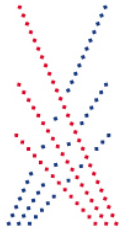

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Title:

Organising for Open Innovation in an Innovation Ecosystem

Abstract:

A range of factors have been eroding the logic of standalone internal R&D for several decades. Particularly, the increasing complexity of knowledge and the quest for its exploitation have favoured the ubiquitous development of networked activities (Iansiti and Levien 2004) and resulted in the shift of companies' innovation practices. In this framework, open innovation and innovation ecosystems have gained popularity as tools to explain and organise the understanding of an increasingly distributed and inter-dependent innovation process (see among others: Autio & Thomas 2014; Adner, 2017; Oh et al., 2016). In line with this literature, this work looks at how open innovation is managed within innovation ecosystems and specifically at the differences emerging between companies using OI for competition alone (e.g.: to pursue internal strategies for market positioning); and companies using OI as a cooperation/collaboration framework to engage with their innovation ecosystem (e.g.: to create networked systems of knowledge sharing). In doing so, we use interview data from a sample of 137 UK & IE companies and apply Qualitative Comparative Analysis (QCA) techniques to understand mechanisms and processes of firms' activities associated to their inbound and outbound practices of open innovation and how such practices are used to establish a position in their innovation ecosystem.

The concept of innovation ecosystems has emerged at the juncture of strategy, innovation and entrepreneurship literatures (Gomes et al., 2016) and builds on the well-established recognition that innovation increasingly takes place at the borders of a firm and results from the interactions between multiple organisations and actors. These observations stem from consolidating open innovation (OI) views, and in particular the OI focus on use and provision of external ideas by firms to improve success in innovation and the models and strategies for achieving this (Huizingh, 2011). Although open innovation is one particular mechanism of multi-organisation innovation, its ideas are increasingly being integrated into a wider 'ecosystems' conceptualisation of innovation that seeks to explain and understand related inter-dependencies and the co-evolution of knowledge, competencies and competitive advantage in particular regions, industries and value chains.

Recent criticisms (e.g. Oh et al. 2016) and attempts to apply ecosystem thinking to empirical data (e.g. Rao and Jiminez 2011) have highlighted that the ecosystem literature is at a hiatus in which a metaphorically persuasive and popular idea has taken root, but has not been significantly extended or developed by ensuing theoretical or empirical interrogations. Therefore, this paper aims to help extend our capacity for theoretical reasoning and empirical evidence in the field of innovation ecosystems, by empirically examining the organisation of open innovation in an innovation ecosystem.

The nascent ecosystems literature consists of a number of overlapping sub-types including 'knowledge', 'business', 'entrepreneurial' and 'innovation ecosystems', which have arisen due to the popularity of the ecosystems analogy in various fields of scholarship on multi-actor assemblages (Gulati et al. 2012; Muegge 2013). In all of these uses we see scholars building from concepts including value chains, networks, clusters, hubs and platforms to describe and explain the incidence of inter-organisational and contextual dependence and fuzzy organisational boundaries, and the related mechanisms and structures for creating and exploiting new knowledge, value, entrepreneurship and competitive advantage. However, recent criticisms (e.g. Oh et al. 2016, Rao and Jiminez 2011) have highlighted that the ecosystems literature although building a persuasive conceptual narrative it is still lacking systematic theoretical or empirical interrogations.

In order to fill this gap, we first reflect on the OI and ecosystem using the analytical distinction between ecosystem as structure and ecosystem as affiliation made by Adner (2017), in combination with the closed versus open ecosystems differentiation illustrated by Rao and Jiminez (2011). We then adopt this novel framework to analyse primary data collected by means of in-depth interviews with UK and Irish companies and examine their adoption of practices of open innovation in relation to their position in the innovation ecosystem and draw conclusions on the emerging patterns of OI within the ecosystem landscape.

Ecosystem as structure/closed ecosystem

Business ecosystems cross traditional industry boundaries, and a defining feature is that actors involved co-evolve capabilities around particular products or services, which may or may not be innovative (Moore, 1996). Companies obtain value from these ecosystems when they are not capable of commercialising a product/service relying solely on their own competences (Lin et al., 2010; Adner, 2006); or they provide entrepreneurial firms with the knowledge/resources needed to navigate in a constantly changing competitive environment (Zahra and Nambisan, 2012).

Adner (2000; 2006; 2013; 2017) and Adner and Kapoor (2010) propose that a ecosystems as structure start with the identification of a company positioning and the consideration that innovation success often depends on accompanying changes in the firm's environment and even

innovation on the part of other actors. This is involves other 'business ecosystems' groups such as suppliers, distributors, manufacturers, technology producers, and customers (Rao and Jimenez, 2011). Hence, there is a strong link between the ecosystem as structure approach and the idea of value networks, e.g.: groups of companies that simultaneously create value by combining their skills and assets for existing customers (Normann and Ramirez, 1993; Eisenhardt and Galunic, 2000). The value creation logic that is used in innovation ecosystems is less linear than in the traditional value chain literature, and contains actors from outside the value chain (Iansiti and Levien, 2004), representing nested commercial systems of 'coopetition' (Christensen and Rosenbloom, 1995; Stabbel and Fjeldstad, 1998) and incorporates horizontal linkages and networks that facilitate collaboration and re-combinations of specialised capabilities (Autio and Thomas, 2014). However, the structural approach is very clearly aligned with the idea that an innovation ecosystem is based around a value proposition and the set of actors that need to interact to bring it into being (Adner, 2017).

The role of large or 'focal' companies is typically emphasised in structural approaches as they possess the means and influence to act as orchestrators of ecosystem emergence and sustainability (Valkokari, 2015) and to create alignment structures between the actors involved (Adner, 2017). Smaller companies, divisions or public research institutes are typically organised around this focal firm or platform, which influences the trajectories of all involved (Iansiti and Levien, 2004; Thomas et al., 2014). This perspective is referred to by Autio and Thomas as the "network embeddedness" theme in innovation ecosystems research, meaning that the emphasis is on structural and relational aspects between partners and the pre-requisites and constraints on the actions of and advantages accrued by each (2014: 215-218). The focal actor does not have to be a large private firm. Indeed, according to Clarysse et al., (2014) 'business ecosystems' include the demand side of innovation as it includes customers, and innovation ecosystems conceptualise both production and user side activities associated with innovation (Autio and Thomas, 2014). Regardless of the focal institution, this type of ecosystem is an intentional community (Moore, 2006) that is consciously managed in that it relates to concrete firms activities like alliance portfolios (Overholm, 2015) and strategies determining firm behaviour, value creation and value capture (Priem et al., 2013). In these ecosystems then, the focus on a clear value proposition or customer means that common objectives or values and alignment between organisations is likely (Nambisan and Baron, 2012).

Accordingly, in the structural account of innovation ecosystems, the core concerns of the members are multi-lateral partner alignment; means of maintaining the ecosystem position (Adner, 2017; Ozcan and Eisenhardt, 2009; Hallen and Eisenhardt, 2012; Wincent et al., 2010); or access to the related flow of resources, including knowledge (Yli-Renko et al., 2001), and a focus on trust and norms (Autio and Thomas, 2014). The focal organisation, is typically at the top of the value chain and we can assume they control at least some of the access to markets or the end customer relative to other members of the ecosystem (See Adner and Kapoor, 2010 and Rao and Jiminez, 2011 for two examples of studies that position innovation ecosystems in this way but do not make the control element completely explicit). This gives the focal organisation a position of power, and also means that membership of structural ecosystems is not open-ended but restricted to those involved in the joint value-creation effort (Adner, 2017). As relationships in these types of ecosystem are intense interactions between complementary partners, we are likely to see members building relational assets to facilitate smooth transactions and collaborations (Dyer and Nobeoka, 2000) and to manage opportunism and the hazards of dependence (Autio and Thomas, 2014). This type of strategic interaction setting is often characterised by greater specialisation and outsourcing (Jarillo, 1998) as firms have a greater awareness of their comparative advantage.

However, change can alter the balance of relationships and create adaptation challenges (Halinen et al., 1999). Therefore some ecosystem thinkers argue that an organisation must retain the capacity to solve innovation challenges on its own to be an effective ecosystem player (Overholm, 2015; Adner and Kapoor, 2010; Main and Garnsey, 2006). Additionally, the focal firm's ability to create value of innovation is impacted differently depending on whether the innovation challenges sits upstream or downstream in the value chain. Where the innovation challenge a focal company is trying to resolve is upstream, the advantage from technology leadership increases via increased opportunities for learning and reducing the likelihood of imitation, whereas if the challenge lies downstream with complementors, i.e. it prevents the customer from using the innovation to its full potential, this advantage disappears reducing incentives for active ecosystem management (Adner and Kapoor, 2010).

Ecosystem as affiliation/open ecosystem

Another approach to ecosystems uses more fluid and dynamic language to describe constellations of actors engaged in exploration and exploitation (which may be informed by societal needs) which uses mechanisms like venturing, open innovation, off-shoots and spin-outs to explore and exploit opportunities. For example Ritala et al.'s (2013) conceptualisation of innovation ecosystems includes a definition based on clusters of innovation activities relating to certain themes like software. Adner summarises this interpretation as communities of associated actors, defined by their networks and platform affiliations, and cites its origin as the acknowledgement that innovation strategy was required to move beyond the consideration of rivals to include dependencies; an emphasis on the breakdown of traditional industry boundaries, and the potential for symbiotic relations in production (2017). The interpretation in Li and Garnsey (2014) links this type of ecosystem to encouraging new sources of innovation by coordinating knowledge flows, making the necessary resources available and introducing entrepreneurial activities into established industries or sectors. It might be organised within a specific territory or regions where the mechanisms of venture capital, legal services and universities represent the finance, legal and R&D departments of an "exploded corporation" (Stam, 2014). Thus, despite the looser groupings of diverse actors, there is an assumption that the logic of action is geographically proximate (e.g. see Valkokari, 2015).

This assumption is probably the result of the roots of affiliation-based accounts in ideas from knowledge production and 'knowledge ecosystems': a term used to describe knowledge creation, dissemination and use across government, higher education and public research institutions, industry and civil society (Carayannis and Campbell, 2009). In this perspective, innovation performance comes from combining different sources of knowledge that are dissimilar enough to create transformative new creations, but not too different that it is hard to bridge i.e.: they are organised at an optimal cognitive distance (Nooteboom, 2000). So for example, accounts of how geographically clustered organisations benefit from their locations highlight the intensity of linkages and the mobility of people and knowledge between different players to facilitate collective learning and increase the speed of diffusion, which again emphasise proximity and distance (Almeida and Kogut, 1999; Baptista, 1988; Jaffe, 1986). Examples or cases also typically come from industries where R&D alliances are good predictors of the commercial potential of the company (Rothaermal and Deeds, 2004), like bio-technology which are focussed on accruing knowledge in a form that can be sold (Clarysse et al., 2014).

Ecosystems as networks of affiliated organizations resonate with multiple recent contributions (e.g., Autio & Thomas 2014; Jacobides et al., 2015; Rong & Shi, 2014). One interpretation of the role of this type of ecosystem is to facilitate partnerships, alliances and open innovation to compensate for the absence of vertical integration – i.e. where value chains are not present and the value

proposition is not immediately obvious (Li and Garnsey, 2014; Chesbrough, 2003). Here, the strategy is to increase the number of actors attached to the ecosystem to increase its power and centrality and the bargaining power of the focal actor (Adner, 2017 citing Brandenburger and Nalebuff, 1996; Jacobies et al., 2015) and to increase the system value through network externalities, i.e. increasing the number of customers able to access the innovation (direct externalities) or by increasing the number of complementary technologies (indirect externalities) (Rao and Jiminez, 2011; Parker et al., 2016). Furthermore, attaching a greater number of actors to an affiliation-based ecosystem increases the opportunities for serendipitous interactions creating new combinations of knowledge and new sources of value (Adner, 2017).

Data & Methods

The data used in this analysis cover a sample of 137 UK and Irish companies and come from a larger EU-scale project that sought to examine innovation practices in innovation-driven sectors broadly defined as agri-food, biopharmaceutical, clean-technology, ICT and manufacturing. The sampling strategy adopted a combined approach building on Pavitt (1984) and Castellacci (2008) taxonomies of innovative companies in order to provide an organic representation of value chain dynamics while offering a robust coverage of the different stakeholders in the ecosystems at hand. Accordingly, information were collected by face-to-face and telephone interviews and complemented with publicly available data. The semi-structured interviews addressed questions relating to the business environment; mapping and monitoring activities in the external environment; the innovation ecosystem; and current innovation management practices.

Methods

Given the exploratory nature of the research question, this works employs Qualitative Comparative Analysis (henceforth: QCA) to look at the patterns of adoption of open innovation practices within innovation ecosystems. QCA is a qualitative method that allows a deeper understanding of causal relationship arising from case-oriented analysis in the social sciences (Ragin 1987; 2000). QCA is suitable for mid-sized samples and for qualitative information that would be dichotomised by a probabilistic approach of data analysis. Instead, QCA develops a framework were cases are compared according to their degree of membership following Set theory and Boolean logic. Hence, instead of degrees of correlation to variables, QCA looks at the multiple sets of membership across cases and their explanatory pattern in relation to the outcome. As cases are attributes to sets, it is possible to conceptualise unions and interactions across them and connect results to the elaboration of typologies of action/behaviour in the case studies (Kvist 2007). This in turn support the unveiling of causal relationships by indicating whether there exist necessary and sufficient conditions in relation to an event or adopted practice.

Main variables & preliminary results

According to the literature outlined above, we identify by mean of text analysis two sets of attributes: one associated to ecosystem as affiliation and the other associated to ecosystem as structure.

We adopt a definition of ecosystem as affiliation where networks of firms group around a focal actor, they are dependent upon each other for mutual effectiveness, and the overall strategy is to increase the number of actors linked to the focal actor/platform to augment power and overall system value as well as the likelihood of encounters that lead to innovation (actor focussed). Accordingly we select for the analysis characteristics associated to OI-open ecosystems defined by distributed and flat relationships, use of alliances, mergers and acquisitions as interaction

mechanisms to absorb new knowledge, expand the ecosystem boundaries and/or develop flexible and customised innovations.

We define ecosystems as structure starting from their capacity to offer a strong value proposition and accordingly seek to identify the set of actors and their interactions. The main strategy in this framework is about creating structural alignment between actors and securing the role of the focal actor in the (competitive) environment, via multi-lateral alliances and defined set membership (mostly activity focussed). Accordingly we developed an OI-closed ecosystems involving coordinated and controlled membership, use of vertical integration as interaction mechanism to produce reliable innovations that are integrated with existing products/services.

Preliminary results indicate that companies configure their practices differently depending on whether their ecosystem is characterised by affiliation versus structure dynamics. In particular, a different role emerges in relation to different ecosystem stakeholders' involvement (such as supplier and customers as well as regulators and research institutions). On the other hand the strength of position within the ecosystem (highlighted by alliances, mergers, new technology development) are necessary conditions to structure the ecosystem.

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