Open Innovation: from hyped phenomenon to sustainable practice

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Fifteen years ago, Henry Chesbrough coined the term “Open Innovation” to describe the process of managing knowledge flows across widely distributed sources of innovation for the purpose of generating new products, services or business models. Since then, Open Innovation principles and methods have been subject to an extensive amount of scholarly work that resulted in the development and implementation of numerous Open Innovation projects and initiatives. Today, innovating organizations do not anymore decide whether to initiate open or closed innovation processes, but rather how to design optimal ways of openness and collaboration involved in their innovation activities. These designs are thereby dependent upon relevant boundary conditions on the individual, group, organizational, and ecosystem level. We discuss challenges arising from some of these boundary conditions and present experience-based ways for addressing them.

1. Introduction

Innovation is considered a key driver of competitiveness and economic growth, and appears to have considerable benefits for those organizations that are able to achieve it. Already Schumpeter (1934) highlighted the value of accessing, mobilizing, and combining widely distributed knowledge for achieving superior innovation performance. However, discussions around how organizations can actually obtain such knowledge inputs to their innovation processes by relying to a great(er) extent than earlier on the surrounding world have only recently gained momentum with advances in information and communication technologies and their extensive use. Particularly during the last two decades,
a rapid evolution has occurred in the way organizations create innovations and capture value from doing so (Teece et al, 1997; Katila/Ahuja, 2002; Chesbrough, 2010), moving the search for new knowledge and technology from closed, proprietary intra-organizational activities to more open, distributed, collaborative, or “democratized” approaches (von Hippel, 2005; Baden-Fuller/Haefliger, 2013). Coming along with developments in open source software (eg, von Hippel/von Krogh, 2003) and community-based or user-driven innovation (eg, Franke/Shah, 2003), Henry Chesbrough (2003) coined the term “Open Innovation” to describe the purposive management of knowledge flows across organizational boundaries for generating innovation. Ever since, the concept of Open Innovation has received increasing attention across different fields of academia and practice (see Figure 1).

![Figure 1: EBSCO database hits for “Open Innovation” in academic’ and practitioners’ outlets](image)

*“Total” refers to the accumulated amount of publications (over the years and sources) on “Open Innovation”; the hits include contributions that have “Open Innovation” in their title, abstract or key words. Academic journals, journals and books are considered as “Academic”. Magazines, trade publications, reports, news, overviews and reviews are classified as “practitioner”. Source: own illustration based on data from EBSCO database*

Also, more and more organizations in different sectors have started experimenting with Open Innovation. They build on a broad variety of Open Innovation principles and methods such as the lead user approach as for example applied at 3M, user innovation communities, co-creation and crowdsourcing activities like Patient Innovation, TellUs!, Local Motors, Innocentive or Lego Ideas for inbound-sourcing of widely distributed knowledge (eg, Lilien et al, 2002; Jeppesen/Frederiksen, 2006; Jeppesen/Lakhani, 2010; Antorini/Muniz/Askildsen,
For outbound Open Innovation, free-revealing (eg, Tesla openly sharing their patents to advance electric vehicle technology), out-licensing activities of patented technology (Perkmann et al, 2013) or technological competence leveraging processes (Keinz/Prügl, 2010) have been subject to substantive investigation (Dahlander/Gann, 2010). More recently, an increasing number of entire Open Innovation initiatives have been established, hosting and organizing multiple Open Innovation projects and building Open Innovation ecosystems (eg, the Open Innovation in Science Center (OIS Center) of the Ludwig Boltzmann Gesellschaft, NASA’s Open Innovation program, the Open Innovation Platform of the Austrian Federal Railways (ÖBB Open Innovation) or the SPOMAN Open Science platform at Aarhus University. Open Innovation has also become more present in policy discussions and agenda setting initiatives. The new research and innovation framework program of the European Commission (Horizon Europe), for example, highlights Open Innovation, Open Science, and Mission Orientation as its three main pillars. Another example is Austria’s Open Innovation Strategy. The strategy paper does not only outline Open Innovation goals and activities for Austria but has also been generated by means of applying Open Innovation principles and methods.

With increasing complexity and the need for multi-domain spanning activities involved in solving 21st century challenges as well as a stronger focus on novelty, efficiency and societal impact of research and innovation activities, the principles and methods of Open Innovation are expected to further gain importance. While Open Innovation processes are often difficult to manage and also face the risk of failure such as in the case of the crowdsourcing platform Quirky, most existing research on the performance of Open Innovation shows that accessing and leveraging innovation-relevant knowledge from widely distributed sources positively effects an organization’s ability to successfully innovate (eg He/Wong, 2004, Katila/Ahuja, 2002; Laursen/Salter, 2006; Poetz/Schreier, 2012).

Overall, it seems as if nowadays all innovation is – or needs to be – (somewhat) open, meaning that innovating organizations do not anymore face themselves confronted with the decision to apply open or closed innovation processes. It rather becomes the art of deciding on different shades of openness to and collaboration with the surrounding world, which strongly depend on boundary conditions at the individual, group, organizational or environmental level. Despite the promising results of Open Innovation, still few organizations have successfully and systematically integrated Open Innovation practices. So, what is required to successfully integrate Open Innovation principles and methods into the DNA of an innovating organization or ecosystem, translating a (rightly?) hyped phenomenon into a sustainable practice? In this article, we argue that for successfully addressing challenges involved in Open Innovation, it is important to better understand and consider relevant antecedents and contingencies. After giving a short overview of basic Open Innovation concepts, the remainder of this article focuses on discussing selected Open Innovation challenges as well as some remedies.
2. Open Innovation – a short review

In search of innovation organizations can rely on using and re-using their local knowledge (local search) and/or systematically explore new (external) knowledge and perform distant search (March, 1991). An organization’s innovation performance is thus a function of its search behavior in terms of search depth (increasing local search) and search scope (increasing distant search) (Katila/Ahuja, 2002). Thereby, the (re-) use of local knowledge shows a curvilinear relationship with an organization’s ability to create innovations, that is, its positive effect diminishes and becomes negative with increasing number of re-combinations of local knowledge (Katila/Ahuja, 2002). In contrast, increasing search scope is considered an important driver for an organization’s long-term ability to create innovations. Building on this, Open Innovation is defined as “a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms” (Chesbrough/Bogers, 2014, 17). There is compelling anecdotal evidence of how companies have successfully used Open Innovation searches to develop new solutions and gain competitive advantage. In the case of Goldcorp of Canada, a mining company, a crowdsourcing approach combined with making the company’s exploration databases openly available to the public generated novel solutions to the problem of pinpointing the exact location of gold on the company’s properties. Offering a prize to anyone who was able to help the company solve this problem, a team from Australia came up with a solution that improved Goldcorp’s “competitive position from producing 53,000 ounces of gold a year at a cost of $360 an ounce to producing 504,000 ounces per year at a cost of $59 per ounce” (Afuah/Tucci, 2012, 356).

Laursen/Salter (2006) provide first large-scale empirical evidence for the positive effects of Open Innovation on innovation performance by analyzing the relationships between external search breadth and search depth (ie, the number of different external knowledge sources used for innovation as well as their intensive use) in a sample of more than 2700 U.K. manufacturing firms. In their analysis, the authors report curvilinear relationships, indicating that there is a tipping point after which transaction and coordination costs may decrease the positive effects of external searches on innovation performance.

External knowledge sources from competitors, suppliers, users, universities or consultants (Laursen/Salter, 2006) can be classified along different dimensions of knowledge dispersion. Building on the functional sources of innovation (von Hippel, 1988), innovation-relevant knowledge is, for example, dispersed over an industry’s value chain (suppliers, manufacturers, users). According to von Hippel (2005, 2017), particularly those who benefit from using an innovation (“the users”), play an important role in developing next-generation solutions to relevant problems. Poetz/Schreier (2012), for example, find that solutions developed by users significantly outperform solutions developed by company professionals in terms of novelty and customer benefit. This is in line with extant literature on lead users and user innovation communities indicating that user-generated innovation plays an important role in successful Open Innovation activities (Bogers/Afuah/Bastian, 2010). Knowledge from contextually
distant sources, that is, sources from outside an organization’s own industry have also been found to be particularly relevant in Open Innovation. Research on the value of contextually distant, yet analogously related knowledge shows positive effects on the outcome of innovative problem-solving processes. (Franke/Poetz/Schreier, 2014; for examples see Poetz/Franke/Schreier, 2014).

Conceptualizing Open Innovation as a distributed innovation process across organizational boundaries implies that Open Innovation must not be understood as a single innovation method. The concept of Open Innovation rather refers to a set of principles such as Joy’s law (“not all smart people work for us”) or Linus’ law (“given enough eyeballs all bugs are shallow”) and serves as a framework for classifying different approaches to open and collaborative innovation (Felin/Zenger, 2014). These approaches can be categorized along the steps in the research and innovation process as well as adapted based on different innovation goals, external knowledge sources, available resources and appropriation strategies (for a graphical illustration see Figure 2). The optimal Open Innovation approach is specifically contingent to the underlying innovation problem and the extent to which knowledge needed to solve this problem is hidden (ie, unknown) to the innovating organization or not (Felin/Zenger, 2014). User community-directed Open Innovation approaches are, for example, particularly valuable when the innovation problem is highly complex and the knowledge needed to solve it is hidden. Then, organizations need to activate self-selection among potential (yet unknown) knowledge holders. In contrast, simple problems for which the holders of the required knowledge are known to the innovating organization can be best solved by contracting with a designated supplier (Felin/Zenger, 2014, 918).

Open Innovation searches includes both, inbound and outbound approaches to accessing and leveraging widely distributed knowledge (Dahlander/Gann, 2010). Inbound Open Innovation refers to different methods for sourcing (non-pecuniary) and acquiring (pecuniary) external knowledge such as in-licensing, crowdsourcing, working with innovation communities or applying pyramid-ing search (Jeppesen/Frederiksen, 2006; Grimpe/Kaiser, 2010; Jeppesen/Lakhani, 2010; Poetz/Prügl, 2010; West/Bogers, 2014). Outbound Open Innovation methods include pecuniary mechanisms such as out-licensing (Perkmann et al, 2013) or identifying alternative application areas for commercializing existing technologies via technological competence leveraging (Danneels, 2007; Keinz/Prügl, 2010). Non-pecuniary outbound mechanisms mainly relate to the free-revealing of knowledge to the external environment (Henkel, 2006; von Hippel/von Krogh, 2003). Well-known examples of doing so are Tesla and Toyota’s free sharing of patents to advance the creation of new markets (eg, infrastructure, demand) for electric and fuel-cell vehicles (Matsushima/Zhao, 2015).

Knowing about which Open Innovation approach is most suitable for solving which innovation problem and what it takes to translate Open Innovation learning into successful outcome is critical to establishing sustainable Open Innovation practices. We argue that nurturing the development of individual and organizational capabilities for Open Innovation increases the overall value created and captured from Open Innovation processes for both, the innovating organizations and their external contributors.
3. Open Innovation challenges

More and more organizations have started experimenting with new forms of open and collaborative practices to generating new products, services or business models over the past two decades. While some of these experiments failed like in the case of the crowdsourcing platform Quirky, most evidence from analyzing individual Open Innovation processes show positive results on the novelty, value and strategic importance of Open Innovation outcome, translating into higher sales revenues and gross margins as well as longer product life cycles (Lilien et al, 2002; Jeppesen/Lakhani, 2010; Poetz/Schreier, 2012; Nishikawa/Schreier/Ogawa, 2013). Also, large-scale investigations on the performance of Open Innovation indicate positive relationships between working with external knowledge sources and organizations’ abilities to innovate (Katila/Ahuja, 2002; Laursen/Salter, 2006). Still, few organizations have successfully and systematically integrated Open Innovation practices into their DNA. We argue that this arises from a set of Open Innovation challenges on the individual, group, organizational and ecosystem level. First, establishing qualified Open Innovation search and collaboration competences on the individual and group level is crucial to successfully practicing Open Innovation. Second, sustainably integrating Open Innovation requires the building of ecosystems which alleviate, facilitate and reward Open Innovation practices on the organizational level. Both challenges are strongly interlinked with new forms of leadership characteristics and practices which acknowledge that the fiat principle of hierarchy rarely applies.
to networks, communities or new forms of collaboration between established organizations and start-ups or crowds (Haefliger/Poetz, 2016).

3.1 Need to build Open Innovation ecosystems

Successfully integrating Open Innovation practices requires organizations to develop their absorptive capacity, that is their ability to “recognize the value of new, external knowledge, assimilate it, and apply it to commercial ends” (Cohen and Levinthal 1990, p. 128). More generally and also applicable to not-for-profit organizations, absorptive capacity describes structural, procedural and cultural arrangements as well as aspects of resource allocation and prior knowledge assets that influence how well an organization is capable of accessing and leveraging external knowledge (Raisch et al, 2009). The way in which firms organize themselves affects both, the direction in which they do innovative search in terms of exploration and exploitation (Argyres/Silverman, 2004) as well as the level of innovative activity within the firm and in conjunction with external parties such as users (Foss/Laursen/Pedersen, 2012).

In line with this, and to build absorptive capacity for Open Innovation, new organizational practices are needed (Foss/Laursen/Pedersen, 2012). Examples are a high degree of delegation of decision rights, extensive lateral and vertical communication, and incentives that are tied to knowledge sharing (Zahra/George, 2002). Hence, the link between successfully accessing and leveraging external knowledge and innovation performance is mediated by organizational design variables (Foss/Laursen/Pedersen, 2011). Structural separation in terms of building and simultaneously operating exploration units and exploitation units within companies (structural ambidexterity) have shown successful results specifically in larger organizations that operate in highly dynamic environments. Developing contextual ambidexterity, that is facilitating individual employees’ abilities to explore new external knowledge and exploit existing (local) knowledge at the same time is even more crucial, and also applies to small and medium-sized enterprises (SMEs). Facilitating contextual ambidexterity includes but is not limited to organizational design factors related to incentives and rewards, procedural support of socialization and external linkages, and providing employees with high levels of autonomy (Raisch et al, 2009). When Chris Thoen (manager of Open Innovation practices at Procter & Gamble) was asked about the relationship between their internal system design and practicing Open Innovation, he argued that “the two things that are important in setting up an innovation system that is effective and works well are that even before looking externally you need good innovation processes internally. Open innovation will not make you a good innovator if you don’t have the processes to deal with innovation – you will only overload.”

In a recent publication, Kolbjørnsrud (2018) highlights the influence of institutional and organizational factors for the implementation of Open Innovation mechanisms and principles. Based on the characterization of three ideal forms of organization (market-, hierarchy-, and community-form) in terms of their core institutional properties (ie, locus of design, goals, resource ownerships and affiliations) he describes hybrid and plural forms which incorporate
governance and coordination mechanisms from more than one of the three ideal forms. Organizations, thereby, may evolve over time, driven by the search for properties provided by other forms. Community forms are characterized by collaboration and knowledge sharing within and across boundaries as well as by being adaptive, innovative and able to solve complex problems. Hence, employing coordination and control mechanisms associated with community forms benefits market and hierarchy forms with such needs. In contrast, governance mechanisms of market forms (ie, prices) allow for more efficient resource allocations, high-powered incentives, and flexibility while hierarchy-forms allow for more control, direction, and orchestrated actions due to formal or informal authority control. This underlines the importance of considering boundary conditions and deciding on different shades of openness to and collaboration with the surrounding world rather than decisions on open or closed innovation processes.

Practices of distributed leadership, that is distributing the innovation leadership function among members of the Open Innovation practice based on their expertise support these processes. Von Krogh, Nonaka and Rechsteiner (2012, 253) argue that distributed leadership is “an outcome of cooperation between individuals that manifests itself in their shared direction, the alignment of their behavior, and their mutual commitment to a particular practice.” Building on this, Haefliger and Poetz (2016) argue that Open Innovation leadership as a trait of the leader, as a process of enabling knowledge creation and value capture, and as an outcome and convergence of interests and results needs to produce and maintain self-managing structures that cross organizational boundaries. This implies the need for giving up (at least certain parts of) the control and replacing control mechanisms by establishing trust.

To build organizational ecosystems that successfully and sustainably integrate Open Innovation practices we recommend organizations to first systematically assess their existing organizational design variables in terms of structural and cultural arrangements, processes, incentive systems as well as policies towards the sharing of intellectual property rights or human resource management in general. The outcome of this analysis can then be assessed vis-à-vis existing insights on building absorptive capacity for Open Innovation. On the basis of this, organizations can systematically develop Open Innovation ecosystems which fit both, their strategic innovation goals and relevant industry dynamics. New forms of Open Innovation leadership practices (cf Haefliger/Poetz, 2016) are needed to initiate these change processes and sustainably integrate their outcomes. Related to this, our experiential insights from Open Innovation projects and initiatives clearly indicate that building Open Innovation ecosystems requires facilitators who contribute to initiating and implementing connections across the boundaries between different actors and knowledge sources involved in Open Innovation activities. The Ludwig Boltzmann Gesellschaft’s Open Innovation in Science Center (LBG OIS Center) or the SPOMAN Open Science platform at Aarhus university are two examples of facilitators who connect scientific researchers, users, citizens, large companies, SMEs and policy makers for the purpose of Open Innovation.
3.2 Need to establish open innovation search and collaboration competences

Building on the knowledge-based theory of the firm, Nickerson and Zenger (2004, 17) argue that the nature of an innovation problem “influences the optimal method of solution search and the optimal means of organizing that search”. In reality, the selection of (open) innovation methods is often driven by the interest in or the hype around a certain innovation method or the expertise of a specific consultant.

Ideally, the decision on working with a specific (open) innovation method should be taken on the basis of relevant boundary conditions. With respect to the nature of the problem, this specifically relates to problem complexity (Felin/Zenger, 2014). The more complex the problem is, the higher is the likelihood that individual organizations cannot manage defining, modularizing and solving it (Pisano/Verganti, 2008). Consequently, the more likely it is that Open Innovation searches may benefit problem solving. Related to the nature of the problem are considerations regarding the expected innovation outcome in terms of the level of innovation (incremental vs radical innovation). If the goal is radical innovation, distant knowledge sources such as lead users or analogous markets are more likely to contribute to reaching this goal than working with existing customers or suppliers (Lilien et al, 2002; Franke/Poetz/Schreier, 2014). Related to this, the choice of the search method will influence whether or not distant knowledge sources can be reached. As argued by Felin and Zenger (2014), search processes aiming at activating self-selection are more likely to unleash hidden and unusual knowledge sources as compared to search processes in which the searching organization is in the driver’s seat (Jeppesen/Lakhani, 2010). Against the backdrop of this, crowdsourcing-based search mechanisms for generating innovation have gained increasing attention over the past years, allowing organizations to activate self-selection among large and potentially unknown contributors to innovation processes (Afuah/Tucci, 2012). Also in crowdsourcing processes, distance matters when it comes to successful problem solving. Jeppesen and Lakhani (2010) find that successful solutions to problems posted on the crowdsourcing platform Innocentive often originate from solvers with a large expertise distance to the original problem domain. Also pyramiding search, an open innovation search process based upon the idea that people with a strong interest in a given attribute or quality, for example, a particular type of expertise, will tend to know of people who know more about and/or have more of that attribute than they themselves do (von Hippel/Franke/Prügl, 2009). Poetz and Prügl (2010) find that pyramiding search is another means to access and leverage knowledge from distant sources, ie, knowledge from structurally similar but contextually distant domains. Both Open Innovation search methods, pyramiding and crowdsourcing, can thus contribute to uncovering hidden knowledge and unblocking the negative effects of local search biases (cf Katila/Ahuja, 2002).

Another aspect in selecting Open Innovation methods and designing optimal Open Innovation search and collaboration approaches relates to how value created in these processes is distributed among contributors. While the distribution of value is usually well defined in strategic alliances, licensing deals or
other forms of R&D collaborations based on contractual agreements, governing rights and obligations among widely distributed partners in crowdsourcing or community-based Open Innovation projects is more complex. It furthermore builds on different types of costs vs. benefits \((Raasch/von Hippel, 2013)\). Fairness in the design of the value distribution mechanism is particularly important in the context of designing crowdsourcing projects \((Franke/Keinz/Klausberger, 2013)\). Leading crowdsourcing platforms have, as a consequence, already started going beyond winner-takes-it-all reward mechanisms. Some challenges at Incentive, for example, invite winners to negotiate the establishment of partnership agreements. At Tongal, contributors can earn Tongal Points for engagement and ideation, even if they are not the challenge winners. Given certain boundary conditions involved in modularizing complex problems, crowdsourcing has recently even been used to facilitate business model innovation \((Waldner/Poetz, 2015)\).

Building qualified Open Innovation search and collaboration competences in terms of selecting relevant innovation problems, matching them with appropriate Open Innovation methods and designing sustainable value capture mechanisms is a learning-by-doing process. From experience, these competences can be best built by means of training and experimentation in safe spaces or in the course of supervised pilot projects. The Schindler Escalator Division, for example, has successfully experimented with Open Innovation methods involving lead users and analogous markets and by doing so established Open Innovation competences over time \((Poetz/Franke/Schreier, 2014)\). Another example is the Ludwig Boltzmann Gesellschaft’s Lab for Open Innovation in Science (LOIS). LOIS is a specific training and experimentation space in which scientists can learn about and experiment with using Open Innovation principles and methods along the entire process of generating and dissemination new scientific insights. Based on their learning, LOIS participants develop and implement actual Open Innovation in science projects in a supervised environment.

The successful integration of knowledge gained via experimentation or pilot projects, however, also depends on personal development work towards individual capacities for openness and sharing, thereby overcoming unconscious biases. Along these lines, absorptive capacity needs to be considered on an individual and team level as well \((Zahra/George, 2002; Volberda/Foss/Lyles, 2010)\). For example, \textit{Wang et al} (2014) show that individual absorptive capacity mediates the effect of perceived organizational factors such as job autonomy and fairness of rewards on creating innovations in the context of information systems. Recent studies have focused on exploring the micro-foundations of absorptive capacity \((\textit{eg}, \textit{Lewin/Massini/Peeters, 2011}; \textit{Lowik/Kraaijenbrink/Groen, 2017}; \textit{Ojo/Raman/Chong, 2017})\), indicating that specific capabilities such as prior knowledge diversity, a bisociate decision-making style (i.e., using imagination and intuition instead of rational thinking, emphasizing of verbal ideas and reasoning), and the creation of a shared understanding are relevant for its development, along with organizational circumstances such as external network diversity. Individual absorptive capacity has also been shown to negatively moderate the positive effect of strong personal, interfirm ties among managers on transferring knowledge across organizational boundaries \((\textit{Khachlouf/Quelin}, ...\)
2018). This indicates a substituting effect in terms that the higher the absorptive capacity of a manager, the less relevant become strong ties among managers for knowledge transfer purposes. In contrast, low absorptive capacity could be balanced-out by communication and motivation-driven activities that facilitate knowledge transfer. Absorptive capacity can and becomes more and more relevant to be trained on an individual level. While organizational changes are relevant and necessary, they might not be sufficient in successfully integrating external and distant knowledge for innovation purposes.

For Open Innovation leaders, the Individual competence of ceding or accepting authority when appropriate becomes critical to the functioning of an open or collaborative innovation efforts (Haefliger/Poetz, 2016). New leadership skills individual leaders need to develop include the capacity to listen, understand and react to collective dynamics in situ (cf Scharmer, 2009).

4. Summary and conclusions

In this article, we argue that translating Open Innovation from a hyped phenomenon to a sustainable innovation practice requires building (1) Open Innovation ecosystems in organizations and (2) establishing Open Innovation search and collaboration competences on the individual and group level. We furthermore argue that Open Innovation requires new forms of leadership characteristics, processes and practices.

We hope to encourage practitioners and researchers alike to contribute to the understanding and development of facilitating structures and mechanisms to strengthen the sustainable integration of Open Innovation principles and methods, as we are still far from an extensive understanding. We believe this is important since innovating organizations in the 21st century do not anymore consider whether innovation processes should be open (vs close) but rather decide on the what, how and under which conditions involved in opening them. In advancing the implementation of supporting factors and learning of capabilities and competences, individuals and organizations can further increase the overall value created and captured from Open Innovation processes for themselves but also for contributing externals.

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Abstract

Open innovation: Vom gehyperten Phänomen zur nachhaltigen Umsetzung in der Praxis
