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## FIFTY SHADES OF INNOVATION

– FROM OPEN TOWARD USER,  
AND OPEN COLLABORATIVE FORMS OF INNOVATION –  
AN OVERVIEW

Starting from the Schumpeterian producer-driven understanding of innovation, followed by user-generated solutions and understanding of collaborative forms of co-creation, scholars investigated the drivers and the nature of interactions underpinning success in various ways. Innovation literature has gone a long way, where open innovation has attracted researchers to investigate problems like compatibilities of external resources, networks of innovation, or open source collaboration. Openness itself has gained various shades in the different strands of literature. In this paper the author provides with an overview and a draft evaluation of the different models of open innovation, illustrated with some empirical findings from various fields drawn from the literature. She points to the relevance of transaction costs affecting viable forms of (open) innovation strategies of firms, and the importance to define the locus of innovation for further analyses of different firm and interaction level formations.

*Keywords:* open innovation, user innovation, collaborative innovation, networks

From the perspective of how and when new solutions emerge, toward the relation between the capacities of a firm and compatibilities of external resources ending up in innovation practices innovation literature has gone a long way. Starting from the Schumpeterian producer-driven understanding of the emergence of new forms and products, followed by user-generated solutions and understanding of collaborative forms of co-creation, scholars tackled to investigate the drivers and the nature of interactions underpinning success. Ever since the scholarship of Institutional Economics firms tend to have their borders viewed with well-defined activities, contractual relations and knowledge boundaries defining them. However, firms tend to be fluid with overlapping networks, activities and ever-changing structures. Scholars argue for the presence of project-based organizations, overlapping knowledge structures, and forms of co-creation, which all imply the need for more dynamic view of the firm. Innovation, production and commercialization stages, viewed mostly as a linear process, seem to have kaleidoscopic

arrangements overlapping firms, and follow a spiral-like shape driven by interactions in its development. Theory of modularity is at hand for describing and understanding these emergent, industry-wide structures on the level of nets.

With its broad and diverse use of the concept, open innovation is a specific field of innovation studies, which goes hand in hand with the different strands of organizational and industry scholarship. Scholars have long noted that firms apply external resources for innovation, and that there is more to adaptation than invention (Cohen – Levinthal, 1990). Open innovation lies in the wider context of institutional openness, and as a theory it has seen different conceptualization frames. Recent scholarship has shown, that channeling in and out resources for innovation, requires organizational rearrangement toward openness with adequate strategy applied (Chesbrough, 2006, 2011; Harison – Koski, 2010). A number of scholars have examined openness beyond its binary understanding of open and closed, rather as procedural or dependent on several character-

istics (Van de Vrande et al., 2009; Chiaroni et al., 2011; Dahlander – Gann, 2010; Barge-Gil, 2010). Some have argued for understanding openness where all related information is a public good (Baldwin – von Hippel, 2011; and related literature on open source models (Lee – Cole 2003, Baldwin – Clark, 2006; Dahlander et al., 2008; Harison – Koski, 2010, Méndez-Durón – García, 2009).

In this paper based on an overview of the most important strands of literature on open forms of innovation, illustrated with some empirical findings from various fields drawn from the literature. Furthermore I provide with a classification of the main approaches based on the various definitions and perspectives of analyses, where I analyze the implications.

Although some identify not less than nine streams of perspectives examining open innovation (Gassmann et al., 2010), or three main approaches (Baldwin – von Hippel, 2011), herewith I structure the strands into four basic categories, with implications of these strands explained later:

- A) the *user-oriented approach* where the producer picks up solutions provided by those (who use the design and product or service single user, lead user, community of users following the definition of Baldwin – von Hippel, 2011), in further developing and commercializing the product,
- B) the *producer-focused model*, where it is the producer who drives innovation, and seeks for sourcing in external capabilities/knowledge for finding new solutions, and adapts a business model in favor of that (by raising absorptive capacity, rearranging its organizational setup, etc.),
- C) the role of *networks and ties in innovation* over firms are at stake, with a stream focusing on knowledge-share across networks (loose coupling, etc.), and
- D) investigations about *collaboration of firms or users*, modes of and incentives for co-creation for innovation, where the focus falls on interaction.

Open innovation has been investigated primarily on examples drawn from high-tech industries, however the scope of investigations has broadened since toward other industries (for eg. creative industries). More to that, scholars apply theoretical frameworks to investigate how firms implement open innovation in practice as regards products as well as services (financial services for eg.) to illustrate the explanatory force of the different frameworks. Before going on with elaborating on these findings, let us resume the different conceptual approaches to open innovation.

## Forms of Open Innovation

Going back in time following reversely the footsteps, one can recognize a definitive focus on technology-led production and innovation activities of firms, investigated thoroughly by scrutinizing the production process: stage by stage, firm by firm.

### The User Model

Back in the seventies von Hippel (1976) spotted the pattern of user's involvement in product development and dissemination in the scientific instrument innovation process. Firstly, it was recognized that commercial success for industrial goods, stems from innovation projects in response to user need, rather than technological opportunity (von Hippel, 1976: p. 213.). Based on a wide sample of scientific instrument innovations the study concludes that 80% of the manufacturers provide the product engineering and manufacturing functions for innovative instrument users. This allows for understanding that *it is not the firms themselves innovative*, but rather the process, which allows for user dominated innovation pattern. Innovative firm means here a firm, which provides for new product development. Based on these findings, von Hippel elaborated the user-model of innovation, with a typical pattern of the user taking over the following steps (von Hippel 1976: p. 220.):

- 1) *invention, prototyping*: the user perceives that an advance in instrumentation is required, invents the instrument, builds a prototype,
- 2) *information diffusion*, and
- 3) *pre-commercial replication and use*: proves the prototypes' value by applying it.

In this scheme the manufacturer takes over the commercial manufacture, market and sale functions. These functions can be stretched where the manufacturer tests, refines and improves the product in the engineering phase. The *locus of innovation* (p. 227.) here thus is the user. Broader implications of these findings are notably for governmental policy arrangements to consider users along with the manufacturers in designing incentive schemes.

Through the case studies further patterns evolve (see p. 231.), where another player: the material supplier for product, enters the idea formation, problem solving, solution and pre-commercial diffusion stages (material supplier dominant), along with the previously exposed: user-dominant, and commercializer-dominant (where the manufacturer takes over the process except for the user's recognition phase) schemes.

Firms can spot the lead users through market research. Based on the suggestions and views of the lead users, firms incorporate the revealed findings into their innovation activity (Herstatt – von Hippel, 1991). The method coined ‘lead user market research’ (carried out at Hilti AG, manufacturer of products used in construction) allows for a product development based on the involvement of a selected lead user concept group in the frame of a product generation workshop. Only solutions appealing to the typical users are elaborated which saves time and cost. The lead users are those who:

- 1) face needs that will be general in a marketplace before the bulk of the marketplace encounters them, and
- 2) expect to benefit significantly by obtaining a solution to those needs (Herstatt – von Hippel, 1991: p. 2., following von Hippel, 1986, 1988).

Users here serve as sources, where producers initiate innovation strategies through elaborated forms of channeling in ideas and needs. In the Sources of Innovation (1988) von Hippel scans innovations developed by manufacturers, suppliers as well as users and he finds that the functional source of innovation varies in fields. Furthermore along with users, product manufacturers or suppliers might take the role in innovation, along with trade in know-how. The model where users actively drive innovation either as single-users or a community represents a shift from this earlier model. User-only innovations can even create systems of innovation, where as a byproduct of dissemination even a brand is documented to be built in the case of Apache software community (Füller – Scholl – von Hippel, 2013).

Users’ incentives to innovate either as manufacturers for in-house use of solutions, or end-users of products and services are mainly defined by their benefit what they get directly from innovation. The profit though, that a single-user can obtain from the use of the invention or innovation, cannot compete with the profit gained by the producer from commercialization on a wide market. The producer’s innovation is designed to serve many users with more investment available for product development. There are arguments on democratizing innovation (von Hippel, 2005) based on an ever-widening role of users’ contribution. The user approach of open innovation investigations is considered to be one of the most examined ones (Gassmann et al., 2010).

### ***The Producer Model***

Following Schumpeter it is the entrepreneur, thus the producer who generates novelties in the economy taking a considerable amount of risk for heading

(Schumpeter, 1934). Innovation scholarship thus tends to rely on scrutinizing the producer in order to understand the emergence of new solutions in firms, and in the economy. In contrast to the user-led innovation studies, open innovation from the producer-focused approach means the purposive activity of the producer to channel in external resources in order to raise its capacities for innovation. Even if talking about collaborative forms of production, this model focuses on the role of the producer handling the spillovers of innovation and creation of new markets. The firm thus, (re)organizes itself in order to meet the challenges of cooperation. For understanding this process herewith I refer to Chesbrough’s definition (2006) of open innovation, which has become a starting point for numerous scholars. Open innovation works at two levels, as:

- 1) the purposive inflow and outflow of knowledge:
  - to accelerate internal innovation: thus to enhance technology,
  - to expand the markets for external use of innovation.
- 2) a business model for firms
  - to rearrange their innovation process and *organizational setup*, and
  - to gain from the wasted spillovers and intellectual property.

The flow of knowledge thus serves as a tool for boosting technological advancement, more precisely technological innovation in its Schumpeterian understanding (1934). In Chesbrough’s understanding market serves as a place for the ideas of the firm, which used to be protected by intellectual property: “the use of internal and external paths to market serve to advance technology” (Chesbrough, 2006: p. 1.) It is related to the Schumpeterian non-technological innovation in a limited sense of exploiting and extending the paths to the market, although strictly said it is not focusing on the activities aiming specifically at developing those new markets.

Chesbrough (2006, especially 2011) stresses the role of transformation of firms in their organizational setting in order to follow the suggested and elaborated business model of open innovation as an adaptation mechanism to gain comparative advantage over the others in competition. The suggested frame considers the rearrangement of the functions and departments within the organization, but the perspective of fine-tuned adaptation of routines and capacities of the firm play little role in his investigations.

Open innovation represents a shift from vertical arrangement of the innovation activity of a firm. It is a transformation of how firms use and manage their

intellectual property, stretching the knowledge-based conceptualizing of the boundaries of a firm. With opening up the knowledge outflow and the gained knowledge through forms of collaboration, firms do not possess them in intellectual property schemes, but provide other players that knowledge. The producer-model of open innovation is a concept relying on the permeability of a firm (Baldwin – von Hippel, 2011).

### **Open Innovation Over Networks**

Scrutinizing networks for design and innovation as unit of analysis, allows for investigations on 1. cooperation of firms, 2. knowledge-share, 3. reshaping the boundaries of firms. The focus thus shifts from the focal firm to networks.

1. *Cooperation.* Firms team up in order to create networks for open innovation (Chesbrough et al, 2006). The locus of innovation might defer according to the center-based activities of firms. Within inter-organizational nets firms are not only embedded through their ties, but they turn out to be parts of regionally nested clusters representing subsystems of regional/national innovation systems. It is also documented that agricultural firms arrange themselves complementing each other in order to create value for specific targets (about value networks Vanhaverbeke, 2006). Scholarship on production and co-creation over networks of firms focusing on the cooperation among agents, meets policy needs to understand determinants like *entrepreneurial attitude, cooperation and connectivity of firms* (Barge-Gil, 2010).

2. *Knowledge-share.* Networks represent source for innovation over firms and partnerships and as such, serve as configurations for knowledge transfers (loose coupling: Brusoni, 2001). It is documented that interactions of organizations in a hierarchical/vertical network allow for a combination of new capabilities in order to develop new products (for eg. architecture of transaction networks in two sectors, Luo et al., 2012). In the realm of knowledge-based approach, one can find that open innovation is the fusion of previously separated knowledge (technologies) by the new relations involving users, consumers, firms with different specializations and competences, and non-firm organizations (Malerba, 2005). However, there are concerns with the imperfect overlap of knowledge and production boundaries in networks of firms (Brusoni, 2001). Simard and West by exploring knowledge networks, construct a classification based on the characteristics of formal/informal deep/wide nature of interfirm ties defining the locus and enabling open innovation (2006: p. 235.).

3. *Networks reshape boundaries of the firm.* Networks of firms in studies on knowledge-creation and

dissemination within projects seem to concentrate on inter-organizational ties, although project-based organizing involves organizational and personal networks as well. The locus of production, knowledge-share and creation spanning boundaries of firms, and organized around tasks are called epistemic communities (Grabher, 2004). Furthermore, Grabher (2004) argues that that the firm still represents a stable and unquestionable unit in the study of project-based work. In answer to Grabher's argument, scholarship on creative industries stretches the role of projects and the formation of project-based organizations over networks. These gain from expertise pool, and act for targeted deadlines (Moraga, 2006), where urban environment favors face-to-face interaction (Lange et al., 2008). Flexible organizations and nets of collaborations favored women writers in the film industry (Smith-Doerr, 2010). Projects in the field of cultural industries are investigated with network analysis (Staber, 2008). Sedita (2008) examined the role of interpersonal and inter-organizational networks in supporting economic performance of organizations in the live music industry in the Veneto region. She argues for the presence of a creative network deploying capabilities based on a latent network.

What is clear from this strand is that: 1. networks supply project-based organizational formations, 2. networks of innovation and production stretch the boundaries of firms, where organizational arguments cannot fully explain the behavior of these firms. All shapes of product/service development stretching firm boundaries ranging from open to user innovation produce forms of collaboration, and can be captured by understanding the production as a web of tasks connected by transactions and transfers, as proposed by Baldwin (2007).

### **Open Collaborative Innovation**

User innovations in documented cases receive contribution from others, a community of users, where a typical area of collaboration is the open source software development (Lee – Cole, 2003; Baldwin – Clark, 2006; Dahlander et al., 2008; Harison – Koski, 2010). Consumer-producer interaction and consumer co-creation is an extension of open-innovation, and primarily investigated in the field of web-based technologies, where patterns of digital citizen journalism, digital photography, and online games development (Potts et al., 2008: p. 459.). Scholarship beyond the web suggests that collaboration linkages might involve inter-industry dynamics as the documented traits in the fashion and music industry tell us about the role of collaborations of independent producers in order to raise competitiveness (Huage – Hracs, 2010), 'iconic' brands with art-

ists for cultural projects (Dell’Era, 2010). A further, cognitive-related aspect is that of *collaborative knowledge creation*, which is examined in teams from human resource dynamics approach (Chatenier et al., 2009). Chatenier et al. find that organizational diversity of the teams raises creativity as well as costs.

What is considered as open collaborative innovation? Scholars seem to rely on different layers of meanings, when they talk about communities of users, open source development, consumer co-creation that might involve the producer, team work of a multi-organizational background, and even linkages between industries for raising profits. Baldwin and von Hippel suggest a narrower framework, in their wording:

“an *open collaborative innovation project* involves contributors who *share* the work of generating a design and reveal the outputs from their individual and collective design efforts openly”,

thus: 1. participants are not rivals, 2. they do not individually or collectively plan to sell products or services based on the innovation or the related property rights (2011: p. 1403.). From this definition we can understand that producer-consumer interaction falls out of scope of

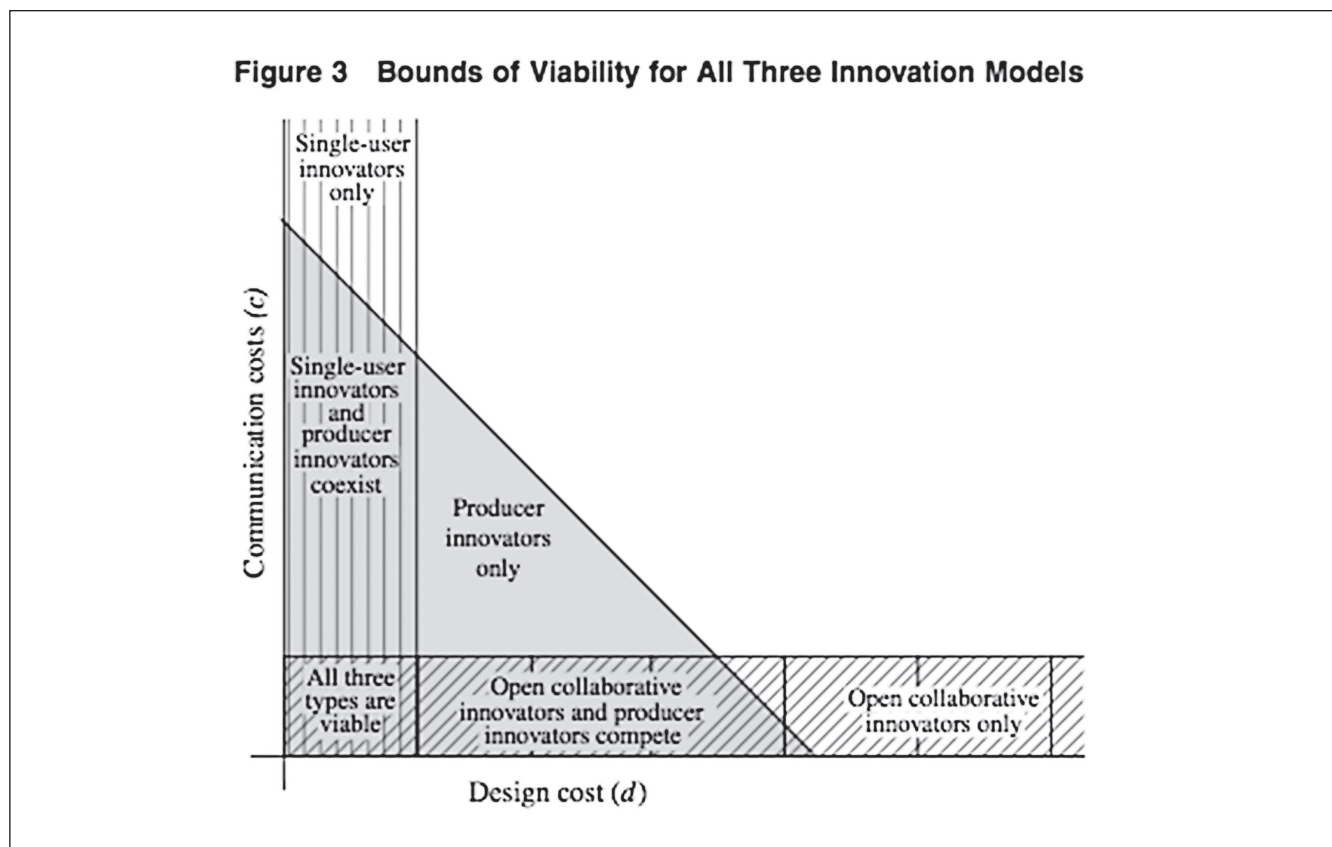
analysis, as the producer definitely has the incentive to sell the product. What we are looking at is individual/collective design what is shared openly for noncommercial purposes, and where intellectual property rights are abandoned, or limited to a minimum. Intellectual property rights over the design and production are believed to bring revenue, if controlled by the producer. Than what are the incentives to participate and share?

For understanding which strategy for innovation is viable (single-user, producer, or open collaborative innovation) Baldwin and von Hippel (2011: p. 1405-6.) suggest a frame based on the design and communication costs. We learn that producers profit depends on the user’s willingness to pay, their incentives depend on users valuations. Furthermore producers are affected by the market size for their products, which implies economies of scale as advantage (the same design used multiple times), but results in higher costs of communication (eg. market research), which later can fall due to technological progress. In the open collaborative innovation model users might benefit from the design itself, or the complements increasing the value of design, along with the private benefits (learning, reputation, etc.). (Figure 1)

Figure 1

### Bounds of Viability for User, Producer and Collaborative Innovation

(Following Baldwin – von Hippel, 2011: p. 1408.)



Baldwin and von Hippel find that each model is economically viable, and that single user innovations compete with producer innovation due to technological progress: communications costs fall, the capabilities of individual designers enhance, and due to the shift toward modularized and digitized product design and production. As the models compete only in specific situations and areas, producer-driven and single-user innovation models as head-to-head competitors have little possibility of occurrence. Important is that hybrid forms are viable in the case of innovation platforms, as they provide for innovation from different contributors. Baldwin and von Hippel list some examples of closed collaborative innovation where no participant knows what the others are doing except the sponsor (2011: p. 1413.).

findings of empirical research on open and user innovation is listed by Dahlander and Gann (2010). Based on Chesbrough et al. (2006), and tackled by van de Vrande et al. (2009) and Chiaroni et al. (2011), Dahlander and Gann (2010) work on the two main dimensions of open innovation: 1. inbound or outside-in open innovation, where firms are opening up to external resources “for improving the firm’s innovation performance, 2. outbound or inside-out open innovation aiming “to commercially exploit innovation opportunities” of firms better-suited to commercialize a given technology (p. 35.). They draw a balance of empirical findings about revealing, selling, sourcing and acquiring resources for innovation, suggesting that benefits and disadvantages of openness play different roles for different firms. (*Table 1*)

Table 1

**Open Innovation**  
(Following Dahlander – Gann, 2010)

Type of openness	Definition
Revealing. Outbound innovation: non-pecuniary.	How internal resources are revealed to the external environment without immediate financial rewards, seeking indirect benefits to the focal firm.
Selling. Outbound innovation: pecuniary.	How firms commercialize their inventions and technologies through selling or licensing out resources developed in other organizations.
Sourcing. Inbound innovation: non-pecuniary.	How firms can use external sources of innovation. Firms scan the environment prior to initiating internal R&D for existing ideas and technologies. If available, firms use them. Accounts of corporate R&D labs are vehicles for absorbing external ideas and mechanisms to assess, internalize and make them fit with internal processes.
Acquiring. Inbound innovation: pecuniary.	Firms acquire input to the innovation process through the market place. Openness here is how firms license-in and acquire expertise from outside.

### Summing up: How Open is Innovation?

Following the structural shift toward open forms of providing inflow and outflow of knowledge, along with the problem of intellectual property rights, firms face the dilemma to what extent to provide openness? Absorptive capacity, which defines how much a firm can exploit (recognize, assimilate and apply) external knowledge, represents the limitation of opportunities for sourcing in (Cohen – Levinthal, 1990). Absorptive capacity is defined by the prior knowledge, and the size of the firm, tending to provide wider possibilities for larger enterprises, while there is a stronger need for external resources in smaller ones (forthcoming Barge-Gil, 2010). Firms also reveal in order to obtain wider markets for commercializing their innovations to different extent, as it became clear that there are benefits and costs of openness (Dahlander – Gann, 2010). First, it is worth to define what openness actually means lying in between the bipolar notions of open and closed.

A map of differing types of conceptualizing openness in literature, along with a thorough classification of the

Following the path to look at the different shades of openness, Chiaroni et al. (2011) channel in the managerial levers of open innovation to the adoption process of the organization. They provide with a thorough illustration of the opening up process with the case of Italcementi. They conclude on tapping the radical organizational rearrangement backed by the commitment of the top management to innovation. (*Figure 2*)

As a further attempt to break with the binary open-closed understanding, and focusing on the procedural nature of innovation, an important contribution in the categorization of degree of openness is made by Barge-Gil (2010). The continuity of open innovation is described by three stages of: open, semi-open and closed open innovation. Barge-Gil adds to the absorptive capacity argument about openness (the more absorptive capacity a firm has, the more it can profit from open innovation), the ‘need effect’ of a firm for openness based on its size and R&D volume. The need effect goes against absorptive capacity, thus the bigger a firm in size and R&D the more it is capable to absorb, but the less it needs it: these firms chose semi-openness,

where the core of their innovation process is kept in-house. In the middle of the two contradictory forces stands open innovation with middle-sized firms. The smallest ones with the lowest absorptive capacity and strongest need for external resources represent the non-cooperating (closed) strategy. The three categories were defined as follows. (Table 2)

source, open science solutions, as well as historical descriptions with examples dating back to the 19<sup>th</sup> century. Firms as well as individuals freely and voluntarily giving up their property rights reveal their developed innovations, for gaining benefit from further development of their ideas by others, network effects, or enhancing reputation.

Table 2

**Open Innovation Strategies**  
(Following Barge-Gil, 2010: p. 586–587.)

Innovation	Strategy	Information sources
<b>Open innovators</b>	innovate mainly through collaboration with other entities or mainly by others	at least one external source is more important than the internal knowledge
<b>Semi-open innovators</b>	innovate through in-house efforts, but having cooperated or bought external R&D	the most important external source is as important as the internal knowledge
<b>Closed innovators</b>	innovate in-house, with no cooperation or external R&D	the most important external source is less important than the internal knowledge.

In contrast to the above-exposed producer-driven models of open innovation as a process, referring to the different levels of organizational permeability, Baldwin and von Hippel (2011) argue for a different use of the concept. While “openness” is used widely as obtaining new ideas, patents, etc. from outside of the firm following Chesbrough’s model (2006), Baldwin and von Hippel understand open innovation when all related information is a public good (p. 1400.). This understanding of “openness”, as pointed out by the authors, is backed by contemporary empirical findings of user innovation research, investigations on open

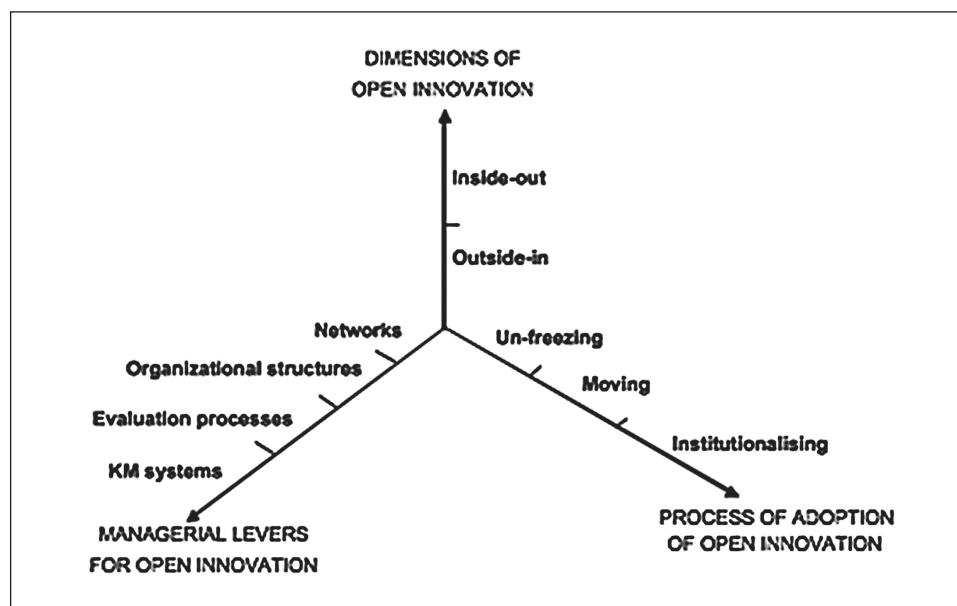
**Transaction Costs of Openness**

Following the institutionalist approach of transaction costs economics one might think that opening up re-configures what is meant by costs of using the market, negotiating, coordination, control of property rights or contracting. The incentives for firms to open up for innovation and production might stem from the lowering costs related to establishing links, rearrangement of the industry, technological advancement or policy affecting institutions (eg. property rights). I do not intend to provide here with a thorough analysis, rather to give a brief list of the transaction costs that might play and that shall be considered in further research on, viable forms emerging, and for policy-making when creating a fertile environment for firms to open up.

**Dimensions, Adoption, and Managerial Levers of Open Innovation**

(Adopted from Chiaroni et al., 2011: p. 36: Theoretical framework)

Figure 2



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A typical coordination problem is the vertical vs. horizontal integration within a firm or industry. When firms shift their innovation and production activity toward horizontal arrangements and partnerships, thus they start collaborating with external partners, then according to Grant (1996 through Dahlander – Gann, 2010) the following costs are affected:

1. *costs of coordination*: emerging from different organizations. It is difficult to bridge organizational boundaries, where there are too many relationships, it might impose the diversion of managerial attention.
2. *costs of competition*: emerge from risk of opportunistic behavior, where protection of intellectual property rights might impose extra costs.

In extending the partnership for innovation from the perspective of capacities, Langlois (1992) draws the attention to the presence of *dynamic transaction costs*, which are:

1. costs related to negotiating, persuading and teaching potential partners with valuable resources,
2. costs related to those lacking resources when in need.

On the other hand though, raising capacities might pay off in the long run, as *absorptive capacity* “reduces the costs of openness by reducing search and assimilation costs, and increases profits by its better application to in-house activities” (Barge-Gil, 2010: p. 580.).

Innovation itself, in its classic Schumpeterian producer-driven understanding, has its transaction costs. The assumption here is that innovation pays off, if the producer can profit from the use of its design for a period of time, protected by intellectual property rights. Baldwin, von Hippel (2011: p. 1409.) specify the related transaction costs of innovation, as which include:

1. costs of establishing exclusive rights over the design (secrecy, and obtaining patent),
2. costs of protecting the design from theft: restricting access, enforcing noncompete agreements, and
3. legally transferring rights for the good/service, and receiving compensation, protecting both sides against opportunism.

As a response single-user innovators might hide some of their innovations to economize on costs. In the case of open collaborative innovation: there are no above-mentioned transaction costs, as they do not sell products nor pay the contributors. They warn though, that in large projects protection might occur, where hierarchical arrangements come to forth for eg. to provide access not to change the master copy (in software development).

Furthermore Baldwin and von Hippel (2011) add that regulation is a transaction cost imposed by the government on all types (producer, single-user, open collaborative) of innovation.

## Where Does Open Innovation Take Place?

Innovation can be understood as the elaboration of a set of rules for new design of products, or solutions to problems. Considering the numerous players involved in both innovation and production, it might seem ambiguous to locate where exactly the elaboration of these new design rules or solutions come from. Following the different strands of scholarship, one might spot the shift of the locus of innovation in different approaches. It is important to define the locus of innovation as it shapes the analytical perspective of analysis.

In von Hippel’s studies (1976, 1988) for example, the locus of innovation can be the manufacturer or the user, or even sometimes the supplier. In contrast Chesbrough (2006) relies on the producer as the core locus for innovation, where attracted external resources serve as complementary contributions to the new solutions. But how to locate innovation where emerging teams or groups provide the dynamics for collaborative forms of cooperative work? Locus in these cases shift to a community of innovators performing group dynamics and situated co-creation. Studies reveal that this gains importance specifically in fields where creative work is related to a less rigid organizational structure. Smaller, flexible firms need less effort for restructuring (moving less human resource capacities, and organizational structures, departments), thus might assign for looser cooperative structures. Beyond the borders of the firm, powerful locus for innovation can be found in the co-creative work of online communities (Dahlander et al., 2008; Lee – Cole, 2003 on Linux Kernel development). Apart from the interpersonal and organizational perspectives the geographical locus of open innovation might explain the embeddedness into regional/national systems of innovation (Simard – West, 2006).

## Open Innovation in Empirical Research

Research on open innovation was firstly overwhelmingly conducted in technology related industries ranging from chemicals, thermoplastics, medical devices to lubricants and aerospace, etc. Chesbrough and Crowther (2006) based on a survey found that adapted open innovation rather tends to complement than substitute of internal R&D activities, and open innovation is adapted beyond high-tech.

The volume of research investigating relationship between innovation and firm size, and innovation and market structure is very impressive (van de Vrande et al., 2009; Dahlander et al., 2010, overview Gassmann et al., 2009). This stream of research contributes to understanding a static picture of firms and innovation, and



does not allow for a dynamic view of the industry, the interaction and transformation of industries within an economy. These analyses are backed among others by the available and constantly improved databases, some of them including questions aiming at modeling forms of cooperation and organizational innovation (for eg. Wynarczyk et al., 2013; Hall et al., 2009; deMassis et al., 2012). There are studies on linking product and process (open) innovation through value chains (Theyel, 2012). We learn that micro and SME firms tend to interact with R&D research centers enabling them for the role of catalysts of open innovation (Roper – Hewitt-Dundas, 2012). Some apply the frame of social capital to understand inter-organizational collaborations in open innovation adapted by SMEs (Padilla-Mélendez et al., 2012). The relationship between the sector and openness is not yet clear in literature, although there is a research bias toward the high-tech sector (Barge-Gil, 2010).

There are empirical findings documented of users innovating for in-house use (Pavitt, 1984) in low-tech (Herstatt – von Hippel, 1992), in sports in different communities (Franke – Shah, 2003), or kite-surfing (Tietz et al., 2005) or about the need for local information as economic incentive for mountain biker's innovation (Luthje – Herstatt – von Hippel, 2002). Morrison, Roberts and Midgley (2004) constructed the leading edge status (LES) to describe users, and found that users with a high level of this variable tend to predict and accelerate early product adoption.

As mentioned earlier a number of scholars have examined open innovation in the context of open source, and creative collaboration in online communities: about Finnish software producers (Harison – Koski, 2010), and open source development (Lee – Cole, 2003; Baldwin – Clark, 2006; Dahlander et al., 2008; Harison – Koski, 2010). These studies tackle the incentives to share knowledge and inventions, and the relation of producer and user in open forms of co-creation. Knowledge transfer in open source development is explained by the role of social capital (Méndez-Durón – García, 2009).

The service sector as the main driver of the advanced economies gained focus in the innovation literature. This scholarship considers the structural change of the economy connecting it to the tradition of macro approach to innovation. The significance of nontangible knowledge-intense services and the knowledge-intense business sector is gaining comparative advantage on a global scale, as articulated by the contributors to this research realm (Chesbrough, 2011; von Hippel, 1992, etc.). Users are found to be active in this field as

well. A study of the banking sector suggests that users are active to innovate nearly in half of the cases in the computerized banking services and retail services earlier than banks offered to them (Oliviera – von Hippel, 1992).

Chesbrough (2011) dedicates his studies to the knowledge-intense services as the considered escape route from the commodity trap and solution for growth. He considers product-focused innovation an outdated conception of innovation to stay on the market, and suggests building platforms to attract further companies. He argues that open service innovation is an approach toward complexity of production and supply, where the customer's knowledge and experience is channeled in as well. Furthermore he provides tips on the organizational matter: how firms should redefine their routines and structures to be able to transform.

Organizational flexibility, and the importance of inter-organizational and inter-personal networks, and interactions in open forms of innovation and production of nontangible goods and services in the creative industries and cultural production has gained the raising interest of scholars (Potts et al., 2008; Huage – Hrac, 2010; Dell'Era, 2010). Here organizational diversity and the project-based form of collaborations stretching firm boundaries are at stake. Networks of interpersonal ties, inter-organizational arrangements and tasks of production and innovation might overlap but they are not the same. There is still work to be done on this matter, based on the findings of open source projects, and/or the theoretical approach proposed by Baldwin and von Hippel about open collaborative innovation (2011).

## Conclusions

Nonetheless the producer model of open innovation was suggested as a new paradigm for production arrangements of firms (Chesbrough, 2006, 2011), von Hippel (1976, 1988, 2005) stresses the importance of single-user, user firm, or lead-user generated product or service development in meeting the firm's production line. Open innovation spans networks of firms, where schemes of cooperation, and knowledge-share are at focus, and especially in cases of frequent changes and project-based activities boundaries of firms urge to be revisited by scholars. It seems that due to the transformation of industries and markets, the lowering communication costs, and increasing role of platforms and modular design of production, open collaborative innovation leads toward a paradigm shift (Baldwin – von Hippel, 2011).

In the current overview I have gone through the growing scholarship on open innovation, grouping it into four broad categories or models of investigation (1. user model, 2. producer model, 3. open innovation over networks and 4. open collaborative innovation). I have summarized models tackling the different shades of meaning of openness, which ranged from the binary models of open/closed, toward more procedural models including further stages and characteristics, ending up with the public good's perspective defined by the elimination of property rights.

Further, I have pointed out to the relevance of the transaction costs related to establishing links, rearrangement of the industry, technological advancement or policy affecting institutions in understanding the viable forms of (open) innovation strategies of firms. It is not less important to define the locus of innovation for further analyses of different firm and interaction level formations. Finally, to illustrate the arguments and some of the conclusions, I draw on some examples deriving from various fields of empirical investigations. What I find as most important challenge for further research is to broaden the scholarship on open collaborative innovation toward fields beyond open source development, and revisiting the boundaries of firms in networks of innovation and production involving interpersonal as well as inter-organizational ties.

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