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Open Innovation in Networks:

Building a Network Perspective and the Role of Firm in Networks

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Abstract

Open innovation in networks has been a popular topic for long, this paper rethinks the concepts of innovation network and network organization, and clarifies the differences between them based on the network perspective. Network perspective means that: network is the context of firms; market and hierarchy can be analyzed from a network approach. Within a network perspective, there are different levels of network, and a firm may not always has the power to “manage” innovation networks due to different levels of power. Based on the strength of a firm’s power, its role may varies from manager, to orchestrator, coordinator, and then to participator and adaptor.

Key Words

Open Innovation, Network Perspective, Network Organization

Introduction

In the past, firms organized R&D internally and relied on outside contract research only for relatively simple functions or products (Powell et al., 1996). More recently, open innovation theory has been promoted by Chesbrough, et al. (Chesbrough, 2003; Chesbrough et al., 2006), analyzing a new organizational innovation which targets at utilizing both internal and external innovation resources to advance their technology and capabilities. Open innovation theory assumes that “knowledge is widely distributed, and that even the most capable R&D organizations must identify, connect to, and leverage external knowledge sources as a core process in innovation” (Chesbrough, 2003; Chesbrough, 2006, pp: 2). Since firms can not rely entirely on their own technology capabilities, they can enter other firm’s market by many ways, such as licensing, strategic alliances, joint ventures, and can develop new market by technology spin-offs. All these ways refer to an open and networking way of innovation, and indicate that open innovation is naturally in line with networks.

Innovation in networks has been a popular research topic among all innovation theories. Not only open innovation, but also national systems of innovation, triple helix, and user innovation are taking “network” into account. Along with the transition from close to open, open innovation scholars suggest innovating companies to set up and manage interorganizational networks, knowledge networks, or value constellations not only to tap into external technology sources in the early stages of an innovation project, but also to commercialize new products successfully (Chesbrough, et al., 2006, pp: 205-258). Gelsing used the concept of industrial networks as a description of sub-systems of national innovation systems (Lundvall, 2010, pp: 119). Etzkowitz (2002) used network of innovation, networked incubators to discuss the relationship between university, industry and government. von Hippel (2004) discussed

horizontal innovation networks and user communities. Other than innovation researchers, scholars in business, marketing, organization and sociology are all talking about “network”. Gereffi et al. (2005) characterized five types of global value chains, within which modular, relational and captive value chains are networks rather than linear chains. International Marketing and Purchasing (IMP) scholars hold an interactive and networking view of business, marketing as well as R&D (Ford, 2002; Håkansson and Laage-Hellman 1984; Håkansson, 2006; Håkansson, et al., 2009), i.e. “No business is an island”. Child (2001, 2005), Scott and Davis (2007), Mile and Snow (1986, 2011), as well as many organization scholars have noticed and conceptualized so called “network organization”.

Generally speaking, innovation networks can be viewed as loosely coupled systems of autonomous organizations. A focal firm can construct or engage in innovation networks with universities, customers, innovation intermediaries, competitors, and governments. The network forms foster learning, represent a mechanism for the attainment of status or legitimacy, provide a variety of economic benefits, facilitates the management or resource dependencies, and provide considerable autonomy for employees (Chesbrough, 2003; Child, et al., 2005, pp: 145; Podolny and Page; 1998).

However, among all the researches on innovation networks, we can easily find that scholars hold different understandings of network and network organization though they are using the same word. Different types of networks and definitions make us feel confused and couldn't help wonder: “what is a network organization?” Also, from the open innovation theory, we can see that the understanding of network relies on many other theories, and the concept of innovation network is always regarded as granted. In order to answer the research question, the author will carry out an inductive research based on massive researches. In line with the discussion on network organization, this paper will move forward to build a network perspective for open innovation. In the open innovation theory, a focal firm can construct an innovation network with both deep and wide ties to enhance its ability of exploration and exploitation. To cope with the network, the focal firm should try to “manage” these ties as well as maximizing returns from knowledge outflows (See Chesbrough, et al., 2006, pp: 232-234). The author argues a focal firm may not always have the ability to “manage” its network due to limitations of its power and ability. Thus, this paper will build a model to integrate different levels of networks, the power of the focal firm and the firm's different roles, and then the model will be supported by one case.

Building a Network Perspective

In terms of innovation network, more literatures remain on the interorganizational level. Then, one question will be: “What is outside a focal firm's network?” One answer may be market. Traditionally, a firm's environment is given, but another way to think is to regard the firm as a proactive actor which can join in the construction of business environment through networking with others. Basically, network can be understood and analyzed from different levels, i.e. inter-personal, intraorganizational, and interorganizational. Here, the author will introduce another understanding, i.e. network as a

context, which means seeing network (or a web of relationships) as a business context or environment that firm lies in rather than a neoclassical market (Johanson and Vahlne, 2009).

Vanhaverbeke accepts this thinking and proposes that the external environment is no longer an exogenous variable, and other firms are no longer enemies but potential partners holding unique knowledge (Chesbrough et al., 2006, pp: 205). To a focal firm, it is facing a network of business relationships which provides it with an extended knowledge base, and its networking process can be seen to a large extent as learning and building trust and commitment through networks and within a network environment (Kogut, 2000; Johanson and Vahlne, 2009). Moreover, these are no clear boundaries between different levels. Inter-personal social networks can be both inside and among firms. An R&D unit can act as an intermediate between TNC's internal global R&D network and local R&D network in host country, so the intra- and inter-organizational networks are overlapping. Besides, they are all inevitably influenced and constructing a broad network context (environment).

Based on this understanding, the author disagrees with Williamson (1991) who takes network as an intermediate form between market and hierarchy, and Powell (1990) who regards network form is separated from market and hierarchy. Here, the author believes that market and hierarchy can be seen as extreme cases of networks and can be analyzed under the logic of networks (Burt, 2000). Podolny and Page (1998) argue that it is wrong to make a trichotomy among market, hierarchy and network, because each market actor is a node with rather loose or no ties with other actors, and a hierarchical organization can be seen as a centralized network in which most or even all ties flow to one central node. Following this thinking, it is not difficult for us to understand: why some networks are rather horizontal and some are quasi-hierarchy but still called "hierarchical network" (See Burt, 2000; Powell, 2001); and why a dynamic network organization is characterized by internal market mechanism (Miles and Snow, 1986).

In conclusion, here we conclude that this paper accepts the network perspective, i.e. network is the context of firms; market and hierarchy can be analyzed from a network approach. For a focal firm's open innovation, theoretically every organization or individual can be partners, and also it is possible for the firm to be networked locally or globally.

Network and Network Organization

So far, this paper has established a network perspective. However, within innovation network literatures, some of them are "networks", and some are "network organizations", so when can we call a network as an organization? Borgatti and Foster (2003) regard this as a linguistic chaos, i.e. some scholars think all firms should transform from separated organizations to networks; while confuse those who think organizations as a combination of networks. Thus, this section will try to clarify the differences between network and network organization.

There is no consensus about the definition of network, based on different focuses there will be different definitions. A network can be simply defined as a combination of nodes and ties (Scott and Davis, 2007, pp: 278). Nodes can be actors such as people, groups, organizations, or other entities such as ideas or resources. Ties can be physical linkages to contractual or personal relationships. An organization is a social structure created by individuals to support the collaborative pursuit of specified goals (Scott and Davis, 2007, pp: 11). It requires defining objectives, control and coordination by rules or incentives, resource allocation; selection of participants, etc. Thus, network organization is one type of “network” with the characteristics of an “organization”, i.e. a social combination of actors and relationships with the aim of achieving certain goals and guided by certain rules. Podolny and Page (1998) define a network form of organization as “any collection of actors ($N \geq 2$) that pursue repeated enduring exchange relations with one another and, at the same time, lack a legitimate organizational authority to arbitrate and resolve disputes that may arise during the exchange.”

More simply, a network organization is always more formal than a network. From this definition, we can see that there are two basic criteria to identify a network organization from networks, i.e. goals and rules. Here, we can make a typology based on four levels of networks (See Table 3), i.e. interpersonal, intraorganizational, interorganizational, and network context.

	Network	Network organization
Interpersonal network	Social network, friendship, kinship	User innovation community
Intraorganizational network	Internal knowledge network	TNC’s structure, project teams, business units, subsidiaries
Interorganizational network	Industrial clusters, and some quasi-organizations (“blade.org”, federations, consortia)	Innovation project network, modular network, a focal firm’s ego network, value chains
Network context	Global business environment	\

Table 1. Network and network organization in different networks.

Within all kinds of interpersonal network relationships, there are some informal ones that build on trust or genetic connection, e.g. friendship or kinship networks. These interpersonal networks are social networks and can not be regarded as an organization. There are some formal interpersonal networks based on contract or regular rules, e.g. employment relationships and expert committee. These can be seen as an organization or at least an important part of an organization.

An intraorganizational network, basically internal networks of firms, are usually based on formal employment contracts and managed by routines. No matter hierarchical structures or flexible teams, no matter head quarter in home country or globally distributed subsidiaries and units, they all share a common goal, which is to enhance the performance of the firm, so it is easy to understand that a firm’s intraorganizational network can always be regarded as an organization made up of a network of smaller organizations. However, a firm’s information and knowledge flows and networks, are networks

that are flexible, hard to control and without a clear goal, thus they are merely networks rather than organizations.

Interorganizational networks can take massive types. Usually, a project innovation network or a modular network coordinated by one firm can be always seen as a quasi-organization, because they are coordinated based on common goals and some formal arrangements to ensure the success and punctuality of the innovation project. In line with this thinking, captive, relational and modular value chains are also network organizations constructed by different firms with the aim of adding value and coordinated by a focal firm (Gereffi et al., 2005). Besides, dyadic, triadic, or multiple strategic alliances are also network organizations, because they are build on trust, and when carrying out innovation projects they will have a agreed coordination. However, when researching on networks like “blade.org” and geographically concentrated clusters, can we still call them network organizations?

In Snow et al. (2011)’s article, “blade.org” is an innovation network but also been regarded as a “multiform network organization”. Here, the author can only partly agree. “Blade.org” is a relatively closed community constructed by strictly selected innovative members, and it is coordinated by IBM with little authority inside. Thus, it definitely shows some formality. However, the goal of IBM is to develop a better way to communicate and generate new knowledge, and the goal of members is to develop different innovation products with different members through temporarily constructed innovation networks. As a result, here we can’t say there is a specific goal of the “blade.org”, but to some extent it looks like a quasi-network organization that definitely can be analyzed through a network perspective. Similarly, some industry consortia or federations are multiform networks that can be seen as quasi-organizations as well since firms inside usually hold regular meetings and agree on some routines.

A firm with in an industrial cluster usually enjoys prosperous knowledge spillovers and motivated by the synergy of network effects, so here the cluster itself is a context where the firm embedded in (Reddy and Rao, 1990). Though Reddy and Rao (1990) even think this context is an organization, i.e. they propose that “industrial market as an interfirm organization”, the author still think that an industrial market or clusters can hardly been called an organization since it lacks a clear common goal. Thus, in order to avoid confusion, all network contexts or environments can not be seen as network organizations.

One thing to emphasize is that, there is not a clear cut between network organization and network since the former is part of the latter, so when to use network and when to use network organization is based on specific research topics. If the research focus is the network structure as well as the content, goal, coordination mechanism, then it is more likely to view a network as an organization.

Components of a Network Organization

In this section, the author will discuss in detail the key components of a network organization. As mentioned before, a network organization is a social combination of actors and relationships with the aim of achieving certain goals and guided by certain rules. Here, the author proposes five key components of a network organization, i.e. actors, resources (complementarity and similarity), commonality, activities (protocols), and infrastructure.

Without actors, there will be no organization. In a network organization for innovation, actors are basically innovators and the network can be called as “networks of innovators” (see DeBresson and Amesse, 1991; Freeman, 1991; Powell and Grodal, 2005). Here we don’t consider physical objects as actors, but only consider actors such as individuals, groups of individuals (such as user communities), units of firms, firms or other organizations (such as NGO, government, university, intermediary); groups of firms or organizations (such as guild, federation, small networks). Actors are the most important part in a network organization: resources are embedded in either individual or organizational actors, and will generate different relationships among actors; an actor in a network organization is no longer “rational” and “opportunistic”, but shares common goals with others and at least willing to free reveal some of its resources; all actors’ activities should be guided by an agreed protocol; all actors’ activities rely on certain infrastructure.

According to resource-based view (Wernerfelt, 1984; Barney, 1991) and knowledge-based view (Grant, 1996), one reason for the formation of innovation networks is searching for valuable resources especially knowledge. Many literatures emphasize searching for complementary resources and few talks the advantages of homogenous resource base. However, here the author thinks similar resources are also needed. Similar knowledge provides a base for mutual understanding and the possibility to generate synergies. Examples are industry federations or clusters. Also, resources from different actors are networked as well, e.g. knowledge network. As knowledge is the most strategically important firm's resource (Grant, 1996), network organization provides a context where knowledge network among actors is embedded in, and also make it possible for actors to access not only explicit knowledge but also tacit knowledge of other actors. Thus in terms of network organization, the competitive capability is also embedded in the network level rather than single firm level.

On the other hand, according to resource dependency theory (Pfeffer and Salancik, 1978), resources will also generate different relationships and will also determine the content of network organization. Thus, if actors share similar knowledge, there will be clusters, consortia or federations among them; if one actor processes critical resource which the other one needs, there will be captive relationship between them; if actors share highly specialized knowledge, there will be a modular network organization; if both actors processes complementary resources, there will be relational or reciprocal interdependence between them.

Actors should share some commonality, which means that different actors should have a common goal though they may also have their own agenda. As mentioned before, without a common goal, there will be a network rather than network organization. Besides a common goal, a network organization may also need activities to combine, develop, exchange, or create resources by utilizing other resources (Ford, 2002, pp: 147). All activities are guided by certain protocols (rules) otherwise they will not be accepted by other actors. The last component of a network organization is the infrastructure. Here, infrastructure can be physical, such as meeting rooms, offices, buildings, and highways; and can be virtual, such as internet, information systems, video conference and telephones.

Can You Manage a Network Organization?

We may have heard these words many times, i.e. management, orchestration, coordination, participation and adaptation, but what are the differences between them and how do they refer to open innovation in different networks? In organizational and managerial papers, “control” and “management” are always referring to the organizing of functional or divisional hierarchical firms. In terms of a firm’s internal network, it is still possible to “manage” it as long as R&D units’ powers are relatively limited. Orchestration means to arrange different elements to achieve a desired overall effect and better performance. Coordination is the act of making different people or entities work together for a goal, which can be used in interorganizational networks. When a firm has some specialty but not able to influence the whole network organization, it can “participate”. At last, when a firm is hard to participate or influence in networks surrounded, the only choice is to be an adaptive system in the complex network environment (Boisot and Child, 1999).

The fundamental factor that determines the ability and role of a firm within a network is the power of the firm. According to resource dependency theory, if one firm processes a kind of key resources that the focal firm highly depends upon, it has power over the focal firm. Here the author develops a conceptual model that illustrates a focal firm’s role in different levels of network (see Figure 1). As mentioned before, power is determined by resources, so different levels of power will influence the ability of a firm. In an intraorganizational network with relatively high or intermediate hierarchy, its head quarter will have strong power and will be able to manage or orchestrate different units. When move beyond a firm’s boundary, its power will be weakened by other network actors, thus the firm can not give commands to others but coordinate the network organization. If a firm has low power then it can only participate in a network organization. Moreover, if a firm’s power is too low to influence the network environment, the better choice is to adapt.

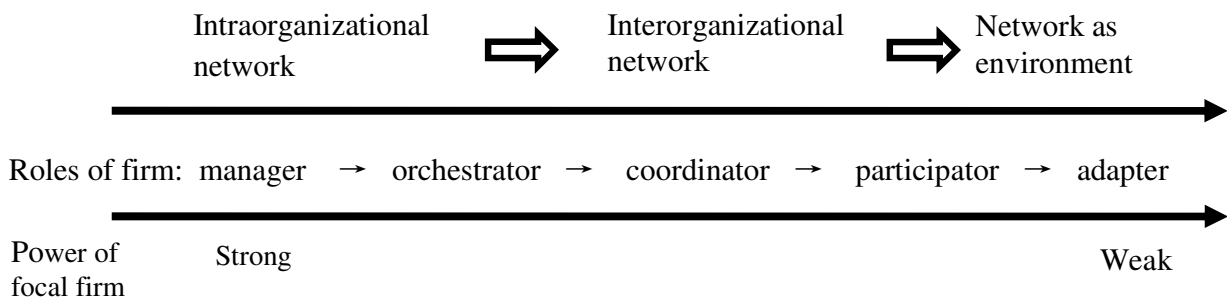


Figure 1. Focal firm's role in different levels of network.

Case: Gabriel's R&D in China

In this section, a case company called Gabriel will be introduced to enhance the understanding of the above conceptual model. The data of the case is either collected from the official website of Gabriel, or from interviews with the chief manager of Gabriel China. Gabriel [1] is a medium-sized Danish enterprise located in Aalborg and focuses on the design and development of furniture and fabrics. Gabriel is organized as a set of independent masters (business units) including SampleMaster, FurnMaster, InnovationMaster and Gabriel China. With such a flat organization, Gabriel is quite innovative though it is not a big company as well as doing business in a relatively traditional industry. Gabriel's main goal is to become a preferred development partner for, and supplier to, leading international manufacturers through value-creating innovation projects in open networks. As we can see from its basic design, Gabriel regards itself to be part of a leading manufacturer's network and its mission is to exploit its own capabilities as well as explore complementary and novel knowledge through the construction of open networks. Gabriel itself is not textile producers, but rather designers and developers that are highly customer driven.

In 2001, Gabriel set up a subsidiary with a small R&D team in China aiming at China/Asian Market and lowering cost. At first, Gabriel China was only a sourcing unit for the Danish headquarter. However, after half a year, it started to have its own design and act as a parallel unit for its Danish headquarter, though until now it still relies on the head quarter to control quality. Also, since Gabriel China doesn't produce on its own, so it should search for, select and work closely with sub-suppliers that can live up to their quality criteria and who are willing to learn new things and develop. For example, Gabriel China only provides advices for its suppliers to meet the requirements. When a new design is being prepared, Gabriel China defines the work in two stages: start-up stage and operational stage. The start-up stage is used to find the best supplier and the right price. When this is done, they will not change suppliers, but work with the same suppliers, using annual contracts with defined parameters that can be changed. Also, Gabriel China is careful not to select suppliers who are too big and have the power to control all the processes, since these suppliers may turn to competitors.

Discussion

As we can see from the Gabriel case, not only big and leading companies from the high-tech industry have the open innovation intention, so do SMEs from relatively traditional industry. However, according to Chesbrough and Teece (2002), in most cases, only a large company will have the scale and scope to coordinated complementary innovations, and only well-managed companies that commit the right internal resources to innovation will shape the markets and build the new industries of the twenty-first century. Here, the author only partly agrees with their proposition, since a firm's ability (power) can not always be strong and it actually varies according to different contexts. As a good example, Gabriel proved the SME's ability to utilize external knowledge from both the early stage of R&D to the commercialization of products. Actually, though SMEs are small in scale, they are relatively more flexible and faster in reaction, and they can be very innovative. According to the previous case description, we can see that Gabriel Denmark and Gabriel China are involved in different levels of innovation networks. Within different innovation networks, the SME may not always be "small and medium", but owns strong power under some circumstances. In this section, the author will try to link the empirical data of Gabriel to the conceptual model.

The first level is the intraorganizational level. As mentioned before, the organizational design of Gabriel is rather horizontal and flexible. Gabriel China has some advantages, such as close to Asian customers and accessing knowledge from China, and as one of the masters, it has decision making right to some extent. However, it is still relying on its Danish headquarter. Due to lacking of ability, Gabriel China should send a sample home for every 800m to be tested. Also, coming down from 100%, Gabriel China now still uses more than half of its design capacity on headquarter-defined tasks. Here we can see that the power of Gabriel's head quarter remains relatively strong over Gabriel China though they are designed with little hierarchy, so the head quarter's role can be seen as orchestrator here.

The second level is the interorganizational level. As a preferred supplier of world leading manufactures, Gabriel itself lies in the leading firm's network, so its power is relatively weak and can just be a proactive participator with its own innovative idea. However, in terms of Gabriel China, it has the right to select Chinese sub-suppliers and R&D partners, and provides them with advices to meet customer's requirements. Also, Gabriel China is aware of power control and always tries to keep its central position. Thus, in the Chinese interorganizational innovation network, Gabriel China acts as a coordinator that balances different organizations to work under a common goal.

The third level is the network context. As a SME, Gabriel faces the challenges from European markets and also opportunities from Asian/Market. Here, as mentioned before, the external market environments are also consisted by different network relationships. Facing fierce competition, Gabriel should first be a flexible adaptor to standards and requirements from customers. After being a successful adaptor, it can join the process of settling standards of the textile industry. In terms of Asian market, at the first half year, it simply did nothing with local partners, i.e. being a complete adaptor.

Now, due to its advanced ability in the Chinese market and textile industry, it will have the ability to move from adaptor to participator.

Conclusion

Open innovation in networks has been a popular topic for long, this paper rethinks the very original concepts of innovation network and network organization, and tries to answer the differences between network and network organization. In order to understand innovation networks, it is necessary to have a network perspective. Within a network perspective, there are different levels of network, and a firm may not always has the power to “manage” innovation networks. Based on this idea, since in different networks firm may have different levels of power, the firm’s role may varies from manager, to orchestrator, coordinator, and then to participator and adaptor. The Gabriel case supports the model, but both the model itself and the paper still have many deficiencies. For example, though this paper takes a network perspective, but the model looks quite linear. Also, since different levels of networks are overlapping with each other, so may be classifying them as interpersonal, intraorganizational and interorganization is inappropriate.

Notes

[1] More information: www.grabirel.dk

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