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The Increased Importance of Intellectual Property in Open Innovation Environments and its Role in Addressing City Challenges

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The Increased Importance of Intellectual Property in Open Innovation Environments and its Role in Addressing City Challenges

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Executive Summary

The overall theme for the 2018 IASP World Conference hosted by Isfahan Science and Technology Town is "Towards sustainable cities and communities: Fostering innovation ecosystems. With respect to the topic "Open Innovation and City Challenges", it has been noted that Science and Technology Parks ("STPs") are increasingly involved in stimulating Open Innovation processes and, in this framework, are encouraged to provide solutions to the major challenges of cities today. This paper begins first by defining more precisely what Open Innovation actually means and by providing some success stories. Second, the paper addresses the increased importance of intellectual property rights ("IPRs") in an open innovation environment. The paper concludes with a discussion on the beneficial synergies between STPs / AOIs and companies in an Open Innovation ecosystem.

Open Innovation: the birth and evolution of a breakthrough paradigm

While the concept of Open Innovation goes back to the 1960s, the modern perspective emerged only in 2003 with the publication of a book by Henry Chesbrough, Open Innovation: The new imperative for creating and profiting from technology.

The groundbreaking concepts described in this and further publications by Chesbrough along with several co-authors are worth exploring in some detail.

In order to fully appreciate the concept of open innovation, it is first important to understand the premise on which it is based. As noted in 2014 by Chesbrough and Bogers:

> At the most fundamental level, open innovation is embedded in the notion that the sources of knowledge for innovation are widely distributed in the economy. As such, the idea that most smart people work for someone else, popularized as Joy's Law, harks back to Hayek's (1945) view of knowledge as being distributed across society. When Chesbrough (2003a) inaugurated the popular use of the term open innovation, it described a phenomenon of companies making greater use of external ideas and technologies in their own business, and letting unused internal ideas and technologies go outside for others to use in their business. The book proposed "erosion factors" that undercut the logic of earlier "closed innovation" model of R&D and developed the logic of an open innovation model. These erosion factors, such as increased mobility of workers, more capable universities, declining US hegemony, and growing access of startup firms to venture capital, changed the conditions under which firms innovate. Here we propose yet another erosion factor that allows firms to leverage increasingly distributed knowledge sources, namely the rise of the internet (and the related rise of social media), which has brought the knowledge access and sharing capabilities of previously firm-specific internal ICT networks to the World Wide Web[1].

In fact, we are in a knowledge-based economy in which knowledge has become widely diffused with the concomitant increase in erosion factors which make the old closed system untenable in many cases. At the same time there is continual pressure to increase the rate of innovation.

Actually, today the pressure to accelerate the pace of innovation has a significant impact not only on innovative companies, but also on a variety of private and public entities, including cities seeking to find sustainable ways to manage their urban environment. Indeed:

> Major urbanization requires innovative ways to manage the complexity of urban living; it demands new ways to target problems of overcrowding, congestion, energy consumption, resource management and environmental protection. It is in this context that smart cities

[1] Henry Chesbrough, Wim Vanhaverbeke and Joel West, *New Frontiers in Open Innovation*, Oxford University Press, 2014, p. 16.

emerge not just as an innovative modus operandi for future urban living, but a key strategy to tackle poverty and inequality, unemployment, and energy management[2].

The concept of smart cities has been evolving together with the development of intelligent solutions in a variety of urban related sectors, such as "smart manufacturing", "smart health", "smart buildings", "smart vehicles", etc.

By adopting an Open Innovation approach, smart and sustainable cities are able to "act as 'living labs' and combine the power of ideas and knowledge from different players while promoting a citizen and user-centric approach[3]".

A key factor for developing an Open Innovation environment has been the World Wide Web.

The World Wide Web in particular has allowed for unprecedented sharing of information that in the past would have been held closely within a company. Moreover, the internet made it possible to create open platforms that allow for the exchange of information and resources between people from all over the world on a variety of collaborative projects.

One such example is a platform called "InnoCentive", which has been described on its website as a web-based system that would attract hundreds or even thousands of minds to tackle a problem in organic syntheses, more effectively exploring the vast domain of solution space"[4] and as a "global pioneer in crowdsourced innovation [that helps] innovation-driven organizations solve their critical business, scientific and technical problems by crowdsourcing ideas and solutions, either from our global network of highly educated problem solvers or from their own internal networks. By accessing vast virtual workforces with InnoCentive, organizations have been able to innovate faster, with less risk, and at a lower cost. We offer our proven Challenge Driven InnovationTM methodology, unrivalled network of over 380,000 problem solvers and purpose-built technology, as well as accompanying training and program management services. To date, InnoCentive have conducted over 2,000 external Challenges for organizations including NASA, DARPA, Thomson Reuters, AstraZeneca, GSK, Anheuser-Busch InBev, and Ford Motors[5].

Another example of an Open Innovation platform is Quirky, which is "a free community-led invention platform that brings real people's ideas to life. Quirky makes inventing and selling products possible by pairing inventors with product designers and big manufacturing companies that can bring their ideas to life"[6].

While the internet is important to Open Innovation as described above, it is just one of the available tools. Indeed, in analysing Chesbrough's work, Aleksejs Busarovs has identified five distinct elements of Open Innovation including (1) Networking, (2) Collaboration, (3) Corporate Entrepreneurship, (4) R&D and (5) Proactive Intellectual Property Management[7].

According to Busarov's paper, "though networking is undeniably one of the major benefits of Open Innovation, in Chesbrough it is understood in a narrow sense", while collaboration is defined as "a formal type of networking, involving partners, competitors, universities and users". Corporate

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[2] Peris-Ortiz Marta, Bennett Dag, Pérez-Bustamante Yábar Diana, Sustainable Smart Cities: Creating Spaces for Technological, Social and Business Development, Spronger, 2017, p.2.

[3] Cities as actors of open innovation: accelerating sustainable urban transformation, published on https://www.eugreenweek.eu/session/41-cities-actors-open-innovation-accelerating-sustainable-urban-transformation

[4] Retrieved from: https://www.innocentive.com/about-us/ on 26 March 2018.

[5] Retrieved from: https://www.innocentive.com/resources-overview/whitepapers/ on 26 March 2018.

[6] Retrieved from: https://quirky.com/ on 26 March 2018.

[7] Aleksejs Busarovs, Open Innovation: Current Trends and Future Perspectives, in Humanities and Social Sciences: Latvia (Volume 21(2), 2013, p. 104.

entrepreneurship refers to non-traditional means for marketing ideas, and includes formation of start-ups and spin offs. The continued importance of R&D is confirmed not only for the traditional purpose of acquiring an advantage over the competition, but also for "developing a company's absorptive capacity" in order to "assimilate and use new knowledge".

Finally, according to Chesbrough's theory, as commented by Busarov, an Open Innovation environment requires a more sophisticated and proactive management of intellectual property issues, which "goes beyond the traditional defensive use of intellectual property" and is focused on the exchange of IP rights which are bought and sold or licensed in or out, contributing to the growth of markets. This last point is expanded upon in the next section of the paper.

Mechanisms and benefits of Open Innovation are made more evident by examining some concrete examples, as described below.

An interesting implementation of an Open Innovation initiative is the so-called "BioVentureHub" created in AstraZeneca, a well-known pharmaceutical corporation, as illustrated in a recent study made by Wikhamn and Styhre[8].

As the authors reported, it seems that the pharmaceutical industry has been stalling, because of the "extremely complex and uncertain development processes, with increased demands from key stakeholders (e.g., regulatory authorities, politicians, users, investors, media), long lead-times, large investments and huge financial risks, and high failure rates[9]. In this situation, "open innovation is increasingly proposed as a way to strengthen the actors within the life science industry[10].

BioVentureHub's initiative is "built on the concept that AstraZeneca opens up office- and lab space to carefully chosen small and middle-sized life science companies. The companies sign rental agreements for these facilities, but the contracts also give them an opportunity to access AstraZeneca's world-class know-how, as well as unused resources and equipment. The employees in the small "hub" firms receive keycards to the whole AstraZeneca site, with the same privileges as regular staff, including access to the restaurant, the gym and other corporate facilities"[11].

One of the key factors that contributed to the success of the BioVentureHub was the clear understanding of the type of companies that would be included in order to create the best possible interaction. In particular, the selection of interested companies was based on the following criteria:

a) the expected benefits of AstraZeneca's knowledge and resources to the interested companies' innovation activities;
b) the interested companies' likely long-term stability, i.e., adequate funding and promising research;
c) the interested companies' synergistic potential with respect to other companies in the hub;
d) the interested companies' degree of maturity.

Interestingly, with respect to the fourth criteria, the authors pointed out that AstraZeneca's purpose "has not primarily been to help the hub companies to create intellectual property — it is more about acting as a lever to enhance their already existing patents (and other intellectual property rights) and to actively guide them in the later stages of drug development"[12].

As a result by 2016 the AstraZeneca innovation hub included 19 companies and about 80 people. The close proximity of companies within the hub has led to several collaborative projects, both between

[8] Björn Remneland Wikhamn* and Alexander Styhre, Open innovation as a Facilitator for Corporate Exploration, International Journal of Innovation Management, 2016.
[9] Cowlrick et al., 2011; Gassmann and Reepmeyer, 2005, page 2
[10] Chesbrough and Chen, 2015; Hedner, 2012; Hessel, 2005; Hunter and Stephens, 2010; Munos, 2006; Munos and Chin, 2009)" (Wikhamn and Styhre, *cit.*, page 3
[11] Wikhamn and Styhre, *cit.*, pag. 8
[12] IBID page 8

AstraZeneca and hub members as well as between hub members. In this respect, "AstraZeneca was able to transform their internal resources to a vibrant and growing open innovation initiative"[13].

Another successful example of open innovation in the life science sector is the United Genome Project, a cloud-based open source genetic database. A recent publication describes the project as "an education and open science platform to train students and biomedical scientists in Africa in genomic medicine by engaging them in computational projects, which address defined challenges that are relevant to the continent. The project will help researchers to tackle real-world issues in genomic medicine by: developing scalable approaches to collate genomic data across multiple African ethnicities; building capacity across the continent using cloud computing and interactive programming interfaces; and facilitating scientific discovery through crowdsourcing and open innovation"[14].

The Increased Importance of Intellectual Property in an Open Innovation Environment

In this second section the authors examine how and why intellectual property plays a greater role in an Open Innovation environment as compared to traditional closed systems, addressing the apparent contradiction between intellectual property rights ("IPRs") and Open Innovation, starting with commonly accepted definitions of each.

IPRs (e.g., patents, designs, copyrights) are defined by the World Trade Organization as "rights given to persons over the creation of their minds ... [which] usually give the creator an exclusive right over the use of his/her creation for a certain period of time".

As discussed above, Open Innovation has been defined as "a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market." It has also been described by Chesbrough as "innovation with partners by sharing risk and sharing reward."

The apparent conflict between "exclusive rights" on the one hand and "sharing" on the other hand can create the impression that these concepts are mutually exclusive. But, as explained below, this is not correct.

Indeed, intellectual property is more important in an Open Innovation environment than in a closed system, as confirmed by a 2017 study by Marcus Holgersson and Ove Cranstrand. Their study concluded that the motivation for patenting appears to be greater in an Open Innovation setting than in a closed setting. This is true whether the motivation is based primarily on a desire to protect innovation or whether the motivation is primarily to increase a party's bargaining position.

Chesbrough and Bogers described three basic forms which they referred to as knowledge inflows, knowledge outflows and a combined or coupled type: "these flows of knowledge may involve knowledge inflows to the focal organization (leveraging external knowledge sources through internal processes), knowledge outflows from a focal organization (leveraging internal knowledge through external commercialization processes) or both (coupling external knowledge sources and commercialization activities)"[15].

In describing mechanisms that companies can use for managing the different types of knowledge flows, the authors refer to a variety of intellectual property-related legal instruments, confirming the value of intellectual property in an open innovation setting.

More specifically, with respect to the inflow of knowledge, companies can engage in the following activities: scouting, inlicensing IP, university research programs, funding startup companies in one's industry, or collaborating with intermediaries, suppliers and customers, and utilizing non-disclosure

[13] IBID page 9
[14] Geoffrey H Siwo, Scott M Williams and Jason H Moore, The future of genomic medicine education in Africa, in https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4526207/.
[15] Henry Chesbrough, Wim Vanhaverbeke and Joel West, *cit.*, pag. 17

agreements. Subsequent research has identified additional mechanisms, including crowdsourcing, competitions and tournaments, communities, and spin-ins or spin-backs". [16]

Mechanisms for managing outflows of knowledge can include "outlicensing IP and technology, donating IP and technology, spin-outs, corporate venture capital, corporate incubators, joint ventures and alliances (i.e., becoming a supplier to or a customer of a new initiative, vs. executing the initiative internally)".[17]

The combination of inflow and outflow forms of Open Innovation processes is referred to by the authors as a coupled type which combines "purposive inflows and outflows of knowledge to collaboratively develop and/or commercialize an innovation. Coupled open innovation involves two (or more) partners that purposively manage mutual knowledge flows across their organizational boundaries through joint invention and commercialization activities"[18].

In this respect, Chesbrough and Bogers note that in coupled open innovation "*companies may implement specific mechanisms, such as strategic alliances, joint ventures, consortia, networks, ecosystems and platforms, all involving complementary partners*".

It should be clear from the examples above, that licensing technology, for example, via a license agreement between a university or a STP resident start-up on one side and a company on the other side is a classic example of Open Innovation. This is true both from the university / STP start-up (out-license) and company (in-license) points of view. IPRs help to make such agreements more manageable, *inter alia*, since they make clear the precise scope of what is being transferred. Indeed, all university technology transfer offices ("TTOs") are based on the premise of an Open Innovation system.

IPRs, particularly patents, are very important for university and STP TTOs. For example, in 2016 the University of California system filed more Patent Cooperation Treaty (PCT) applications than companies such as Nissan, General Electric and Nokia. The University of California itself does not directly commercialize any of these inventions.

While the university example above refers to a straightforward two-party exchange in an Open Innovation setting, when multiple parties are involved, for example, in joint development projects, it is very important to have precise written agreements in place which control how IP rights will be managed. Otherwise the potential economic value of knowledge may be significantly diluted.

Multi-party joint development projects also can take place, of course, among, for example, one or more start-ups (or SMEs) and one or more larger companies. In recent years, companies in a variety of technology areas, such as biotech and semiconductor firms, have moved away from a closed and vertically integrated model to open horizontally oriented models. For such firms, which often lack substantial tangible assets, intellectual property is critically important since "ownership of their own knowledge assets is crucial for securing finance and ensuring that they can keep at least some of the returns to the joint innovative activity:"[19]

In contrast, management of IPRs in older closed systems is less complicated. Indeed, in such systems technology also could be protected by non-patent IP rights such as trade secrets. In addition, in such vertical systems out-licensing and in-licensing are much less relevant.[20]

STPs and AOIs in an Open Innovation Ecosystem

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[16] H. Chesbrough, W. Vanhaverbeke and J. West, cit. p. 19

[17] IBID p. 19).

[18] *Bogers, 2011; Bogers, Bekkers, and Granstrand, 2012*

[19] Brownwyn H. Hall, cit.

[20] It should be noted that trade secret rights can potentially continue indefinitely, e.g. Coca Cola, while patent rights are limited in duration, typically 20 years from the filing date of a patent application.

Finally, it follows that STPs and Areas of Innovation ("AOIs") can provide services to facilitate the development of an Open Innovation environment and the proper use of intellectual property in such an environment, in order to meet, *inter alia*, the targets of the United Nations Sustainable Development Goals, namely SDG 11 with respect to sustainable cities and communities. Indeed, since "Open Innovation implies an innovation ecosystem where ideas and knowledge flow across firm boundaries", as noted by Bronwyn H. Hall from the University of California at Berkeley (USA) and University of Maastricht, the Netherlands, STPs and AOIs - as significant stakeholders in innovation ecosystems - can play a key role in this respect.

In light of the above, what can STPs and AOIs do to facilitate processes and activities in an Open Innovation environment, in particular to help reach the objectives of SDG 11 with respect to sustainable cities and communities?

STPs and AOIs are well-suited to facilitate interactions between their residents and these companies potentially interested in their technology. This is confirmed by recent statements made by large companies with respect to their recent Open Innovation experiences interacting with start-up companies. For example, the Italian insurance company, Gruppo Unipol, which collaborates frequently with external partners in connection with innovative projects, recently stated that it is preferable to work with start-ups rather than research centers because start-ups have entrepreneurial goals while research centers are more focused on publishing research results.[21]

While we have seen that some large companies, such as the AstraZeneca innovation hub, have the culture and the resources to take the lead in establishing their own Open Innovation ecosystems, other companies, both large and small, may find it more convenient to collaborate with intermediaries, including STPs and AOIs, in order to gain access to start-up companies which have relevant technology[22].

Therefore, it is important that STPs and AOIs have tools in place in order to match the requests for specific technologies made by outside companies with the proper resident start-up companies. Thus, STP and AOI management might include one or more Innovation Manager professional to facilitate these interactions.

In addition, given the increased importance of intellectual property in today's Open Innovation setting, it is also very important that STP and AOI have IP managers with specialized knowledge and experience in drafting and negotiating various types of IP-related agreements in order to protect the position of an STP or AOI resident, particularly when such a company is working or negotiating with a larger entity which often has its own IP specialists. This is important if only to level the playing field between the parties. An IP manager also should have at least a basic knowledge of all IPRs, particularly with respect to patents.

Conclusions

After describing the Open Innovation model both in theory and with concrete example, the authors discussed the increased importance of intellectual property rights in an Open Innovation environment and the beneficial synergies between STPs / AOIs and companies in an Open Innovation ecosystem. The paper also discussed the important role of professional IP and Innovation managers in linking the various stakeholders in Open Innovation ecosystems and managing the intellectual property generated by innovation.

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22 See https://www.zerounoweb.it/cio-innovation/innovazione-cio-innovation-manager-e-startup-a-confronto/ retrieved on 26 March 2018.