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Additional Information

Open innovation platforms as public policy tools boosting knowledge co-creation: an analysis of the Demola model

(The Demola model as a public policy tool boosting collaboration in innovation: A comparative study between Finland and Spain)

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Abstract

The next generation of Science, Technology & Innovation (STI) policies will be defined by mission orientation and co-creation processes, and implemented by dynamic public-private partnerships. However, the experience of European countries up to now in attempting to boost cooperation in innovation reveals a very different story. Beyond some contextual factors, the characteristics of the agents involved, the dynamics of their relationships and the design of the collaboration tools also have a critical influence at organisational level. This paper aims to identify these organisational factors in different contexts through the analysis of the Demola model, a university-industry innovation platform created in Finland which has spread to other countries, including Spain. Demola applies a standardised model but it has differences in its functioning depending on the national levels of collaboration in the innovation systems. In our case study, we have compared Finland and Spain, bearing in mind the features of the agents involved and their relationships, through a content analysis of primary and secondary information. The results of the study show that the institutional structure of the collaboration and the organisational culture of each institution are key factors in its functioning. These results can be useful for innovation managers, university leaders, educational experts and policy makers.

Key words: public-private partnerships; university-industry collaboration; innovation; co-creation; Demola.

Introduction

Public intervention is justified in innovation systems by systemic failures that occur as a result of relational dysfunctions between their public and private agents (Borrás, 2011; Fagerberg, 2017). Public policies aimed at solving them are largely based on different Public-Private Partnership (PPP) formulas, which much of the literature considers to be the most appropriate instrument to solve this issue (Kattel and Mazzucato, 2018; Muscio et al., 2015). In this paper, PPPs in innovation are considered as formal mid or long-term relationships established between public and private agents within a framework set out by the competent authorities to jointly finance, operate and manage innovation activities, in which risks and benefits are shared between the agents involved (Catalá-Pérez and De-Miguel-Molina, 2019).

Since 2004, all EU countries have promoted policies to improve public-private collaboration in innovation systems with varying degrees of success (Izsák et al., 2013, pp. 52–58). A significant part of the literature agrees on the existence of determining factors that account for this success (Rybnicek and Königsgruber, 2019). Another part is interested in identifying the factors that best account for the innovative performance of the particular collaborations (Carbonara and Pellegrino, 2019, 2018). However, there is little evidence about the factors that affect the predisposition of a system to promote such policies, beyond the definition of the “innovation policy mix” patterns of a particular country (Izsák et al., 2013) or region (Kroll, 2016), whose variables include the dissemination level of these PPP experiences.

The definition of these clusters suggests that there are contextual factors, related to the territory and the innovation system, that influence the spread of PPPs in an innovation system (Kroll, 2016).

In fact, Catalá-Pérez and de-Miguel-Molina (2019) have applied a PPP multidimensional analytical framework to the case of Spain, highlighting the weaknesses of the Spanish innovation system in terms of public-private collaboration, the territorial and sectorial factors that can have the greatest influence on this problem and possible new approaches in the design of PPP policies. Yet, in addition to territorial and sectorial factors, organisational factors (including structural, cultural and behavioural factors) also influence the success of a PPP initiative (Bjursell and Engström, 2019; Parrado Díez and Reynaers, 2017), and also affect the system's predisposition to promote PPPs in innovation. As Borrás (2011) stated, organisational capacity is an "institutionally determined factor explaining diversity in processes and degrees of policy learning and change".

Thus, this paper aims to identify the factors related to the organisational and institutional structure of the PPPs themselves, which hinder or facilitate their implementation as a public policy in a given context. Therefore, the main research question is which characteristics of the agents involved in the PPP and of the collaboration formulas are decisive for their dissemination in that context? To answer this, this paper proposes the application of the aforementioned analytical model (Catalá-Pérez and De-Miguel-Molina, 2019), which also enables PPPs to be studied via their organisational dimension, and through the revision of a specific PPP instrument, the Demola model. Demola can be considered as a PPP in the framework of the current platform policy trend (Raunio et al., 2016b). It is applied in different countries following a globally standardised methodology; and it is an international award-winning model which has been successfully tested in Finland, where it was created in 2008 (Raunio et al., 2016a). Thus, the proposal is to compare the model between the successful Finnish context and the poor collaborative Spanish system, where Demola has existed for six years.

The outcomes of this paper will thus contribute to academic discussions on PPPs in innovation broadening the knowledge on factors contributing to their dissemination in different innovation contexts. Moreover, this knowledge will be useful for 1) innovation managers interested in learning about an innovative approach to industrial renewal, 2) university leaders and educational experts interested in finding new ways to connect university education to real-life problems and industrial processes, 3) and policymakers to ascertain the success factors that are key to fostering such PPP instruments.

A new scenario for university-industry collaboration

Next generation innovation policies

The Sustainable Development Goals (UN General Assembly, 2015) constitute major challenges. How they are tackled and achieved by government will determine the design of different public policies. These include science, technology and innovation policies which, beyond their importance for economic growth, must play a fundamental role in addressing these challenges. Accordingly, this will require new approaches in redefining their design (OECD, 2015; Roure et al., 2015, p. 12). In this context, some of the literature has proposed a transformative innovation policy model leaving behind the policy design frameworks based on the promotion of R&D and the innovation system approach (Diercks et al., 2019; Schot and Steinmueller, 2018). Other authors argue that the

transition to new policies must be based on the experience and knowledge accumulated through these frameworks (Fagerberg, 2018), thus emphasising and redefining the role of fundamental actors, such as the public sector (Kattel and Mazzucato, 2018; Kuhlmann and Rip, 2018), the business sector (Giuliani, 2018) and civil society (Rask et al., 2018). From this perspective, proposals such as mission-oriented (Mazzucato, 2018) and challenge-oriented (Boon and Edler, 2018) STI policies try to give specific answers to the demands of this new scenario.

From a "traditional" systemic perspective, collaboration between public and private agents in an innovation system is essential both for the generation and transfer of knowledge, and for the governance of the system itself (Catalá-Pérez and De-Miguel-Molina, 2018). Within this next-generation STI policy framework, public-private interaction becomes the backbone of each policy. It requires governments to embrace a metagovernance perspective that creates conditions for others to self-organise and experiment around societal challenges (Edler and Boon, 2018). In this sense, from a holistic approach, Edquist (2019, p. 871) states that the public sector "should support or supplement the actions of the private sector". Kuhlmann and Rip (2018) talk about creative corporatism, a concept in which governments can adopt the crucial role of facilitating broader and more diverse varieties of cooperation. Thus, governments are responsible for organising platforms for collective action through, for example, what the authors themselves call transformative PPPs (Kuhlmann and Rip, 2018, p. 448). In fact, according to Kattel and Mazzucato (2018, p. 798) major challenges can only be solved through dynamic PPPs, in which "public, private, and third sector actors can work together in new ways to co-create and shape the markets of the future" (Mazzucato, 2018, p. 813).

For some authors, this transition to next generation innovation policies also implies evolving from old-fashioned cluster policies to new platform policies in which concepts like co-creation are combined with the paradigm of open innovation (Chesbrough, 2003), the Triple (Etzkowitz and Leydesdorff, 1995), Quadruple and even Quintuple Helix models (Carayannis and Campbell, 2010) and the "knowledge triangle" strategy (Raunio et al., 2018, 2016b, 2016a). Thus, the concept of open innovation platforms (OIP) emerges as "any operating environment, technology, system, company, product or service, whose development and/or content production has been systematically opened up to outside developers and value creation, and whose key aims are the benefit produced by the platform's users to each other and the network effect brought by participation" (Raunio et al., 2016a, p. 12). This concept of OIP is directly related to the transformative and dynamic PPPs commented by Kuhlmann and Rip (2018, p. 448) and Mazzucato (2018, p. 813).

Success factors for university-industry collaboration

University-industry is one of the most studied types of public-private collaboration and has a long tradition in many countries around the world (Ankrah and Al-Tabbaa, 2015). Yet there are several factors that can influence it. Cottam (1990) differentiated between soft barriers, i.e. those which arise as a result of the human aspects of the relationship, and hard barriers, which arise from the technical aspects of the relationship. Since then, other authors have tried to identify the factors that lead to the success of this collaboration (for example, Bjursell and Engström, 2019; Bruneel et al., 2010; Muscio and Vallanti, 2014).

Rybnicek and Königsgruber (2019, pp. 228–230), based on a systematic and exhaustive review of the literature, proposed a model that synthesised the success factors for university-industry collaboration. They divided success factors into four general groups included in the collaboration framework: agents/organisations (institutional factors), relationships (relationship factors), results (output factors) and context (framework factors). Some factors could be considered as organisational culture factors: “structure”, which is related to bureaucracy, the flexibility of organisations and to decision-making differences; “commitment”, which refers to the issues of how much a person or an organisation identifies with the collaboration and its goals; “trust” between organisations; “willingness to change” which means, “adapting to different circumstances and cultures, being open to listening and managing corporate changes”; and “communication”, which implies regular interaction, continuous feedback, mutual exchange of information and updating partners about incidents and new activities. The authors also identify what they call moderators, which represent collaboration circumstances that can have an impact on the way individual factors affect the partnership: the collaboration phase, the size of the partners, the organisational level and the (scientific) discipline.

Finally, literature is almost unanimous in accepting the influence of national culture on innovative performance. There are several studies analysing the effect of Hofstede’s cultural dimensions on the level of innovation performance in a specific country (Andrijauskiene and Dumciuviene, 2018; Khan and Cox, 2017; Moonen, 2017).

Methodology

The literature proposes a transition to new public innovation policies in which actors, especially the public sector, are expected to take a more active role. In this sense, Rotmans et al. (2001, p. 19) talked about macro, meso and micro levels when analysing transition management in public policy. The analytical framework used in this work proposed an analysis of PPPs from a multidimensional approach, establishing the territorial (macro), sectorial (meso) and organisational (micro) dimensions (see Table 1) (Catalá-Pérez and De-Miguel-Molina, 2018).

TABLE 1

Given the scope of this paper, this analytical model has been applied solely to review the organisational dimension of a specific PPP instrument. However, as territorial and sectorial dimensions also have a major influence on how an innovation system is structured (Catalá-Pérez and De-Miguel-Molina, 2018), a brief approximation to these contextual factors would seem necessary in order to better understand the research results. In that sense, the comparison between Spain and Finland is interesting given both countries’ experience with Demola yet there are differences regarding collaboration at innovation performance levels.

From a methodological point of view, a single case was analysed by process tracing, which is an appropriate methodology when we want to find the relationships between the analysed variables and establish whether certain variables can explain the result of a process (Beach, 2017). As is usual in case studies on public policies, the approach followed was basically of a qualitative nature, although some quantitative data were presented (Gerring, 2017). The data gathered consisted of

secondary and primary information and it was collected from different sources to facilitate data triangulation. Regarding the techniques used, part of the information was collected from a critical documentary review of scientific articles, working documents, policy reports, legislation and other official Spanish and Finnish publications. In addition, other data collection techniques were used: direct observation in two Demola work sessions; a focus group session with nine public policy and co-creation experts discussing the Demola model as a PPP; and twelve in-depth semi-structured interviews with different Finnish and Spanish actors involved in the Demola model. All the fieldwork was carried out between January and September 2019. For more details about the interviews and the rest of this fieldwork, see Appendix 1.

The content analysis of the information was carried out through the qualitative analysis software Atlas.ti. This software enables researchers to associate codes with text fragments and is especially useful in certain areas of the social sciences (Hwang, 2008). It enables researchers to identify, organise, analyse and provide patterns from careful reading and rereading of the information collected, identifying numerous cross references, linking several concepts and opinions, and thus inferring results (Braun and Clarke, 2006). The codes defined for this analysis coincided with the organisational dimension variables of the analytical model used, which were related to the structure and characteristics of PPPs. Yet, given the relevance of the aforementioned study about collaboration success factors by Rybnicek and Königsgruber (2019), the so-called moderators and factors directly related to organisational culture were also codified in order to check their possible relationships with the model variables. Table 2 shows the codes defined for the analysis.

TABLE 2

Then, the Atlas.ti consultation tool was used to obtain code-document tables and a concurrency analysis (see Appendix 2). Thus, the review of the codes that occurred in the same quote facilitated the establishment of certain relationships between those codes and, therefore, between the variables they represented. The codes with the highest rooting were identified for the Spanish and Finnish cases, depending on the actors involved. The detailed review of the citations in which the concurrences occurred indicated in which sense the specific factor influenced the PPP experience. When a specific quotation was cited in the text, textually or to support arguments, the document code and the quotation number is indicated in brackets (e.g. D8: 23).

Case study

Demola: an open innovation platform fostering university-industry collaboration

Demola is an initiative based on the OIP concept, born in 2008 within the "Creative Tampere 2006-2011" local economic development programme (Luova Tampere -ohjelma, 2011, p. 122). In essence, Demola (see Figure 1) is an innovation platform and university-business collaboration model for the creation of new products and services. Multidisciplinary university student teams, supervised by lecturers, work together with staff from a private, public or third sector organisation on real-life challenges provided by that partner, following a standardised professionally facilitated methodology (Vallance, 2016, p. 19).

FIGURE 1

These challenges have a duration of eight weeks and there are four events especially designed to facilitate interaction between students, the rest of the agents and some invited experts, which are the kick-off session, jam I, jam II and the final meeting. In between these events, there are three work phases that help teams to organise their project: the discovery phase, the ideation and prototyping phase and the refine and package phase (Figure 2). All the process is legally controlled with contracts and intellectual property rights (IPR) agreements which grant parallel access rights to the results for corporations and students who also obtain academic credit recognition for their work.

FIGURE 2

Originally, the initiative was funded through the aforementioned local development programme and the regional Centre for Economic Development, Transport and the Environment (ELY Centre). Yet the biggest boost came from the Nokia Research Centre, which was looking for a new open innovation model to take advantage of the talent of the young students in the region. At the beginning, the Demola model was operated by the semi-public technology agency Hermia Oy (Vallance, 2016, p. 19). The Council of Tampere Region, which subsequently incorporated Demola into its regional development strategies, and the Centre of Expertise of the Tampere Region (OSKE), which housed the first Demola activities until the creation of the collaborative workspace New Factory in the Finlayson industrial area of Tampere, also supported the initiative (Luova Tampere -ohjelma, 2011, p. 51). Finally, the project also had the necessary collaboration of the three universities in the city of Tampere (Luova Tampere -ohjelma, 2011, p. 120). Thus, Tampere became the first operational node of Demola, defining a relationship dynamic that has been similarly reproduced in later experiences.

In 2011, with the end of the Creative Tampere programme, Demola joined other regional and national development programmes as a tool to boost innovation, and began a process of expansion and internationalisation (Raunio et al., 2018). The creation of the New Factory International organisation (later, Demola Global) by some of the individual driving forces of the model, encouraged the set up of different operational nodes nationally and internationally (e.g. in Hungary and Lithuania). Thanks to the results obtained in its early years, the Demola project received several international awards, e.g. from the Assembly of European Regions (AER), the Baltic Development Forum and the Nokia Foundation. Since 2018, Demola has been part of the Finnish DIMECC innovation ecosystem, a large PPP defined as a leading co-creation platform for digital transformation (Dimecc, 2019). Demola is now an international network that extends to 17 countries and works with more than 50 universities representing at least 750,000 students (Demola Global, 2019).

Therefore, when we talk about Demola we refer to the organisation (Demola Global) that coordinates the international network; to the network itself (Demola Alliance) and the platform that supports it; and to the innovation model that is promoted. If Demola is considered as an organisation, it could be called a "hybrid organisation" (Sabeti, 2009) as it combines a business-based operational mode with a social purpose which, in the case of Demola, is making innovation a

tool and a right for all students and professionals, regardless of their role or organisation. If the entire Demola environment is considered, this universe fits perfectly with the revised OIP scheme. Finally, Demola could also be defined as a PPP instrument that supports the governance of the Demola model.

Demola brings together university students and organisations to co-create solutions for real challenges. However, beyond these specific solutions, the scope of Demola challenges the old paradigms of innovation and education experience. In this sense, higher education institutions (HEI) are expected to improve students' innovation capabilities and entrepreneurial skills, and to create cooperation with work-life organisations and provide students with entrepreneurial connections (Helin, 2019, p. 3). In terms of innovation, business, academia, government and civil society work together in end-user demand-focused teams, co-creating the future and driving structural changes far beyond the scope of what any single organisation or person could do alone (Silvén et al., 2018). Thus, Demola offers several benefits for the different agents involved (Table 3).

TABLE 3

Brief comparison of the territorial and sectoral dimension of PPPs in Spain and Finland

One of the most important differences between Spain and Finland is their multilevel government structure. Finland has a state and local government level, and a regional administration in which both coexist and are well coordinated through different institutions. While at the national level, Finland had low PPP activity (Krumm, 2016, p. 59), at local level, the so-called lifecycle projects (*elinkaarihanke*), a type of PPP, have been implemented for decades (Jaspers, 2014). PPPs are characterised by a pragmatic approach focused on a particular purpose such as environmental protection or the promotion of innovation (Krumm, 2016, p. 60).

Spain is a highly decentralised state with three levels of government and a complex division of powers that has caused conflicts between them in recent state PPP experiences (Catalá-Pérez and Del-Pino, 2018). From the second half of the nineties onwards, Spain became one of the European countries with the largest number of PPP projects implemented both at state and regional levels (Švigelj and Hrovatin, 2013, p. 77). However, Spain has been criticised for using PPPs without a strategic perspective, and basing them solely on budgetary objectives (Allard and Trabant, 2008). There is no specific legislation on PPPs, either in Spain or in Finland, nor is there a PPP task force or a dedicated PPP unit. In both cases, the main legal framework for PPPs is the public procurement law, but the Finnish one includes the specific figure of innovation partnerships.

Regarding the STI policy sector, Spain has very weak coordination between national and regional levels in terms of the design, application and evaluation of these policies (European Council, 2019), despite the existence of a multilevel coordination body, the STI Public Policies Network. Spain has a specific Science Law that defines the Spanish innovation system and recognises the lack of public-private collaboration in the system. Finland has built one of the leading national innovation systems in the world through 'co-evolutionary' dynamic interaction between state and local governments that enables national policies to have a major influence on local development activities but "vice

versa, many feasible and successful local initiatives have fed back into the national level policy discourse” (Sotarauta and Kautonen, 2007, p. 1095). In addition, a Regional Development Law establishes the cooperation conditions between Regional Councils and State authorities for economic, industrial and business development issues.

The structure (in terms of institutional profiles) of Spanish and Finnish innovation systems is quite similar. However, according to the European Innovation Scoreboard 2019 (European Commission, 2019), Finland is an Innovation Leader, ranking second among EU countries, while Spain is a Moderate Innovator, standing in 19th place. This difference in innovation performance is reflected in terms of Gross Domestic Expenditure on R&D (GERD) in 2017 as a percentage of GDP: 2.76% in Finland, and 1.2% in Spain. Figure 3 shows GERD by source of funds in 2016 for both countries and for the EU. In Finland, business sector funding is more than ten points higher than in Spain. The trend is similar in terms of performance sectors (Figure 4). This is a really important issue because the higher the participation of business sector funding, the better the country’s innovation performance (Catalá-Pérez and De-Miguel-Molina, 2019).

FIGURE 3

FIGURE 4

According to the Innovation Survey for the 2014-2016 period, in Finland, 23.8% of companies with ten or more employees which were involved in product and process innovation activities cooperated with universities and 16% with public research organisations (PRO); while in Spain, these percentages were 9.1% and 7.2% respectively (Official Statistics of Finland, 2019; Spanish National Statistics Institute, 2016). To summarise, international innovation indexes reflect the differences in innovation performance and in the degree of public-private partnerships between Finland and Spain (Table 4).

TABLE 4

In the early 1990s, Finland was one of the few countries to have implemented a consistent approach towards cluster-based industrial policies (Sotarauta, 2012, p. 783). Thus, in terms of collaboration, one of the strengths of the Finnish innovation system is the existence of a strong cooperation culture (OECD, 2017, p. 22). Similarly, over the last few years, since the discontinuation of some of the most successful policy initiatives (OSKE, SHOK and INKA programmes), there has also been a lack of ambition and a holistic approach to developing new PPP formulas. According to the OECD “public-private collaboration programs should be relaunched, they require more diverse stakeholder participation and improved governance mechanisms” (2017, p. 24). In general, the current trend in Finland is to promote skills platforms that facilitate co-creation between different-sized enterprises, education providers, research institutes, third-sector operators, public administration and end users, through new PPP formulas combining the powers of all these stakeholders (Ministry of Economic Affairs and Employment, 2019).

These new instruments include the “Six City Strategy 2014–2020”. One of the cornerstones of this instrument is to develop open innovation platforms as functional structures integrated into the community to enhance productive diversification (Bortz et al., 2018). One of the main financing

agents of the Finnish innovation system, Business Finland, has also developed three financing instruments, "Co-creation", "Co-innovation" and "New business from research ideas (TUTLI)" aimed at promoting collaboration between research organisations and companies to develop solutions for new business needs (Business Finland, 2019). The Academy of Finland is also developing programmes aimed at strengthening public-private collaboration to varying degrees. These include programmes funded by the Strategic Research Council (SRC), the Centres of Excellence (CoE) Programme, and the Finnish Flagship Programme (Academy of Finland, 2019).

In Spain, the lack of public-private collaboration has been a structural problem for several decades, despite policymakers' awareness of the need for this type of partnership. The explanatory statement of the former Science Law (1986) already recognised this problem. In 2011, the current Science Law once again included the promotion of public-private collaboration among its objectives. However, the situation has not improved and Spain has been warned on several occasions by the European authorities about its poor performance in this area (the last one by the European Council, 2019).

In the late 80s and early 90s, the creation of technology transfer offices and the first technology and scientific parks were promoted in Spain. These measures were complemented after 2000 with relatively successful collaborative research programmes, mainly CIBER and CENIT (Giachi, 2017). At present, the CIEN program is trying to recover the space these programmes occupied and the CERVERA Network is the first serious attempt to implement in Spain what were, for example, SHOKs in Finland. In any case, the disconnection between levels of government and large territorial differences makes it difficult to set up robust, well-coordinated state programmes in Spain.

Results: the organisational dimension of Demola in Spain and Finland

Demola model roles and agents involved

Demola was born "in the context of Triple Helix environment due to the convergence of three main motivations: a business reason, a university reason and a societal reason" (D4:9). Nokia was looking for new fresh ideas and they thought that undergraduate students, "used as a mirror" could help them "to predict the future" (D12:3); for universities, collaborating with a world leader like Nokia "was very attractive" (D12:40); and regional innovation policymakers were looking for new ways to boost cooperation between industry and academia, given that "many players were not fully satisfied with the traditional way of doing collaboration in R&D projects" (D4:9).

Demola swiftly obtained "some very promising results" (D4:13) and the interest of "many delegations, asking how they can copy this model into their home country" (D12:41). Thus, approximately two years after it started, Demola's creators realised that the model could be developed as a standardised strategic innovation management tool. They understood that Demola was "redefining the role of the public sector, universities and corporations in that Triple Helix collaboration environment" (D4:13).

In any case, there is a difference between the agents involved in the Demola model and the role they play in it. In fact, some Finnish interviewees agreed that a key factor for understanding the

dissemination of Demola since its creation is that there are well-defined key roles that can be played by different agents (D12).

Demola Global has a prominent role as the international Demola Alliance coordinator and the Demola model manager. It provides all methods, tools, processes, IPR and the legal management framework and is also responsible for all local facilitators' training. The Alliance is formed by regional partners that can act as local operators facilitating their own challenges or just as student providers for globally launched challenges. Sometimes, Demola Global directly runs regional sites, and it is increasingly co-facilitating all key milestone events of the Demola process in all regional locations. In any case, according to the information gleaned from the interviews, when an Alliance partner acts as an operator in a Demola regional site, there are several roles and agents involved (Table 5).

TABLE 5

The role of local operators is essential within the Demola model. Finnish local operators are usually universities and Demola Global itself who co-facilitate milestone events in all Demola Finland locations. In fact, the trend is to establish supra-regional and even national nodes as has occurred in Portugal. Demola Global is trying to harmonise the Demola node structure. The role of local operator is played in Spain by four different agents, which creates differences in the relationships with the other agents:

- The Demola Basque Country operator is a private organisation that provides advanced training solutions and has a strong business client portfolio (D9:5) but also finds difficulties in accessing universities due to a lack of involvement and bureaucratic issues (D:10). Thus, it incorporates Vocational Education and Training students into their teams, as it has easier access to this type of student profile (D9:6).
- The Demola Canary Islands operator is a public technology centre dealing in the promotion of research and innovation for the manufacturing sector. It has easy access to the region's two public universities, despite their poor involvement in terms of promoting projects and managing teams (D10:29, D10:31), and it also has easy access to companies (D10:22).
- The Demola Campus Iberus operator is the Campus Iberus of International Excellence, a project launched in 2010 by four public universities from four different Spanish regions: Aragon, Navarre, La Rioja and Catalonia. The need to coordinate the interests of these universities has been a critical challenge for this operator (D7:47, D7:50). The involvement of companies has been irregular (D7:38). The continuity of this operator in the Demola Alliance is not guaranteed due to changes in the organisation's executive management (D7:73)
- The Demola Southern Catalonia operator is the *Rovira i Virgili* University, through its own foundation. This is probably the Spanish node closest to the Demola sites standard structure. It was created as part of a long-term regional development strategy promoted by university and local government based on the Quadruple Helix framework (D8:56). To some extent, Demola Southern Catalonia takes on the role of a regional development agency (D8:62, D8:104).

According to Räsänen, one of the Demola promoters from the public sector, the success and resistance factors for tools like Demola are mainly related to the agents involved (D4:30 to D4:32). Success factors include:

- “Commitment of the top management in the innovation community”
- “The existence of very capable persons included in Demola’s operations”
- “Involvement of key corporate organisations and businesses to attract other important economic actors and corporations”

Whilst resistance factors include:

- “Lack of cooperation culture”
- “Lack of trust between the innovation players”
- “Focusing on a local instead of a global context”

Analytical model variables as Demola collaboration features

Objectives

The analytical model variable, the “purpose of the PPP”, refers to the scope, objectives and specific innovation activities that are the focus of the collaboration. This variable was the most commented aspect in both the Finnish and Spanish groups of interviews, mainly referring to the Demola objectives. In this sense, a long-, medium- and short-term approach can be identified.

For companies, Demola has that triple goal: “to change company thinking, to find the best talent and to create next generation products” (D12:12). From a long-term approach, Demola is understood as a “factor of cultural change” (D11:6). Thus, Demola helps organisations to innovate in a new manner. The experience in Finland, where companies usually renew their participation in Demola, shows that this goal is especially significant in that case. However, in Spain, participation in Demola is usually something sporadic and is not systematic (D9:26). Although there are companies that have launched several challenges in the same call (D9:26), there are only cases of companies participating in different calls in Demola Canary Islands (D10:16). Therefore, we can say that medium- and short-term goals are more prominent in Spain. For example, for human resource departments, Demola provides an opportunity to attract and select talent; while for production departments it is a formula to solve specific organisational problems (D7: 108).

Demola also seeks to rethink the role of universities and students while becoming a knowledge-based employment engine, from a multidisciplinary and international perspective. Thus, universities should consider Demola as a service, whose objective is to offer students new experiences and opportunities and add value to their training (D4:22, D7: 86, D8: 56). In Finland, most universities “understand their role as a provider, as an enabler” (D4:22), and few of them are still reluctant (D3:8). In Spain, when the local operator is not the university itself, Demola is seen as something external and distant despite existing collaboration agreements (D10:31).

Demola has been included in several public strategies and development plans in local, regional and even at national level in Finland (D13:31). Thus, the public sector is promoting Demola as a new way

to work together, as a policy tool in the aforementioned open innovation platform policy framework. In addition, it is usual that Finnish public organisations act as Demola users, proposing several challenges. In other countries such as Portugal, Demola is being promoted by the national government with the aim of “enhancing the education system and changing the current way of working at the universities towards more cooperation with companies” (D13:33). However, in Spain, public sector participation has been scarce, mainly due to the bureaucratic and legal requirements (D10:8). Although in some cases, local and regional governments are considered to initially promote the model (D7:75, D8:56, D9:27), the public sector has only become the main promoter in Demola Canary Islands (D10:4), using it as a public intervention tool, and in Southern Catalonia, where it is specifically referred to as a strategic element of a recently published regional development plan (D8:56, D8:62, D8:65).

The lack of strategic vision when applying PPP formulas and defining their objectives, focusing on short-term results, is an important feature of Spanish PPPs in general, and it is reflected in the case of Demola. In the Finnish interviews, Demola is related to a long-term vision of the model itself. There are two problematic situations in terms of Demola’s objectives:

- Typically, both in Finland and in Spain, the work of students in companies has been based on internships or traineeships with detailed, clearly defined functions (D4:19, D8: 18). Understanding Demola in this way implies a distortion as it focuses on results, since in Demola “results can follow the lines of what is being thought or not” (D9: 20). This means that Demola challenges “have a wide spectrum of possible solutions” (D14: 2). Demola is based on continuous interaction and co-creation where both parties are learning (D4:19, D2:15). In the Demola context, “students are not working for but with companies” (D13:5). Students and corporation staff are working as equals. In this sense, the Finnish non-hierarchical culture and equality thinking have helped the Demola model to succeed (D4:19). In Spain, although a few companies have accepted this situation (D10:13), many others do not understand it. They feel uncomfortable sharing innovation decisions with students, and sometimes, they even consider it a threat (D9:19). For other companies, Demola is a kind of low-cost outsourcing and consultancy service (D9:19, D9:23). Few Spanish companies understand Demola as a new innovation model that could help them to redefine their internal innovation dynamics (D8:19, D9:30). This is a cultural issue, and changing culture requires time and effort (3:10).
- Many companies have very high expectations when they participate in Demola and the results do not always match them (D7: 108, D10: 18). Sometimes they expect “immediate value” (D10: 17). Again, the focus is placed on the results, rather than on the process and this leads to the students’ work not being valued to the extent that one would expect (D7: 109, D9: 22, D9: 23, D10: 17). In fact, in Spain there are criticisms over the lack of honesty and opportunism of some companies that take advantage of student work without recognising it (D7:38, D9:34, D10:17). On other occasions, the student teams themselves may not be sufficiently committed (D7: 24, D9:37). In any case, the model has evolved to obtain a higher level of commitment from corporations and to value students’ work more fairly (D9: 25). In addition, Demola Global is currently working on moderating its discourse

regarding the creation of expectations, so that the level of ambition of the participants is realistic and attainable for all of them (D13: 26 to D13: 29).

Duration

The temporary nature of the collaboration refers to its duration. Accordingly, the duration of Demola as a PPP depends on the planned objectives. Demola as a cultural change factor or as a policy tool requires a long-term perspective to obtain results. In this sense, Demola Global offers three-year agreements with local partners that are usually extended. When Demola is implemented with medium-term objectives, local partners can think about continuing with the alliance membership after this time. This is what is now happening in Demola Campus Iberus, where changes in the executive management of Campus Iberus are causing strategy to be redefined (D7:73).

Demola as an innovation model has evolved since its beginnings. For example, the duration of the challenges has gone from three or four months to the current eight weeks (D10:14); in the beginning, the companies' staff did not work together with the students as they do today (D10:14); and until last year, companies took on no economic commitment for their participation, paying fees only when they wanted to license the results (D9:28).

Demola Basque Country and Demola Canary Islands, the two oldest Spanish nodes, have experienced and adapted to some of the changes in Demola, although they were initially reluctant to do so (D10:14). In this context, both sites presented satisfactory data with licensing rates of approximately 65% (D10:19). Therefore, it can be said that continuity and following the proposed model whenever possible are factors that encourage the success of Demola.

Complexity

PPP complexity refers to the distribution of functions and the existence of a certain degree of public control. The main functions for each of the roles involved in Demola have already been discussed but it is interesting to delve further into the complex role of the local operator:

- Regarding facilitating activities, Demola Global is increasingly co-facilitating milestone events in each regional location "taking advantage of their experience in operating almost 4000 projects globally" (D13:35). Some metrics show that Demola's own facilitation is a critical factor for a site's success (D13:35 to D13:37) and Demola Global managers state that "it's a huge relief for the current local facilitators, because this support brings feeling of security and networking and, in addition, when Demola Global brings its own expertise, the attractiveness of the universities in the companies' eyes increases" (D13:39). Actually, this change could alleviate the lack of human resources in some local Spanish operators because not all local facilitators work full-time in Demola activities (D8:102).
- Inviting companies to participate in Demola can be quite difficult in some cases. Although Finland is looking for new methods to improve university-industry collaboration, there is already a strong tradition in this sense (D4:17, D13:34). The critical role of Nokia in boosting Demola gives a clear idea of this (D3:11, D4:16, D12:16). Yet in Spain, local operators find it difficult to engage big companies in Demola. Interviewees give some reasons: poor

innovation culture and short-term vision (D8:68, D9:41); difficulty in gaining access to large companies' CEOs (D8:14, D9:18, D10:10); low decision-making capacity and biased vision of the innovation needs by intermediate managers (especially R&D department managers) (D8:24, D8:89, D9:18); decision-making centres are far from peripheral regions (D8:14, D10:10); and distrust (D9:19).

- Demola was conceived as “an agile and multidisciplinary method and as an environment that could provide an easy access point for that kind of players that are not typically part of the innovation clusters of collaboration” (D4:9). From the beginning, it avoided including universities in the legal framework and focused on student-company cooperation, looking to minimise bureaucracy (12:28). Despite this, it is obvious that clear involvement by universities is needed for the model to work. It is understood that when a university functions as a local operator this engagement should exist. However, the situation changes and access to the university becomes difficult when, as in Spain, there are other types of local operators (D9:10). This occurs not only because of legal issues and the huge bureaucratic burden existing in the Spanish university system, but also because of a lack of commitment and involvement (D7:49, D7:55).

It seems that complexity matters. The experience in Spain reveals that when joining Demola depends on several people in a company, no agreement is usually reached (D10:18). Thus, the most common profile of companies working with Demola is that of medium-sized regional companies, previously linked to the university and whose CEOs are between 40 and 55 years old. In addition, they are usually sensitive to the role of innovation in the future of the company, and the decision to join Demola depends solely on them (D8:14, D9:18, D9:19, D10:9 to D10:12). The problems multiply when the local operator needs to coordinate several universities from different regions, with different organisational structures and cultures (D7:45, D7:50). The response of universities is poor even when operators are public agencies, although their access to universities is easier due to the position they occupy in the innovation system (D10:29).

In Demola, the degree of public control is determined by the role played by public agents. The existence of local public operators and promoters implies the existence of a monitoring and evaluation system which is primarily activity-based. Demola Canary Islands is the clearest example in Spain (D10:7). This system can include indicators such as number of projects implemented, students/companies involved, percentage of licences bought or percentage of completed projects licensed by project partners. Another kind of supervision is that of universities regarding the academic recognition of students' work. Most university partners recognise participation in Demola with academic credits. Thus, the involvement and supervision of lecturers (D1:22) is required to ensure that the student has gained the knowledge, skills and/or competences expected. The figure of a Demola academic coordinator exists in Finnish universities but is missing in Spain because of lecturers' poor involvement in the initiative (with few exceptions) (D10:31). Finally, there is implicit public control in the legal framework that regulates IPR and Demola agents' relationships (D4:26).

Shared responsibilities

Shared responsibilities refer to shared resources, costs, risks, and benefits. Finnish interviewees focused their discourse on the model's benefits. In the Spanish case, although this was also the most commented aspect, the references to the costs and risks were significantly higher. Aspects linked to resources were of similar importance in each country.

- All agents involved must allocate human resources and time to a different extent, especially those who actively participate in Demola activities. It is obviously a problem if there is a lack of students (D7:87, D9:13) due to university indifference or disinterest in promoting participation in Demola (D10:29). In Spain, not all universities officially recognise students' work, and this could be related to this issue. Another problem is the high workload in Spanish university curricula, which leaves little room for students to fully engage in Demola if their work is not officially recognised (D7:35 to D7:37). It should be noted that a Demola project requires an approximate dedication of 15 hours per week per student. Knowledge creation and sharing is another critical resource for Demola. Therefore, close communication between actors is necessary. The experience in Finland shows that a strong cooperation culture (D13:34), a well-defined IPR framework (D14:8) and the trust that high-skilled facilitators can create (D4:31) are factors that can improve communication levels.
- Regarding costs, as some Spanish interviewees stated, Demola cannot imply a disbursement of a university's own funds (D7:92). Demola partners contribute to partnership activities with an annual fee that involves benefits, such as being invited to Demola annual events and participating in international cooperation (exchange of best practices, connecting researchers with companies, etc.). Yet the aim is to make Demola's activities sustainable through the service and participation fees paid by the companies. In some cases, as in Demola Canary Islands, regional government support, partly financing Demola, is fundamental to its success (D10:3). In this case, the public funds supporting companies' participation fees may be a key factor to overcome this possible entry barrier (D10:20).
- Regarding risks, issues with demand are especially worrying for local partners and indirectly for Demola Global, given the difficulties involved in getting companies to engage (D8:17). The risk of availability is related to poor quality of the services provided. This risk could be critical for Demola Global and corporations if the local operator does not achieve standards in the service provision (D1:23). In this sense, the recently proposed co-facilitation framework can reduce this risk (D13:12). Availability could also be the most important risk for universities (and students) if expected academic and personal development objectives are not reached. Finally, residual value risk refers to the future market value of the asset the project centres on. This could affect corporations and the public promoter (if they exist) if results do not tackle the challenge satisfactorily when the effects of Demola implementation in the system are not as expected.

Risk sharing is essential in a PPP. The introduction of a company participation fee has redefined the balance of risks taken on by each agent. Before this change, companies only paid for the results depending on their satisfaction level (D9:24). Accordingly, the

companies' loss was basically time (which, of course, is also valuable) while most of the risks were taken by the local operator and the public promoter (if they exist). This caused some companies not to act honestly (D7:39, D9:23). Nowadays, companies need to show a greater commitment from the start and they must be willing to interiorise Demola's values (D9:25). The public sector could combine the promotion of Demola with tools like innovation vouchers to partially subsidise companies' involvement when economic factors may be an entry barrier (D4:21).

- The main benefits of Demola for students, corporations, universities and the public sector have already been reviewed but it is interesting to add some comments. Students' general level of satisfaction is high. In fact, some students repeat the experience (D10:30), others work to promote the model, even internationally (D5:12, D9:38, D10:30, D14:17), and others have gone from being students to being members of the Demola teams (D5:10). The internationalisation of the Demola challenges is more developed in Finland than in Spain, and this is one of the most important benefits, not only for students (D4:24) in Finland but also for companies there (D4:25). In Spain, this is viewed as a very interesting option but there is not yet much experience (D8:6, D9:15, D10:27). Being hired by corporations is an important benefit for students in both countries (D3:7, D6:5, D10:16) and attracting talent is also beneficial for companies (D7:108, D10:16). In any case, the most immediate value that Demola gives students is contact with real life, working in multidisciplinary teams, and having real decision-making power (D9:36, D10:21). Interestingly, sometimes, extrinsic motivation, that is, academic recognition or benefits for IPRs are not the main motivations for students (D8:44, D8:49). For companies and universities, participating in Demola means being part of a successful internationally recognised programme, which provides them with a new methodology of proven quality (D7:26, D7:91, D8:66). This gives companies especially the chance to adopt a new approach in their innovation model and think about the future of the organisation (D8:13, D8:70, D8:79 D9:42).

Formalisation

The collaboration established through Demola is formalised contractually. The creation of a new regional node does not imply the creation of a new organisation, but the regional partner, whoever it is, takes on a new role (local operator) after signing a contract (D8:30, D12:49). These contracts have evolved as the Demola model itself has done, on many occasions, thanks to the experience, comments and suggestions of the regional partners themselves (D4:27). This has led different types or models of regional sites to coexist. This is especially evident in Spain. Therefore, Demola Global is carrying out a process of harmonisation across locations through a new contractual model (D13:1, D13:38). Furthermore, another contract formalises the relationship between local operator, partner organisations and students when launching challenges, especially in terms of IPR. In fact, Demola's IPR legal framework differs from other similar models that emerged later (D7:64, D9:14), even within the universities that initially participated in Demola (D9:35).

Results summary

Table 6 shows a summary of some of the main results regarding the Demola model's features.

TABLA 6

Discussion

Demola reflects the transition to a new generation of innovation policies (Fagerberg, 2018). As an OIP, Demola is one of those transformative PPPs that Kuhlmann and Rip (2018) talk about in the context of mission-oriented (Mazzucato, 2018) and challenge-oriented (Boon and Edler, 2018) STI policies. Based on solid cluster policies, Demola was designed as a specific industry-university collaboration tool which has changed the role of innovation process agents. Demola fits clearly in the Triple Helix framework (Etzkowitz and Leydesdorff, 1995), but from the moment student participation is formalised directly with them and they take on a specific role in the model, they can be said to be the fourth agent in a Quadruple Helix framework, or even Quintuple Helix if environmental issues are considered (Carayannis and Campbell, 2010; Silvén et al., 2018). In fact, Demola could open up new perspectives in the definition of these OIP. It could be said that Demola is a "segmented OIP" for students (D12:29). This makes the model work efficiently (D12:30) because roles are clearly defined, always keeping in mind the agents the platform is oriented to. Segmentation for other kind of agents would require another kind of platform design (D12:30).

According to the new scenario for STI policies, the public sector must adopt a metagovernance role facilitating conditions for others to co-create (Edler and Boon, 2018; Sørensen and Torfing, 2017). In Finland, Demola operators have weekly and even daily discussions with policymakers to help them to succeed in their objectives (D13:31). Thus, several Finnish local and national public programmes are including Demola among the tools they use to reach these programmes' goals. The strong Finnish collaborative tradition is a key factor in this sense. The idea of co-evolution (Sotarauta and Kautonen, 2007) between local and state government is evident in the case of the Demola model: it was born at the local level, but has been a tool used at regional level and is currently included in national strategies such as the Six City Strategy (D4:15).

As mentioned above, in Spain, only the regional Canary Islands government is taking on the metagovernance role. Demola Southern Catalonia also understands the potential of Demola as a public intervention tool, but it needs the support of public agencies in order to create synergies. Spanish universities are reluctant to disburse extra funds for Demola activities, and for operators like this one, with scarce human resources, it is difficult to upscale the Demola model.

Following Räsänen's definition of Demola's success factors, the involvement of key corporate organisations is important to attract other important economic actors and corporations. This was the role played by Nokia when Demola started out in Finland (D4:16, D12:48). This is one of the most serious problems in Spain, as it is not easy to get large companies engaged not only in Demola but in PPPs in general. In 2016, less than 2% of companies working on innovative products and processes that were working with HEIs and PROs had 250 or more employees (Spanish National Statistics Institute, 2016). It is not easy either to get top management in the innovation community to commit.

Literature has shown that the lack of university commitment is one of the biggest concerns of Demola sites in Spain (in fact, the continuity of one of them currently depends on the final decision of its executive director); and access to company CEOs is not easy most of the time. There are very capable people involved in Demola, a fact that the interviews have revealed, showcasing the commitment of local Spanish facilitators. This is an interesting issue, because many of the Demola success stories, both in Spain and Finland, are largely based on individual actors:

- The essential role played by Demola's ideologists in creating, evolving and differentiating the model.
- The importance of having students with the right balance of intrinsic and extrinsic motivation that guarantees their commitment.
- Operators and facilitators with high organisational, coordination, dissemination and negotiating skills.
- Academic coordinators at the university who must be involved and aware of the model's value.
- Public decision-makers who understand that the momentum of the model may imply a change in the innovation dynamics of a given territory.
- Representatives of corporations who act with honesty and who understand that the model, beyond solving a specific problem, can bring a new business strategy to their companies.

The first of Räsänen's resistance factors is the lack of a cooperation culture, which is one of the main structural problems of the Spanish innovation system (European Council, 2019). Another one is the lack of trust between innovation players, referring to a situation in which there are conflicts between universities, faculties in a university or other innovation agents, who Demola is supposed to bring together. This kind of internal conflicts hinders the functioning of Demola, as has occurred in Demola Campus Iberus (D7:68). Finally, Demola may be most valuable for regions and cities that are actively looking for new partners and new opportunities globally. In Spain, this perception is not yet well developed (D10:28).

Throughout the analysis, some of the moderators and cultural factors defined by Rybnicek and Königsgruber (2019) have gained special relevance. The collaboration phase has no effect in the case of Demola, as challenges have a standardised structure. In terms of the specific scientific discipline in which the collaboration occurs, multidisciplinary is seen to be a key feature of the student teams. The difficulties of Spanish local operators when dealing with corporations and university representatives depending on the department and position they occupy shows that the different organisational levels affect collaboration. In addition, the key role that major companies play as drivers of the Demola model shows that the companies' size also has an influence.

For Spanish interviewees, "commitment" is a factor of particular concern, mainly in reference to corporations' response to students' work and to the students' work itself. In addition, universities' commitment must be greater when facilitating access to local operators or recognising students' contributions in academic terms. For Finnish interviewees, "willingness to change" is one of the key factors for the success of the collaboration. This factor is perhaps the closest one to the idea of collaborative culture in companies. Willingness to change implies "the ability of partners to learn

about and understand one another for a successful collaboration” and the necessity of having “time for this learning process” (Rybnicek and Königgruber, 2019, p. 230). Thus, “communication” is logically another important factor for collaboration success. “Structure” is related mainly to bureaucracy, and this factor is especially present in Spanish interviews, since as discussed, this affects Demola especially in Spain. Finally, “trust” is another of the key success factors of Demola in Finland. The strong public-private cooperation tradition has contributed to building a climate of trust which is greater in Finland than in Spain.

Conclusions

Spanish companies play a discreet role in the financing of R&D activities and there is a lack of innovation culture among them. It is not easy for companies to understand the value of tools like Demola. The difficulty to access large companies’ CEOs may be a determining factor in this regard. When dealing with intermediate managers, either they do not perceive the usefulness of the model due to their partial vision of the business strategy, or they do not have decision-making powers. Accordingly, this makes it difficult to jump start cultural change.

There is a very small percentage of companies working with HEIs and PROs, despite the fact that Spain has been promoting policies to boost this percentage for decades. While Finland has implemented robust programmes that have created a substrate for and a culture of collaboration, Spain has encountered difficulties in establishing this kind of state programmes. The complex Spanish multilevel government system has been a determining factor in this regard, together with the heavy bureaucratic burden and lack of flexibility that characterise the Spanish innovation system.

In general, Spanish universities are less flexible than Finnish ones and have different organisational structures, operating dynamics, and degrees of integration in the territory. They maintain features that impede non-traditional actors from entering. Some procedures are still slow and cumbersome. Some lecturers see models like Demola as a threat to their status quo and they do not promote their dissemination.

Demola’s work is not always officially recognised by Spanish universities. This turns participation in Demola into an extra burden for students. This situation can cause a deficit of students that slows the growth of the model. The positive reading is that, when there is no recognition, the motivation for students’ participation in Demola is intrinsic. In general, the assessment of the model that students make is usually positive. It should be noted that the practical content of the Spanish curricula is not very high and Demola can cover that gap.

All the nodes agreed on the importance of the role the public sector can play in the model, as a driver of the model on one hand and setting challenges and creating projects on the other. In the latter case there are varying experiences. Difficulties usually occur as a result of the high degree of bureaucratisation of Spanish government. Promotion by the public sector, the existence of public funds, full-time dedicated staff and the facilitation of easier access to universities and companies, favours the stability and continuity of the model.

The different structure of Demola nodes in Spain causes differences in their management and functioning. It has not been possible to implement the pure Demola model in all cases. The participation of vocational education and training students in Demola Basque Country is one example of standard model deviations. Another one is the lack of agreement between Demola Campus Iberus universities on academic recognition of the students' work. What seems obvious is that the nature of each operator has some influence on the main focus of each node. The fluency and degree of coordination between local operators and the rest of the agents also depends on the nature of the operator.

The challenges of Demola in Spain are complex, but interviewees agreed that there are opportunities that can be used to tackle them successfully:

- As it is an international network it can provide a global environment of innovation that opens up major opportunities for participating organisations. The internationalisation of projects is a clear incentive for both organisations and students.
- The model has a consolidated track record and has been able to evolve and adapt as circumstances have changed. Its correct implementation guarantees results.
- Belonging to a network of Finnish origin, with everything this implies in the field of education, and given that the model is recognised by different international organisations, offers guarantees for the universities involved.
- The generational change in the management of Spanish companies could act as a driving factor for their participation in models such as Demola.
- The experience of sites like Demola Canary Islands suggests that, in Spain, the role of the public sector facilitating access to and coordinating with other agents could be a key factor for success.
- The existence of public agencies like the Canary Islands' Technology Centre in the rest of the Spanish regions could become an opportunity to promote and coordinate a national strategy with instruments such as Demola.

This research has enabled us to establish a series of interesting conclusions about the organisational dimension of PPPs in the Spanish innovation system. The analysis of a single case, though carried out following the process tracing method with a comparative approach, should be complemented with the study of other PPP tools to compare these conclusions. The study of the Demola model in other countries could also be an interesting alternative.

Throughout this work, we have observed that some national cultural dimensions, such as power, distance, long-term vision and individualism, are linked to the greater or lesser success of the analysed instrument. Future lines of research could go in this direction. The analysis of instruments similar to Demola, such as the Microsoft Innovation Centres and the Design Factory could be interesting options to strengthen the dynamics of this type of platforms from the segmentation perspective pointed out in the paper. Finally, an analysis of Demola from the point of view of its impact on the innovation system could help to understand its relevance to improving collaboration.

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Appendix 1

The in-depth semi-structured interviews were conducted, recorded and transcribed between April and September 2019. The average duration of these conversations was one hour. This appendix collects the data of the interviews carried out and of all the other documents included in the content analysis. All the people interviewed gave their consent to be cited in this paper.

ID	NAME	ROLE IN DEMOLA	DOCUMENTS	DATE
D1	Garvey, Bernard	Director Of Operations at Demola Global	Informal talk (notes)	16/01/2019
			Seminar presentation (notes)	01/03/2019
D2	Eskola, Jane	Director Of Corporate Partnerships at Demola Global	Kick-off Demola Session (notes)	16/01/2019
	Nyroos, Erik	Facilitator at Demola Helsinki (Finland)		
D3	Kairamo, Ville	CEO of Demola Global	Informal talk (notes)	16/01/2019
			In-depth face-to-face interview (notes)	15/04/2019
			Skype talk (notes)	04/06/2019
			Several e-mails	July, 2019

D4	Räsänen, Petri	Promoter of Demola - Council of Tampere Region	In-depth Skype interview (transcription)	29/05/2019
D5	Saarinen, Jukka P.	Promoter of Demola - Nokia Research Centre	Published interview on the internet	08/08/2016
D6	Silven, Pekka	VP of University Alliance Development at Demola Global	Published interview on the internet	06/09/2018
D7	Continente, Rafa	Campus Iberus of International Excellence - Coordinator of Demola Campus Iberus (Spain)	In-depth face-to-face interview (transcription)	13/05/2019
D8	Cartanyà, Jordi	Universitat Rovira i Virgili - Coordinator of Demola Southern Catalonia (Spain)	In-depth face-to-face interview (transcription)	23/05/2019
D9	Tovar, Pilar	Fondo Formación Euskadi - Facilitators at Demola Basque Country (Spain)	In-depth face-to-face interview (transcription)	27/05/2019
	Mitxelena, Zalao			
D10	Dobarro, Lucía	Canary Islands Technology Centre - Facilitators at Demola Canary Islands (Spain)	In-depth Skype interview (transcription)	28/05/2019
	Guerra, Pilar			
	Santana, Carmina			
D11	Kairamo, Ville	CEO of Demola Global	In-depth face-to-face interview (notes)	22/08/2019
D12	Saarinen, Jukka P.	Promoter of Demola - Nokia Research Centre	In-depth face-to-face interview (notes)	30/08/2019
D13	Silven, Pekka	VP of University Alliance Development at Demola Global	In-depth face-to-face interview (notes)	30/08/2019
D14	Wessman, Jere	Creative Director at Demola Global	Skype talk (notes)	17/01/2019
			Two published interviews on the internet	Sept. 2019

Appendix 2

This appendix shows the code concurrence analysis between analytical model variables and agents involved and code-document tables for moderators and cultural factors.

CODE ID		C1.4.1	C1.4.2	C1.4.3	C1.4.4	C1.4.5	C1.4.6	C1.4.7	
C1	C1.1	Spain	5	3	4	8	5	7	2
		Finland	11	2	5	13	9	11	2
	C1.2	Spain	9	10	11	13	10	14	2
		Finland	11	2	5	7	4	4	1
	C1.3	Spain	3	2	2	3	1	1	0
		Finland	2	0	2	4	0	0	0
	C1.4	Spain	29	51	59	57	56	40	27
		Finland	47	28	41	42	41	24	12
C2	Spain	3	5	6	4	1	0	2	
	Finland	4	2	1	2	1	1	1	
C3	C3.1	Spain	2	16	7	9	12	3	2
		Finland	24	18	12	13	7	13	4
	C3.2	Spain	0	2	0	0	2	7	0
		Finland	1	0	0	0	0	2	0
C4	C4.1	Spain	12	13	23	11	7	3	2
		Finland	13	10	7	7	7	5	3
	C4.2	Spain	6	3	3	13	4	5	0
		Finland	4	2	1	2	3	1	0
	C4.3	Spain	23	14	32	20	20	5	2
		Finland	15	5	28	18	20	4	2
	C4.4	Spain	5	2	3	8	6	2	0
		Finland	5	3	2	2	1	0	0
C5	C5.1	Spain	2	7	7	4	3	7	0
		Finland	4	1	5	2	2	2	0
	C5.2	Spain	0	0	0	0	0	0	0
		Finland	2	0	0	0	0	0	0

CODE ID	SPAIN			FINLAND			Totals	
	Abs.	% Row	% Column	Abs.	% Row	% Column	Abs.	% Row
C6.1	15	57.69%	21.74%	11	42.31%	19.30%	26	100.00%
C6.2	31	60.78%	44.93%	20	39.22%	35.09%	51	100.00%
C6.3	19	46.34%	27.54%	22	53.66%	38.60%	41	100.00%
C6.4	4	50.00%	5.80%	4	50.00%	7.02%	8	100.00%
Totals	69	54.76%	100.00%	57	45.24%	100.00%	126	100.00%

CODE ID	SPAIN			FINLAND			Totals	
	Abs.	% Row	% Column	Abs.	% Row	% Column	Abs.	% Row
C7.1	60	71.43%	31.25%	24	28.57%	21.62%	84	100.00%
C7.2	23	56.10%	11.98%	18	43.90%	16.22%	41	100.00%
C7.3	52	71.23%	27.08%	21	28.77%	18.92%	73	100.00%
C7.4	12	41.38%	6.25%	17	58.62%	15.32%	29	100.00%
C7.5	45	59.21%	23.44%	31	40.79%	27.93%	76	100.00%
Totals	192	63.37%	100.00%	111	36.63%	100.00%	303	100.00%

Tables and figures

Table 1: Multidimensional analytical framework

DIMENSIONS	LEVELS	VARIABLES
A. Territorial dimension (country)		
	A.1. PPPs as a historical context and a cultural set of assumptions	
	A.1.1.	Political-ideological influences
	A.1.2.	Territorial design
	A.1.3.	Economic and financial factors
	A.1.4.	Administrative culture
	A.1.5.	Institutional framework for PPPs in general
B. Sectoral dimension (STI policies)		
	B.1. PPPs as a governance model	
	B.1.1.	Sectoral legal framework
	B.1.2.	Institutional framework: innovation system
	B.1.2.1.	Vertical governance: agents and competence distribution
	B.1.2.2.	Horizontal governance: agents, roles and level of involvement
	B.2. PPP as a public policy	
	B.2.1.	Evolution
	B.2.2.	Strategy
	B.2.3.	Policies Instruments/tools
C. Organisational dimension		
	C.1. PPP as a management tool / PPP as a project	
	C.1.1.	Purpose of the PPP
		Scope
	C.1.2.	Temporary validity
		Objective
	C.1.3.	Complexity
		Service or activity affected
	C.1.4.	Shared responsibilities
		Agents involved and role assumed
	C.1.5.	Formalisation
		Distribution of functions
		Public control and supervision
		Resources
		Costs
		Benefits
		Risks
		Type of PPP relationship
		Form of formalisation

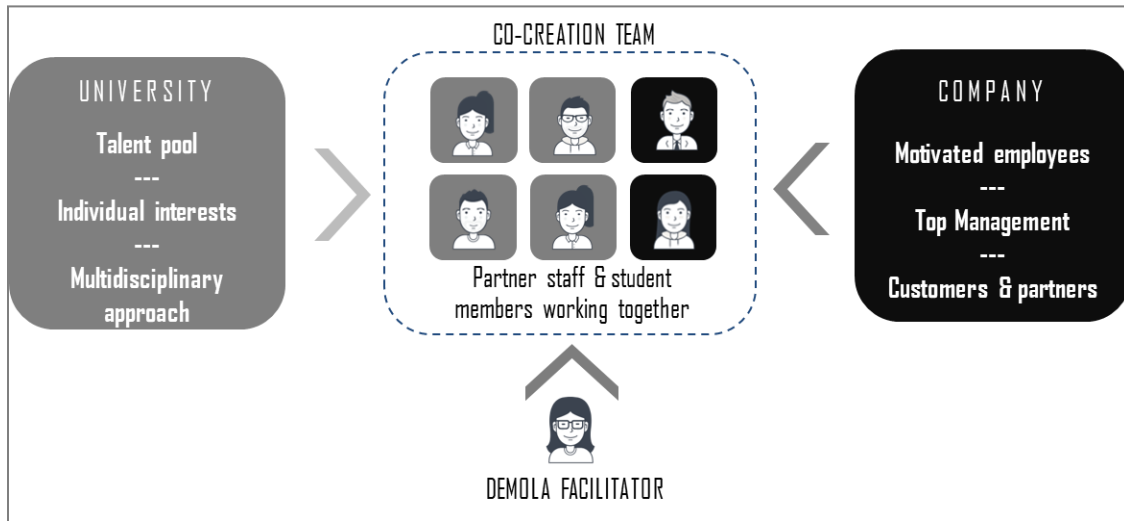
Source: adapted from Catalá-Pérez and de-Miguel-Molina (2018)

Table 2: List of codes

CODE NAME	CODE ID
Purpose of the PPP	C1
Scope of the PPP	C1.1
Objective of the PPP	C1.2
Service or activity affected by the PPP	C1.3
Agents involved in and role taken in the PPP	C1.4
Demola Model	C1.4.1
Operator	C1.4.2
Student teams	C1.4.3
Corporations	C1.4.4
Universities	C1.4.5
Public sector	C1.4.6
Individuals	C1.4.7
Temporary validity of the PPP	C2
Complexity of the PPP	C3
Distribution of functions	C3.1
Public control and supervision	C3.2
Shared responsibilities	C4
Resources per agent	C4.1
Costs per agent	C4.2
Benefits per agent	C4.3
Risks per agent	C4.4
Formalisation of the PPP	C5
Type of formalisation	C5.1
Type of PPP relationship	C5.2
Moderators	C6
Different disciplines	C6.1
Different organisational levels	C6.2
Different scales	C6.3
Collaboration phase	C6.4
Organisational culture	C7
Commitment	C7.1
Communication	C7.2
Structure	C7.3
Trust	C7.4
Willingness to change	C7.5

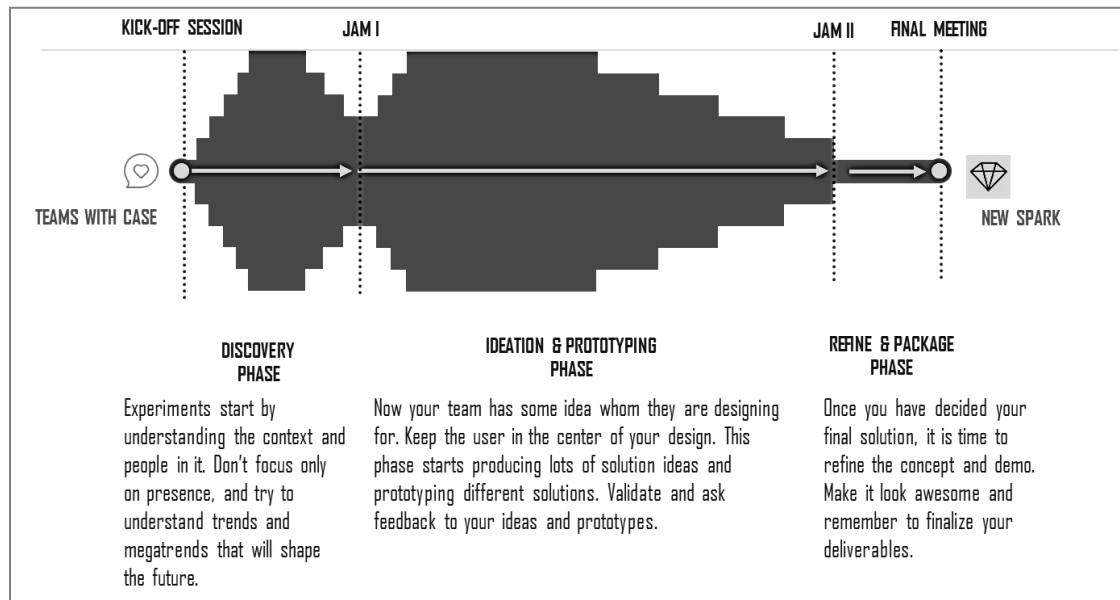
Source: authors' own.

Figure 1: Demola model



Source: Wessman (2018)

Figure 2: Demola challenge structure



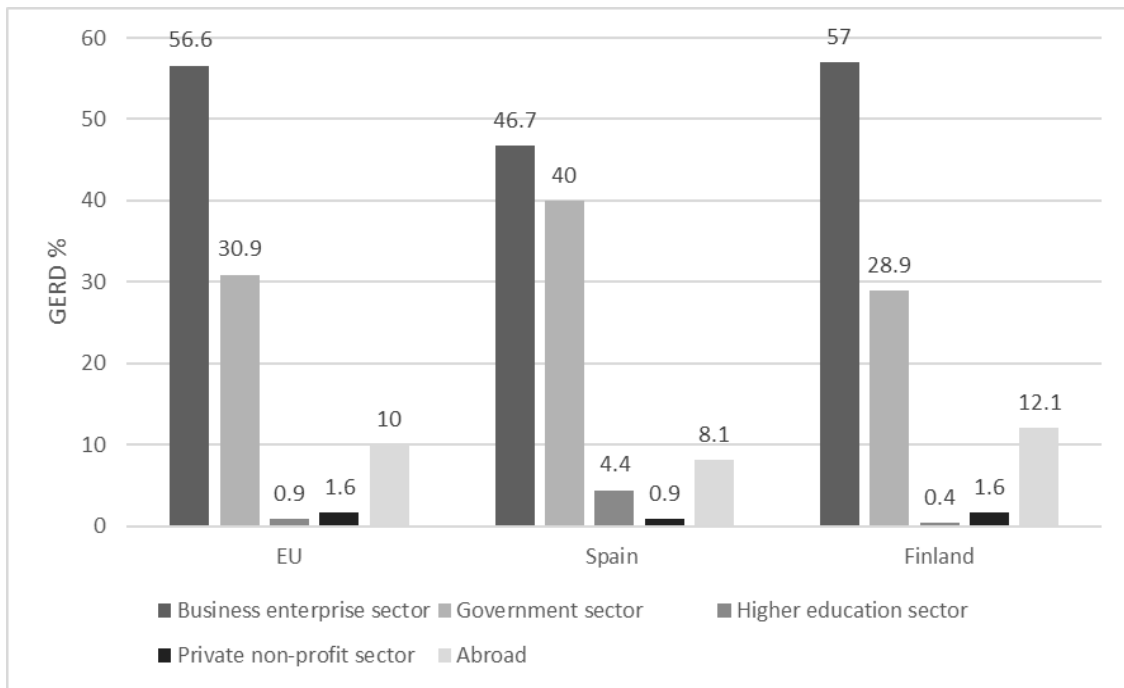
Source: Demola presentation for students (Wessman, 2018)

Table 3: Demola benefits for each agent

ACTORS	BENEFITS
Students	<ul style="list-style-type: none"> • To add real-life work experience into the conventional path towards a career. • The chance to work in a multidisciplinary and international environment. • Specific training in innovation and new methodologies. • Acquisition of professional skills and competencies and personal/social skills. • Opportunities to establish start-ups based on Demola project results. • Recruitment opportunities at partner corporations. • Professional contacts. • Recognition of the activity through academic credits and a Demola Global certificate. • Revenue from licensed results.
Universities	<ul style="list-style-type: none"> • Universities participating in this initiative provide their students with access to a unique learning experience that prepares them for their professional career, while giving them the opportunity to develop their personal and professional capacities. • Development of a new kind of teaching and learning environment as well as new co-operation opportunities between degree programmes, universities and other higher education institutes. • The behavioural and cultural knowledge of the Demola network could improve the training skills and methods of lecturers. • Researchers and lecturers are also given the chance to work in a real-life environment, implementing and validating their ideas and their research outputs. • Demola offers academic partners the chance to create and maintain contacts with the industry and link scientific research to industrial cases through this cooperation.
Companies	<ul style="list-style-type: none"> • Professional support in a fully facilitated environment for a new innovation model based on co-creation. • New knowledge, new fresh perspectives and new ideas. Demola provides insights from outside companies' own box. • Less uncertainty and risk in the innovation process. • Access to the best young talent through highly-educated university students eager to collaborate in real-life projects. • Internationalisation • Finding insights into and new directions for business development based on a new innovation culture. • Providing a unique working method and inspiration to companies' own employees • The chance to develop internal innovation processes based on what has been learnt through participation in Demola A mental shift outside the corporate comfort zone is facilitated. • Contacts and possible future co-operation with universities and recruiting opportunities.
Public sector	<ul style="list-style-type: none"> • Leading a change in the mindset of innovation thinking in local, regional and national environments. • The Demola model has proved especially useful where cooperation between universities and companies is infrequent, study programmes lack practical aspects, and collaboration models are weak. • The cities and regions where Demola has been present for years have experienced a notable leap forward in their innovation performance. In some of them, Demola is part of clusters and innovation platforms as another instrument of open co-creation and innovation. • Demola works with a variety of companies and organisations that operate in different fields from humanitarian work to quantum physics.

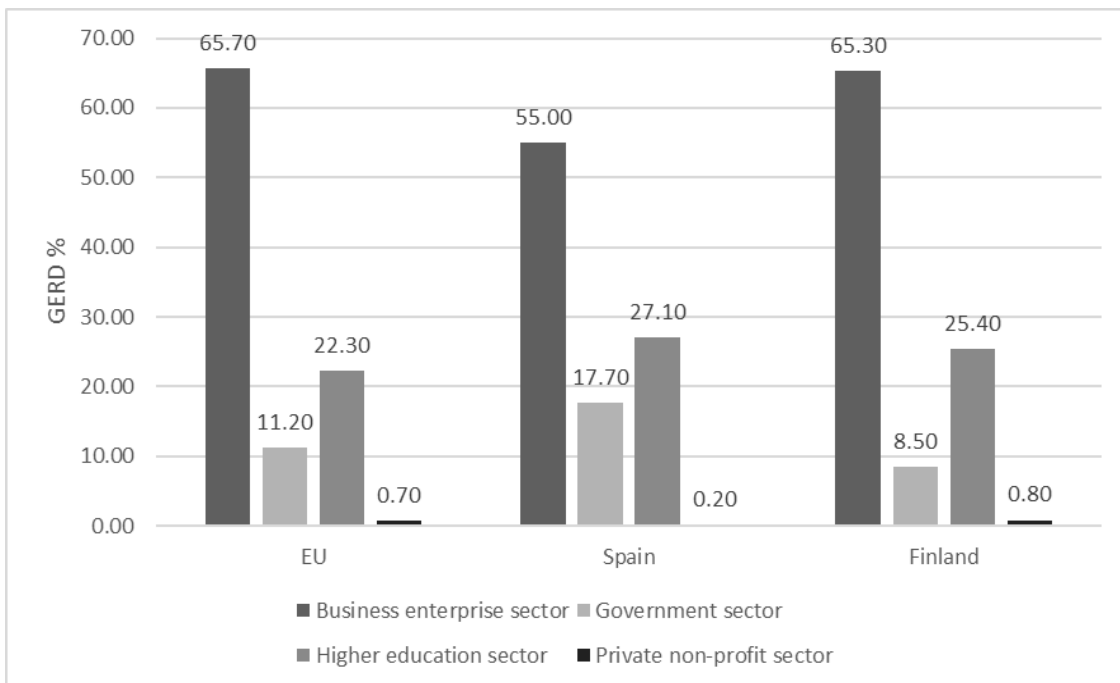
Source: authors' own based on several sources (Demola Global, 2019; EKOS, 2017; Raunio et al., 2018, 2016a, 2016b; Silvén et al., 2018).

Figure 3: GERD by source of funds in 2016



Source: authors' own, taken from Eurostat

Figure 4: GERD by sectors of performance in 2017



Source: authors' own, taken from Eurostat

Table 4: Finnish and Spanish performance in international innovation indexes

INDEX	INDICATORS	FINNISH RANKING	COUNTRIES ABOVE FINLAND	SPANISH RANKING	COUNTRIES ABOVE SPAIN
European Innovation Scoreboard 2019 (including EU and non-EU countries)	Summary Innovation Index	3/36	5.56%	23/36	61.11%
	3.2 Linkages	6/36	13.89%	23/36	61.11%
	3.2.1 Innovative SMEs collaborating with others	8/36	19.44%	27/36	72.22%
	3.2.2 Public-private co-publications	7/36	16.67%	23/36	61.11%
	3.2.3 Private co-funding of public R&D expenditure	8/36	19.44%	17/36	44.44%
Global Innovation Index 2019	General Index	6/129	3.86%	29/129	21.70%
	5.2 Innovation linkages	4/129	2.33%	60/129	45.74%
	5.5.1 University/industry research collaboration	5/125	3.20%	59/125	46.40%
	5.2.2 State of cluster development	17/125	12.80%	36/125	28.00%
	5.2.3 GERD financed from abroad	35/102	33.33%	47/102	45.10%
	5.2.4 Joint venture/strategic alliance deals	10/110	8.18%	55/110	49.10%
	5.2.5 Patent families filed in at least two offices	3/123	1.63%	32/123	25.20%
Global Competitiveness Index 2018	General Index	10/137	6.57%	34/137	24.10%
	11.3 State of cluster development	17/137	11.68%	36/137	25.55%
	12.4 University - industry collaboration in R&D	4/137	2.19%	67/137	48.17%

Source: authors' own adapted from EIS 2019, GII 2019 and GCI 2018 data.

Table 5: Roles in Demola model

ROLE	MAIN FUNCTIONS	AGENTS
Local operator	<ul style="list-style-type: none"> Inviting local companies/other organisations to launch challenges Engaging students and building teams Daily facilitation of teams 	HEIs or organisations depending on them
		Public sector institutions
		Private organisations
		Demola Global
Challenge launcher	<ul style="list-style-type: none"> Setting real challenges or problems that affect them 	Companies
		Public sector institutions
		Non-profit organisations
Challenge solver	<ul style="list-style-type: none"> Co-creating solutions for real challenges 	Student teams and company staff
Academic manager	<ul style="list-style-type: none"> Disseminating the model and providing students Supervising and recognising student work 	HEIs
Promoter/funder	<ul style="list-style-type: none"> Promoting the creation of the regional site and providing funds for its financing 	Public sector institutions

Source: authors' own based on interview information.

Table 6: Results summary

DEMOLA FEATURES		SPAIN	FINLAND
Objectives	Companies	Focus on immediate results: short term objectives. Eventually medium-term objectives.	Triple approach: long-, medium- and short-term objectives.
	Universities	Lack of commitment when the initiative does not come from the university itself.	Universities as enablers.
	Public sector	Scarce public sector challenges. Demola understood as policy tool when there is a public promoter.	Public sector as user and as facilitator: Demola included in several public programmes.
Duration		Continuity favours success.	Long-term perspective.
Complexity	Local operator functions	High level of facilitator commitment. Difficulties to engage large companies Bureaucratic burden of the Spanish university system.	Co-facilitating model. Critical role of large companies (Nokia). Demola conceived as an agile and multidisciplinary method.
	Public control	Public control system when public support exists.	Importance of Demola academic coordinators in universities.
Shared responsibilities	Resources	Some universities' features do not dovetail with the functioning of Demola	Good levels of communication.
	Costs	Importance of public support.	Sustainability of the model.
	Risks	Lack of honesty in some companies.	Balancing risks with participation fees.
	Benefits	Internationalisation as an opportunity. Satisfaction in students: recruitment opportunities, real life contact. Proven, award-winning model.	Internationalisation as a proven benefit for all agents. Students as Demola ambassadors. New innovation model.
Formalisation		Heterogeneity: different models co-exist.	Contractual harmonisation.

Source: authors' own