

Open Innovation: from OI to OI2

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Abstract

Popularized in the early of 2000s, the concept of Open Innovation (OI) is a systematic process that instigates the circulation of ideas among different exploitation vectors focused on value creation. Over the past decade, the OI paradigm had a significant impact on the emergence of innovation networks and ecosystems.

With the emergence of digital disruptive technologies, a new approach to OI has emerged - Open Innovation 2.0 (OI2) - incorporating technological, social, political, environmental dimensions, based on principles of integrated collaboration and co-created shared value, cultivating innovation ecosystems, unleashing the power of exponential technologies, with extraordinarily rapid adoption.

This article will begin by explaining the evolution from IO to IO2. Key incentives, risks and costs associated with this new strategic approach to innovation will also be identified, as well as, the factors and the conditions of success that lead companies to formulate OI2 strategies starting from OI. This study will culminate in the identification of some initiatives developed in Portugal that are contributing to this transition.

The analysis carried out will show that OI2 is not a panacea that can solve any challenge, but help drive significant structural changes and benefits through innovation to society and industry.

Keywords: Open Innovation, Open Innovation 2.0, co-creation, Digital Agenda, networking.

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1. INTRODUCTION

In developed economies, innovation is not just an imperative for economic and social progress, but a composite of mentality, art, skill, and social capacity that enables the sustainability, survival, and progress of the human species.

MIT's Michael Schrage commented that "innovation is not what innovators do but what customers adopt". Schrage added that "Innovation happens when a customer becomes a co-creator of value, an active subject of the innovation process" (Schrage 2004).

In 2003, Henry Chesbrough creatively conceptualized the idea of open innovation where ideas pass to and from different organizations for exploitation.

In Henry Chesbrough's book "Open innovation: the new imperative for creating and profiting from technology" (2003), open innovation referred to 'a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology.

Nowadays, innovation success is characterized by how well innovation ecosystems assembled from a multitude of participants create novel products and services that are quickly adopted.

This trend has encouraged the emergence of cross-organizational innovation networks and ecosystems involving a variety of partners, such as the universities, governments, users, citizens, suppliers, customers, start-ups and large firms. In this context, a new concept emerged: Open Innovation 2.0 (OI2)

OI2 paradigm is based on principles of wide networking and co-creative collaboration among all the actors of modern society, in generating and enabling innovation and creating shared competitive advantages (Curley & Salmelin, 2013).

Very briefly, OI2 is a process that involves all stakeholders: businesses, public institutions, academia and citizens (Hubavenska, 2018).

The organizations evolving from OI towards OI2 business models are experiencing a shift from delivering products and services towards the development of distributed product/ service systems.

This article begins by explaining the key aspects associated with the transition from OI to OI2, identifying the barriers, success factors and conditions that seem relevant to this change, and exploring the strategies undertaken by some organizations in Portugal that promote this transition.

2. METHODOLOGY

This research employs a qualitative and explanatory approach as it considers all the components of a situation, their reciprocal interactions and influences, the extent and nature of cause-and-effect relationships, in a holistic view.

The first phase of this research is bibliographic as it is made from material already published (books, articles, journals, etc.), allowing to know what has already been said and conclusions reached on the subject. This analysis will allow to identify the main characteristics and consequences of this phenomenon and understand the process itself, the barriers and facilitators and the results.

The second phase of this study is to identify different initiatives undertaken by organizations in Portugal.

In the last chapter, it will be possible to identify the success factors and conditions that lead companies to formulate OI2 strategies starting from OI.

3. FROM OI TO OI2.0

Originally, OI was intended to stimulate some collaborations between companies, sharing intellectual property rights to create new products.

More recently, it has been defined as an innovation process based on knowledge streams that are managed across organizational boundaries (Kune et al, 2018).

Open innovation 2.0 extends the scope to include the diverse stakeholders of the quadruple helix and the innovation ecosystem (Kune et al, 2018).

This new concept highlights the difference between early attempts at open innovation and the new wave of professionally managed open innovation initiatives (Curley & Salmelin, 2013).

Open innovation 2.0 focus increasingly on sustainability in terms of environment, societies and industries, as well as on the role of governments and regulators (Turkama, 2018).

One of its original objectives is the recognition of a new innovation paradigm, i.e. open community-centric innovation model.

Martin Curley, as a driver of this new thinking, writes, “Today, the concept is evolving fast. Driven by plummeting communication costs and the ever-increasing numbers of connected people and devices, it has never been so easy to exchange information and ideas” (Curley, 2016).

Between 2010 and 2017, there was the emergence of new concepts and practices associated with OI2, highlighting the following:

- **The OISPG (Open Innovation Strategy and Policy Group)**, with around 35 members, was created in 2010 to share knowledge about open innovation 2.0. It unites industrial groups, academia, governments and private individuals to support policies for open innovation at the European Commission. The achievements of the OISPG include its six yearbooks and five international conferences. These are excellent sources of knowledge and inspiration, and resources for knowledge networking.
- Several articles have addressed multiple concepts associated with OI2. Martin Curley and Bror Salmelin (2013) highlight twenty key elements (**20 snapshots**) as the transformative factors for the modern innovation approach:
 - #1. Shared Value and Vision: Shared value is the value created at the intersection of corporate performance and society, and is best achieved in the context of a shared vision.
 - #2. Quadruple Helix Innovation: Industry, government, academia, and citizens work together to co-create and drive structural changes far beyond the scope of what organizations can do on their own.
 - #3. Innovation Ecosystem Orchestration and Management - Innovation has moved out of the lab and into an ecosystem that crosses organizational boundaries. Innovation networks are the driving force. An innovation network is an informal or formal grouping based on

trust, shared resources, shared vision, and shared value. Ecosystems are most effective when they are explicitly orchestrated and managed.

#4. Innovation Co-creation and Engagement Platforms - Co-creation includes all stakeholders, including citizens, users, or customers, in the development of innovative solutions. An engagement platform provides the necessary environment, including people and resources, for co-creation.

#5. User Involvement, User Centricity, User Experience - The role of the user has changed from being a research object, to being a research contributor, and on to being a co-innovator.

#6. Openness to Innovation - The position of society is in line with the adoption of innovation.

#7. Focus on Adoption: *“Innovation is not innovators innovating, it is customers adopting.”* (Schrage, 2004).

#8. 21st Century Industrial Research - 21st century industrial research is characterized by visioning, inventing, validating and venturing. Successful innovation initiatives will be led by teams of boundary spanners that possess multidisciplinary skills.

#9. Sustainable Intelligent Living - Beyond designing for user experience, OI2 defines innovation as co-creation of services and solutions which add value, improve resource efficiencies, and collectively create a trajectory towards sustainability.

#10. Simultaneous Technical and Societal Innovation - In OI2 there is simultaneous technical and societal innovation with changes affecting technologies, business cases, organizations, business processes, and all of society.

#11. Business Model Innovation - Business model innovation is about defining and designing new models for capturing business value. Business model canvas is a good tool for visualizing and prototyping business models and incorporates techniques such as visual thinking, design thinking, patterns, and platforms.

#12. Intersectional Innovation - Breakthrough insights occur at the intersection of fields, disciplines and cultures.

#13. Full-Spectrum Innovation - Doblin’s taxonomy, the Ten Types of Innovation, is a powerful framework for describing a full spectrum. Doblin’s research showed that often the highest returns from innovation come from business model innovation, ecosystem orchestration, user experience innovation and brand innovation.

#14. Innovation Approaches Using Mixed Models - OI2 encourages an appropriate mix of disruptive, modular, incremental and architectural innovation approaches to maximize the impact of innovation. Key approaches include prototyping, experimentation, and living labs.

#15. Servitization - Servitization is the delivery of a service component as an added value when providing products.

#16. Network effects - In OI2 we focus on designing for network effects where new users, players or transactions reinforce existing activities.

#17. Management of Innovation as a Process or Capability - OI2 recommends explicitly setting up management systems for innovation and systematically improving innovation capability in individual organizations as well as across members of innovative ecosystems.

#18. High-Expectation Entrepreneurship - High-expectation entrepreneurship is the intersection of high ambition and disruptive technology to create growth businesses.

#19. Social Innovation - Development of innovative activities and services motivated by the goal of meeting a social need, developed and disseminated by organizations whose main purposes are social.

#20. Intellectual and Structural Capital - Intellectual capital is collective knowledge, whether tacit or explicit, in an organization or society that can be used to amplify the output of other assets, create wealth (both business and societal), and help achieve a competitive advantage.

- The **First International Open Innovation 2.0 Conference**, held in 2013, brought the Dublin Declaration, which corresponds to a set of clear and inspiring principles and actions for aligning Open Innovation 2.0 with modern organizational practice, namely:

Action No 1: Develop a new business model for the European Union

Action No 2: Design for a new end state

Action No 3: Create an EU Innovation Strategy

Action No 4: Move from European Research Area to European Innovation Ecosystem

Action No 5: Create a European Innovation System and Capability

Action No 6: Quadruple Helix Innovation

Action No 7: Focus on Innovation – Adoption Matters

Action No 8: Create incentives to encourage Openness to Innovation and Experimentation

Action No 9: Stimulate High Expectation Entrepreneurship

Action No 10: Drive Intersectional Innovation

Action No 11: Promote Successful Innovators and entrepreneurs as Hero's

- At the **Second International Open Innovation 2.0 Conference**, also in Dublin (2014), reinforced the approach of the Dublin Innovation Declaration, and was focused on the idea that science and practice need to merge to develop innovative products, services and business models through a collaboration of universities, research centers, public administration and companies.
- At the **Third International Open Innovation 2.0 Conference**, in Espoo (2015), it began to describe how to link everything in real practice. This conference highlighted the action process of Espoo, inspired by how the city orchestrates its innovation processes. In this context, were identified “Eight action fronts for realizing open innovation 2.0 in practice”:
 1. Energize Local and Regional Innovation Ecosystem
 2. Co-create Collaboration Platforms
 3. Promote Activities for Citizens as Innovators
 4. Engage New Professionals: Bridgers and Curators
 5. Pioneer the next phase of Smart Cities & Urban Agenda
 6. Boos regional Quadruple Helix Innovation & Entrepreneurship
 7. Encourage Experiments in Public Sector Innovation
 8. Write and Speak about Open Innovation in the Language that people relate to
- At the **Fourth International Open Innovation 2.0 Conference**, in Amsterdam (2016), a further step was taken to develop ‘*innovation literacy*’ in Europe: the initiative to develop a pattern language for open innovation 2.0. Curley’s article in Nature (Curley, 2016) describes the first patterns, along with several recent OI2 examples from the world of business and industry.

- The **Fifth International Open Innovation 2.0 Conference** take place in Transylvania - Cluj-Napoca (2017), and focus on “*The Platform for Digital Innovation*”. The conference’s approach embraces multiple aspects of the society and the transformative power of digitalization.

OI2 Events brought a fresh perspective and many new ideas. They fostered synergies between different participants, enabling them to address and link specific topics and leading to open discussions and interactions.

Some important open innovation 2.0 concepts, such as ecosystem thinking and the quadruple helix, are already entering the mainstream of Brussels discourse. Open innovation 2.0 ideas may be about to reach a wider audience, especially in the field of business and academia. (Kune *et al*, 2018).

When it comes to the modern development of open innovation concepts, two of the most important key factors are the changing role of citizens (and the growing importance of putting the citizens first) and the changing role of government.

Martin Curley (2016) has identified **twelve principles** to consider when facing an OI2 strategy:

1. Purpose: Commitment rather than compliance; shared value; A win–win scenario is more sustainable than a win–lose outcome.
2. Partner: The ‘quadruple helix’ of government, industry, academia and citizens joining forces aligns goals, amplifies resources, attenuates risk and accelerates progress.
3. Platform: An environment for collaboration. Platforms should be integrated, modular and open. Challenges in security, standards, trust and privacy need to be addressed.
4. Possibilities: New business model, a better process or a new user experience.
5. Plan: Focus on the ‘four Us’: utility (value to the user); usability; user experience; and ubiquity (designing in network effects).
6. Pyramid: Enable users to drive innovation. Users are an enormous source of innovation, and when products or services are co-created with users they are designed for adoption from the start. Usability in OI2 can be achieved faster by collaborating with users with real-world experiment. When considering the development of an innovation one should really think first about designing for adoption. Simple steps, such as involving users in the innovation process, can have dramatic impacts. Designing for adoption is one of the key patterns in the emerging pattern language of OI2
7. Problem: Most innovations come from a stated need
8. Prototype: Solutions need to be tested and improved through rapid experimentation with users and citizens. Prototyping shows how applicable a solution is, reduces the risks of failures and can reveal pain points.
9. Pilot: Projects need to be implemented in the real world on small scales first
10. Product: Prototypes need to be converted into viable commercial products or services through scaling up and new infrastructure globally.
11. Product service systems: Organizations need to move from just delivering products to also delivering related services that improve sustainability as well as profitability.
12. Process: Innovation is a team sport. Organizations, ecosystems and communities should measure, manage and improve their innovation processes to deliver results that are predictable, probable and profitable.

Martin Curley (2016) also identifies the key features that make it possible to distinguish Closed Innovation, Open Innovation, and Open Innovation 2.0 models, enabling a better understanding of OI2 as well as identifying how to make the transition from OI to OI2:

Table 1: The transition from Closed Innovation to Open Innovation 2.0

Closed Innovation	Open Innovation	Open Innovation 2.0
Dependency	Independency	Interdependency
Subcontracting	Cross-licensing	Cross-fertilization
Solo	Bilateral	Ecosystem
Linear	Linear, leaking	Nonlinear mash-up
Linear subcontracts	Bilateral	Triple or quadruple helix
Planning	Validation, pilots	Experimentation
Control	Management	Orchestration
Win-lose game	Win-win game	Win more-win more
Box thinking	Out of the box	No boxes
Single entity	Singe discipline	Interdisciplinary
Value chain	Value network	Value constellation

Source: Martin Curley in "Twelve principles for open innovation 2.0" (2016)

Regarding the transition from OI to OI2 strategies, we can identify **three key factors** that enable this transition (Di Minin *et al*, 2018):

(1) Technological pivot as a result of OI

Companies anchored their OI2 strategies to a previously developed technology, often resulting from an OI strategy.

(2) The presence of a clear appropriation strategy

The evolution from an OI to an OI2 setting requires a balance between openness and control, in other words, a balance between the opportunities and the risks of an OI2 approach (high levels of community engagement vs loss of technological control). In its turn, a balance between appropriation strategies and community involvement represented a critical governance choice that led to adequate returns on R&D investments.

(3) The ability to orchestrate a rich ecosystem.

It is also important to emphasize that companies are investing in human resources training to interact with other ecosystem actors who generally have different types of knowledge. In this context, the involvement of "outside innovators" (e.g. customers and/or suppliers) has increased, as well as interaction with universities and public institutions in human resources training programs (e.g. through the development of industrial PhDs).

Large companies implementing OI2 are also developing new interaction channels. For example, intra organizational knowledge-sharing platforms are increasingly used in order to map skills and share experiences.

4. OI2 IN A DIGITAL ECOSYSTEM

Digital technologies have changed the way we store, consume and create information and knowledge.

At the aggregate level, the ease of knowledge distribution and creation in the digital economy gave rise to new forms of innovation.

Digitalization has opened new opportunities for open innovation, makes it more accessible for new actors and has enabled more sophisticated collaboration and value creation models that, along with the accumulated learning and knowledge base, have encouraged companies of all sorts to start with open innovation initiatives (Turkama, 2018).

Evermore complex product and service configurations have challenged the existing value chains and strategies, and companies are increasingly looking for competences and collaborations from outside of the company.

With advanced digital technologies the optimization of processes has been the main focus, especially in business-to-business operations where the most profitable and well-known IoT and big-data applications have arisen.

In the digital ecosystem, companies like BMW and GE have announced collaborations with software companies rather than trying to own the whole ecosystem themselves, allowing others to manipulate data, while these anchor companies focus on value creation (Turkama, 2018).

In this context, OI2 has gained notoriety, bringing together different stakeholders and presenting tremendous potential in an industry-driven 4.0 and IoT-driven business context. (Hubavenska, 2018).

Given the above, in the new digital age, OI2 should take on the following dimensions (Turkama, 2018):

1. **Ecosystem Orchestration:** The level of coordination in collaborative solution creation has shifted from the single company level to the ecosystem level. With this, the proposed focus for open innovation should be on orchestration at the ecosystem level. Cultivating and orchestrating innovation ecosystems are important parts of OI2.
2. **Knowledge Management:** With an increased focus on value capture and application of knowledge, the management of knowledge that flows across and within the companies becomes of greater importance. The processes of translating data into knowledge and intelligence have been among the focus areas for open innovation but are still underdeveloped for big-data applications. Company processes for using data and user inputs for tangible business benefits still requires more research and could benefit from open innovation processes.
3. **Business Process Management:** With decreasing product margins management's focus shifts to services, processes and business models. Increasingly complex and integrated solutions offer opportunities for new business models, customer experience and efficiency gains. However, building on that capacity requires a broad understanding of the industry on a system level, which should be the focus of open innovation projects from the beginning.

In short, the digitization of information and knowledge and the digitally induced changes in the way we organize economic activities have a tremendous impact on our economy and society. First, growing confidence in knowledge that can be easily shared, distributed, and easily

modified creates new conditions for innovation. Second, the direction of technology development in self-organized networks is not imposed by a hierarchy. Thus, the digitization of knowledge and the new forms and processes of innovation challenge the traditional forms of organization of economic activities.

5. OI2 IN PORTUGAL

Analyzing the historical evolution of Portugal's National Innovation System – SNI - (Santos, 2016), it is possible to distinguish the following phases:

1. 1960s - Investment in science and research infrastructures, mainly through national universities and laboratories;
2. 1970s - Stimulating the development of R&D capacity in some sectors of activity, more oriented towards the strategic application of knowledge;
3. 1980s - Industrial policy, stimulating the links between universities and companies, stimulating the development of internal technology and the development of interface institutions;
4. 1990s - Increasing the quality and professionalization of R&D in research entities
5. Since the 2000s, the internationalization of the National Scientific and Technological System (SCTN), the interconnection between companies and R&D entities, incentives for collaborative projects and the development of clusters, were some of the priorities of innovation policy.

This evolution of SNI in Portugal seems to follow a similar orientation to that observed in most OECD countries, starting from a linear view of innovation (science as the main driver of innovation and growth) to a more integrated and systemic view.

When analyzing the strengths of SNI (FCT, 2013) it is possible to highlight the significant number of actors in the system, namely interface entities; the improvement of research entity evaluation systems; public intervention through operational programs; the existence of world-class innovative companies and some competitive business clusters.

The main weaknesses pointed out by SNI (FCT, 2013) are related to the structural characteristics of the Portuguese economy and society, as well as to institutional aspects:

- i. lack of articulation/coordination and strategic vision regarding innovation policy by public entities, with difficulties in overcoming the dichotomy between science and economics;
- ii. institutional weaknesses, notably a risk-orientated culture and skilled entrepreneurship, low density of relationships and cooperation between SNI actors and low level of trust between them;
- iii. lack of qualifications and competences for innovation in SNI institutions, namely companies, interface entities, financial system and public administration - reflecting Portugal's structural problem in terms of low levels of education and qualifications;
- iv. Technologically intensive production specialization

According to the Director of the Portugal National Innovation Agency (ANI), António Bob Santos (“Jornal Económico”, 2018), the long-term existing data show that Portugal has been able to converge with the European Union (EU) average, regarding the main innovation indicators (except 2011-2015), positioning this country as moderately innovative in the EU (“European Commission”, 2019). Evidence shows that such convergence is largely due to the

action and effort of public policies (not only in terms of funding, but also in the capacity and diversification of the SNI actors), but also in the growing number of companies that perform innovation activities (product, services, process, organization, marketing) and research and development. Innovation and collaborative R&D is a growing and increasingly adopted reality, confirmed, for example, by the strong demand from Portugal 2020 financial instruments that support collaborative projects, but also the strong adherence of national entities to Horizon 2020.

For the next decade, it will be essential to strengthen the tools for creating technology-based start-ups, but also the upgrading of existing businesses through digitization, training of their leaders and their participation in international R&D and innovation projects. In this field, mechanisms such as clusters, technology infrastructures or the newly created Collaborative Laboratories could play a key role in business transformation and technology upgrading, given their important interface between academia and business, capacity building and resolution of concrete problems.

On the other hand, the diffusion of innovation will have to be anchored in the international dissemination of our national R&D and innovation capabilities (and thereby attracting new investment and “selling” our specialized services on a global scale), but also in a strategy of economic and social valorization of the technological solutions, products and services developed here.

The 25% reinforcement of the financial perspective for the ninth EU R&D framework program (which will follow the current Horizon 2020) is a good sign, with around € 100 billion available (from 2020) for project networks, innovation networks and open innovation initiatives at European level. In the same vein, the next cycle of structural funds in Portugal is being elaborated, where competitiveness through innovation will be one of the pillars. It will be an interesting challenge to move from being a “starter country” to a “country open to innovation”.

In the new programming period 2021-2027, according to the European Commission proposal (2018), the governance of the national or regional strategy for smart specialization is the only enabling condition (a precondition for effective and efficient implementation) for Cohesion Policy Objective 1: “A smarter Europe, promoting smart and innovative economic transformation”.

This enabling condition is fulfilled when the following assumptions are met:

- Updated analysis of bottlenecks for the diffusion of innovation, including digitization;
- Existence of a regional/national institution or body responsible for managing the smart specialization strategy;
- Existence of performance monitoring and evaluation systems of the smart specialization strategy;
- Effective operation of the entrepreneurial discovery process;
- Identification of actions needed to improve national or regional research and innovation systems;
- Identification of actions to promote the industrial transition;
- Identification of international collaboration measures.

So, in this context, the main challenges for the new programming period are:

1. Develop the Innovation Eco-System, which depends on the:

- Public policy
- Cluster Policy (structuring of ecosystems)
- Technology Infrastructure Policy (knowledge and people circulation in the ecosystem)

- Integrated R&D&I strategies, aiming at the economic and social development
 - Policy to encourage national participation in programs and European initiatives and the enhancement of their results
 - Participation (direct or indirect) in European for a
 - Harmonization, simplification and alignment of rules and specific instruments + incentives
- 2. Cross-fertilization (increase valuation and impact), across:**
- Collaborative R&D
 - Mobilizing Projects
 - Demonstrators
 - Formation
 - Hiring Human Resources
- 3. Synergies (multi-type and multi-level), by increasing participation in European R&D projects**

Now, aiming to analyze the business sector framework at the level of OI, and according to a study conducted by Aurora Teixeira and Mariana Lopes in 2012 (Teixeira & Lopes, 2012), which involved the application of a survey to 70 Portuguese companies, it was concluded that, one-half of the firms in the sample have a closed innovation model, 24.3% have an intermediate innovation model, and 25.7% an open or very open innovation model. It is important to highlight that only 10% of firms practice a very OI model, regarding the absorption of external knowledge, and in the transfer to other organizations. Companies that follow a very open innovation model, operate in the services market, strongly associated with information and communication technology. The global result reveals a low take-up and adoption of the OI model by the more innovative Portuguese firms. Only around a one-quarter of firms have an intermediate OI model, justified essentially by the absorption of technology part (and not by the transfer of technology and knowledge to other organizations).

Another study about OI in Portuguese companies (Freitas, 2019) concluded that OI Inbound (absorption of external knowledge/technology) is the strategy more commonly used, and OI Outbound (results on the transfer of knowledge/technology to other organizations) being more neglected, and yet in Portugal the closed innovation model being the prevalent one. Literature also state that collaboration with universities, R&D cooperation and Co-creation with customers, and innovation with customers and competitors, were the most used mechanisms.

One of the indicators used to analyze the degree of innovation in a particular country or region is the industrial property (Godinho, 2019): in 2008 the number of applications for the protection of inventions originating in Portugal submitted to the European Patent Office was 127; A decade later, in 2017, the corresponding figure more than doubled, with 272 orders. On a dynamic basis, with an average annual growth rate of 7.9%, up from 3.2% for total requests over the same period, this could be considered a reasonable performance.

After the analysis, we can conclude that Portugal meets all the conditions and requirements for the transition from OI to OI2 to achieve the desired success, but much remains to be done. The public authorities are committed to this transition with an active presence through financial incentives; academy seeks through R&D&I to develop innovative technological solutions; It is now important to focus on companies, change mindsets, management models, and business models, bringing them closer to academia so that the solutions developed fit the needs and realities of companies, taking advantage of government financial incentives and support.

If, in the first half of the 2000s, public funding programs and instruments were primarily concerned with improving infrastructures supporting the production of knowledge and innovation (e.g. acting on the 'supply' side) from the second half, the focus was on promoting innovative business, strengthening the link between companies and the national scientific and technological system, and promoting the creation of collaborative innovation networks.

6. KEY FACTORS FOR SUCCESS

Being part of an OI2 ecosystem provides significant benefits to the companies: high visibility and good reputation, easy access to complementary assets and the flows of knowledge and information on R&D priority setting that stem from the communities in which they are actively involved.

However, the changes in mindset from OI to OI2 could also be a significant organizational barrier, as the ecosystem practice in the spirit of OI2 is not yet fully in place.

We can observe four key managerial approaches, relevant for OI strategy, that are also important in the transition to an OI2 strategy (Di Minin et al, 2018):

(1) Carefully balancing internal and external resources

When OI2 strategies are approached companies need to effectively distribute their resources between their traditional business and the activities openly conducted, and in collaboration with the different communities of stakeholders. An appropriate balance of internal and external resources allows companies to avoid the risk of failing and losing control over core competencies and to pursue the evolution and adaptability of their business model.

(2) Leveraging organizational culture

Spreading an 'open innovation culture' within organizational boundaries (eg shared vision, shared values, common language) is essential to fostering 'business as usual' collaboration and thus ensuring success of the open strategy.

A shared culture combined with building trust becomes a crucial issue in dynamic OI2 environments, enabling fast, frictionless knowledge flows between partners and thus rapid scalability of the business model.

(3) Developing a sound business model

Establish a business model that takes into account partners, needs and interests.

(4) Managing human resources

In cases in which we observe a transition from OI to OI2, the active participation of citizens and users as communities of external innovators is relevant. The transformation has already begun, and the new skills base is essential. New professions and new curricula are needed to provide skills in innovation systems creation, functioning and harvesting. The formal training institutions (universities, institutes of applied sciences and the like) play an important role in the creation of new curricula.

7. CONCLUSIONS

Over the last decade Innovation itself has moved from different phases from open innovation (Chesbrough, 2003) through networked innovation and now to participative innovation, which is an integral characteristic of Open innovation 2.0 (Curley, 2016).

For OISPG, the OI2 paradigm is an innovation model based on extensive networking and co-creative collaboration between all actors in society, spanning organizational boundaries well beyond normal licensing and collaboration schemes. With OI2, sharing and the co-generation of innovation options will enable a significant competitive advantage and will help achieve broader scale innovation benefits for larger numbers of stakeholders. In OI2 there is also a cultural shift away from resisting change and toward innovation and the creation of shared value.

In today's complex world, research and technological development cannot be done in isolation. Collaborative research will accelerate the innovative process and improve the quality of its results. While innovation in the closed world will not disappear, it will be undermined by team efforts that enable a broad spectrum of stakeholders to take active roles.

The intersection of digitization trends, mass collaboration and sustainability needs have created a unique opportunity to enable increased shared value due to innovation.

However, despite there are more than ten years since the Open Innovation concept was presented for the first time, companies still demonstrate some difficulties in its implementation.

OI2 requires a new mindset focused on teams, collaboration, and sharing value and vision. OI2 is a paradigm that is also concerned with the creation of shared value, sustainable prosperity, and improvements in human well-being

Only with this focus will it be possible to break down the walls that separate civil, academic, business and government innovation. These walls will be replaced by creative commons, shared social capital and the systematic harvesting of experimental results. Information technology will play a special role by providing the necessary connectivity and enabling social networks between innovators and the communities they serve.

However, there is much that needs to be done to properly establish OI2 in Europe. This is why policy-makers must make serious efforts to strengthen the framework supporting open innovation approaches.

The view on the process of innovation is today systemic, far from the simple and linear view that prevailed in economic science for much of the twentieth century (Santos, 2016). These developments influenced the view of political power on the role of the government in promoting innovation, and in defining the most appropriate instruments in each time period.

In this context, government is being a relevant actor in stimulating the innovation process. Public policies are relevant in acting on the supply side, the demand side and the articulation between the elements of the innovation system. But they are also relevant in actively defining strategic objectives that respond to global competitive pressures and societal problems.

In this context, innovation policies feel the need to promote the links and interrelationships of economic agents at global level, their insertion in international knowledge and innovation networks or the flows of technology and knowledge.

In Portugal, the orientation of public policies follows the European strategy to favor collaborative processes and projects, the commercialization and promotion of R&D results and innovation, as well as international cooperation or citizen involvement in the innovation

process. In other words, the public policies pursued have incorporated some of the main guidelines summarized by OI2.

The Lisbon Strategy and Europe 2020 programs are aligned with the OI approach. Since 2000, the financial instruments of the European programs have been more focused on making innovation policies more effective and in line with business needs, in particular by encouraging greater cooperation between business and other economic actors.

Finally, it is important to emphasize that most of the value of innovation comes from its successful adoption. In this context, innovation in OI2 presupposes the creation and adoption of something new that creates value for the entities or users who adopt it. In short, any strategy or policy defined by the government, academia or company should always be user-focused.

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