Knowledge Sharing and Innovative Corporate Strategies in Collaborative Relationships: The Potential of Open Strategy in Business Ecosystems

Anna Wulf(✉) and Lynne Butel

Plymouth University, Business School, Mast House, 24 Sutton Road, Plymouth, PL4 0HJ, UK
Anna.wulf@plymouth.ac.uk

Abstract. Knowledge is a central resource in gaining competitive advantage. Sharing of knowledge between partners in collaboration has been an important research focus in the area of strategic management. In different collaborative structures, the determinants and capabilities knowledge sharing differ, as do the strategies employed, the positions taken and the roles played. The following conceptual work provides an insight into how knowledge is shared between partners, how knowledge is influenced by the partners' environment and their capabilities; depending the position they take and the roles they play.

Keywords: Networks · Business ecosystems · Competition · Collaboration · Knowledge sharing · Open strategy

1 Introduction

The topic of collaboration between companies and firms working in a network of interconnections is popular for many years now [1–4]. Resource sharing and exchange is a major reason for collaboration between partners [5]. Knowledge as a central resource to build competitive advantage and develop innovative ideas [3, 4] is considered to be the key resource for cooperation between partners [5]. When analyzing network governance and firm governance mechanisms, as well as network characteristics, the question arises if knowledge between partners can be similarly shared as knowledge within companies [6]. Similar to mechanisms in companies, knowledge between partners is shared through formal and informal relations [7]. Formal relations can be governed in a different way from informal relations and underlie distinct knowledge sharing mechanisms [7, 8]. Companies acting in networks maintain different partnerships and different relations, depending on the industry structure as well as the position fulfilled within the network [9, 10].

In this work theories about knowledge sharing within organizations, formal and informal knowledge sharing mechanisms [11, 12], knowledge sharing in networks and governance mechanisms of networks [3, 13, 14] are conceptualized by addressing findings from a combined business ecosystem and network theory approach, in order to further develop the understanding of knowledge sharing. The resource based view and resource exchange between firms determined by the type of relationship maintained [15],

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structural and relational embeddedness of the social capital perspective [16, 17] is also employed. This conceptual approach to knowledge sharing is new as the combination of business ecosystem theory and network theory helps to define and explore knowledge sharing mechanisms and capabilities in certain network environments, which influence and are influenced by the distinct roles and positions within networks.

2 Methodology

This paper provides a conceptual approach to different theories about inter-organizational relations, detecting similarities between approaches and combining them to provide a new conceptual approach network theory [18]. The paper is uses theoretical and conjectural writing to formulate new constructs to allow advanced thinking [19]. This paper offers a new approach and a new way of conceptualizing knowledge sharing amongst organizations, which has not been addressed in previous literature [18]. It is founded in the combination of business ecosystem and network theory literature and synthesizes the existing ideas to produce a new conceptual model or framework [18, 20]. In this way a new insight into the widely acknowledged issue of knowledge transfer and competitive advantage is developed [20]. Furthermore, it can be seen as a certain research strategy that contains subjectivist and interpretivist elements often driven by an author's approach to theory [20]. Conceptual research uses data, gained mainly from existing knowledge and concepts by detecting new contexts and relations [18, 20] and is defined by a topic rather than by a certain method [20, 21]. Conceptualizing research and rebuilding existing theories through a conceptual approach is very important and complements empirical research [22]. Theoretical contribution in conceptual research means that the work must offer valuable insight into the phenomenon and advance the knowledge related to it [23] by combining knowledge rather than data [24].

This study aims to re-conceptualize common elements in research of networks by philosophical conceptualization, in order to link them to Business ecosystem theory and explain the need of identifying different roles and strategies of companies acting in different network environments and stimulate theory development in that area.

3 Knowledge Sharing in Networks

Collaborative relationships often develop in order to share resources [15, 25] and mutually develop innovative ideas in order to gain competitive advantage [3]. Consequently, firms acting in collaborations cannot be understood without understanding structural and relational mechanisms in their networks [15]. Networks are seen as being neither traditional markets nor hierarchies [26]. Hierarchies such as organizational structures have different knowledge sharing mechanisms from networks and are totally different structures [12, 14]. Organizational theory investigates the mechanisms taking place within organizations that are driven by hierarchical structures and bureaucratic processes [13, 27]. Network structures lack the coordination function that organizations have [13]. As networks are neither market nor hierarchies [27] they have different governance mechanisms that contrast with normal market and pure hierarchy mechanisms [28].

"Network governance overcomes these problems (of bureaucracy) by using social mechanisms rather than authority, bureaucratic rules, standardization, or legal recourse [28]." Consequently, collaborative relationships cannot only be seen as networks but also as constructs that are determined by structural and relational factors influenced by organizational theory [12, 27, 29, 30] as well as social and business network theory [3, 14, 15, 31, 32].

Furthermore, when investigating resource exchange between different partners, the resource based view plays an essential role to explain the distinct incentives to collaborate in networks [15]. This view helps to explain resource dependency, core competencies and the importance of reaching competitive advantage [25]. Knowledge is considered to be the most important resource as it enables firms to develop new capabilities and innovative strategies [3, 13, 32, 33] and therefore plays a vital role in collaborative relationships [34]. Knowledge creation, assimilation and transfer is seen as a key capability which in turn is essential for building competitive advantage [35]. Knowledge sharing within networks cannot be done by the same mechanisms as within hierarchical structures. Hierarchy as a bureaucratic system typically relies on rules, routines and directive for authority execution but hierarchy can also be used for information and knowledge passing [33]. Networks lack these mechanisms completely or partly, depending on their network structure, and have to be governed by social network mechanisms [15] when formal mechanisms are not at present. This means that networks can be structured by formal [14] and informal relations [15]. Depending on the type of relationships maintained by the single firm of the network, different resource exchange mechanisms take place [3, 32, 36]. Grant recognized three alternatives for knowledge transfer and integration in order to share knowledge related resources which he explained to be "internalization within the firm, market contracts, and relational contacts [13]." Resource exchange in formal relations is based on saving transaction costs and enabling activities within the value chain of the company [14] which is a strong formal structure determined and controlled by formal and informal relations [13, 14, 32]. Resource exchange in social network refers to the social embeddedness perspective [37] and social capital perspective [38, 39]. Network structures are in fact the way relationships are build up [14]. Often knowledge sharing and transfer activities across intraorganisational boundaries are shaped by both, formal and informal relations [7] as it is determined by the type of relationships the company maintains [3, 32, 36].

3.1 Formal Structures, Informal Structures and Knowledge Sharing

Different researchers and different research streams concentrate on different aspects of knowledge sharing in hierarchies and networks. Summarizing the above, knowledge sharing mechanisms can be influenced by strong hierarchical formal structures as well as informal structures determined by social mechanisms.

Formal relations in networks are related to bureaucratic structures as they are common in organizational structures. Not all networks have the same governance mechanisms, therefore the ability of a single firm to access and share knowledge within a network, cannot be explained completely by formal governance mechanisms such as in hierarchies [27, 28]. Nevertheless, networks can, depending on their structural

characteristics, be formed by formal contractual relationships [40]. As explained above, knowledge sharing in bureaucratic structures is different when compared to knowledge sharing in socially determined environments. The less hierarchically a network is structured, the less bureaucracy it contains and the more social mechanisms are governing the network [28]. Companies acting in a very structured and controlled network have strong governance mechanisms and they are often adapted to relatively stable conditions being a more mechanistic type of organization. The organization used to a changing environment, and less able to control its network partners, is a more organic type of organization [41]. These company and network structures will again influence the company culture, its ability to collaborate and the ability to share knowledge [12]. Hierarchy can be useful for information and knowledge passing [33] as information and knowledge sharing in hierarchies is not based on mutual information exchange due to existent authority relations [33]. In order to incorporate the knowledge gained the organization need to learn through new development and routine [33] and tacit knowledge can often be found in such routines as they are repetitious and highly patterned [42].

As described above informal relations, their type and their structure play a vital role in networks. Jarillo for example used the structural and the relational perspective to explain different structures in strategic networks [14]. The same structural approach can be taken when looking at different network structures from a social capital perspective coming from a social network background [15]. This perspective refers to a structural and relational embeddedness perspective of social and informal structures explaining resource exchange and co-creation between firms and how structural and social links between firms can enhance resource exchange determined by trust as well as a shared vision [15, 43, 44]. In order to analyze the relational setting between firms again a structural and relational dimension needs to be taken [15]. Inkpen and Tsang introduced the structured- unstructured dimension to explain different types of relationships in a network [45]. Shafique related the type of embeddedness of the firm directly to its ability to access knowledge and reach diversity and establish linkages to the knowledge base of other firms believing a greater variety of knowledge offers more possibilities to gain new knowledge [46].

Structural embeddedness refers to the degree of centrality of the company within the social network and the informal structures it acts in [47–49]. This in turn is influenced by and influences the number of informal relations and the type of informal relations maintained. Strong ties are determined by strong mutual and frequent interactions [15] which are maintained over time. The structural embeddedness of the firm [36, 47, 48] also corresponds to the view of open and sparse networks [16] and closed networks [17] defining the structure of different relationships as close or open relations [16, 17]. Not only the structural dimension is important, especially when looking at informal relations as they are not governed by hierarchical mechanisms, but by trust, mutuality and frequency of interaction [12, 30, 36, 48]. When looking at relational embeddedness, the degree of interaction and the amount of trust becomes essential which is identified by researchers to differing degrees in strong and weak ties [34, 50, 51]. The social capital perspective corresponds very strongly to Burt's, Granovetter's and Colemann's concept of strong and weak ties as well as to their closed and sparse network perspective [16, 17, 37]. Strong ties are characterized by a strong interaction, with the facilitated sharing

of information and tacit knowledge [34] as the partnership is based on a mutual and deeper understanding. Network members are dependent on each other and develop trust [50]. Strong ties are also characterized by strong social control methods [51]. Weak ties, described by Granovetter as 'local bridges' [37] are not that strongly connected but more likely to deliver new information and knowledge. Weak ties therefore relate to Burt's idea of structural holes [52]. A sparse structure, observed between weak ties allows access to new and previously undetected knowledge [16]. The same refers to McEvily's and Zaheer's concept of bridging ties, as they refer to structural and relational aspects as well [53].

Some researchers tend to explain business relationships with social mechanisms. Social relationships and social mechanisms are important to develop ties and governmental structures in informal relations and they are essential for the facilitation of knowledge sharing. However, interpersonal ties differ from interorganisational ties [48, 52] as they differ from formal structures that are governed by contracts and stronger hierarchical mechanisms [12].

3.2 Network Governance and Knowledge Sharing

Summarizing the above, structural determinants in terms of formal and informal relationships are maintained as well as relational determinants referring to the degree of embeddedness of social networks can be identified as being important influencing factors to the ability to govern the network and access knowledge.

The number of formal and informal relationships in networks affects the degree of influence among network partners as formal relations can be regulated by contractual and hierarchical relations [48]. In comparison to a bureaucracy the influence and regulation is less, still it is determined by formal requirements [14]. In the same way the influence changes between partners, depending on formal and informal relations and the ability to access knowledge differs as it cannot be accessed in the same way. Explicit knowledge is easy to access and use, whereas tacit knowledge is nearly impossible to access, but only usable and learnable within its context [54, 55]. For example by learning its routines and by application [33] which makes it transfer slow, costly and uncertain [54] and which also requires strong and reliable relationships which can be either passed on a contract and hierarchy or strong informal relationship [56]. Especially tacit knowledge is rooted in procedures, norms and rules which can only be shared over time by learning from network members [57]. Therefore, specialized and tacit knowledge can be found in learning mechanisms and routines [33, 42] non-specialized and less codified knowledge in less authority based relations [3, 32, 33].

Research also found that, in clusters, proximity facilitates the exchange of tacit based knowledge and experience and can replace formal relations [58]. This corresponds to the embeddedness perspective focusing on the type of informal relations, where direct and strong ties are seen as being closely linked to the organization whereas indirect ties and weaker ties are more remote and not that close to the network [36, 47, 48, 59]. Here again the amount of influence differs by type of relationship and therefore has an impact on the knowledge shared between partners. Direct ties or dyadic ties [59] are highly influenced by solidarity, cooperation [60, 61] and trust [36]. Trust can be seen as a key

factor influencing relational embeddedness fostering collaboration and knowledge sharing [48]. Another important aspect is the degree of commitment of the partners, the overlapping of objectives and maintenance effort put into the relationship [48]. Granovetter as well argues that intensity and intimacy within a network can have strong effects on resources exchanged [37]. In his concept about relational embeddedness he differs between strong and weak ties, first being strong relationship characterized with trust and detailed information exchange [34, 50, 51]. Strong and weak ties as well as direct and indirect ties therefore again describe the degree of influence partners have on each other and in turn affect the type of knowledge shared.

When looking at Burt's and Coleman's concept of structural embeddedness the degree of influence between partners becomes again important. Coleman argues that strongly embedded and closed network structures are superior to more open networks [17, 62]. Densely embedded networks with many connections and well developed social structures are seen as 'closed networks' or 'closed communities' with stronger rules of interaction [17]. Having a better control of the outcome of the network and a more structured communication, the social capital in such closed network is more beneficial and can be better used than in open networks [5, 17, 62].

Burt sees more benefits offered by networks that are not densely tied to each other which offers a greater variety and a more open approach to networks, being sparse networks [16]. Grant as well argues for as well a wider set of linkages to profit from organizations [13]. The diversity reached by collaboration can help companies to get more and diverse knowledge for an innovative use of knowledge [47, 63]. This approach to networks as open networks [5] is named sparse [52] or for example disconnected network structure [5].

The unstructured dimension refers primarily to the centrality of certain members within a network, making clear member roles and relationships possible in a very structured and centralized network and a more diffuse structure without clear tasks in an unstructured and decentralized network [13, 14, 45]. Therefore centrality and openness of the network, as well as the type of relationships among partners highly influences the mechanisms of network governance and knowledge sharing [5, 15, 28, 52]. Some researchers have investigated governance mechanisms and the type of knowledge exchanged. Sawhney and Nambisan for example differ between a centralized governance structure, determined by formal structures and hierarchical mechanisms and a community led structure being influenced by informal structures [64]. From their view, knowledge space can either be less defined and unstructured, therefore suitable for knowledge exploration [57] or very well defined and specialized suitable for exploitation [57, 64]. This knowledge in turn can be access differently depending on the structure and relations the company is acting in [57].

Summarizing the above, structural and relational determinants influence the degree of formal or informal governance mechanisms and therefore as well the mechanisms of network governance and knowledge sharing [5, 28, 52]. Networks determined by strong formal structures can act more like bureaucracies [28] exchanging knowledge differently from networks determined by more informal relations [3, 14, 32]. The degree of informal and formal relationships also refers to a more open or closed network [14, 40] comparable to Burt's and Coleman's approach to open and closed networks coming from the

social network perspective and the degree of relational and structural embeddedness [16, 17, 43]. Therefore, the degree of social embeddedness and the openness of the network in terms has a strong influence on network governance mechanisms. Furthermore, the degree of openness, structural and relational embeddedness is in turn dependent on the environment that influences network structure [11, 40].

3.3 Network Structure and Its Environment

Gulati referred to networks as relational models that do not see organizations as atomistic firms but as participants embedded in closely connected industry structures that influence the nature of competition [61] and highly influenced by its dynamic environment. The influence of the environment can either be the industry or technology the company is in or its evolutionary stage which in turn influences if the network is stable and mature or unstable and developing [11, 40]. For example, perceived uncertainty in industries can hinder innovation especially in the first stage of innovation [65] and especially in early stages of innovation a great stock of knowledge can help to reduce uncertainty [66] which in turn requires different relationships to gain that knowledge than in stable environments [11].

Depending on the environment the company is in, being 'stable or variable [67]', 'low or high velocity [68]', within 'smooth or abrupt development [69]' the challenges are different [70] as well as the knowledge required [36]. This requires a more holistic view of companies acting in networks and how the networks are shaped by the environment as well as the knowledge sharing mechanisms maintained by certain actors within the networks [9, 71].

Therefore, the environment of the network can significantly influence the type of relationships maintained and the structure of the network within the industry. This again can be explained by the amount of influence needed among network partners within certain industry environments. Adner and Kapoor see the challenges faced by companies in networks relative to the position of the network in industry and the challenges the industry holds for the network [70]. Furthermore, network resources are distributed heterogeneously in networks [15], so the access to the resources can be determined by the type of relationship and the structure of the network [72]. Central positions for example seem to have a beneficial position for resource exchange, information and knowledge sharing [73–76]. Companies acting in networks can only access the resources that are available through their patterns of ties which implies that some positions in networks might be superior in knowledge sharing as they offer a different access to ties [52, 62, 77]. Network position can also influence firm behavior and outcomes [5].

Summarizing the above, network environment and network structures are determined by environmental dynamics influencing as well positions taken within networks. Business ecosystem theory focuses not only on environmental influencing factors but also on positions and strategies taken in different network surroundings.

4 Business Ecosystem Theory

Business ecosystem theory addresses the reaction of companies to a stable or fast changing environment [70] as well as the importance of certain network positions [9] and their network capabilities [11]. Business ecosystem theory couples the changing environment with the organization acting within the ecosystem, which means that external variety within the ecosystem environment also leads to internal diversity of network structure and the structure of the individual organization [78]. Therefore business ecosystem theory refers to the structural and relational dimension described above, seeing organizations as being embedded in a network of ties and social relations [61, 79] with different structural properties [16, 17] or tie attributes [37] depending on the environmental influences.

4.1 Business Ecosystems as Networks

"The business ecosystem perspective offers a new way to obtain a holistic view of the business network and the relationships and mechanisms that are shaping it, while including the roles and strategies of the individual actors that are a part of these networks [71]." Business ecosystems can be seen as open systems in which companies mutually interact with each other in order to exchange resources [80, 81]. The terminology and idea of business ecosystems come from biological systems [82, 83] and subscribe the interdependency of ecosystem actors performing different roles in order to keep the community healthy [80, 84]. Business ecosystem theory therefore offers a new perspective to approach interacting network partners and their behavior [85] being bound together by a mutual aim or a shared vision [9]. Overall, the biological metaphor was introduced to describe the idea of firms acting within and being dependent on its environment in order to meet today's challenging demands to the single firm [85]. The view of a single isolated firm acting in a market or industry between and against its competitor is complemented here by a network approach, seeing firms as being mutually dependent [63], co-evolving with each other [82, 86–88].

When investigating what authors did in terms of ecosystem structure the first aspect is the type of relationships that are maintained in business ecosystems and in what structure they are organized. Iansiti and Levien point out that: "The robustness and long-term dynamism achieved by these networks in nature highlight their power. Moreover, the specific features of theses ecosystems- their structure, the relationships among members, the kinds of connections among them, and the differing roles played by their members-suggest important analogies for understanding business networks [9]". Both authors also advance that the balance of relationships, how they are tied to each other, how the ties look like and how exactly the members are dependent on each other should be investigated further [9].

Seeing organizations embedded in network structures helps to explain resource and knowledge sharing mechanisms, still it misses the heterogeneity aspect that inherits any organization and any network. Every organization is shaped by its capabilities, abilities and structure and is therefore better or less able to access and share knowledge on the basis of its capabilities [87]. Furthermore, it inhabits a certain position of structural and

relational embeddedness, with a number of ties in a dense or open network. All these differences point out that not every organization profits the same way of being embedded in network structures and that the ability to share knowledge must depend of many individual factors. Research on embeddedness has been focused on networks acting as a whole and not on what single actors can achieve or contribute within the network [48]. The focus has been to explain behavior and outcomes of networks rather than certain positions [48, 77, 89, 90].

Network resources are distributed heterogeneously within the networks and enable different access to different positions [77]. The social capital perspective already refers to the difference between actors in terms of their structural and relational embeddedness, still difference of single actors within the network remain unclear [48, 91].

4.2 Knowledge Sharing in Business Ecosystems

Business ecosystem theory investigates different roles and positions taken in a network of collaborations as well as how business ecosystem structure can influence the positions and roles fulfilled [9]. Business ecosystem structure and the position of certain players within it again influences the relationships maintained between the partners and vice versa [11, 40]. The ability to share knowledge between partners in turn, is influenced significantly by the partnerships maintained and available within the business ecosystem and the way the connection is characterized [7]. Knowledge sharing as a resource exchange and the capability to share knowledge on the level of the single company is therefore highly dependent on the environment it is in, the position and role it takes within a network, the relationships it maintains and its own characteristics [7, 9–11, 40]. Depending on knowledge sharing capabilities, companies develop the potential of their open approach and consequently their open strategy differs. The degree of openness refers here to the structural and relational openness determining the degree and type of knowledge shared in order to gain competitive advantage and generate innovative business strategies [3, 4, 92]. Therefore, as already explained above, business ecosystem theory shall help to outline how company environment, position and roles taken and relationships maintained can influence the way knowledge is shared and what kind of knowledge is shared between partners by referring to network theory and clusters, business ecosystem theory and knowledge sharing mechanisms approached from a resource based view perspective.

As described above, resulting from differences in structure and relations, not all actors within a network can fulfil the same role or occupy the same position within a network of players. This brings up the idea of different roles in business ecosystems, which has been introduced by Iansiti and Levien as well. “Perhaps the most important one is that the structure of biological networks is not homogenous […] [9].” The roles identified by both authors refer to certain strategic roles that some authors define as ecosystem strategies [93]. Iansiti and Levien identified Keystones, Dominators, niche players and hub landlords as possible roles, which might vary or change over time [9]. The roles are explained as follows: “[…] active Keystones whose interests are aligned with those of the ecosystem as a whole and who serve as critical regulators of ecosystem health […] embodied in a special member of the system or encoded in universally

agreed-to protocols, rules, and goals- that enhances stability, predictability, and other measures of system health by regulating connections and creating stable and predictable platforms on which other network members can rely [9]." Niche players in turn are often located at the edge of the ecosystem, to bring in new ideas and innovations, whereas dominator and landlords specialize to extract value and resources out of their business ecosystems [9].

In network theory centralization is defined by the concentration of links around a focal point [29] that is why hubs are also often called focal companies [31]. Therefore a hub or focal point is located in a central position within the network as it has more connections to network members than the other firms in the network so its positions is relative to the other members [73]. The focal firm can then decide to play a dominator role or a Keystone or even a niche player role, when it is building up its ecosystem [11]. For ecosystem structures roles seem to play a vital role for the way how interconnections are build up, relationships are maintained and structured. The roles seem not be fixed to certain network positions but seem to change over time with the evolution of the business ecosystem [11, 40]. Critics of the roles explained by Iansiti and Levien are that they focus on firm level strategy rather than business ecosystem level and that the transformation and evolution of roles has not been investigated [85].

Not only the roles played are important but also the relationship between the roles play are vital to be recognized as the interactions for co-evolvement may be competitive, co-operative or co-opetitive [78]. Co-opetition means competitive cooperation [94]. The relationship between the roles is therefore as important as the role itself as it influences the development of the system itself [95] and it enables the single firm to think about its own strategic movements [10].

4.3 Ecosystem Roles and Knowledge Sharing Capabilities

As Keystones fulfil a value distribution strategy and Niche Players a value creation strategy [95] within their business ecosystem, these two most important roles shall be explained below. The physical size of a Keystone is relatively small in comparison to the population of firms within that business ecosystem [9, 88]. In order to maintain their connections and be able to distribute value, Keystone often introduce a platform of interaction for all partners of the business ecosystem [95]. The distribution of value is not an altruistic strategy but is done for the purpose of growing the own business together with the business ecosystems being the firms most important environment [9, 82, 88, 96, 97].

The platform architecture highly influences the architecture of the ecosystem, this is why a Keystone organization must consider future changes and challenges when enhancing interaction and value sharing [88, 98]. This means that poor control mechanisms and poor exchange mechanisms that do not enhance the exchange between niche players bringing in ideas for Keystones or that do not support the ability of the Keystone to communicate its needs can harm the health of a business ecosystem [9, 88, 97]. This is as the exchange of value is vital to attract new players to the ecosystem and enhance its development [82]. Niche Players usually opt for specialization that encourages them to innovate in order to maintain a sufficient level of differentiation compared to the other

actors, therefore ensuring their survival. However, if platforms represent opportunities that offer access to certain resources to which they can add value through new services, they can also be construed as threats to their own survival. Indeed, if they are too generic, their services may be incorporated into the platform by the Keystone as a way for it to enhance its own value proposition [95]. Additionally, Niche Players compete within their own sub-industry in order to be able to offer the better product [88]. "[…] it is precisely this competition that keeps the ecosystem healthy: Without Niche Players who understand and exercise this leverage, ecosystems will be less healthy than they could be and may fall into sickness if their Keystones loses sight of its role [9]." Niche Players are more effective when they are independent venture as they are better in integrating new ideas and innovations as they look for them across boundaries rather than within the own boundaries [10].

Keystones and Niche Players not being aware of the structure of their business ecosystem, the network governance mechanisms in place and the organization structure necessary to face the requirements can do great harm to the health of the business ecosystem [9, 88, 97].

5 Discussion

This conceptual work combines findings from network and business ecosystem theory in order to understand the importance of the sole actor within a certain network environment influencing the whole network ecosystem. The description of Keystones and Niche Players in Business ecosystem theory relates to certain roles played in an ecosystem depending on certain positions occupied [95]. Research on network theory and network structures has concentrated on the degree of embeddedness of companies [6] rather than on the roles and positions played within networks [9] and how these roles are influenced by formal and informal relations as well as centralized and decentralized networks.

When combining network and business ecosystem theory it becomes obvious that knowledge sharing capabilities are very much influenced by the structural and relational embeddedness of the Keystone and the Niche Player [16, 17, 47–49] as well as their organizational fit to the business ecosystem requirements [9]. Depending on the degree of hierarchies in the network, the location of the Keystone as a central firm in between formal relations, being less embedded and in between formal and informal relations being highly embedded the ability to share knowledge differs [64]. The same applies to the organizational requirements set by the environment of the business ecosystem as well as the organization's capabilities to share knowledge [12]. So far, network embeddedness has been researched from a network level perspective focusing on network as a whole and not on the role of the sole actor [48]. The focus has been to explain behavior and outcomes of networks rather than certain positions [48, 77, 89, 90]. Firm strategy and its capabilities are determined by its position within the network and this in turn is influenced by the relationships maintained and the network environment. Figure 1 below describes these influencing factors and their impact on network governance mechanisms.

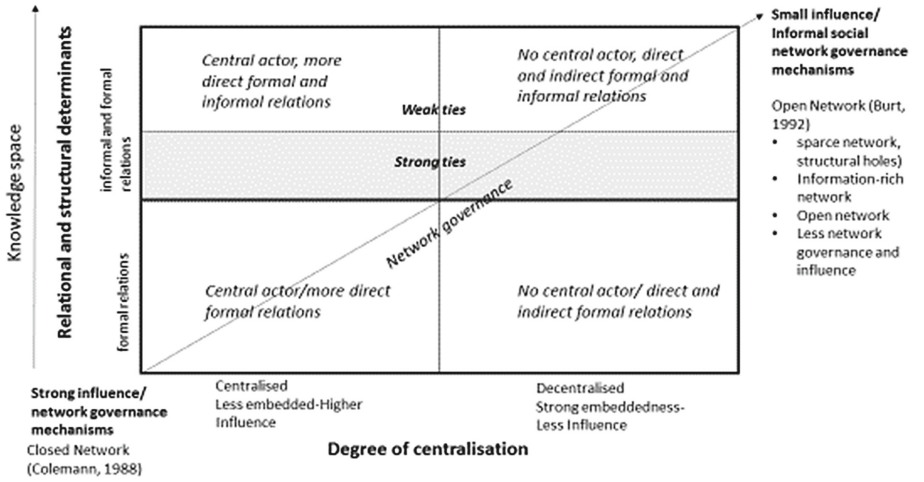

Fig. 1. Changes in network governance depending on the business ecosystem structure (own figure). The figure shows that Keystones in more closed networks need to have different knowledge sharing capabilities than Keystones in more open network structures. Their ability to access knowledge needs to be different as well, as tacit knowledge is accessed differently than explicit knowledge (see Sect. 3).

As explained above in Sect. 3 formal and informal relation determine the type of relationships maintained as well as the degree of structural and relational embeddedness. This in turn influences the degree of centralization of actors, all being influenced by the environment the network acts in. This influences again relations the actors can maintain and the position they are in and the way their organization structure is build up being more organic or mechanistic [41].

Central positions in controlled and closed network seem to better able to access knowledge as the control is higher [73–76] but this does not automatically mean that the knowledge accessible is the knowledge needed to create innovative strategies or competitive advantage. Relations in closed networks are build up differently than in open networks and enable a central firm to play a dominating role in terms of knowledge shared [99]. Less controlled and open networks can reach a higher diversity and a greater variety of linkages [46] and knowledge exploration instead of exploitation [57, 100].

Keystone and Niche Player strategy therefore need to be adjusted very well to the relationships available in their business ecosystem, the position they are in and consequently the strategy they follow. The same applies for their knowledge sharing strategy and other capabilities [53, 77]. This is, as the position again influences the possibility to develop different knowledge based capabilities [47]. Figure 2 shows the relation between knowledge available, openness of network and network governance mechanisms in place.

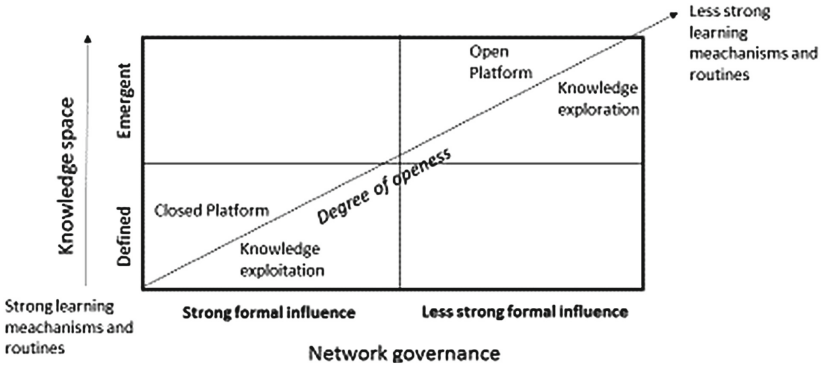

Fig. 2. Business ecosystem structures, platform openness, network governance and knowledge space (own figure)

A Keystone position might be superior in accessing knowledge as they are supposed to be deeply connected to the other actors of the network [52, 62, 77, 78] in order to drive the ecosystem [9]. Still, their capabilities and their knowledge sharing strategy needs to differ by the relationships available and maintained [7, 9–11, 40] and consequently their approach to open strategy and the knowledge accessible differs [101]. Business ecosystem theory is a broader approach to network theory that enables the company to act with its broader environment and be more open in terms of company boundaries. When there is to make strategic sense of that openness, the mechanisms of knowledge sharing in certain network environments [102] and in certain network positions as well as the capabilities required to share knowledge need to be understood. This study aims to make a first step into the direction of a concept for knowledge sharing determinants in network environments and for certain positions to meet strategic fit [103]. The next step is the investigation of knowledge sharing capabilities of Keystones and Niche Players and the influencing factors of network relations and structures within the network they act in.

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