

Choosing Open Innovation Intermediaries through their web-based platforms

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Abstract. This paper examines the services provided by Open Innovation Intermediaries (OII) through their web-based platforms, in order to understand how OIIs can effectively support innovation seekers in their innovation processes. Relying on the existing literature exploring the roles and functions of web-based OII platforms, we carried out an exploratory and comparative qualitative study to identify the services available, to classify them by the various phases of the innovation processes in which they can be beneficial, and to link them to general roles and functions. Our analysis of the services provided by OII platforms sheds light on the dynamics of innovation seekers' choices, and gives meaningful insights that can help improve this information and these services, so that OIIs can improve their offer in terms of complementary resources and knowledge for the innovation processes.

Keywords: Open Innovation Intermediaries; Web-based platforms; Intermediaries' services, Seekers in Open Innovation contexts.

1. INTRODUCTION

Open Innovation Intermediaries aim to make it easier to adopt the so-called Open Innovation paradigm. Open Innovation Intermediaries' web-based platforms support innovation seekers looking for external ideas, knowledge, and innovations in choosing the most appropriate Intermediary.

The Open Innovation (OI) approach is primarily focused on opening up firms' innovation processes to external actors (Chesbrough, 2003; Christensen *et al.*, 2005; Gann, 2005; Helfat, 2006; Enkel *et al.*, 2009; Dahlander and Gann, 2010; Harison and Koski, 2010; Herzog and Leker, 2010; Huizing, 2010; Manzini *et al.*, 2012; Chesbrough and Bogers, 2014; West and Bogers, 2014). Following this paradigm, firms should involve external actors—that is, solvers such as universities, research centres, professionals, other firms, communities, and individuals—to acquire new ideas and resources, to intensify and accelerate their internal innovation processes, and to expand markets using their innovative outcomes (Chesbrough *et al.*, 2006).

Access to external knowledge sources, as well as the search for solvers, can be facilitated by Open Innovation Intermediaries (OIIIs), which are defined as organizations that stimulate, operate, and support any aspect of innovation processes (Howells, 2006; Stewart and Hyysalo, 2008; Sieg *et al.*, 2010; Hakanson *et al.*, 2011; Ollila and Elmquist, 2011; Tran *et al.*, 2011; Katzy *et al.*, 2013; Ye and Kankahalli, 2013).

Academic contributions on OIIIs have mainly focused on their critical roles in innovation processes (Gassmann *et al.*, 2011; Agogue *et al.*, 2013; Mirkovski *et al.*, 2015), their wide range of functions and activities (Howells, 2006; Daziel, 2010), their modes of interaction connecting innovation players and their related successes (Lakhani, 2008), their unique abilities, competences and capabilities to effectively activate and manage knowledge combination and recombination processes (Verona *et al.*, 2005) (including in new product development processes) (Colombo *et al.*, 2014), the value that seekers can derive from interacting with them (Roijakkers *et al.*, 2014), their life cycle (Hallerstede, 2013) and recently also on trying to build theories and models for their market (Hossain, 2012). In addition, contributions concerned with OIIIs consider their advanced web-based platforms as the virtual *locus* in which OIIIs effectively stimulate, link, coordinate, and sustain interactions and exchanges of ideas and knowledge between 'innovation seekers' and 'innovation solvers', and find appropriate partners worldwide (Howells, 2006; Gassmann *et al.*, 2011), highlighting the IT role also following a Service-Dominant Logic perspective (Lusch and Nambisan, 2015).

Nonetheless, very little evidence exists of the services delivered by OII through their advanced web-based platforms. Services represent the practical way in which OIIs operate and support seekers; it is therefore clear that their differences in terms of services have to be considered by seekers as a criterion for choose the best suited to each moment of the innovation process. In fact, the complementary resources, knowledge, and solutions, needed by the seeker, can emerge both at the starting point and at each phase of the innovation process in different ways. In consequence, seekers have to select the right OII, taking into account the real problem to be solved; looking at roles, functions, and the OII's stated mission does not tell the seeker exactly how the OII can really help at a given time or with a specific issue. Moreover, each seeker firm and each OII's peculiarities need to be harmonized to lead to a successful innovation process; services represent the way in which these actors can interact in practice; they have to be profoundly known before the right OII can be selected.

To address this gap in the literature and to give some practical insights to seekers interested in approaching Open Innovation through OIIs, two main research questions arise:

- 1) *Which are the services that innovation seekers can obtain through web-based OII platforms?*
- 2) *Which are the differences in the ways OIIs fulfil their roles and functions through the web-based services they provide?*

To answer to these research questions, following a brief review of earlier studies on the roles and functions of OIIs, we carry out an explorative and comparative qualitative analysis considering eight different web-based OII platforms to make clear the differences in terms of services provided by these Intermediaries. In doing so, we also distinguish services by considering the various phases in which an innovation process develops, with the aim of clarifying which services can be benefited at each stage of the innovation process by choosing different OIIs. Moreover, we link the services found on web-based OII platforms to the roles and functions already identified in the literature to show how these can be differently interpreted by each individual OII, making it clear that even if these can be shared amongst OIIs, then the activities carried out can

vary significantly, calling for a careful selection of intermediaries. The paper ends with a discussion of the results and with a conclusion, which also contains theoretical and managerial implications, further research steps, and the limitations of the study.

2. ROLES OF OPEN INNOVATION INTERMEDIARIES

A wide range of terms is used in different research fields to define OII (Mantel and Rosegger, 1987; Bessant and Rush, 1995; Hargadon and Sutton, 1997; Winch and Courtney, 2007): knowledge intermediaries, superstructure organizations (Lynn *et al.*, 1996), technology brokers (Provan and Human, 1999), infomediaries (Hagel and Rayport, 1997), innomediaries (Sawhney *et al.*, 2005; Roijakkers *et al.*, 2014), and cross-sourcing initiatives (Sieg *et al.*, 2010).

The common denominator of these definitions is that the intermediaries are always oriented to bridge the gaps between resources and knowledge by introducing, connecting, and facilitating interactions and relationships among diverse external parties that would otherwise be disconnected (Hargadon, 1998; Hargadon and Sutton, 2000) and would difficultly communicate (Flensburg, 2009). They can therefore contribute to decreasing innovation costs and time related to the development of new products and technologies, rapidly involving complementary capabilities in knowledge generation and acquisition processes, and increase the opportunity of finding the appropriate paths for bringing technologies to the market (Diener and Piller, 2010).

According to Howells (2006), innovation intermediaries —considered generally as independent third parties— can be defined as agents or brokers “helping to provide information about potential collaborators; brokering a transaction between two or more parties; acting as a mediator, or go-between, bodies or organizations that are already collaborating; and helping find advice, funding and support for the innovation outcomes of such collaborations”. The crucial role of these intermediaries during complex innovation processes has been examined from different perspectives: (a) scanning information and identifying needs (Diener and Piller, 2010; Gassmann *et al.*, 2011); (b) knowledge transfer, experience sharing, and diffusion (Diener and Piller, 2010; Gassmann *et al.*, 2011); (c) brokering for problem solving (Agogue *et al.*, 2013); (d) intermediation

for technology transfer (Lichtenthaler and Ernst, 2008; Agogue *et al.*, 2013); and (e) systems and networking (Gassmann *et al.*, 2011; Agogue *et al.*, 2013).

Several studies have explored the main functions from the fundamental role of the *middleman* who operates on behalf of his client when dealing with diverse clients (Howells, 2006). More specifically, OIIs perform a wide range of core functions, linked appropriately with the above mentioned roles, which are the following: a) connecting, involving, and mobilizing different actors in innovation processes (Hakanson *et al.*, 2011; Agogue *et al.*, 2013); b) facilitating the identification of suitable technology commercialization opportunities (Lichtenthaler and Ernst, 2008), diffusing technology transfer (Diener and Piller, 2010) and supporting “accreditation, validation and regulation, protection of the results” (Howells, 2006, p. 721); c) processing knowledge by connecting companies with problems to solvers from different domains and industries (Howells, 2006; Stewart and Hyysalo, 2008; Lopez and Vanhaverbeke, 2009; Hakanson *et al.*, 2011; Ye and Kankanhalli, 2013); d) solving (or mitigating) conflicts between stakeholders (Agogue *et al.*, 2013); e) foresight, diagnostic, and information processing (Howells, 2006), working closely with clients to define problems and find solutions (Ye and Kankanhalli, 2013), as well as brokering information flows (Diener and Piller, 2010).

To perform these heterogeneous functions, OIIs can use web-based platforms that facilitate interactions and more easily build networks among different entities worldwide, transforming this traditional one-way communication form into a persistent global dialogue (Sawhney *et al.*, 2005).

As a relatively new phenomenon, OII services still need further research to investigate some of their peculiar aspects. Although a number of academic contributions have focused on their roles, functions (Howells, 2006; Lopez and Vanhaverbeke, 2009), activities (Bakici *et al.*, 2012; Colombo *et al.*, 2014), and mechanisms (Gassmann *et al.*, 2011) to foster open innovation processes, there is still a lack of research on the services provided by OIIs and how they foster innovation processes through the integration of internal and external knowledge sources. Moreover, OIIs can use their web-based platforms in different ways: some of them function as a form of first contact, with services mostly provided offline; some are the real *locus* of all their intermediation activities; and others

work either way, depending on the seeker's preference (Roijakkers *et al.*, 2014). We therefore begin filling this gap in the literature by focusing our study on OII services provided directly online, as this better suits the methodology used (for example, we didn't carry out in-depth interviews with OIIs that provide their services offline); it also makes the real support OIIs provide through their web-based platforms clearer, and helps to suggest to seekers that they look at the services provided when choosing the most suitable OII at each given time, rather than examining general roles, functions and stated mission.

3. RESEARCH METHODOLOGY

To pursue our research objectives and to answer our research questions, we used an explorative and comparative analysis with the multiple case-study methodology (Yin, 2003). We adopted this methodology, because it allows the exploration of the phenomenon of interest—that is, of the services provided by innovation intermediaries through their web-based platforms, in order to facilitate and support seekers and solvers in the challenging innovation context.

We examined eight web-based OII platforms for how they provide a wide range of services oriented at sustaining innovation processes. To choose our sample, we considered that the birth and development of OIIs can be divided into two distinct periods: the first runs from 1999 to 2002; the latter concerns the years between 2009 and 2010 (Bakici *et al.*, 2012). Following this evolutionary trend, we created two distinct subsamples of intermediaries and examined four platforms from the first period and the same number from the second period. Reference was made to Bakici *et al.* (2012), who fundamentally examined five of the selection of subsamples of the more recent operators (2010–2012). From this group, it was necessary to exclude *challenge.gov*, as it is a US General Services Administration property (Bakici *et al.*, 2012) and not directly comparable under various profiles with other spontaneously developed private innovation intermediaries. Also, the Presance intermediary was excluded, as it is no longer accessible. In order to consider recent trends in Europe that are not yet available in the literature, we added an Italian Open Innovation Intermediaries founded in this same period. The first subsample contains *Big Idea Group*, *Openideo*, *Inpama*, and *mercatodellinnovazione.it*.

The OIIs chosen have been frequently studied and cited in the literature; these are *NineSigma* (Chesbrough, 2006; Bakici *et al.*, 2012; Hossain, 2012), *Innocentive* (Huston and Sakkab, 2006; Lakani *et al.*, 2007; Sieg *et al.*, 2010; Hossain, 2012), *yet2.com* (Lichtenthaler, 2008; Abbate and Coppelino, 2011; Hossain, 2012) and *Big Idea Group* (Lopez and Vanhaverbeke, 2009).

Once we selected the innovation intermediaries, we designed our research analysis in two main steps. First of all, we examined contributions to the academic literature, official reports, dossiers, and documents in order to obtain useful data and information on these OIIs, especially on their roles and functions.

We then made several rounds of desk analysis directly on each of these web-based OII platforms, in order to compare their available and usable services. In doing so, we classified the services, focusing on the different innovation phases normally followed in an Open Innovation context when an Intermediary intervenes, derived from the literature on the roles and functions of OIIs. To track each research activity, we developed *ad hoc* spreadsheets using the Excel program. This survey was carried out between the 2nd and 13th of February 2015, ensuring that the material from literature was up to date.

It should be noted here that it is not possible to statistically generalize results from an exploratory multiple case study analysis (Yin, 1984). However, our findings can nonetheless inform future theoretical and empirical studies regarding OIIs and their services to facilitate the adoption of OI in the context of different activities.

4 RESULTS

4.1. Services provided by OIIs: a comparison

The range of services provided by OIIs is wide and, as highlighted by Howells (2006), shows interesting elements of selection for seekers, as shown in Annex 1 .

As far as “connection mode” is concerned, all OIIs allow the contact between seekers and solvers mediated by their own platform, being the main aim of OII creation, while only five of the sample web-based platforms support direct contact between seekers and solvers (*NineSigma*, *Big Idea Group* and *Big Idea Groups* - the Nokia owned platform- are the exceptions). The only marketplaces used for

the exchange of complete technologies or patents are *yet2.com*, *Inpama*, and *mercatodellinnovazione.it*.

The “Communication services” are, in most cases, enabled by the OII platforms and the e-mail, even if some OIIs allow some personal communications as NineSigma, *Innocentive* for the *Grand Challenges* and by telephone for the *Premium Challenges*, *yet2.com*, *Big Idea Group*, *Big Idea Groups* and *mercatodell'innovazione.it*.

Under the heading “Services providing support for contact and initiation of innovation process”, or what can be understood as the process “from innovative idea to product”, it is possible to clearly identify some generic services that are common to many web-based OII platforms (such as “Acceptance services, text preparation, and revision of post”, “Preventive analysis ideas/demand/problem”, “Information guide/support to a shared innovation process”, “communication and distribution to community members or specific partners”, “Support services by experts on request/project”, etc.), while other, more specialized, services characterize only some web-based platforms; this is an interesting factor of differentiation. For example, *mercatodellinnovazione.it*, NineSigma and *yet2.com* offer the possibility of evaluating “existing and emerging technology to guide firms in innovation choices”, while other intermediaries, such as NineSigma, *Innocentive* (only for *Premium Challenges* and *Grand Challenges*), *yet2.com* and *Inpama*, offer “services seeking specialized partners to comply with the prerequisites dictated by the firm” and as well as *Big Idea Group* and *mercatodell'innovazione.it* foster and sustain the “creation of ad hoc groups for the resolution of problems”. Four of the OII web-based platforms we analyzed offer services deemed to the “definition and evaluation of the solutions found” (*Innocentive* -only for *Premium Challenges* and *Grand Challenges*-, *yet2.com*, *Big Idea Group* and *Openideo*). Only *Innocentive* provides “services defining the price range” of innovation exchanged, probably due to its mission as a marketplace for innovations.

The more widespread services are the “technical–technological services to support innovation” and “support for the launch of innovation and ‘licence-out’ services”, while “product design support through prototype” services are only

provided by *NineSigma*, *Innocentive – Premium Challenges*-, *Big Idea Group* and *Openideo*.

“Technical–technological consultancy services to the firm” are found in the case of *NineSigma*, while *mercatodellinnovazione.it* offers “support identifying aspects and/or projects for further investment by the firm”. Besides these, *yet2.com* offers “services to improve existing and/or integrable technology in the firm”.

Big Idea Group and *Inpama* stand out with their “consultancy services” for financial and marketing questions, while *yet2.com* offers services focused specifically on “seeking partners for venture capital operations”, and *mercatodellinnovazione.it* concentrates its consultancy service on firm internationalization processes and activities.

NineSigma, *Innocentive*, and *Openideo* offer the interesting possibility of participating in “big innovation projects” concerning relevant subjects such as environment, security, nutrition and so on, while only *NineSigma* provides “training and coaching” services and the opportunity of carrying out sophisticated services, such as “psychometric tests on team leaders and project managers”.

Summarizing, looking to services provided it is clear that the four more recently created OII platforms are more specialized than the older ones. *Big Idea Groups* is a firm owned platform to implement OI thanks to the experts and the community insights; *Openideo* is really focused on the idea and the design, but not on following all the innovation process thus avoiding redundant services; *Inpama* and *Innocentive* are marketplaces with the former more focused on competition, a smaller number of services provided; also *mercatodell'innovazione.it* is a marketplace, which has recently divided the platform provided services activity from its offline consultancy services through *Innovuum*, a new purposely created firm.

4.2. Linking services provided to OII roles and functions

Relying on the information retrieved from the existing literature on the roles and functions of OIIs, and on the data already collected in our study, we build a table linking the roles, functions, and services provided in general and for each of the investigated OIIs (see Annex 2).

It is evident from Annex 2 that several services provided by OIIs through their web-based platforms not only differ from each other (for example, in, “definition and evaluation of solutions found”), but also that some OIIs do not play certain roles or enact some intermediary functions, such as *IdeasProject* and *Inpama* in our sample.

As stated on its web-based platform, *IdeasProject* “*is an online community for everybody from all around the world to brainstorm. It enables the two-way exchange of ideas between users and developers around innovation powered by Nokia*” (www.nokia-ideasproject.com).

This explains why the services provided by this platform specifically support Nokia’s innovation projects and, as a consequence, the only roles fulfilled are “networking” and “intermediation for technology transfer”, while the functions are carried out only on behalf of Nokia’s innovation activities.

Inpama is a useful “*marketplace to sell inventions and patents*” that is available for free to inventors, patent owners, “creative people”, and entrepreneurs (<http://www.Inpama.com>). For this reason, it is not interested in “scanning information and articulating needs” since it supports solvers in their search for innovation seekers and helps them with a guide and some specific tools and materials that let them commercialize their invention or idea on their own.

From Annex 2 it is also clear that roles and functions, do not correspond to the same services made available for seekers and solvers. This, indeed, depicts a more heterogeneous panorama than the one that so far can be found in the literature based on OIIs roles and functions. Looking at the “networking” role and considering the OIIs services, it becomes clear that the network is built linking different partners and needs to follow the main goal of the specific OII. *NineSigma*, the most important OII at global level seems to be not interested in patents, unlike *yet2.com* that focuses its activity on patents. The second OII role we considered is the intermediation for technology transfer. Intermediation for technology transfer is not the basis for services provided by *NineSigma* or *Innocentive* which focus on ideas and knowledge in whichever form (see the “Knowledge transfer/experience sharing” role in Annex 2), not necessary linked to the technology field. This is because these OIIs allow the contact with the

community (directly for *Innocentive*, only through the platform for *NineSigma*) which is normally created by customers and not only by experts. Therefore they can only provide new knowledge, ideas and insights.

The “problem solving” role make clear (see Annex 2) that there are great differences among OIIs. In fact, only few OIIs are able to provide services deemed to help seekers and solvers to unravel all the problems arising during the full development of the innovation process. These differences are determined by both the main goal of the OII and the different expertise they want to provide. This information is of real value for the choice of the right OII. Indeed, if the seeker is not fully aware of all the possible risks and problems which may arise during the innovation journey, he would better consider an OII that is able to provide the complementary expertise. “Scanning information and articulating needs” role is another service that not all OII provide.

We found a gap in the existing literature on OII that is it lacks to highlight the OII original role in enhancing new and widespread research projects starting from an original idea/suggestion. In the sample we analyzed we found that *NineSigma*, *Innocentive* and *Openideo* provide the opportunity to participate to meaningful challenges for the main world social challenges. Considering that this activity is not carried out on behalf some identified seekers, but independently created by the OII, it would be worth to consider the OII role in enhancing the innovation activity of all interested parties aiming to foster social well-being.

5. DISCUSSION AND CONCLUSION

5.1. Discussion

In answer to our first research question on how service-seekers can gain benefit through the services provided by web-based OII platforms, our results show significant difference between intermediaries. Some OIIs offer a wide range of services, sometimes unexpected (such as training and coaching for *NineSigma*), and are able to fully follow the seekers’ innovation processes, providing all the needed complementary resources and knowledge—even if solvers can only be contacted through their intermediation, and not through the web-based platform (e.g., *Nine-Sigma*). Other OI intermediaries are more focused on purposely created services based on their more specific goals; they therefore have a different

attitude towards the exchange of ideas, innovations, and sometimes patents. These OIIs are not interested in providing the “full” support available from other OII platforms, but they do allow direct contact with the solver (e.g., *yet2.com*). Moreover, the services provided by the OIIs in our sample are targeted at particular OII knowledge, resources, and goals; they are consequently more suited to requirements for specific resources and knowledge at specific stages of the seeker innovation process. We can thus assert that examining the services provided may be a better criterion than considering the OII’s stated mission, general roles, and functions. Moreover, we found that only few OIIs could provide new opportunities to innovate for firms through their “*Grand Challenges*” projects which could open new scenarios for those firms and a first approach to OI.

Answering our second research question on the ways in which OIIs fulfil their roles and functions through web-based services, our results contradict some of the literature on the topic, which asserts that each OII fulfils all roles and functions (Howells, 2006; Bakici *et al.*, 2012; Colombo *et al.*, 2014). In our sample, we found that it is not true that each OII fulfils all roles and functions. General roles and functions have their value, but are not able to support seekers in their choice between intermediaries; services can help indicate the real added value provided by each OII for the seeker’s needs at each phase of the innovation process, being aware of the seekers’ proper knowledge, resources and capabilities to foster the innovation process. An entrepreneur who has developed an idea and would like to sell it is unlikely to pay for the use of *NineSigma*’s services, instead of using *Inpama*, a free OII targeted to inventors’ needs. Then again, for a patent, the best-suited OII would likely be *yet2.com*, and so on.

5.2. Theoretical implications

From a theoretical point of view, our study moves a step forward towards a better understanding of OII services’ roles and functions. Our study sheds the light on the more specialized and recent services provided by OIIs platforms. In particular we analyzed their clear intent, mission and different expertise in carrying out their activities and give shape to the services provided to seekers and solvers. These insights still deserve more attention with the aim of understand the OII practical role in supporting firms willing to implement OI. The study highlights that OIIs

can no longer be considered as mere “mediators”, “brokers”, “third parties”, etc. between seekers and solvers, but deserve a new consideration in the innovation scenario. OIIs activities, indeed, go often far beyond their primary aim, supporting seekers and solvers as full range consultants, providing advices and all complementary resources which are necessary to successfully carry out the firms’ innovation processes. Moreover, if fulfilled to enhance the social well-being, some OIIs are able to create their own new innovation opportunities linked to widespread innovation projects able to become active and supporting part of the innovation scenario. This aspects deserve a more in-depth study.

5.3. Practical implications

From a practical point of view, the paper clarifies that the OII selection to implement an OI process should be based on the services offered, instead of on general roles and functions which are not really always fulfilled. Indeed, services are the practical interaction mode that seekers and OIIs have to turn open innovation processes into successes. In this context, the “map” of services provided in this paper, witnesses the differences among the service offered the OIIs we analyzed. Moreover our analysis offers a framework to help firms to find which are the services available from each OII web-based platform. Being aware of the services available on OII platforms may help firms to identify which of them can be available at each stage of the OI process. Bearing in mind which knowledge, resources, capabilities are necessary complete their own OI, is pivotal for firms to evaluate the relevance of the features provided by the different OIIs. In doing so, innovation seekers could identify the OII that better fit to each step of their innovation process basing their choices on services that match with their own innovation requirements, in terms of internal resources and capabilities.

This approach to OII is of major value to exploit the full potential of services available on the market. Moreover, firms should be aware and consider the innovation opportunities autonomously offered by some OII through the *Grand Challenges* tool, trying to widen their innovation network and acquiring new knowledge and resources participating to these widespread projects.

5.4. Limitations and future research

We are aware that the main limitations of this paper are associated with both the explorative nature of the empirical research and the small number of cases investigated here. The topic still needs further research, including, for instance, an extensive empirical analysis of all OIIs, considering also the services they provide offline (as for instance those recently implemented by *mercatodell'innovazione.it* through *Innovuum*). Further research could also be conducted on several ways, as for instance: using interviews to better study how seekers select OIIs; using a longitudinal analysis to evaluate the change in OIIs over time and the rationale for such change; carrying out an analysis of the weights assigned by seekers to specific categories or individual services; or studying how seekers suggest evaluating OII efficacy and success (e.g., new products, new patents).

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<http://www.openideo.com>

<http://www.openinnovators.net>

<http://www.pgconnectdevelop.com>

<http://www.yet2.com>

Annex 1. Services provided by OIIs

Classification services	Services	Nine-Sigma	Innocentive			yet2.com	Big Idea Group	Big Idea Group (Nokia)	Openideo	Inpama	mercatodellinnovazione.it
			Brainstorming Challenges ¹	Premium Challenges ²	Grand Challenges ³						
Method of contact management between seekers and solvers	Connection between solvers and seekers managed through the platform	YES (1,2)		YES Supported by experts (1,3)	YES Shaped ad hoc (1,3)	YES Yet2 Strategic Dealflow Service (1,2,3)	YES	YES	YES	YES Only for the commercialization of patents (1)	YES
	Connection between seeker and solver communities managed autonomously		YES (3)	YES (3)	YES (3)	YES			YES	YES Only for the commercialization of patents	YES
	Purchase and sale of patents in the marketplace					YES (1,4,5,6)				YES	YES
Communication services	Communication services	Platform, e-mail, personal	Platform, e-mail	Platform, e-mail, telephone	Platform, e-mail, personal	Platform, personal	Platform, personal	Platform, e-mail, personal	Platform, e-mail	Platform, e-mail	Platform, e-mail, personal

¹. Bakici *et al.*, 2012; ². Hakanson *et al.*, 2011; ³. Verona *et al.*, 2005; ⁴. Huston and Sabbak, 2006; ⁵. Lichtenthaler and Ernst, 2008; ⁶. Lopez *et al.*, 2009; ⁷. Sieg *et al.*, 2010; ⁸. Lakhani, 2008; ⁹. Sahwney *et al.*, 2005.

Source: our work on data from the sites and from the existing literature.

¹ “do-it-yourself challenges” through open and collaborative Web 2.0 instruments

² Challenges for product innovation (ideas, design, prototypes), connected to *Big Data*, or for molecule development in pharmaceutical, chemical, and other fields, with specific research partners.

³ Challenges concerning the big themes in disparate fields (e.g., environment, renewable energy, etc.).

Annex 1, continued. Services provided by OII

Classification services	Services	NineSigma	Innocentive			yet2.com	Big Idea Group	Big Idea Group (Nokia)	Openideo	Inpama	mercatodellinnovazione
			Brainstorming Challenges	Premium Challenges	Grand Challenges						
Services providing support for contact and initiation of innovation process	Acceptance services, text preparation, and revision of post	YES <i>NineSigma RFPTM</i> (4,6)	YES By the seeker or through the community	YES (7)	YES	YES <i>TechPaks</i> (3,4)	YES		YES Together with challenge sponsor		YES
	Preventive analysis ideas/demand/problem	YES <i>NineSigma QuickScanTM</i>		YES	YES	YES	YES		YES		YES
	Evaluation of existing and emerging technology to guide firms in innovation choices	YES <i>NineSigma's Technology Landscaping^T_M</i>				YES (1)					YES
	Information guide/support to a shared innovation process	YES <i>NineSigma Linked InnovationTM</i>		YES	YES	YES	YES			YES	YES
	Services defining the price range		YES	YES	YES						
	Communication and distribution services to community members or specific partners	YES <i>NineSigma RFPTM</i>	YES weekly Newsletter	YES weekly Newsletter, used by social media	YES Completely personalized programs	YES <i>Tech of the Week</i> (3)	YES		YES (1)	YES	

¹. Bakici *et al.*, 2012; ². Hakanson *et al.*, 2011; ³. Verona *et al.*, 2005; ⁴. Huston and Sabbak, 2006; ⁵. Lichtenthaler and Ernst, 2008; ⁶. Lopez *et al.*, 2009; ⁷. Sieg *et al.*, 2010; ⁸. Lakhani, 2008; ⁹. Sahwney *et al.*, 2005.

Source: our work on data taken from the sites and from the existing literature.

Annex 1, continued. Services provided by OII

Classification services	Services	NineSigma	Innocentive			yet2.com	Big Idea Group	Big Idea Group (Nokia)	Openideo	Inpama	mercatodellinnovazione.it
			Brainstorming Challenges	Premium Challenges	Grand Challenges						
Services providing support for contact and initiation of innovation process (sequel)	Support services by experts on request/project	YES <i>Expert advisory service</i> (1)		YES With a standard process (3,7,8)	YES With ad hoc process (8)	YES			YES (1)	YES Contacted directly by the <i>seeker</i>	YES
	Services seeking specialized <i>partners</i> in answer to prerequisites dictated by the firm	YES <i>NineSigma Targeted Partner Search™</i>		YES (1)	YES	YES				YES	
	Creation of ad hoc group services for the resolution of problems	YES <i>NineSigma Linked Innovation™</i> (1, 9)		YES	YES	YES (9)	YES (1)			YES	YES
	Monitoring throughout the entire innovation process	YES <i>NineSigma RFP™</i>		YES	YES	YES	YES		YES (1)		YES By at least two experts
	Definition and evaluation of solutions found			YES	YES	YES (1)	YES		YES		

1. Bakici *et al.*, 2012; 2. Hakanson *et al.*, 2011; 3. Verona *et al.*, 2005; 4. Huston and Sabbak, 2006; 5. Lichtenthaler and Ernst, 2008; 6. Lopez *et al.*, 2009; 7. Sieg *et al.*, 2010; 8. Lakhani, 2008; 9. Sahwney *et al.*, 2005.

2. Source: our work on data taken from the sites and from the existing literature.

Annex 1, continued. Services provided by OII

[illegible]

Annex 1. Services provided by OII (sequel)

Classification services	Services	Nine-Sigma	Innocentive			yet2.com	Big Idea Group	Big Idea Group (Nokia)	Openideo	Inpama	mercatodellinnovazione.it
			Brainstorming Challenges	Premium Challenges	Grand Challenges						
Other services and/or innovation opportunities	Training and coaching services	YES									
	Psychometric tests for team leaders and project managers	YES The Collaborative Innovation Profile together with Caliper									
	Possibility of participating in big innovation projects in fields of great interest worldwide (e.g., in environment)	YES NineSigma, Grand Challenge™			YES Stimulated by seekers				YES Big challenges for social good		

Source: our work on data taken from the sites and from the existing literature.

Annex 2: OII services linked to general roles and functions

Roles	Functions	Services provided by OIIs
1. Networking (Gassmann <i>et al.</i> , 2011 ; Agogue <i>et al.</i> , 2013)	To connect, involve and mobilize large number of actors (Hakanson <i>et al.</i> , 2011; Agogue <i>et al.</i> , 2013).	- Connection services between seekers and solvers direct (Innocentive, Yet2.com, Openideo, Inpama for patents, Mercatodel, linnovazione.it) and through the platform (all eight platforms); - Support services by experts on request/project (Nine-Sigma, Innocentive except for Brainstorming Challenges, Yet2.com, Openideo, Inpama, Mercatodellinnovazione.it); - Services seeking specialized partners in answer to prerequisites suggested by the firm (NineSigma, Innocentive except for Brainstorming Challenges, Yet2.com, Inpama); - Creation of ad hoc group services for the resolution/response to problems (NineSigma, Innocentive except for Brainstorming Challenges, Yet2.com, Big Idea Group, Inpama, Mercatodellinnovazione.it); - Purchase and sale of patents for OII which are marketplaces (Yet2.com, Inpama, Mercatodellinnovazione.it).
2. Intermediation for technology transfer (Lichtenthaler and Ernst, 2008; Agogue <i>et al.</i> , 2013)	To facilitate the identification of technology commercialization opportunities (Lichtenthaler and Ernst, 2008) and the diffusion of technology transfer (Diener and Piller, 2010). “Accreditation, validation and regulation, protection of the results, commercialisation and evaluation of outcomes” (Howells, 2006, p. 721).	- Definition and evaluation of solutions found (Innocentive except for Brainstorming Challenges, Yet2.com, Big Idea Group, Openideo); - Services defining the prize range (Innocentive); - Searching for commercialization opportunities through networking (all platforms, for details look to the previous row).
3. Knowledge transfer/experience sharing (Diener and Piller, 2010; Gassmann <i>et al.</i> , 2011)	Knowledge processing and combination/recombination by connecting companies with problems to a broad range of solvers from different domains and industries (Howells, 2006; Stewart and Hyysalo, 2008; Lopez and Vanhaverbeke, 2009; Sieg <i>et al.</i> , 2010; Hakanson <i>et al.</i> , 2011; Bakici <i>et al.</i> , 2012; Ye and Kankanhalli, 2013).	- Information guide/support to a shared innovation process (NineSigma, Innocentive except for Brainstorming Challenges, Yet2.com, Big Idea Group, Inpama, Mercatodellinnovazione.it); - Monitoring throughout the entire innovation process (all platforms except Innocentive for Brainstorming Challenges, Big Idea Group, Inpama); - Communication and distribution services towards community members and/or specific partners (all platforms except Big Idea Group, Mercato dellinnovazione.it).
4. Problem Solving (Agogue <i>et al.</i> , 2013)	To solve (or mitigate) conflicts among stakeholders (Agogue <i>et al.</i> , 2013).	- Techno-technological support services for innovation: (a) Product design support through to prototype (NineSigma, Innocentive for Premium Challenges, Big Idea Group, Openideo); (b) Innovation launch support and licence-out services (NineSigma, Innocentive, Yet2.com, Big Idea Group, Inpama); - Other consultancy services: organizational and financial, on suppliers and supply chain management, partner seeking services for venture capital operations, marketing services for Big Idea Group, Inpama; partner seeking services for venture capital operations for Yet2.com; internationalization support for Mercatodellinnovazione.it; training and coaching services and psychometric tests for team leaders and project managers only for NineSigma).
5. Scanning information and articulating needs (Diener and Piller, 2010; Gassmann <i>et al.</i> , 2011)	Foresight and diagnostics, scanning and information processing (Howells, 2006). Working closely with clients (seekers) to define the problems and to find possible solvers (Ye and Kankanhalli, 2013). Brokering information flows, filling information gaps (Diener and Piller, 2010).	- Acceptance services, text preparation and revision of post (all platforms except Big Idea Group, Inpama); - Preventive analysis ideas/demand/problem (all platforms except Innocentive-Brainstorming challenges, Big Idea Group and Inpama); - Evaluation of existing and emerging technology to guide the firm in the innovation choice (NineSigma, Yet2.com, Mercatodellinnovazione.it); - Technic-technological consultancy services to the seeker (NineSigma, Yet2.com only for Existing technology improvement services and/or integrable to firm, Mercatodellinnovazione.it).
	OII own functioning activities	- Communication services (online for all platforms, personal only for NineSigma, Innocentive-Grand Challenges, Yet2.com, Big Idea Group, Big Idea Group, Mercato dellinnovazione.it) - Other innovation opportunities provided by the OII (NineSigma, Innocentive - Grand Challenges, Openideo).