

The synergy approach to understand entrepreneurship and innovation ecosystem taxonomy

Book or Report Section

Accepted Version

Belitski, M. and Godley, A. ORCID: <https://orcid.org/0000-0002-3160-2499> (2020) The synergy approach to understand entrepreneurship and innovation ecosystem taxonomy. In: Tsvetkova, A., Schmutzler, J. and Pugh, R. (eds.) Entrepreneurial Ecosystems Meet Innovation Systems: Synergies, Policy Lessons and Overlooked Dimensions. Edward Elgar. ISBN 9781789901177 Available at <https://centaur.reading.ac.uk/91820/>

It is advisable to refer to the publisher's version if you intend to cite from the work. See [Guidance on citing](#).

Publisher: Edward Elgar

All outputs in CentAUR are protected by Intellectual Property Rights law, including copyright law. Copyright and IPR is retained by the creators or other copyright holders. Terms and conditions for use of this material are defined in the [End User Agreement](#).

www.reading.ac.uk/centaur

CentAUR

Central Archive at the University of Reading

Reading's research outputs online

Proposed Book Chapter ENTREPRENEURIAL ECOSYSTEMS MEET INNOVATION
SYSTEMS

Editors: Alexandra Tsvetkova, Jana Schmutzler, Rhiannon Pugh Submission deadline for

**The complementarity approach to understanding entrepreneurship and innovation
ecosystems taxonomy**

Maksim Belitski

Henley Business School, University of Reading
Reading, RG6 6UD, United Kingdom
Email: m.belitski@reading.ac.uk

Andrew Godley

Henley Business School, University of Reading
Reading, RG6 6UD, United Kingdom
Email: lesgdley@reading.ac.uk

Abstract

In recent years, there has been increased interest in the ways in which entrepreneurship ecosystems affect regional economic development. Building on the entrepreneurship and innovation literatures we apply a complementarity perspective to demonstrate that entrepreneurial ecosystem components should align with each other to be able to deliver economic development to heterogeneous EEs.

Our results provide a general framework formed by four components, which could help develop a taxonomy of territories according to their main characteristics. Based on this approach, it is argued that in cases where a territory lacks one of the four components under consideration, the role of the missing element within the system could potentially be provided by the complementarity between the components that are in place. We applied this framework to the Greater Reading area in the United Kingdom and demonstrated that it is the complementarity between entrepreneurial actors which facilitates entrepreneurship.

Introduction

In recent years, entrepreneurial ecosystems (EEs) has become a popular way to further explain why some places grow and agglomerate while others deteriorate and slowly stagnate (Isenberg, 2010). This idea was already implicit in the literature on innovation systems. There are a number of differences between them, particularly in the units of analysis used, context mechanisms, roles of individual agents in regional economic development, and the ways by which entrepreneurial opportunities emerge (Autio et al., 2014, 2018; Adner & Kapoor, 2010).

The entrepreneurship ecosystem framework builds on Marshall's (1890) legacy and re-awakens the 'new economic geography' (Feldman & Braunerhjelm, 2006; Buenstorf & Fornahl, 2009). EEs benefit from local industrial specialisation so knowledge spillovers across ecosystem actors are stimulated, which results in broader economic benefits (Stam, 2015).

While the EE framework is intuitively appealing, its rapid adoption has tended to overlook the heterogeneous nature of specific EEs (Isenberg & Onyemah, 2016). There are several ground-breaking studies highlighting the importance of accounting for the systemic nature of

EEs (Autio et al., 2014; Spigel, 2017; Stam, 2015) and the need to develop an EE taxonomy (Mason & Brown, 2017). We define 'EE taxonomy' as the set of common characteristics that could be applied to territories with different types of EE.

EE taxonomy offers a practice-based (bottom up) approach by Mason and Brown (2017) which includes four distinct components: entrepreneurial actors, resource providers, entrepreneurial connectors and entrepreneurial culture. Entrepreneurial actors are not always connected to each other. In fact, the major difference between an entrepreneurial and innovation ecosystems is that actors may or may not be connected at all.

Entrepreneurial resource providers fill up an ecosystem with debt and financial capital. They also coordinate supply and demand of resources, and enable the transfer of resources between entrepreneurs, firms and other stakeholders. Financial connectors comprise banks, venture capital firms, accelerators, business angels and other financial institutions (Clarysse et al., 2015).

Entrepreneurial connectors are represented by networks of nascent ventures and stakeholders in other EEs (Granovetter, 1973; Sullivan & Ford, 2014).

Entrepreneurial culture and orientation represent societal norms and attitudes towards entrepreneurship activity, entrepreneurial aspirations and attitudes of individuals to entrepreneurship.

Despite the long-standing theoretical and empirical relationship between entrepreneurship and innovation, the question of the components which facilitate EE and innovation ecosystems has received little attention.

Acs et al. (2014) argue that the innovation ecosystems literature hardly mentions entrepreneurship ecosystems, and even the most influential concept - the National Systems of Innovation - has been unable to explain the process of new venture creation. This is because of the institutional tradition of the innovation ecosystems literature, which reinforces country's institutions effect in creation and dissemination of new ideas and knowledge. The EE draws our attention to individual-level entrepreneurs and firms as well as to the micro-processes of entrepreneurial innovation.

While the structure and institutions are present as in innovation ecosystems, the EE literature has increasingly focused on entrepreneurship quality, high-quality jobs, opportunity self-employment and growth ambitions. This contrast calls our attention to how institutional characteristics contrast EE components, in particular the role of capital availability, connectivity and entrepreneurial actors in EEs (Bowen & De Clercq, 2008; Levie & Autio, 2011). Still, the gap remains: although increased availability of data on entrepreneurship has opened new opportunities for comparative EE research, identification of the combinations of components related to entrepreneurship and innovation ecosystems remains much in its infancy (Autio & Acs, 2010; Autio et al., 2014; Stam & Spigel, 2016).

There has been criticism of the concept of innovation and entrepreneurship systems and its focus on the national level, which is heterogeneous in terms of geography and sectors (Malerba & Breschi, 1997; Autio et al., 2014). As a result, the concept has been extended to cities and regions (Szerb et al., 2013; Charron et al., 2014).

There are a number of other gaps in the literature. Firstly, existing EE taxonomy lacks an explanation in regards to absent components and the ability of the EE to complement those components to different EEs (Mason & Brown, 2017). Secondly, it is unclear which components and combinations of components are more efficient in channelling knowledge to market and supporting entrepreneurial strategies across heterogeneous EE's (Isenberg & Onyemah, 2016). Thirdly, while the network perspective is often used to analyse ecosystems, it is not enough to explain how EE's function (Stangler & Bell-Masterson, 2015).

Bridging this theoretical gap (Williamson & De Meyer, 2012; Autio et al., 2018; Adner & Kapoor, 2010) we distinguish EE components and explain how regions which lack several of the components of EE taxonomy may still be successful in supporting entrepreneurship. We introduce the complementarity perspective to EE taxonomy and use the example of Greater Reading as a case which describes how a combination of complementors within the EE taxonomy facilitates EE growth while discussing the factors that may impede it. This study is particularly important for EE's which aim to innovate with limited resources and exploit existing capabilities rather than engage in exploration activities. This study makes the following contributions to the literature on entrepreneurship, small business economics and the resource-based approach. Our first contribution is in critically analysing and demonstrating that entrepreneurial ecosystems are a distinctive unit of analysis in the management, entrepreneurship and economic geography literatures with a complex system of complementors. Although the complementarity approach has been extensively used in industrial economics and management, its application in small business economies and management has been limited (Stangler & Bell-Masterson, 2015). More theoretical and empirical work is needed to better explain how various combinations of EE taxonomy may work as complementors. Our second contribution is expanding the entrepreneurship, management and economic geography literatures by explaining how different types of complementarities and combinations of four components of EE taxonomy can be used to predict the performance of heterogeneous EE's. We apply a complex system of complementors to the case of the Greater Reading EE in the United Kingdom (UK). The remainder of this paper is organised as follows. The next section describes the existing literature and theories, and introduces the complementarity approach to EE taxonomy. Section 3 illustrates the case of the Greater Reading area. Section 4 discusses EE taxonomy as applied to Greater Reading, while Section 5 concludes.

2. Theoretical framework

2.1. Entrepreneurship ecosystem

The concept of the entrepreneurial ecosystem has evolved rapidly over the last few years, and has helped researchers and policy-makers think in systemic terms when considering the entrepreneurial activity of regions and countries. As a new unit of analysis, the entrepreneurial ecosystem provides a more realistic portrayal of the entrepreneurial phenomenon. It also allows researchers to adopt a much broader perspective when considering the role of each economic actor (Audretsch et al., 2006).

Mason and Brown (2014, p. 5) defined EEs as a “set of interconnected entrepreneurial actors, entrepreneurial organizations, institutions and entrepreneurial processes which formally and informally coalesce to connect, mediate and govern the performance within the local entrepreneurial environment”. Clearly, the dynamic and systemic nature of the concept encompasses multiple actors, institutions and processes.

However, the majority of innovation and entrepreneurship scholars view ecosystems primarily as a spatial concept (Feldman & Braunerhjelm, 2006; Mason & Brown, 2014, 2017) to explain why certain places have high levels of entrepreneurial activity (Stam, 2015). So rather than having innovation at its core, entrepreneurship is the fundamental driver behind the concept. Radosevic & Yoruk (2013) discussed the entrepreneurial propensity of innovation systems by integrating knowledge-intensive entrepreneurship (KIE) and innovation system (IS) concepts. The authors were the first to assess the influence of a system's complementary activities on the emergence of KIE, and confirmed that technological innovation is an important determinant of

entrepreneurial opportunity and performance (Audretsch et al., 2008; Eckhardt & Shane, 2010). At the same time, the concept of innovation systems has been criticized because the literature is based on a relatively narrow conception of innovation, with the focus on patentable technological innovation.

Another criticism is that the concept provides only limited insight into the factors driving change in the innovation system, with a limited explanation to its evolution over time (Hung & Whittington, 2011). The literature calls for the systemic perspective to account for multi-level factors which influence the capacity to generate entrepreneurial activity. These include personal factors (individual level), inter-personal (team level), organisational (firm level), networks (industry level) and spatial factors (regional level) which can influence both innovation and entrepreneurship.

From the innovation systems perspective, entrepreneurship is the property of systems of innovation and depends on both structural features of the economic system and on social mechanisms. From an entrepreneurship perspective, the key structural feature of an economic system is its capacity to generate entrepreneurial opportunities independent of individuals' capacity to recognise them (Radošević & Yoruk 2013). However, a well-known gap in the entrepreneurship literature is its narrow focus on the entrepreneur and firm while paying little attention to how components of the ecosystem and the local context regulate the behaviour of entrepreneurs and the choices they make (Phan, 2004). This is a significant omission, since we know that entrepreneurial action occurs in institutional contexts which affect the outcomes of entrepreneurial choices. The EE perspective thus views entrepreneurial activities as deriving directly from entrepreneurial behaviour and the traits that characterize entrepreneurial actors, such as entrepreneurial cognition (McMullen & Shepherd, 2006; Autio et al., 2013) and from the external environment as represented by systemic conditions.

In contrast to the innovation systems literature, the dimensions portrayed in the entrepreneurial ecosystems literature demonstrate differences in the unit of analysis, context mechanisms and the role of individual agents in regional economic development. Whereas the innovation systems literature portrays entrepreneurship cognition as something of a 'black box' (Stam, 2015), it recognizes the importance of the contextual mechanisms facilitating entrepreneurial choices. The EE literature uses the individual pursuing a new venture creation as a core unit of analysis, while in the innovation systems literature the role of individual agents was not considered to appear automatically, being instead influenced by institutions (Baumol, 1993).

Finally, the context mechanisms in IS are top down (i.e. government policy) and complex sets of interactions. Meanwhile, in EE the context mechanisms are bottom up (i.e. individual entrepreneurs, firms, communities) and decentralized. Resource endowments and government support is substituted with resource orchestration instead.

Various innovation and entrepreneurship scholars have attempted to explore and interpret EEs with a focus on individuals and firms and with respect to their multi-actor networks. However, it is the fusion of diverse perspectives which has proved to be the strongest asset of EE. At the same time, the fusion of diverse perspectives to EEs as a unit of analysis and their hybrid nature makes the measurement of EE complex (Acs et al., 2014; Stangler & Bell-Masterson, 2015; Isenberg & Onyemah, 2016; Audretsch & Belitski, 2017). Case studies have remained one of the most logical and comprehensive ways to address the genesis of EEs in local contexts (Best, 2015). Although there is some evidence of EE's in European cities and regions (Stam, 2015), there is a lack of case studies in emerging metropolitan areas and in countries adjunct to Europe."

2.2. Complementarity approach to entrepreneurship ecosystem taxonomy

To date, there has been little explicit theorization around EE components and the outcome of EE's (Stam, 2015). Given the ability of entrepreneurs to achieve complex tasks with limited resources, applying the resource-based view to EEs could be helpful in understanding how resources are distributed within an EE. The ability to accumulate and effectively use financial resources across different EE's depends on both entrepreneurial actors' endowment and the contextual factors where entrepreneurs (firms) operate. The interdependency between entrepreneurial actors and financial resource providers could be expressed as functional congruence, with the main function to provide resources for entrepreneurial opportunity recognition and commercialization of ideas. The interdependency between entrepreneurial actors and resource providers (EE stakeholders) on the one hand and the external environment, as represented by entrepreneurial regulations, culture, networks and institutions, on the other hand, can be called strategic congruence. This implies that the design and implementation of a successful EE strategy in a region requires a strategic congruence of an entrepreneurial actor's strengths and weaknesses to the wider contextual factors that may complement each other. Both institutional and individual (firm) levels aim to achieve productive entrepreneurship (Desai et al., 2013; Stam & Spiegel, 2016) as the outcome of EE.

The conceptual model which comprises entrepreneurial culture and networks as well as actors and resource providers embedded within an institutional environment (Autio et al., 2014; Mason & Brown, 2017) can influence complementarities between each component of EE (Szerb et al., 2013; Charron et al., 2014). While individual entrepreneurs respond to external opportunities created by the EE, they are also considered important in the exploitation of opportunities. The opportunities to which entrepreneurs 'respond' may not be exogenous but can also be shaped and created by entrepreneurs (Radosevic & Yoruk, 2013).

The individual dimension of the EE comprises entrepreneurial actors and resource providers such as governments, corporations, entrepreneurs, angel investors and universities (Audretsch & Belitski, 2017; REAP MIT, 2016) who are responsible for creating and commercializing market opportunities. The institutional dimension is represented by regulation for entrepreneurship, networks, entrepreneurial orientation and culture which shapes the mindset of entrepreneurs and affects their responses to the exogenous factors (Autio & Acs, 2010)

The conceptual model of entrepreneurial ecosystem taxonomy and the complementarities between them is illustrated in Figure 1.

INSERT FIGURE 1 ABOUT HERE

The traditional innovation system approach focuses on the components within the innovation systems, such as entrepreneurial actors and institutions (Nelson, 1993; Breschi & Malerba, 1997). We take an EE perspective (Isenberg, 2010) and demonstrate that EE influence entrepreneurship processes through the networks of stakeholders, interdependences and by changing the institutions. Entrepreneurial actors are not independent of each other, but instead support and interact with one another. In order to understand EE functionality we should thus allow for the interactions between stakeholders of EE and their embeddedness into institutional context.

It is unlikely that a region has all components at the stakeholder level and institutional context needed to facilitate the congruence between all components of the entrepreneurial ecosystem taxonomy. Complementarity between taxonomy components can leverage the missing components and result in new entrepreneurial opportunities being recognized and commercialized (Acs et al., 2013)

Highly complementary components create a highly interdependent EE, while mismatched components weaken the EE. Higher levels of congruency among the different components in

the EE lead to higher levels of entrepreneurial opportunity (Figure 1) and more efficient EE's. This resonates with the long-term perspective on economic growth based on complementarities as described by Freeman and Louca (2001) and with Kremer's (1993) O-ring theory of economic development as well as the entrepreneurial propensity of an innovation ecosystem (Radosevic & Yoruk, 2013).

Building on Radosevic (2010), we argue that EE's and entrepreneurial opportunities should be explored from a complementary perspective. This perspective is based on complementarity between the EE components, and can explain how heterogeneous EE's with different combinations of entrepreneurial agents and stakeholders can generate entrepreneurial opportunities and contribute to regional economic development.

Interdependencies between entrepreneurial agents and their embeddedness in institutions (Adner & Kapoor, 2010; Autio et al., 2014) constitute entrepreneurial opportunities. Shane's (2000) three sources of opportunities are technological change, political/regulatory change and social/demographic change. Within these, the complementarity perspective (Radosevic, 2010) can demonstrate that interactions between entrepreneurial agents within an EE constitute technological and market opportunities, while entrepreneurial culture and networks lead to institutional opportunities.

As the degree of complementarity between each of four components of EE is different, it changes the entrepreneurial opportunities and thus the performance of the entire EE.

As one would expect in the ecosystem, entrepreneurial actors are not always connected to each other. In fact, the major difference between an entrepreneurial ecosystem and an innovation ecosystem is that entrepreneurial actors may or may not be connected at all (Baum et al., 2014). Both entrepreneurial actors and institutional environments will create entrepreneurial opportunities (Shane, 2000) that affect entrepreneurial choices.

Our main hypothesis is that EE's are driven by complementarities arising from the interaction of all four components of taxonomy and result in the creation of entrepreneurial opportunities. This perspective is indeed an integration of three views on entrepreneurial and innovation ecosystems: Mason and Brown (2017), Adner and Kapoor (2010) and Radosevic (2010). In each of these views, the EE is the result of different driving factors:

- Mason and Brown (2017): actors, connectors, finance resource providers and entrepreneurial orientation as four elements of taxonomy;
- Adner and Kapoor (2010) and Autio et al. (2014): institutional context, complementarities or synergies;
- Radosevic (2010) on the systemic approach to the entrepreneurial propensity of innovation ecosystems.

In EE's no single entrepreneurship actor can work independently of another actor in addressing customer needs (Williamson & De Meyer 2012). This means that the entrepreneurial ecosystem should include analysis of the complementarity of EE components (Adner & Kapoor, 2010). This is because these four EE components cannot generate entrepreneurial opportunities on their own, but only through their mutual interaction. Accordingly, an EE is able to nurture and exploit the interactions of these four components.

The channels that link the four components with entrepreneurial outcomes in terms of entrepreneurial activities are interactions between components, i.e. complementarities. In general, complementarities are defined as processes (Radosevic & Yoruk, 2013) where two or more components of the taxonomy reinforce each other. More formally, Milgrom and Roberts (1995) define complementarities as situations where doing more of any activity increases the returns of other activities.

The mechanism within an EE is triggered when there is a mutually compatible set of opportunities (Shane, 2000) to be pursued by actors. If there is no mutually compatible set of opportunities, actors will not be able to create opportunities as the EE will not have sufficient

critical mass to emerge. Entrepreneurship activity is a function of stakeholder characteristics along with other systemic features, including the institutional environment.

Fig. 1 depicts the conceptual differences between mainstream and complementarity perspectives on EE. In the mainstream perspective, entrepreneurship opportunities (technological, market and institutional) and new firm formation is explained as an outcome of the framework and systemic conditions (Stam, 2015; Audretsch & Belitski, 2017). In the complementarity perspective, entrepreneurial opportunities are the outcome moulded through complementarities and interactions between the different components of the EE taxonomy. This includes entrepreneurial experimentation by actors, availability of financial capital, networking and the institutional environment that includes entrepreneurial culture.

The conceptual model in Fig. 1 illustrates the logic of our approach by depicting the relationships between the different components of the EE taxonomy. These components shape different combinations of entrepreneurial outcomes which are not exogenous (as in the mainstream approach) but also constitutive of the EE.

Additional support for the complementarity perspective of EE's comes from the economic geography literature, where a region is seen as a space which contains numerous entrepreneurial actors (Kenney & Von Burg, 1999). Changes among entrepreneurial actors may affect how resource providers change the functionality of EE's (Figure 1) as well as how entrepreneurial culture affects the overall strategic congruence between entrepreneurial agent and contextual levels of taxonomy. Both intra-ecosystem changes, contextual factors (Autio et al., 2014) and regional entrepreneurial culture (Stuetzer et al., 2018) affect entrepreneurial behaviour.

3. The case of Greater Reading and research method

Greater Reading is sub-region of South East England which is centred on the River Thames. It is to the west of London and covers the urban areas of Slough/Windsor, Reading in Berkshire and (to the north) Oxford and south Oxfordshire, as well as largely rural Buckinghamshire. This westwards arc of about fifty miles around the western section of the M25 motorway from St Albans to Guildford represents the sweet-spot of post-crisis economic growth in the UK. Within the broad Thames Valley region, Reading (historically the county town of Berkshire) has emerged as a thriving urban area with over 320,000 inhabitants and is the area's dominant commercial centre. Of all the major satellite towns surrounding London, only Reading has emerged as a net commuter destination in recent years. Unlike the economies of Cambridge, Oxford Reading has higher inward than outward commuter trips as it is greatly embedded in London's economy. At the same time Reading has emerged as an important centre to compete with London as a commuter destination in the South-East of England (TVB, 2014).

To date the Thames Valley region with the Greater Reading area at its heart has secured and allocated £182m of UK and European public funds to deliver a wide range of initiatives in the Thames Valley Berkshire area. Alongside London, the area is the UK's economic powerhouse contributing over £37bn in gross value added to the national economy (TVB, 2014).

In order to gain a deeper understanding of the Greater Reading region and thus the complementarity of its EE elements, we approached this study with an interpretivist lens. We decided to follow the REAP MIT (2016) approach and interview seven potential stakeholders of the Reading EE (see Appendix B). Interview questions are provided in Appendix A. Their subjective evaluation of the EE in Reading with respect to their businesses and roles in the region was important as it allowed us to apply the taxonomy. Furthermore, the interpretivist lens of the interviews allowed us to exploit our own expertise within the Greater

Reading region, as well as our access to and understanding of Thames Valley/Berkshire-specific documents obtained for this study.

For this research, we identified and interviewed seven representative stakeholders in the Greater Reading area. Our selection of interviewees used purposive sampling logic, which is the purposeful selection of participants based on their unique characteristics which can “inform an understanding of the research problem and central phenomenon in the study” (Creswell, 2007, p. 125). To maintain originality of thought, we provide verbatim quotes from interviewees which directly speak about the Reading EE and can be used to justify the analytic evaluations we made in this study (Corden & Sainsbury, 2005).

4. Complementarity perspective of Greater Reading’s Entrepreneurial Ecosystem

4.1. Entrepreneurial actors.

In recognition of the role large organisations and multinationals play in Greater Reading’s EE, the ecosystems literature highlights the importance of knowledge spillovers (Napier and Hansen, 2011; Coutu, 2014; Audretsch & Belitski, 2017). These spillovers come from scale-ups, which Mason and Brown (2014) refer to as ‘blockbuster entrepreneurs’, entrepreneurial community, local government and capital generating positive externalities for entrepreneurs firms (Buenstorf & Fornahl, 2009).

Scale-up firms are the most important entrepreneurial actors in the Greater Reading EE. Scale-ups are businesses which have achieved a 20% growth rate year-on-year for the past three years and have an annual turnover of over £1 million (Scale-up Berkshire, 2019).

Start-ups in Reading serve as a role model for other new entrepreneurial firms as well as large incumbent firms in the Greater Reading area, such as Microsoft, Verizon and Cisco.

The Thames Valley Local Enterprise Partnership (LEP) agency was established to promote regional economic development and support scale-ups, and has started focusing more on supporting policies for scale-ups in Reading. Frances Campbell, a Head of Business Environment at LEP, states that “Reading EE is maturing and evolving. It is very fragmented”. In order to decrease the fragmentation, the Business Environment Programme Group was created and given responsibility for the business environment. The Berkshire Local Industrial Strategy (BLIS) has also been developed, where scale-ups are explicitly described as the “drivers” of Reading’s regional economy. Louise Clarke, a head of ConnectTVT business incubator in Reading, adds: “Entrepreneurial actors in Reading are lacking, instead their role is performed by business coaches running programmes, rather than scale-ups themselves”.

The ScaleUp Advisory Group was established to support and advise businesses (Scaleup Berkshire, 2019). The main issue for Reading is that entrepreneurial actors who should be helping EE development are reluctant to change. Sharon Cunningham, director of Santander Bank’s Reading branch, notes “There are many shared office spaces, but actors such as the Chamber of Commerce are still very traditional”. Tom Fox, a C-level manager at KPMG Tech Growth in Reading, said “Connections between actors are not in a great place now”.

4.2. Entrepreneurial resource providers

Reading is closely connected with London and has a number of financial channels for entrepreneurs to build on. Along with debt financing, accelerators are important sources of EE finance in Reading and provide additional support to businesses becoming so-called ‘startup factories’ (Miller & Bound, 2011). These have grown very rapidly in recent years in large cities such as London, Chicago and Berlin (e.g. Y Combinator, Rocket Internet, Barclays Techstars, Innovation Warehouse, Funlab and Wayra). The start-up grid incubator also known as ConnectTVT for business is located in one of Reading’s three international business parks. It

has brought accelerator culture and the ConnectTVT project from large cities to smaller innovation hubs such as Greater Reading.

However, the following issues remain. Louize Clarke, a head of ConnectTVT, states that

We need entrepreneur-led activity and investment in the risky companies who will innovate. We don't have any real incubation in Reading and most of the co-working is more expensive than London. The only affordable co-working spaces are outside of town which are not the best for start-ups who often need to be connected directly into London.

Knowledge spillover and resources are available from software development companies located within Reading, and through debt financing with general lack of equity capital. The Reading Santander Bank branch director highlights the help available for start-ups as "Working capital, asset funding, machinery".

Tim Martin, CEO WorkInConfidence, adds that

More angel networks outside of London are needed, but still not particularly. Non recourse banking capital is the same as everywhere in the United Kingdom, it's non-existent. Crowdfunding platforms – you don't really need to be in an area to tap these VCs and Angels.

This thesis highlights the importance of the digitalization of finance (Cumming et al., 2019) which significantly expand access to capital for distant EEs. Thomas Henderson, head of HSBC branch in Reading confirms it "There is a struggle for funding. I would say it's less than 10 years ago cyclical thing - funding goes up and down Lack of marketing !!! what funding is available is not advertised properly to entrepreneurs and there is a lot of austerity. We also have less state funding (opportunities) than before".

Unlike banks and VCs scale-ups in Reading between themselves have accumulated entrepreneurship financing.

4.3 Entrepreneurial connectors

The Greater Reading EE is characterised by a 'nested geography' with a higher embeddedness in the South East of England area between Oxford and London. It involves multi-scaler interactions with entrepreneurial actors in both cities.

Incubators and accelerators are known as the main "connectors" for EE in city. However, their location relative to transport links is important. Frances Campbell, head of Business Environment at LEP, states that "There are less incubators than in other places. For example, in Bristol, they invested in a LEP and it has been constructed right next to the train station - Engine Shed (university was also involved), We need more hubs of innovation!"

Incubators and co-working spaces may create the information and communication environment needed for all EE actors, in particular incumbents and scale-ups, to enable face-to-face interactions and the co-location of people and firms within the same area (Bathelt et al., 2004).

Tim Martin, CEO of workinconfidence scale-up, adds

Better than most parts of UK we have incubators but still limited. We approached local government about our service to connect us to other actors and they don't respond, while incubators somewhat limited – all offer the same old advice you may not need plus limited access to funding for companies which grow.

“Greater Reading is perhaps the region with the largest numbers of dealmakers” says Jurek Sikorski, head of the Henley Centre for Entrepreneurship. The relational dealmakers are individuals with “valuable social capital, who have deep fiduciary ties within regional economies and act in the role of mediating relationships, making connections and facilitating new firm formation” (Feldman & Zoller, 2012, p. 24). Dealmakers were also described by Napier and Hansen (2011) as a specific type of entrepreneurial connector that facilitates networks. At the same time, entrepreneurial connectors complain about limited collaboration with the local university. Louise Clarke, head of the ConnectTVT business incubator in Reading, laments that: “To date Reading University has largely not wanted to collaborate with our business incubator, but I do see a change with the appointment of a new Commercial Director at the University.” The main reason for this is that EE stakeholders aim to connect to incubation facilities, such as the Thames Valley science park as an extension of University of Reading.

4.4. Entrepreneurial culture

Entrepreneurial orientation and culture is still developing and is distinct from the incumbent firm’s culture. Over time incumbents work as attractors of skilled labour and customers for many scale-ups which have yet to become incubation springboards for entrepreneurs. The development of the software sector triggered the development of diversity and corporate orientation, and not quite entrepreneurial culture as discussed in Mason and Brown (2017). Large multinationals recruited highly skilled workers, some of whom went on to found successful businesses. Frances Campbell argues that “The universities are key to ecosystem culture”, while Thomas Henderson, head of Reading’s HSBC branch, stated: “People seem willing to take risks despite Brexit. The hub of activity is growing and this is how we see the culture”.

The casual inference is that the local area has benefited from the accumulation in local skills and inward investments, as the individuals who left incumbents have then created their own businesses in Reading and London.

Overall this component of the EE taxonomy has remained weak in Reading. Tom Fox, head of the KPMG branch in Reading, believes this is because

The fear of failure is present and people take less risks. They don’t go as big as they wish they did. Academic strength – university of Reading, developing the business culture locally, but definitely there is a prestige for self-employment.

Positive attitudes and understanding the character of a place is missing in the EE, in addition to risk-aversion it is also the perceived lack of regional identity as an entrepreneurial hub of the Thames Valley region.

5. Conclusions

A growing number of policy-makers around the world are actively promoting the systemic approach to entrepreneurship policy. However, adopting the exploratory-based approach when advising policy may be dangerous as it runs ahead of its theoretical underpinnings. In this study we built on complementarity theory to develop a taxonomy which could analyse and compare heterogeneous EEs (Adner & Kapoor, 2010), the entrepreneurial propensity approach to innovation systems (Radosevic & Yoruk, 2013) and the resource-based

approach. Our model can help policy-makers to compare and contrast ecosystems as well as to explain that the complementarity perspective to EE can be used by policy-makers as a location-based tool to bestow entrepreneurial opportunities in places with a mix of available resources.

Our work is particularly valuable for territories that lack one of the four components considered. The role played by these elements within the system could potentially be provided by the complementarity between the components that are in place.

We used a case study of the Greater Reading area in the UK and conducted semi-structured interviews with seven relevant stakeholders in Reading to corroborate our theoretical model. One of our most interesting findings for the Greater Reading EE is that knowledge exploitation by small businesses and scale-ups may take place through a system of complementarities and IT-enabled services (Li et al., 2016).

This study's limitations lie in the lack of a mixed-methods approach in developing the concept, in particular the mix of qualitative and quantitative methods. Further primary data should be collected from a broader range of stakeholders that describe each level of the entrepreneurial action and allow for a greater diversity of resource providers, connectors and corporations. Future research could address this issue by seeking to gain access to primary and secondary data across a variety of entrepreneurial ecosystems. This taxonomy could then be used to compare them and to use the causality approach to link these four components of EE to entrepreneurial opportunity identification, entrepreneurial outcomes and economic growth. Subsequent research will also benefit from natural experimental analysis, whether with one EE within the same country or two or three EEs within several countries with different entrepreneurial policies, institutional histories and cultures of entrepreneurship.

Acknowledgement

We would like to thank Dr. Sara Amoroso, Joint Research Centre European Commission Sevilla, Spain and Dr. Lebene Soga at University of Reading for helpful comments and support at the earlier stage of this project.

References

- Acs, Z. J., Autio, E., & Szerb, L. (2014). National systems of entrepreneurship: Measurement issues and policy implications. *Research Policy*, 43(3), 476-494.
- Adner, R., & Kapoor, R. (2010). Value creation in innovation ecosystems: How the structure of technological interdependence affects firm performance in new technology generations. *Strategic management journal*, 31(3), 306-333.
- Audretsch, D. B., Keilbach, M. C., & Lehmann, E. E. (2006). *Entrepreneurship and economic growth*. Oxford: Oxford University Press.
- Audretsch, D.B., Bönte, W., & Keilbach, M. (2008). Entrepreneurship capital and its impact on knowledge diffusion and economic performance. *Journal of Business Venturing*, 23, 687–698.
- Audretsch, D. B., & Belitski, M. (2017). Entrepreneurial ecosystems in cities: establishing the framework conditions. *Journal of Technology Transfer*, 42(5), 1030-1051.
- Autio, E., & Acs, Z. (2010). Intellectual property protection and the formation of entrepreneurial growth aspirations. *Strategic Entrepreneurship Journal*, 4(3), 234–251.
- Autio, E., Frederiksen, L., & Dahlander, L. (2013). Information exposure, opportunity evaluation and entrepreneurial action: an empirical investigation of an online user community. *Academy of Management Journal*, 56(5), 1348–1371.
- Autio, E., Kenney, M., Mustar, P., Siegel, D., & Wright, M. (2014). Entrepreneurial

innovation: The importance of context. *Research Policy*, 43(7), 1097-1108.

Autio, E., Nambisan, S., Thomas, L. D., & Wright, M. (2018). Digital affordances, spatial affordances, and the genesis of entrepreneurial ecosystems. *Strategic Entrepreneurship Journal*, 12(1), 72-95.

Baum, J., Cowan, R. & Jonard, N. (2014) Does evidence of network effects on firm performance in pooled cross-section support prescriptions for network strategy? *Strategic Management Journal* 35, 652–667.

Bathelt, H., Malmberg, A., & Maskell, P. (2004) Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation. *Progress in Human Geography*, 28(1), 31–56.

Baumol, W. J. (1993). Formal entrepreneurship theory in economics: Existence and bounds. *Journal of business venturing*, 8(3), 197-210.

Best, M. H. (2015) Greater Boston’s industrial ecosystem: a manufactory of sectors. *Technovation*, 39, 4–13.

Bowen, H., & De Clercq, D. (2008). Institutional context and the allocation of entrepreneurial effort. *Journal of International Business Studies*, 39(1), 1–21.

Buenstorf, G., & Fornahl, D. (2009). B2C—bubble to cluster: the dot-com boom, spin-off entrepreneurship, and regional agglomeration. *Journal of Evolutionary Economics*, 19(3), 349–378.

Charron, N., Dijkstra, L., & Lapuente, V. (2014). Regional governance matters: Quality of government within European Union member states. *Regional Studies*, 48(1), 68-90.

Clarysse, B., Wright, M. & Van Hove, J. (2015) A look inside accelerators. London: Nesta

Corden, A., Sainsbury, R. (2005). Verbatim quotations: Whose views count? *Qualitative Research*, 1(1), 4–6.

Coutu, S. (2014, August 1). The scale-up report on UK economic growth. Retrieved <http://www.scaleupreport.org/scaleup-report.pdf>

Creswell, J.W. (2007). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*, Thousand Oaks: Sage Publications.

Cumming, D., Meoli, M., & Vismara, S. (2019). Investors’ choices between cash and voting rights: Evidence from dual-class equity crowdfunding. *Research Policy*, 48(8), 103740.

Desai, S., Acs, Z. J., & Weitzel, U. (2013). A model of destructive entrepreneurship: Insight for conflict and postconflict recovery. *Journal of Conflict Resolution*, 57(1), 20-40.

Eckhardt, J.T., & Shane, S.A. (2010). Industry changes in technology and complementary assets and the creation of high-growth firms. *Journal of Business Venturing*, 26 (4), 412–430.

Freeman, C., & Louca, F. (2001). *As Times Goes By: From the Industrial Revolutions to the Information Revolution*. Oxford: Oxford University Press.

Feldman, M., & Braunerhjelm, P. (2006). The genesis of industrial clusters. *Cluster genesis: Technology-based industrial development*, 1, 1–13.

Feldman, M., & Zoller, T. D. (2012). Dealmakers in place: Social capital connections in regional entrepreneurial economies. *Regional Studies*, 46(1), 23-37.

Granovetter, M. S. (1973). The strength of weak ties. *American journal of sociology*, 78(6), 1360-1380.

Hung, S. C., & Whittington, R. (2011). Agency in national innovation systems: Institutional entrepreneurship and the professionalization of Taiwanese IT. *Research Policy*, 40(4), 526-538.

Isenberg, D. J. (2010). How to start an entrepreneurial revolution. *Harvard Business Review*, 88(6), 40–50.

Isenberg, D., & Onyemah, V. (2016). Fostering scaleup ecosystems for regional economic growth (innovations case narrative: Manizales-Mas and Scale Up Milwaukee). *Innovations: Technology, Governance, Globalization*, 11(1-2), 60-79.

- Kenney, M., & Von Burg, U. (1999). Technology, entrepreneurship and path dependence: industrial clustering in Silicon Valley and Route 128. *Industrial and corporate change*, 8(1), 67-103.
- Kremer, M. (1993). *The O-ring theory of economic development*. *Quarterly Journal of Economics*, 108, 551–575.
- Levie, J., & Autio, E. (2011). Regulatory burden, rule of law, and entry of strategic entrepreneurs: an international panel study. *Journal of Management Studies*, 48(6), 1392–1419.
- Li, W., Liu, K., Belitski, M., Ghobadian, A. & O'Regan, N. (2016). e-Leadership through strategic alignment: an empirical study of small-and medium-sized enterprises in the digital age. *Journal of Information Technology*, 31(2), 185-206.
- Marshall, A. (1890). *Principles of economics*. London: Macmillan.
- Malerba, F., & Breschi, S. (1997). Sectoral innovation systems. In C. Edquist (Eds.), *Innovation System* (pp. 130-156). London: Edward Edgar.
- Mason, C., & Brown, R. (2014). Entrepreneurial ecosystems and growth oriented entrepreneurship. *Final Report to OECD, Paris*, 1-38.
- Mason, C., & Brown, R. (2017). Looking inside the spiky bits: a critical review and conceptualisation of entrepreneurial ecosystems. *Small Bus Econ*, 49, 11–30.
- McMullen, J. S., & Shepherd, D. A. (2006). Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. *Academy of Management review*, 31(1), 132-152.
- Miller, P., & Bound, K. (2011). *The startup factories*. London: NESTA.
- Milgrom, P., & Roberts, J. (1995). Complementarities and fit Strategy, structure, and organizational change in manufacturing. *Journal of Accounting and Economics*, 19(2), 179–208.
- Napier, G., & Hansen, C. (2011). *Ecosystems for young scaleable firms*. Copenhagen: FORA Group.
- Nelson, R. (1993). *National Innovation Systems: A Comparative Analysis*. New York, NY: Oxford University Press.
- Phan, P. (2004). Entrepreneurship theory: possibilities and future directions. *Journal of Business Venturing*, 19(5), 617–620.
- Radosevic, S. (2010). What makes entrepreneurship systemic? In F. Malerba (Eds), *Knowledge-Intensive Entrepreneurship and Innovation Systems* (pp. 52–76). Routledge.
- Radosevic, S., & Yoruk, E. (2013). Entrepreneurial propensity of innovation systems: Theory, methodology and evidence. *Research Policy*, 42(5), 1015-1038.
- REAP MIT (2016, June 3) Regional Entrepreneurship Acceleration Programme MIT. Retrieved from <https://reap.mit.edu/>
- Scaleup Berkshire (2019, January 20). Business Growth Hub. Retrieved from <https://www.berkshirebusinesshub.co.uk/scaleup-berkshire-programme>
- Shane, S. (2000). Prior knowledge and the discovery of entrepreneurial opportunities. *Organization Science*, 1(4), 448–469.
- Spigel, B. (2017). The relational organization of entrepreneurial ecosystems. *Entrepreneurship Theory and Practice*, 41(1), 49-72.
- Stangler, D., & Bell-Masterson, J. (2015). Measuring an entrepreneurial ecosystem. Kauffman Foundation. March 2015.
- Stam, E. (2015). Entrepreneurial ecosystems and regional policy: a sympathetic critique. *European Planning Studies*, 23(9), 1759–1769.
- Stam, F. C. & Spigel, B. (2016). Entrepreneurial ecosystems. *USE Discussion paper series*, 16(13).

- Stuetzer, M., Audretsch, D. B., Obschonka, M., Gosling, S. D., Rentfrow, P. J., & Potter, J. (2018). Entrepreneurship culture, knowledge spillovers and the growth of regions. *Regional Studies*, 52(5), 608-618.
- Sullivan, D. M., & Ford, C. M. (2014). How entrepreneurs use networks to address changing resource requirements during early venture development. *Entrepreneurship Theory and Practice*, 38(3), 551–574.
- Szerb, L., Acs, Z. J., Autio, E., Ortega-Argilés, R. & Komlósi, É. (2014). REDI: The Regional Entrepreneurship and Development Index–Measuring regional entrepreneurship Report for the European Commission Directorate-General Regional and Urban Policy under contract number 2012. Retrieved from <http://www.projectfires.eu/wp-content/uploads/2017/07/>
- TVB (2014, October 10). Thames Valley Berkshire. Delivering national growth, locally, Strategic Economic Plan 2015/16 – 2020/21. *The Evidence Base*, p.2.
- Williamson, P. J., & De Meyer, A. (2012). Ecosystem advantage: How to successfully harness the power of partners. *California management review*, 55(1), 24-46.

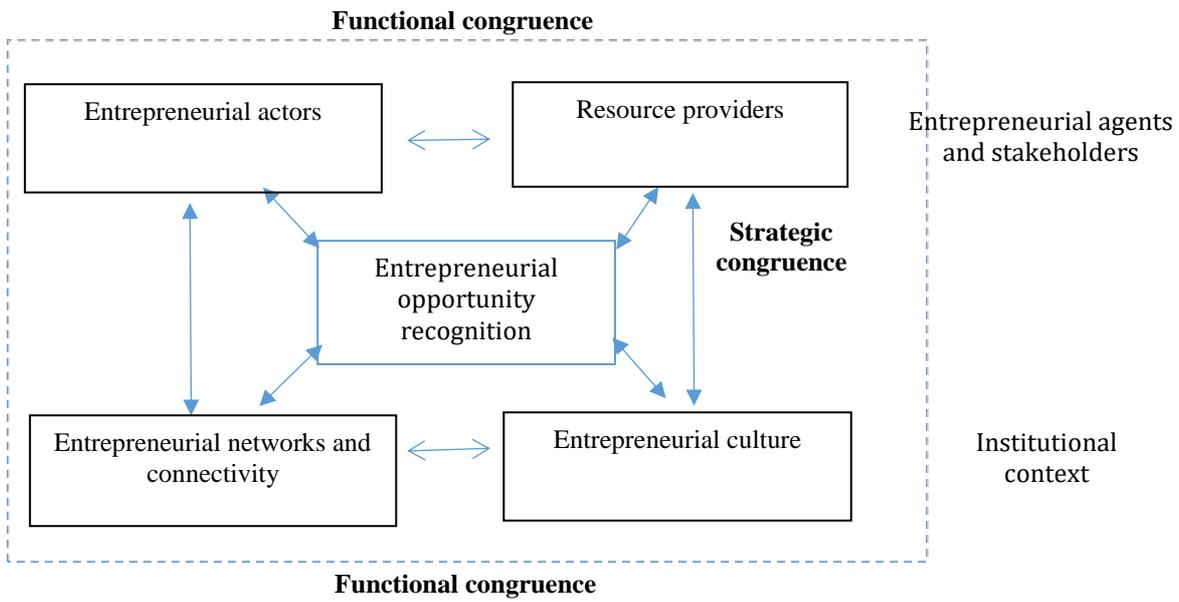


Figure 1. Complementarity perspective of Entrepreneurial Ecosystem Framework

Source: Authors

Appendix A

Interview protocol establishing the Entrepreneurship Ecosystem framework

Questions	EE Taxonomy element	Indicative reason	Justification from the literature / study objective
How has your location in the Thames Valley been of influence for your business?	Entrepreneurial orientation	Broad answer expected for analysis. Might include EE elements.	Economy of place literature.
How has the presence of other businesses in the Thames Valley influenced you and your business? Any role models?	Entrepreneurial actors		A show of EE element interaction. <i>Role model question targeted as per argument in the paper</i>
How would you describe the development of entrepreneurial actors in Reading (such as incubators, local and national government, Chamber of commerce, IKEA, serial entrepreneurs)	Entrepreneurial actors+ Connectors	Answers to show who does mentoring services, what is government programs support, incubation activity	Paper's objective; we argue that not all EE components must necessarily be present
How would you describe the development of entrepreneurial resource providers?	Financial resource providers	Answers to demonstrate the role of large firms, crowdfunding platforms, R&D centres, equity (angel and VCs), banking capital in funding ideas	Understanding resources to entrepreneurship.
How would you describe the development of entrepreneurial connectors?	All	Answers here expected reveal investment - investee matching, entrepreneurship and business clubs, university-business school networks	Paper's objective
How would you describe the entrepreneurship culture in The Thames Valley?	Orientation and culture	Answers to confirm prestige of self-employment, role models, entrepreneurship education	Addresses one element of the EE; culture.

Source: Authors.

Appendix B

List of Expert Interviewees

Full Name	Role in the company	Company	Company description
Frances Campbell	Head of Business Environment	Thames Valley Berkshire LEP	Thames Valley Berkshire Local Enterprise Partnership is a business-led, multi-sector partnership mandated by government to lead activities that drive local economic growth.

Louize Clarke	Director	Connect TVT	The vision for ConnectTVT was to give an amplified voice to the innovative companies in the Thames Valley through a rich events programme.
Sharon Cunnington	Branch Director	Banco Santander	Santander Bank UK Ltd (financial services to business and entrepreneurs)
Thomas Henderson	Branch Director	HSBC	Bank (financial services to business and entrepreneurs)
Tom Fox	Senior Manager	KPMG Tech Growth	KPMG is a network of professional service firms and one of the Big Four auditors
Tim Martin	CEO	WorkInConfidence	WorkInConfidence is a scale up that delivers solutions which help organisations and stakeholders to connect. (IT communications)
Jurek Sikorski	Head	Henley Centre for Entrepreneurship	University of Reading – business and educational services