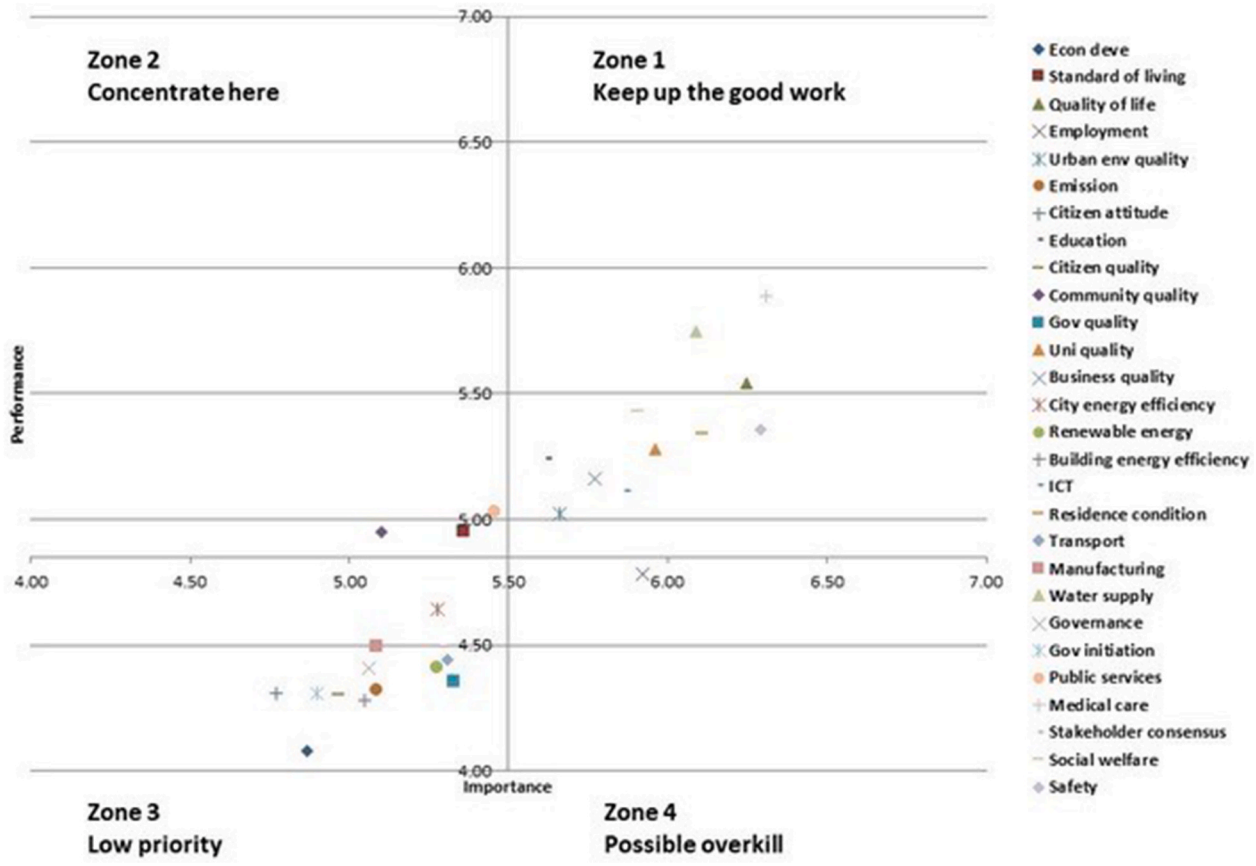

Fig. 2. I–P grid of Innsbruck smart city attributes rated by local residents.

e.g. in terms of the quality of universities (M = 5.28), the quality of the business sector (M = 5.16), and provisions for public services (M = 5.03) respectively. This implies that there are healthy ESS components, and that the sustainability of the tourism industry has to address a tourist-focused demand.

According to the experts, entrepreneurial leadership is another positive aspect. However, the public sector does not perform satisfactorily due to the quality of the government (M = 4.35), overall city governance (M = 4.41), and government as a smart city initiator (M = 4.31). According to local expectations, all of these lag behind. Similarly, the expert interviewees also had an opposing view of the contributions of formal institutions.

Moreover, the contribution of a smart city to overall economic development was doubted by both the locals and experts. Whereas the local ratings such as “smart city leads to overall economic development” received the lowest score (M = 4.08), the lack of financing options and the unwillingness of investors to take risks also weakens the ESS of the Innsbruck area. Finally, how locals perceived the insufficient employment opportunities (M = 4.78) brought about by a smart city was also found in the expert comment on the shortage of IT professionals in the region.

What can be derived from the expert interviews is that tourism influences various elements of the EES and entrepreneurial output as a result (Nissan, Galindo, & Méndez, 2011). Furthermore, knowledge and research institutions are a strong driver for tourism and destination development (Del Vecchio & Passiante, 2017). According to the interviewees, tourism has a major impact on physical infrastructure, the entrepreneurial culture, and support services. To summarize, the components of the EES in Innsbruck and its surrounding regions are positively influenced and perceived because of the tourism industry. These findings are also in line with the visitor survey results, in which the physical infrastructure and the environment and living conditions found in Innsbruck (e.g. safety, medical care, ICT, water supply, quality of life) were seen as top concerns to outsiders.

Although the qualitative interview data does in fact confirm the importance of the elements in Stam's (2015) EES, not every element was perceived as having the same level of importance. In the eyes of the interviewees, not all of them are relevant in enabling successful or productive entrepreneurship. Some elements such as culture or knowledge need to be further improved. In addition, the results underline the importance of combining and connecting them within the EES. Here, networks appear to play a very central role in the ecosystem, which could stand to be more highlighted and included in the EES (Gulati, 1998; Gulati, Nohria, & Zaheer, 2000) (see Fig. 3).

On the one hand, networks provide access to the element of the leadership successful entrepreneurs are part of. Networks also provide better access to financing, e.g. by contacts to private investors or risk venture companies. On the other hand, suggestions or advice for specific support services are also part of the network dimension (Hrabanski, Bidaud, Le Coq, & Méral, 2013). So networks play a major role in the entire EES. Based on our results, they should be included as an element in the EES.

5. Conclusion

The EES approach ultimately reveals itself as an adequate framework for evaluating smart tourist destinations as they foster a more sustainable development of cities. It widens the sole focus of ICT, including people and institutional logics alongside the entrepreneurial attributes of smart urban development. This study advances the theoretical framework of smart cities and smart tourism through an empirical demonstration of the importance of entrepreneurship. This paper also contributes to an enhanced understanding of the EES approach, EES elements, and their interactions. The qualitative results from expert

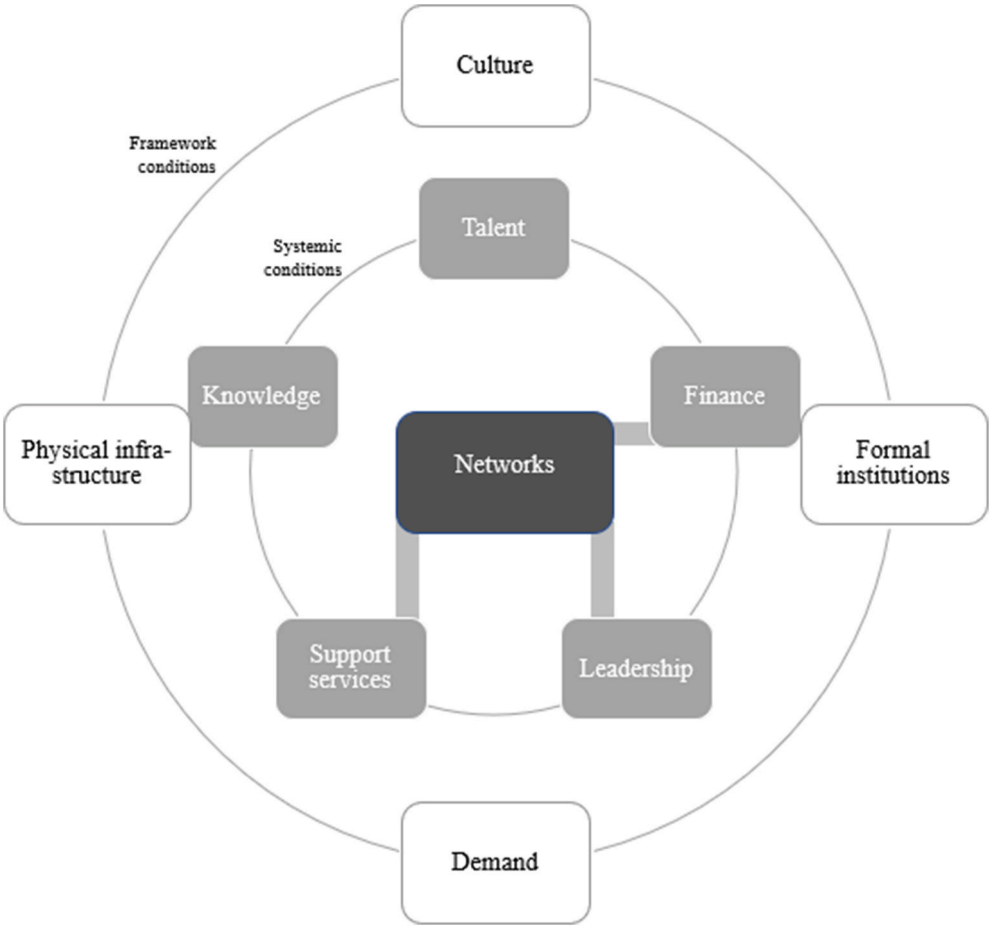

Fig. 3. Networks as an integrated element in the entrepreneurial ecosystem (adapted in line with Stam & van de Ven, 2018).

interviews and the quantitative analysis of local and visitor surveys support a parallel and synergic development of Innsbruck as a smart destination and place for tourism industries. Even though smart city attributes are commonly shared across/among stakeholders in tourism industries, different focuses may in fact appear as a result of the diverse expectations and needs of local people, tourists, and other tourism entrepreneurs.

Surprisingly, experts have frequently addressed tourism as a dominant industry in the EES in Innsbruck: tourism has an unquestionable impact on entrepreneurship in the region. Moreover, the intensity and development of the tourism industry supports young companies' or start-ups' success. The development of tourism-related start-ups in particular seems to have huge potential in this region. And the qualitative data stress the intensive investment by government and private investors in recent years to facilitate business settlements or start-ups. New networks have been developed as well, with new forms of working spaces to support entrepreneurship within the region. Although there are still shortcomings in some areas, e.g. financing, most experts have a positive attitude towards this kind of entrepreneurial development. With this in mind, our study reveals the potential influence of a dominant industry within an EES, demonstrating its impact on various EES elements.

This study also enhances the understanding of local residents' and tourists' perceptions of smart city attributes, allowing policy implications to be drawn from them. Local residents and tourists in Innsbruck have a similar perception of the most important smart city attributes. Local residents believe that Innsbruck possesses the desirable conditions to become a smart city, while the EES benefits from the tourism industry in the region by improving various EES elements such as physical infrastructure, entrepreneurial culture, and support services. Consequently, these ESS conditions lead to enhanced entrepreneurial activity. The weaker elements include the lack of an ICT-skilled workforce and risk-taking financial functions/providers in the region. It is important for policymakers in tourist destinations to strategically invest in some important shared smart city infrastructure and policies that allow the outcomes to address the most significant part of the entrepreneurial ecosystem and ultimately lead to long-term effects across the ecosystem's components and actors. Our study has also highlighted the smart city development conditions with the help of the I–P grid. The results show that the conditions for smart city development in Innsbruck are generally satisfactory, with some smart aspects situated in the "keep up the good work" zone (these are considered the strengths of the city). No critical item falls within the "concentrate here" zone, implying that there is no important aspect that is failing or in need of immediate attention. However, the presence of more items in the "low priority" zone in the I–P grid and the possible consequent adoption of IPA-based solutions may cause these relatively lower important aspects to be neglected (Lai & Hitchcock, 2015; Sever, 2015), which means they should be kept in mind as future developments continue. Smart governance and energy consumption issues on the I–P grid are generally due to a lack of local attention, which may eventually lead to imbalanced and delayed urban policy solutions in Innsbruck.

A potential further study could identify and differentiate the entrepreneurial perception of smart city development between industries (e.g. tourism versus non-tourism) and sizes of businesses (e.g. small- and medium-sized enterprises and large corporations). The findings that result would further inform policymakers about urban development, hopefully helping them tackle the diverse needs of entrepreneurial environments and conditions in different industries.

Possibly due to the study's lengthy questionnaire, the low rate of

response to socio-demographic questions by the local residents caused a major missing data issue in this study. The resident sample also contains a large percentage of young respondents due to the age-related bias caused by the tablet data collection method (Klovning et al., 2009). The study's qualitative nature as well as its regional context represent further limitations of this study, restricting its result generalizability. Although the in-depth interviews were conducted in the context of a region with particular characteristics, these were not targeted to achieve generalizable results. Nevertheless, the interviews did in fact offer rich data that is very helpful for gaining an understanding of different EES elements.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We would like to express our appreciation to the anonymous reviewers for their comments on this paper.

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EICHELBERGER, Sarah is PhD student at the Department of Strategic Management, Marketing and Tourism at the Faculty of Business and Management, University of Innsbruck. Her research interests include quality of life in tourism, entrepreneurial ecosystems, as well as responsible and sustainable tourism.

PETERS, Mike is Professor at the Department of Strategic Management, Marketing and Tourism at the Faculty of Business and Management, University of Innsbruck. His research interests include small business development, family businesses in tourism, destination management, entrepreneurship, and innovation.

PIKKEMAAT, Birgit is Assistant Professor at the Department of Strategic Management, Marketing and Tourism at the Faculty of Business and Management, University of Innsbruck. She is particularly interested in researching the areas of innovation and product development, destination management, and tourist behavior.

CHAN, Chung-Shing is Research Assistant Professor at the Department of Geography and Resource Management, Chinese University of Hong Kong. His teaching and research interests include place branding and marketing, sustainable tourism, and eco-tourism.