Mondragon Unibertsitatea

DOCTORAL THESIS

Developing relationships between corporations and startups through public-private collaboration: A BASQUE case study.

LIHER PILLADO ARBIDE

To Brenda

for helping me believe in myself every single day

To Emili

for challenging me every day to be a better human and a better father

To my family

who have helped me build the values I stand for

Mondragon Unibertsitatea

MTA MONDRAGON TEAM ACADEMY

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Thesis directed to obtain the title of DOCTOR
by MONDRAGON UNIBERTSITATEA

Mondragon Team Academy
Mondragon Unibertsitatea
2023 September

Statement of originality

I, Liher Pillado Arbide, declare that this thesis is the result of my personal work, and that it has not been previously submitted to obtain another degree or professional qualification. The ideas, formulations, images, illustrations taken from other sources have been duly cited and referenced.

Acknowledgments

The development of this thesis has been part of I would say several stages of my life. First of all, I wanted to express my infinite gratitude to Irun Teamcoaches Team, the Accompanying Team and all the Teampreneurs from Irun Lab, with whom I learn, grow and enjoy life every single day. Your commitment and contributions inspire me every single day and the completion of this thesis has shown me that we have ample room to contribute and transform the way research is carried out. I'm afraid we face the responsibility to do so.

Secondly, this thesis would have not been completed without the dedicated guidance of Sain Lopez, Saioa Arando, Aitor Lizartza and Lander Beloki. Thank you for your time, patience and inputs.

Thirdly, I cannot thank you enough to Aitor Urzelai and Marian Gabilondo, as well as the interviewed Corporations and Startups for opening the doors to a very unique program that is BIND 4.0. My deepest congratulations for the groundbreaking work that is being carried out for the competitiveness of the Basque Country.

Last but not least, thank you MU Enpresagintza S.Coop. for offering the resources to complete this thesis, to Jon Aldazabal and Aitor Bediaga for their contributions, as well as some other people from the organization who have previously pursued their thesis and have shared tips and cheered me throughtout the journey.

Abstract

Digitalization is changing our lives in ways that are yet to be discovered. It definitely is bringing profound transformations not only in our lifestyles, but also how value creation takes place within today's globalized and connected world.

The manufacturing industry is one of the sectors that most is being transformed given the fast pace of development that digitalization is bringing or more known as the Industry 4.0, changing dramatically the competitiveness of firms, regions or even countries.

The present research is focused on analyzing and understanding a new form of Open Innovation, both from the literature standpoint as well as from the practitioner perspective where a Corporate-Startup collaboration model set up by the Basque Government is analyzed. More specifically, a program that pretends to answer two main needs: accompany existing corporations within their digitalization and competitiveness strategy as well as support the consolidation of startups.

The results of this thesis aim to contribute to understand a unique model of Open Innovation, a regional Venture-Client model that aims to provide solutions to the challenges of the market as well as the society that existing companies of the Basque Country as well as emerging Start-ups are facing.

The applied methodology has been a case study through the Taxonomy of Gomm (2000). This methodology aims to understand and define the particularities of the BIND 4.0 program that the Basque Government set up in 2016 through its department of industrial development, known as the SPRI (Society for the industrial development). Within this research the first three editions are analyzed given the uniqueness of the program.

Given the particularities of the program that is researched within this thesis, a case study of corporations and Start-ups of the first three editions are carried out. Additionally, several theoretical and practical cases are added: Firstly, a theoretical framework that helps understand both on a global as well as regional scale the motivations and characteristics that foster the development of relationships between startups and corporations is provided. Secondly, theoretical proposals and researched companies are compared from the Open Innovation and corporate-startup collaboration perspective. Thirdly, the unique case of the BIND 4.0 program is analyzed in order to contribute to the knowledge body.

Keywords: Open Innovation, Corporate-startup collaboration, Innovation Ecosystems, Entrepreneurship.

Laburpena

Digitalizazioaren ondorioz gure bizitzak erabat eraldatzen ari dira oraindik konsziente ere ez garen moduetan. Gure bizimoduak aldatzeaz gain, balio sorkuntza gaur egungo mundu globalizatu eta konektatuan nola gauzatzen den ere aldatzen ari da.

Manufaktura industria da gehien aldatzen ari den sektoreetako bat, digitalizazioak dakarren garapen erritmo bizkorraren ondorioz (edo ezagunagoa den 4.0 Industria). Hau dela eta, enpresen, eskualdeen eta herrialdeen lehiakortasuna nabarmen aldatzen ari da.

Ikerketa honek Berrikuntza Irekiko eredu berri bat aztertu eta ulertzea du helburu, bai literaturaren ikuspegitik, bai profesionalen ikuspegitik, non Eusko Jaurlaritzak ezarritako Enpresa-Startup lankidetza eredu bat aztertzen delarik. Bereziki, eskualde bereko bi premia nagusiri erantzun nahi dien programa aztertzen da: digitalizazio eta leihakortasun estrategiaren barruan dauden enpresei laguntzea, eta sortzen ari diren enpresei sendotzen laguntzea.

Tesi honetako emaitzen bidez Berrikuntza Irekiko eredu bakar bat ulertzen lagundu nahi da, eskualdeko “Venture-Client” eredua deitzen dena hain zuzen. Eredu honek gizarteko eta merkatuaren erronkei irtenbideak eman nahi dizkie, baita Euskal Autonomi Erkidegoko enpresa eta sortzen ari diren Startupei ere.

Erabilitako metodologia kasu-azterketa bat izan da, Gomm-en taxonomiaren bidez (2000). Metodologia horren bitartez, Eusko Jaurlaritzak abian jarritako BIND 4.0 programaren berezitasunak ulertu eta definitu nahi izan dira. Programa hori 2016. urtean sortu zen, SPRI (Industriaren Garapenerako Sozietatea) izeneko industria-garapeneko sailaren bidez. Ikerketa honen barruan, programaren lehen hiru edizioak aztertu dira.

Tesian aztertzen den programaren berezitasunak kontuan hartuta, lehen hiru edizioetan parte hartzen duten enpresa eta startupak aztertu dira. Gainera, zenbait kasu teoriko eta praktiko gehitu dira: lehenik eta behin, esparru teoriko bat eskaintzen da, mundu mailan nahiz eskualde mailan garatzen ari diren startup eta korporazioen arteko harremanak sustatzen dituzten motibazioak eta ezaugarriak ulertzen laguntzeko. Bigarrenik, proposamen teorikoak eta ikertutako enpresak berrikuntza irekiaren eta korporazio-startup arteko lankidetzaren ikuspegitik konparatzen dira. Hirugarrenik, BIND 4.0 programaren kasu berezia aztertzen da ezagutza zabaltzeko.

Funtsezko hitzak: Berrikuntza Irekia, Korporazio-Startup kolaborazioa, Berrikuntza Ekosistemak, Ekintzailetasuna.

Resumen

La digitalización está transformando nuestras vidas y estas transformaciones no sólo están teniendo lugar en nuestro estilo de vida, sino también en la forma en que se crea valor en el mundo globalizado y conectado de hoy en día.

La industria manufacturera es uno de los sectores que más se está transformando debido al rápido desarrollo que está trayendo la digitalización o más conocida como la Industria 4.0, cambiando drásticamente la competitividad de empresas, regiones o incluso países.

La presente investigación se centra en analizar y comprender una nueva forma de Innovación Abierta, tanto desde el punto de vista de la literatura como desde la perspectiva de la práctica donde se analiza un modelo de colaboración Empresa-Startup puesto en marcha por el Gobierno Vasco. En concreto, un programa que pretende dar respuesta a dos necesidades principales en una misma región: acompañar a las corporaciones existentes dentro de su estrategia de digitalización y competitividad, así como apoyar la consolidación de las startups.

Los resultados de esta tesis pretenden contribuir a entender un modelo único de Innovación Abierta, un modelo "Venture-Client" regional que pretende aportar soluciones a los retos tanto del mercado como de la sociedad a los que se enfrentan las empresas existentes en el País Vasco así como las Start-ups emergentes.

La metodología aplicada ha sido un estudio de caso a través de la Taxonomía de Gomm (2000). Esta metodología pretende conocer y definir las particularidades del programa BIND 4.0 que el Gobierno Vasco puso en marcha en 2016 a través de su departamento de desarrollo industrial, conocido como SPRI (Sociedad para el desarrollo industrial). Dentro de esta investigación se analizan las tres primeras ediciones del programa.

Dadas las particularidades del programa que se investiga en esta tesis, se realiza un estudio de casos de empresas y Start-ups de las tres primeras ediciones. Además, se añaden varios casos teóricos y prácticos: En primer lugar, se proporciona un marco teórico que ayuda a comprender tanto a escala global como regional las motivaciones y características que favorecen el desarrollo de relaciones entre startups y corporaciones. En segundo lugar, se comparan las propuestas teóricas y las empresas investigadas desde la perspectiva de la Innovación Abierta y la colaboración entre corporación y startup. En tercer lugar, se analiza el caso único del programa BIND 4.0 con el fin de contribuir al conocimiento.

Palabras clave: Innovación Abierta, Colaboración Corporación-Startups, Ecosistemas de Innovación, Emprendimiento.

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GLOSSARY

LIST OF ABBREVIATIONS

BIC	Business Innovation Centres
BRIC	Brasil, Russia, India & China
BIND	Basque Industry
CA	Corporate Accelerator
CE	Corporate Entrepreneurship
CEO	Chief Executive Officer
CIPE	Center for the International Private Enterprise
COO	Chief Operating Officer
CTO	Chief Technology Officer
EU	European Union
EUSTAT	Euskal Estatistika Erakundea
GDP	Gross Domestic Product
IT MANAGER	Information Technology Manager
KET	Key Enabling Technologies
MTA	Mondragon Team Academy
OECD	Organization for Economic Co-operation and Development
R&D	Research & Development
SEP	Startup Europe
SPRI	Sociedad para la Promoción Industrial
WEF	World Economic Forum

CHAPTER 1

Introduction

1. Introduction

Turning into new millenia has brought tremendous changes in the world we live in. Driven by the digital revolution and several other transformations, humanity lives in a world that is heating up, speeding up, is increasingly interconnected and experiences soaring inequality (United Nations, 2020).

This reality has been created partly due to 5 technological revolutions that have taken place in the last 250 years, the last one kicking off in 1971 when Intel launched the first microprocessor which marked the beginning of today's age of information (Perez, 2009). Due to major changes in the technologies available, each period alters the competitiveness criteria as well as the innovation processes.

The democratization of technology in each of the periods has followed similar patterns, one led by finance and the other one by production, but it is usually a financial crash what has ignited the transformation (Perez, 2009).

The downfall on September 15th of 2008 of the financial services firm Lehman Brothers cracked a large share of the financial system of the US economy, generating consequences on a global scale. This event was later considered to be the biggest bankruptcy of the US' economic history and led to visualize how interconnected the world is as its consequences had a global outreach (Rodini, 2013).

After the debacle of the financial system, governments and public institutions started to take action on budgetary and fiscal policies with the goal to generate a fertile macroeconomic framework for the recovery: inflation control, lower interest rates, credit injection…with the goal to support innovation and entrepreneurship related initiatives to flourish (Landabaso, 2012).

Parallel to that reality, new firms that started in the 90's in Silicon Valley were incorporating advanced technology and had the ability to disrupt entire industries by generating tremendous innovation. These new organizations were called startups and were becoming profitable surprisingly fast, acting as engines of prosperity and job creation igniting the movement later in Europe (Chorda & Mosser, 2011). Consequently, corporations and firms that had been operating for decades were experiencing that on the one hand they were generating massive layoffs, and on the other hand startups were disrupting industries they had been operating in and hiring the best talent corporations were laying off.

Jack Welch, former CEO of General Electric and referent business professional, argued that when firms of new creation external to a corporation that are in the same market are able to innovate faster, the competitiveness of a corporation will face its end soon. This belief connects with what corporations were experiencing compared to what startups were capable of doing. Henry Chesbrough, a California based scholar who coined the term of Open Innovation in 2003, together with other authors have defended that the knowledge and the skills needed to create innovative solutions lie outside of today's corporates' spaces (Chesbrough & Brunswicker, 2013). In fact, startups and its founders have been considered better on that (Dushnitsky & Lenox, 2005).

With the goal to be closer to the startups and be part of the game they were playing, corporations have been implementing open innovation strategies to attract entrepreneurial talent to their organizations' boundaries (Mocker, 2015). It has been clearly seen that startups are better and faster at building business solutions, but they often lack what a corporation is best at: offering resources to scale and consolidate (Weiblen & Chesbrough, 2015).

The ability for a startup to connect with its environment as a way to accelerate innovation has brought a lot of attention both from academia as well as professionals (Chesbrough & Bogers, 2014).

In Weiblen and Chesbrough's (2015) most recent work, following discoveries have been identified: "Large companies have long sought ways to become more entrepreneurial." "Large corporations and startup ventures are decidedly different organizations. One side has what the other one lacks: the corporation has resources, scale, power, and the routines needed to run a proven business model efficiently. The startup has none of those, but typically has promising ideas, organizational agility, the willingness to take risks, and aspirations of rapid growth." (p.67)

According to a team of consultants from Boston Consulting Group, "If emerging competitors are threatening parts of your business, if technology or regulations are reshaping your company's value chain, or if your competitors are experimenting with new innovation tools, inaction is not an option." (Brigl et al., 2017, p.17). Same authors suggest that innovation sources, tools, goals and to which strategy they answer needs to be clearly defined according to the firms' needs (Brigl et al., 2017). From public institutions, SEP (Start Up Europe), to banks (BNP, Barclays), venture capitals (L-Marks, Project A) to consultancy firms (Deloitte, Accenture, KPMG) or agents that act as accelerators (Techstars, Plug & Play, Rocket Space) are agents that are experimenting with new ways of engaging startups and corporations. In fact, Accenture already coined the term "Bridgemaker" for the organizations that help bridge startups and corporations.

CITRIX was the pioneering firm on launching a Corporate Accelerator, an inhouse accelerator that would allow the corporation to have startups closer to its R&D unit. Its purpose was through a program to connect with the innovation that startups were creating outside and support them with the knowledge and resources it had. Since the launch of the first corporate accelerator in 2010, some sources estimate that there have been more than 120 corporate accelerator programs globally speaking, reaching its peak in 2016 (Desai, 2016).

As launching a corporate accelerator usually involves less resources than traditional R&D lab development, corporations by dozens started launching their own corporate accelerator. Florian Heinnemann has been another referent scholar, who developed the most accurate database of corporate accelerators to date, listing 71 in 2016. However, by January 2019 only 40 of these programs were still active and Heinemann (2015) in his thesis invites "to understand in more depth how existing product architectures are impacting the effectiveness of corporate accelerators" (p.71). By product architecture Heinemann argues that depending on the product/service a firm develops, the collaboration with startups might offer more or less opportunities.

The literature review carried out during this research outlines that the effectiveness and key performance indicators of corporate accelerators should be researched (Kanbach & Stubner, 2016; Mahmoud-Jouini et al., 2018; Richter et al, 2018). On the other hand, some other researchers suggest that new models to run corporate accelerators are constantly emerging and that they should be looked into (Shankar & Shepherd, 2018, Richter et al., 2018; Moschner et al., 2019).

Business ecosystems and corporations often tend to be more focused on value capturing rather than value creation, that is why innovation ecosystems place the value creation to the center stage (Adner & Kapoor, 2010; Priem et al., 2013; Ritala et al., 2013). The ecosystem look to the innovation and entrepreneurship that happens in a given region reflects the relationship built between the actors that aim to foster technology development and innovation (Jackson, 2011). In fact, Governments' and policy makers' new role is to identify the existing potential within their own region and act as catalysts by generating interactions among the different agents (Müür, 2021).

It is clear that an increasing number of academics have been focused on understanding how Open Innovation is taking new forms and shapes, especially when it comes to corporate innovation and the opportunities for collaboration that exist between the start-ups and corporations. A number of scholars share as well in the conclusions of their work that following topics could be researched:

- The effectiveness and key performance indicators of corporate accelerators (Kanbach & Stubner, 2016; Mahmoud-Jouini et al., 2018; Richter et al, 2018).
- Understanding how Open Innovation is taking new forms and shapes, especially when it comes to corporate innovation and corporate accelerators and the opportunities for collaboration that exist between the start-ups and corporations (Shankar & Shepherd, 2018).
- Understanding the models that can exist for collaboration between the two (Weiblen & Chesbrough 2015; Kohler, 2016; Moschner et al., 2019).
- Particularities and challenges of the relationship (Minshall et al., 2008;Hora et al, 2017; Brigl et al., 2017).
- Understanding the phenomenon from the startup perspective (Battistella et al., 2017; De Toni & Pessot, 2016).
- Some others from the corporation perspective (Kanbach & Stubner, 2016; Mahmoud-Jouini et al., 2018; Shankar et Shepherd, 2018).

Steiber & Alänge (2020a, 2021) suggest that governments have started to support the startup-corporate collaboration by launching several initiatives, aiming to consolidate startups, freshen up the corporations and contribute this way to the national economy as well as its competitiveness within the global scene. They also have invited researchers to understand the effects this might generate within the local, regional and global ecosystems. In fact, it is said that innovation cannot be dictated but can be cultivated (Sallet et al., 2009)

How this support benefits society is hard to measure (Steiber & Alänge, 2021). However, to understand the results and what triggered them from the learning perspective for all the stakeholders involved (Chen, 2015) might be the most adequate framework when it comes to understanding publicly funded startup-corporate collaboration.

Collaboration between corporations and startups in the Basque Country

This research pays special attention to the Basque Country, where national culture as well as the active participation of the government plays a key role in its socio-economic development since 1980 (Cooke & Morgan, 1998; Valdaliso, 2015).

Since the end of the dictatorship era in the late 70's in Spain, the estate was divided in 17 autonomous communities and the regional development of the Basque Country has been considered to be one of the most equal ones in terms of social and economic balance. This statement is backed by the fact that Basque Country ranks in the 15th position within the global scene when it comes to the Human Development Index - United Nations Development Program (Eustat, 2022).

This development has helped it to be considered very inclusive and among the top in Europe when it comes to the GDP per capita as well as the lowest when it comes to the population that lives in poverty or risk of social exclusion (Markuartu, 2015).

On top of that the Basque Country has been a region where the industrial sector has developed together or not much later than in other leading regions of Europe. Organizations that work towards human and regional development such as the OCDE, know well and manifest that the Basque Country is a successful model of industrial transformation (OECD, 2011, p. 42). Some more recent indicators such as the Regional Innovation Scoreboard (RIS) which assesses the innovation performance in a given European region, frame the Basque Country as reference of excellence (European Commission, 2021).

Markuartu (2015) sums up the following way the radical transformation the Basque Country has had during 30 years (1980-2010) and considers it as referent model for Sustainable Human Development, outlining it the following order:

1. Building the concept of national identity
2. Shared public-private leadership
3. Commitment to the real economy
4. Economic growth hand in hand with social balance
5. Self-governance

In the Basque Country, Industry represents a very significant weight in the GDP. According to EUSTAT, the Basque Institute for Statistics, it consistently sustained at about 24.2% in the period of 2015-2020 (EUSTAT, 2020), whereas within the EU28 this percentage is 19,3% (Red de Parques Tecnológicos de Euskadi, 2020).

Acknowledging the uniqueness of the Basque region, its reference model for sustainable development and the weight industry has in its economy and competitiveness, the author of this document has explored its flagship program named BIND 4.0, a program promoted by the Society for the Industrial Promotion (SPRI) - a government led institution.

BIND 4.0 aims to foster the collaboration between corporations and startups, helping corporations advance in their Industry 4.0 related challenges and startups within their growth and development. According to the organization, since 2017 there have been 7 editions, connecting +190 startups with +70 corporations, which have worked on more than 270 projects together invoicing +7.7 million € (BIND 4.0, 2023). BIND 4.0 has been

recognized by many a referent program and European Union Commission recognized it in 2020 as the winner within the European Enterprise Promotion Awards (Asín, 2021)

Alänge et al. (2022) have perpetuated extensive research on the work carried out by Vinnova, the Swedish Innovation Agency also publicly run, and its support towards the Corporation-Startup collaboration. Although some scholars have mentioned BIND 4.0 in their research, there has not been any scientific research done that aims to understand the particularities of the BIND 4.0 program as well as define its main features.

Keeping in mind that the BIND 4.0 was designed and launched as a program with the goal to provide solutions to pre-identified challenges, the theoretical framework applied in the research is Program Theory (Chen, 1990, 2006; Pawson & Tilley, 2004). This theoretical framework reveals how by implementing a program in a specific context can help to shift from a given scenario to another one. In this case it would mean that in a scenario where radical innovations are being developed by startups rather than large organizations but startups struggle to consolidate and grow, explore how a program could mediate and change that.

Astbury and Leeuw (2010) state that “For the theory-driven evaluator, programs are embodiments of theories in at least two ways. First, they comprise an expectation that the introduction of a program or policy intervention will help ameliorate a recurring problem. Second, they involve an assumption or set of assumptions about how and why program activities and resources will bring about change for the better.” (p.364)

Inspired by the research carried out by Richter et al. (2017) who applying this theoretical framework have explored the features of multiple open innovation programs using corporate accelerators, the research aims to understand the key features of BIND 4.0 program from a multistakeholder perspective. When mentioning multistakeholder, it means all the agents that are involved in the program: startups, corporations and SPRI as the organization that promotes it. This has been done considering the diverse nature of each stakeholder.

The research model aims to understand and critically assess how the BIND 4.0 program intended to function, as well as its key features and particularities. However, it does not aim to measure satisfaction rates, achieved outcomes or effectiveness.

Using a program evaluation framework, which is a methodological approach, the aim is to provide information based on a specific taxonomy to identify the action model of the BIND 4.0 program (Chen, 2006). Also known as program features, a standard taxonomy for programs that covers strategy, resources, procedures, structures, the environment and metrics will be used (Gomm, 2000).

It is expected that this research will contribute considerably to academia by scientifically outlining the characteristics of the BIND 4.0 program. It can be summed up that the main research questions are the following:

- What is the underlying reasoning, or “program theory” behind this approach to open innovation?
- What are the essential and non-essential features of this particular public-private accelerator program?

Therefore, this research plan has the following objectives:

1st Objective: To understand the motivations and characteristics that foster the development of relationships between startups and corporations.

2nd Objective: To analyze a unique case that takes place within a concrete geographical, cultural and business context in order to contribute to the knowledge body.

3rd Objective: To value the degree of coincidence in the behavior of the theoretical proposals and researched companies within the field of open innovation and corporate-startup collaboration.

1.2 Justification of the research

1.2.1. Practical Motivations

Michael Porter (1993) confirmed that the competitiveness of a nation, and as a consequence its economical foundation, remained in its capacity to innovate constantly. However, different driving forces have not only made the environment more competitive, they've transformed it. Within this context, innovation is not understood only as a process to create new products and services, but it's been understood as a tool or platform to orchestrate the business context where the organization operates. A space where clients, suppliers and other agents are connected and become interdependent.

Over the last 50 years the innovation models have been evolving from simple linear models to more complex, systemic and interactive models (Rothwell, 1992). First references for innovation start with linear innovation models, a concept that Godin addresses from its origin to its historic evolution (Godin, 2006). Hobday (2005) presents five generations of innovation models. When looking into the work developed by different authors, it can be seen that some models are more widely accepted. The innovation models that are named as the fifth generation are the ones that embrace the innovation as a process that integrates systems and establishes networks. The fifth generation highlights the learning that takes place inside and between the companies, and suggests that the innovation is generally and fundamentally a distributed process in a network.

The first industrial revolution shifted manual work towards machines that were powered by steam. The second industrial revolution took off driven by electricity and assembly line productions. The third one got significant when IT solutions were implemented and production lines got automated. Lastly, when the Internet of Things and service oriented thinking reached the manufacturing industry is when the fourth industrial revolution has taken off (Kuo et al., 2019).

From the manufacturing standpoint, exponential technologies enable the connectivity among devices, decentralized decision making and access to transparent information, generating this way smart systems (Hermann et al., 2016). Implementing Industry 4.0 related resources, requires gigantic transformations within the organization (Sony & Naik, 2020) as well as upskilling training for the employees (Pejic-Bach et al., 2020).

Given the fast-paced economies we live in, the globalization, the high degree of

interconnectivity, the new technological advances and the emergence of new startups has placed to many companies of all sizes in challenging conditions. Most of them are aware they need to radically shift the way they operate, especially in the way they adopt technology, develop product and service and/or bring forward commercial strategies. But the day to day becomes challenging for corporations, on the other end startups struggle to consolidate and that is when programs as BIND 4.0 make sense as accelerators of technology adoption.

The innovation ecosystem is extremely relevant as it strongly supports the social and economic development of Europe, and start-ups and scale-ups are being identified as key innovation providers. Beyond that, start-ups and scale-ups create more jobs compared to other firms, they increase the EU innovation and competitiveness, strengthen the economy and offer more flexible and more modern working conditions.

The EU Commission has estimated that there could be up to 1 million new jobs created and up to €2000 billion added to GDP in the EU over the next 20 years by start-ups and scale-ups.

Acknowledging these trends, BIND 4.0 helps corporations to integrate technology into their manufacturing processes and startups take off in their early stages, all being supported by SPRI.

1.2.2. Scientific Motivations

Last but not least, a large number of scholars have highlighted that new models of corporate-startup collaboration are constantly emerging and that to better understand these new models is relevant (Shankar & Shepherd, 2018; Richter et al., 2018; Moschner et al., 2019). Shankar & Shepherd (2018) in their article, share some of the following questions for future researchers:

- Corporate Accelerators: Are there more pathways that corporations can take to design and run CA programs? Do organizational contexts (e.g., nature of business, industry) matter for how the CA is designed and run? How?
- Innovation Ecosystems: Does national culture play a role? How?
- Collaboration and co-opetition/sharing and connected economy: Are CA a way for large corporations to collaborate, especially while searching for new opportunities?

Although Open Innovation is a term developed by Henry Chesbrough almost twenty years ago, it is relevant to understand the different paths it has taken the last few years (Randhawa, Wilden and Hohberger, 2016). Following these researchers' work, there are two paths out of four that are connected with this thesis:

A path that follows how organizations manage networks and relationships, which is connected with the creation of corporate ventures, spin-offs, partnerships, creation of sustainable business models or ownership and governance of Open Innovation.

Another one that explores socio-economic regions and how Open Innovation can help policy makers support innovation performance. In fact, regions can provide a supportive platform so that companies of all types and sectors can participate creating a regional open

innovation ecosystem (Torkkely & Ahonen, 2007).

Building on the statement that new models of engagement are constantly emerging and whether national culture can play a role or not (Shankar et Shepherd, 2018), it is important to understand the phenomenon carried out by the developers of BIND 4.0. Additionally, this research aims to provide a practitioner wisdom perspective as it blends the phenomenological experience of the users' situation with the use of scientific information.

1.2.3. Personal Motivations

The author of this document is Teamcoach and Researcher at Mondragon Team Academy (MTA), unit of entrepreneurship within Mondragon University. With a background in International Business and Entrepreneurship, he pursued a semester as International Student in Tiimiakatemia Finland during student times, experiencing first hand what was going to be the foundation of MTA. Additionally and through his work at Mondragon Team Academy, has had the opportunity to learn and explore some of the most vibrant entrepreneurial ecosystems in the world: Silicon Valley, Boston, Shanghai, Berlin…

Mondragon Team Academy was born in 2008 with the purpose to recreate the original spirit of Mondragon Group, one of the largest worker owned business group in the world. Mondragon is often known globally as Amal Chevreau suggests, policy analyst at the Center for Entrepreneurship at the Organization for Economic Cooperation and Development in Paris, "one of the landmarks of the social economy movement because of its scale"

Even though Mondragon Team Academy started in the Faculty of Business of Irun, nowadays MTA's programs are being developed in 12 other locations globally. In 2018 at MTA's 10th anniversary, several reflections were made as part of the constant development spirit of the network. Some of the main highlights were the followings:

- MTA was delivering life changing experiences through the LEINN program, the rate of satisfaction from graduates and the companies that would hire them was high.
- MTA was good at developing entrepreneurial talent through its programs, but did not find the way to provide concrete solutions or become a trusted partner for the innovation challenges existing companies could have.
- 35% of graduates were able to create their companies after graduation, but most of them being for self-employment and had difficulties to scale and be invested.

Keeping in mind the reflections mentioned above, the author of this document decided to both dig deep in the literature available within the fields of Entrepreneurial Ecosystems, Corporate Innovation and Open Innovation. Additionally, after interviewing some of the referent business people in the field, he identified that already in the Basque region of Spain there was a program being run by the local government that could be both meaningful to contribute in the academia as well as get some answers for the challenges of Mondragon Team Academy.

CHAPTER 2

State of the art

2. State of the art

2.1. Introduction

During the first 20 years of turning into a new millennia, humanity has experienced change in unprecedented fast pace and economic cycles are the shortest they have ever been.

Generally speaking, in the early 2000s economies of large number of countries were having an outburst of economic growth, many experiencing double digit growths in their GDP. Among several others were the BRIC countries (acronomym for Brazil, Russia, India, China and South Africa), term coined by Goldman Sachs economist Jim O'neill in 2001 who stated that BRIC countries were going to be the leading economies by 2050.

However, the downfall of the financial services firm Lehman Brothers and its negative effects on a global scale on September 15th of 2008 led the globe into a social, economic and political decline. It obviously hit very strongly the countries of the European Union (EU) and helped reveal some of the challenges it was facing. The crises made it clear certain unsustainable developments that had taken place in many EU countries, how inter-connected EU's economies were and that new practices for policy coordination were going to be key to foster economic and social recovery.

There are a number of perspectives of why this global decline took place. However, two main drivers have gained a general consensus. Firstly, governments and policy makers driven by their egos and aiming a re-election at all costs, generated initiatives that were fiscally dangerous (Landabaso, 2014). Secondly, the ludicrously overfinanced construction sector bubble (Lewis, 2011) with the support of tax-opaque offshore and unregulated markets (Shaxson, 2012) led to the global financial crises.

Response of the governments to the global crises, especially in the EU:

The social, political and economic consequences that the global crises of 2008 brought in were of unprecedented levels. Not only private firms experienced firsthand massive layoffs or even closed its doors, but the social consequences it had forced governments to actively take bold steps. Some of the leading economies reach unemployment rates of nearly 25%, being 50% within the segment of under 30.

As initial steps, governments' path towards recovery started on budgetary and fiscal policies: inflation control, lower interest rates, credit injection…with the ultimate goal to generate a fertile macroeconomic framework (Landabaso, 2012). That is in fact a very needed reality for innovation and entrepreneurship related initiatives to flourish.

After the crises of 2008, EU's strategy towards the 2020 was focused on three main priorities, to foster a growth that was going to be:

- Smart: Investing in education, research and innovation
- Sustainable: Promoting a low-carbon economy
- Inclusive: Strong focus on job creation and reduction of poverty

For the EU, it was clear as well that the collaboration among private sector, academia, R&D, public sector and civil society would be the only way to move on from the challenges it was facing due to the crisis.

During the 2010s, EU encouraged the Member States and its own regions to identify their assets, their developments in R&D and do tunnel focus work on a limited amount of priorities. The request to specialize answered to the EU's desire to move on from the crises and create a more competitive Europe. More competitiveness meant that the regions needed to be more responsible in all the other three dimensions also: Environmentally, Socially and Financially.

Hand in hand with EU's 2020 strategy, the European Commission defined the importance the Smart Specialization Strategies (S3) had. This approach to development required that each region identified its strengths and assets and based on that defined a priority-setting participatory process in which national and regional innovation strategies were set (European Commission, 2012). These long term goals had in theory been clearly defined, they have had in mind the needs and visions of the Member States and its regions and the expected outcome was measured.

Today the EU is embarked in a new 2021-2027 horizon, where the S3 strategy has shifted towards S4: Smart Specialization Strategies for Sustainable and Inclusive Growth, connecting smart specialization and mission-oriented policy for sustainable development.

Steps to tackle the crises

Often, governments and policy makers consider that by simply creating or importing state-of-the-art technology will help them to compete and stay relevant in the global scene. That's one way to look at it. Others consider that acknowledging and promoting what already exists in the region and uplifting it to a global scene, will help them to catch up with referent countries and find their place within the competitive market.

Overall speaking, EU's approach has been focused on valuing and recognizing the existing knowledge and resources, Service sector accounting for the 70% of the economy, followed by Industry with 20% and Agriculture representing the remaining share.

With the goal to diversify and promote a healthier and more stable economy, the last couple of years the European Commission has put more effort towards preserving the industrial sector. It has been seen that a strong manufacturing sector is crucial for EU's competitiveness as well as preserve its jobs. The following data showcases the underlying opportunities in the manufacturing industry when it comes to generating growth and job opportunities:

- The European Commission's target was that the industrial sector could shift from representing 17.3% of the GDP in 2015 to representing 20% by 2020 (European Commission, 2014).
- Industrial sector attracts 80% of the private funds for R&D (European Commission, 2014).
- As a sector, it employs 23.6% of European workers (European Commission, 2014).

- For each job created in manufacturing, 0.5-2 jobs in other sectors are created (European Commission, 2014).
- 80% of European exports come from the industrial sector (European Commission, 2014).
- Large amount of manufactured goods are exported within the EU and they contain more added value than other goods exported from other countries (European Commision, 2014)
- Last but not least, EU is a leading creator of new knowledge in Key Enabling Technologies (KET), specially in the fields of industrial biotechnology or advanced materials where European products content technology of higher value than some other referent economies (European Commission, 2013)

EU's industrial policies have targeted certain sectors or technologies such as advanced manufacturing, sustainable economies or servitization (Warwick, 2013). Those were verticals that European Commission identified as key enablers of job growth and competitiveness.

Europen Union's focus towards leveraging its potential:

EU's state members shared a diagnose that the public sector should focus more on channeling the underlying potential within a region for growth based on innovation. Some Asian countries, as Korea among others, have been pioneers on that, where governments have played a key role helping private sector modernize and upgrade technologies of crucial industries of the country by leveraging scientific and technological qualifications (OECD, 2012a).

Scholars have come to a general consensus that in a context of a not so abundant macroeconomic framework where access to capital is limited and public debt is high the role of the government cannot be just to stimulate consumption through unlimited public debt, but to promote private investment in R&D including people, technology and infrastructure where there is strong collaboration between the regional as well as local government and the private sector (Sachs, 2013).

This model of interventionism embodies a long term perspective and is focused towards stimulating the growth of existing organizations as keeping the existing jobs as well as create new ones and foster the competitiveness of the local and regional companies is crucial for the wellbeing and stability of the EU system.

In academic literature the discovery of potential for innovation in each region driven by the public sector is also called ENTREPRENEURIAL DISCOVERY or SMART SPECIALIZATION, where innovation policies to promote local based traditional industries are defended.

The existing potential for innovation is usually discovered by putting together information that comes from market forces and private sector. From that base innovation policies can be drafted and governments set the expected outcomes empowering the agents that could be most capable of accomplishing them (Foray & Goenaga, 2013). Frankly speaking, smart specialization are more about bottom-up than what traditional industries have been about (OECD, 2012b).

Keeping this base in mind the theory framework addressed within this thesis will be analyzed the following way:

- Firstly and following EU's approach to leave the crises behind the concept of Entrepreneurship will be described.
- Secondly, the challenges and upgrade of corporate innovation will be described
- Thirdly the underlying opportunities regarding the collaboration among the two will be described
- Last but not least, a short description of the region where the research takes place will be outlined.

2.2. Entrepreneurship

The last ten to twenty years, and especially the financial crises of 2008, has shifted enormously how the entire world and economies have been operating for decades. Practices and ways of operating that long way established companies pursued for years, were suddenly not bringing the results they used to, leading into a financial crisis that created a profound uncertainty in the society and business.

Parallel to that reality, the 2010s brought tremendous entrepreneurial activity that would have felt impossible after the dot.com bubble (Weiblen & Chesbrough, 2015). Driven by advancements in digital technology, a solid system of supporting institutions (incubators, co-working spaces, government funded programs, access to capital), a cultural shift and the creation of new market opportunities, led to an outburst of entrepreneurship of up to 10% between 2010 and 2016 fueling economic growth, innovation and job creation (GEM, 2017; Startup Genome, 2017; Beck et al., 2017)

2.2.1 Defining Entrepreneurship

A lot of scholars have been working on trying to define the profile of an entrepreneur, and there's ample literature aiming to address this space. However, even though it's not a new concept and has been vastly used, there's not a widely accepted definition (Shane & Venkataraman, 2000).

Richard Cantillon was the first person who introduced the term "entrepreneur" in his work "Essai sur la nature du commerce en général" in order to define the profile as someone that would employ people or do business, where the expenses are known and clear, but the incomes unknown or unclear. Therefore it can be said that the entrepreneur is an individual that assumes risks in unknown circumstances (Cantillon, 1755).

Despite this first draft, the figure of the entrepreneur has been addressed from multiple fields: History, Economy, Psychology and Business (Herbert & Link, 1989), among others depending on the functions that the entrepreneur would undertake.

In the economic field, various researchers identify the entrepreneur as someone that gathers financial resources, innovates, allocates resources and takes decisions (Herbert & Link, 1989), whereas other researchers propose an alternative definition centered around the profile that is seeking out new economic opportunities and introduces new ideas in the

market (Thurik & Wennekers, 2001).

Veciana (1999) highlights that the entrepreneur beyond belonging to different knowledge fields, can as well be defined depending on the role he/she plays in the economy and society. In this sense, the entrepreneur can be identified on the one hand as someone that creates companies, and on the other hand as someone that sets up new ventures within existing companies. Both scenarios can be happening at the same time.

When the entrepreneur is identified as someone who creates a new company, he/she is named as someone who innovates, combines resources and identifies business opportunities, with the ultimate goal to obtain financial results within a risky and unknown context. When the entrepreneur is identified as someone who sets up new ventures within existing businesses, he/she is identified as an intrapreneur. Organizations that aim to create new ventures are named as entrepreneurial organizations (Aragón et al., 1997).

Authors such as Schumpeter (1934) & Wennekers & Thurik (1999) classify the entrepreneur as entrepreneur (new business creator) and intrapreneur (venture creator in existing organization). Schumpeter in his book “The theory of economic development”, defines the entrepreneur as a dynamic and uncommon human being, someone who blends production resources creatively. Additionally, he includes in his definition not only people who create businesses but also those who create ventures in existing organizations. On top of this, Schumpeter identifies entrepreneurs as professionals that cause instability in the markets of goods and services as they may be able to provide what humankind has not experienced or seen before.

Wenneker & Thurik (1999) connect the profile of the entrepreneur with the capacities and desires of the individuals, either as individuals or teams. Whether it’s within or outside of organizations, they create new business opportunities, new products, establish new ways to organize, develop new production methods, introduce their ideas into markets, while they cope with uncertainty and take risky decisions.

However, other authors identify entrepreneurs as business creators, not referring to the intrapreneurial profile. The Austrian School of Entrepreneurship through one of its representatives, Kirzner (1979), defines the entrepreneur as the profile that identifies opportunities in the market. A pioneer that finds the way to obtain a profit. The entrepreneur creates a company and obtains benefits in uncertain realities. Within this framework, Stevenson & Gumpert (1985) define the entrepreneur from its capacity to innovate, that beyond creating a company, he/she is on the constant look out to create new opportunities and profits. Galindo (2009) supports this concept, suggesting that entrepreneurs create companies, and therefore employment and growth, generating wealth and wellbeing in the country.

Another referent thought leader, Peter Senge – Senior Professor at the MIT, in a conversation with Master Nan identified that in ancient Chinese language entrepreneur means the person who wants to create a business to improve the community (Senge et al, 2005).

Some other authors define that even since the Greek era, the concept of “higher purpose” has been present (Pontefract, 2016). From the Vth century BC to the IVth BC, called as “the

classical era", Greek were serial entrepreneurs. From wider fields such as mythology, philosophy or more concrete solutions like cartography or odometers were invented with the ultimate purpose to improve society, not simply own and develop their ideas.

Today, the most recent entries when defining the profile of the entrepreneur can be found in *the Global Entrepreneurship Monitor 2011* (and beyond, GEM), Salas (2010) and OCDE (2009). This way, according to GEM that aims to measure the entrepreneurial activity, the profile of the entrepreneur is defined as an adult who is between 18 and 64 years old and is in the process launching a business. 0 to 3 months if working on it, 3 months to 42 months when consolidating it.

According to Salas (2010) and proposed by OCDE (2009), the entrepreneurs are the people who have created and are owners of companies that aim to generate value through the creation or expansion of the economic activity, identifying and developing new products, processes and or markets.

After all this analysis, the profile of the entrepreneur can be identified in the following way: "The person that after defining his/her purpose is in the process of launching a business or consolidating, identifying and developing new products and/or markets, facing high level of uncertainty as well as other difficulties, adopting risky decisions with the goal to make economic profits and provide answers to the initial challenge identified in the first place"

Universities globally have been doing extended work on incorporating entrepreneurship related courses within their curriculums and youth generally speaking are pretty open to new technologies. Last but not least, the economic crisis of 2008-2011 and recent COVID 19 pandemic, has unfortunately limited the career opportunities for recent graduates and to startup might have been the only option.

More experienced profiles might also be interested in joining the startup creation adventure. Usually people who have had couple of years or even up to a decade of experience in the corporate world might be in search of something more meaningful. They bring in the experience and networks of the corporate world, and a more unknown experience with questionable salaries at least the first few years is an option many professionals aim to pursue.

Even though startups are a minority of firms within the SME sector, it is considered that they shake in a positive way the business environment as they challenge different sectors, make products and technology accessible faster, cheaper and better. On top of that they have the potential to create plenty of jobs in the future as well as rejuvenate the atmosphere in cities and areas where once factories operated. They also have helped on breaking what once were separated agents into a more open and united ecosystem of actors than can help leverage their potential.

It is also foreseen that cities and regions must support the startup creation in order to become hubs that attract talent, economic growth and future economic development. It's been identified that startups are the key vehicle by which regions and their citizens can take advantage of technological change, there is an ongoing revolution in this sense (Schumpeter 1934; Voicu-Dorobantu et al., 2014). Startups depend on strong ecosystems. They, however, can take years, even decades, to develop (Startup Genome, 2017).

2.2.2 What are Startups

Within the existing literature startups may have different meanings depending on the source. Some scholars agree that a startup is a company or project created by an entrepreneur or a team of entrepreneurs to search, develop and validate a scalable business model (Robehmed, 2013). It needs validation because that's how it knows that its product/service can solve users or customers' problems, and that what makes a company be desirable. While entrepreneurship can be related to all new businesses, including self-employment and businesses that never intend to grow beyond making the ends meet, startups usually aim to grow big from the beginning.

The last few years startups have been the hype version of recently created firms and many professionals see the startup world as a very passionate career path. Youth professionals are some of the most attracted profiles to this path, as they feel they can change the world through the solution they are creating. On top of that, they usually take decisions by themselves or together with their team and that's something they value, whereas if they work for a larger organization the decision making takes longer and it might be taken by someone else.

Setting up a startup allows people to design the environment they want to create to pursue their dreams, what matters to them and what feels good to them. It allows to build a business in a market that serves the problem they are bothered about. Ken Robinson in his book The Element suggested that every human being should find his/her element as the best way to become happy, which is defined as "The meeting point between natural aptitude and personal passion" (Robinson, 2009). He also suggested that finding this space requires to have the right attitude and search actively the opportunities, and in the process it is important to have clarity on where do you stand as a person on certain personality characteristics and how do you want your life to be, and see how can there be a match on with your day to day.

It is understood that the first startups were generated at the beginning of the 90s in Silicon Valley (USA) as generators of constant innovation and incorporators of technology and ignited the movement later in Europe (March-Chorda, 2011).

Not only regions have shown interest in startup creation, but has also become a core research field within academia (Shook, Priem & Mcgee, 2003). As startups foster innovation as well as the creation of wealth, to deepen its understanding and research has become more acclaimed (Shane & Venkataram, 2000; Beckman et al., 2012).

2.2.3 Type of startups

Defined by the father of modern entrepreneurship Steve Blank (2010) "A startup is a temporary organization that is in search of a scalable, repeatable and profitable business model". It is temporary due to the fact that its starting up phase is limited in time. Once the testing period, either it becomes a sustainable company or it will shut down.

According to Blank (2011), there are six type of Startups:

- ***Lifestyle* Startups: Work To Live Their Passion**

A lifestyle entrepreneur is living the life they love, works for themselves, while pursuing their personal passion.

- ***Small Business* Startups: Work to Feed the Family**

Anyone who runs his/her own business, mostly creating jobs locally and not so much focused on scaling. Ownership of the company mostly within the entrepreneur and it is the most common type of start up.

- ***Scalable* Startups: Born To Be Big**

Scalable startups are what usually entrepreneurs from Silicon Valley or other referent entrepreneurial hubs in the world aspire to build. Generally, founders believe that their vision can change the world. Unlike small business entrepreneurs, their interest is not in just earning a living but rather in creating equity in a company that eventually will become publicly traded or acquired, generating a multi-million-dollar payoff.

- ***Buyable* Startups: Born to Flip**

Startups, usually with a Web and/or mobile app base, aiming to disrupt markets through technology. Their goal is not to build a billion dollar business, but to be sold to a larger company for $5-$50M.

- ***Large Company* Startups: Innovate or Evaporate**

Startups founded by Corporations, either by acquiring or attempting to build a disruptive product internally. Ironically, large copmany size and culture make disruptive innovation extremely difficult to execute.

- ***Social* Startups: Driven to Make a Difference**

Social entrepreneurs are no less ambitious, passionate, or driven to make an impact than any other type of founder. Their goal is to make the world a better place, not to take market share or to create to wealth for the founders. They may be organized as a nonprofit, a for-profit, or hybrid.

Completed by Erik Ries (2011), stating that “a startup is a human institution designed to create a new product or service in an environment of extreme uncertainty”.

Startups are organizations that focus on the value creation of a concept. Generally, they provide a solution to an identified challenge and are focused on scaling the product/service that has been created. The more markets and realities can cover, the more will be the value of it. And the more will have the focus on developing as an organization.

When Blank (2010) in his book mentions “in search of a business model”, highlights that a startup initially does not know its business model because normally they are focused on developing products, services or markets that do not exist for the time being, having a very high degree of innovation. A startup also manages a very high degree of uncertainty

because it is not sure if the initial business model is the one that will finally serve to consolidate the company and make the business sustainable.

Said this, when it comes to a business model that is scalable and replicable, Blank (2010) mentions that not all the businesses can be classified as startups. In order it to be labeled that way, it is required it to have a high degree of growth, relatively easy to make it grow, and also replicable to take the business model to other markets. More precisely, he defines a business model the one that has big growth possibilities, can be internationalized and is capable to generate incomes much faster than the growth of its cost structure.

Additionally, Blank (2010) highlights that generally startups are technological, as in general terms they are modern technologies, specially internet, which has allowed the creation of these sort of companies. However, being a tech company does not mean it's a startup, as it could be that its business model is not scalable and replicable.

Ries (2011) states that there's no concrete definition when it comes to the sizing of the company, industry or sector, therefore anyone could be the entrepreneur behind a startup, as long as it carries out the creation of a new product or business in a setting where the uncertainty is extreme.

Startups primarily operate with high R&D costs, advanced technology and professionals with deep knowledge on specific field and/or technology. The uncertainty level is usually high and have openness to navigate in risky situations, as well as aim to be the first ones launching specific technology or product. For them the only way to access in the market is by being more innovative than other existing firms. Their market tends to be global and have no fears on going international from day one, and can switch overnight market dynamics and shares (Criscuolo, Nicolau & Salter, 2012).

Startups usually face tremendous instability, mainly driven by the fluctuation in their sales as well as in their cash flow. Consequently, a large share of them fail (Dahl & Reichstein, 2007) and few of them make it until they reach a medium size (Kirchhoff, Linton & Walsh, 2013). Shortly speaking, startups' endurance will depend on the size and resources they are able to attract as well as the timespan they are able to sustain (Dahl & Reichstein, 2007).

A limited amount of them will endure and some prosper given the uniqueness of their value proposal, which will allow them to obtain large profit margins as no other competitor is able to provide what they deliver. Many startups' long-run vision is to be acquired by a larger corporation (Cink Emprende, 2013).

But considering all the uncertainty and risks entrepreneurs need to undertake, more and more these days people are wondering why people startup, why it's even a path that professionals want to pursue.

The reality is that in 2016, 93% of Stanford MBA students took at least one entrepreneurship course and 15% of the graduating class of 2016 launched a business (Symonds, 2017). That is a sign that more and more people are willing to pursue a career in the field of entrepreneurship and it is not limited only to few elite schools but can be considered that is slowly spreading on a global scale across all type of faculties.

With such an ample definition, startups can be operating in all sort of sectors and markets, but usually in literature and within this document, Startups will be referred to *ventures of recent creation*, that *apply exponential technologies as part of their core value proposal to develop a solution* and *are in search of a business model that makes them can be scalable*.

2.2.4 Phases Startups face

Startups get a lot of attention for various reasons: sometimes they become organizations that may disrupt industries (generating fear for larger firms), usually being founded by professionals who are rather young and otherwise would not get much attention, tend to be able to attract the best talent and offer the freedom that larger organizations usually do not offer…therefore many researchers have explored how they get created.

In academia, there is a general consensus on the fact that a startup goes through the following phases: first phase starts by defining the idea, second phase is about validating the idea, third one about the growth of the organization and fourth is about consolidating the startup.

However, Startup Commons Global (2013), referent initiative that aims to support the development of entrepreneurial ecosystems and growth of startups in Europe, adds two more phases in the initial part: I) Ideating II) Concepting III) Committing IV) Validating V) Scaling VI) Establishing

I. Ideating:

Inner call and enthusiasm to generate a product or service that is scalable and can meet the needs of a market large enough so that it can sustain the business model. Can be a single person or a small team at an initial stage with little or none existing organizational design.

II. Concepting:

Early vision and mission definition and long term call with a strategy development and key milestones. Concrete team of co-founders with predefined leadership roles as well as complementary skills. Possible collaborators or team members with specific roles.

III. Committing:

Devoted and evened team in terms of skillsets as well as shared vision and responsibility. Capable of developing the first product/service offering, as well as first investments. Shareholder agreement created by the co-founders and milestones as well as money commitments in a time scope of 3-5 years outlined.

IV. Validating:

Testing product/service with customers in order to identify what works and what doesn't, experiencing user growth and incomes. Designing Key Performance Indicators and income of funds in other forms can be sourced such us receiving investments for equity or loans.

V. Scaling:

Work focused towards reaching the KPIs previously defined as a team. Growth in customers and market as well as targeting fast growing markets. Aiming fast growth, hiring teams and attracting ample funding.

VI. Establishing:

Growth is significant and is expected to be steady in the long run. People and financial resources attracted. Aiming to keep the start-up culture within the organization despite having a larger size, and founders and/or early investors possibly taking exits.

FIGURE 1:
Startup Development Phases
Source: Startup Commons (2013)

Ranjay Gulati (2019) professor at Harvard University suggests that to retain and keep present in the day to day WHY a Startup was created is important in the long run. In his research, he identifies that a startup has a soul and attributes the soul of the startup to the purpose defined by the founders in the early years. It is the responsibility of the founding team to maintain the inner flame and it is often undervalued but safeguarding it is critical. In the long run, it will keep close and inspired not only customers but also other stakeholders, even that the company might shift from a chaotic and unknown reality to a more disciplined and professionalized one. He also suggests that the business purpose should go hand in hand with other two key elements: connection with customers and employee experience. He suggests that those are the key pillars not only for growth but also for greatness in the long run.

2.2.5 Context where Startups develop

Startups usually take off in a context where resources are limited, therefore their growth most of the times is a cocktail of internal knowledge as well as external resources (Presutti, Boari & Majocchi, 2011). In fact, a key skillset of startup founders is their ability to identify external knowledge that can be valuable for the development of their business model, leading this way to more varied market opportunities (Gruber, Macmillan & Thompson, 2013).

A more diverse external knowledge and wider market opportunities are usually found in rich innovation ecosystems, where access to networks, clusters and institutions is key (Adner, 2006). In fact, startups' success will be substantially influenced by the innovation ecosystem it operates (Nambisan & Baron, 2013). The ability for a startup to connect with its environment as a way to accelerate innovation has brought a lot of attention both from academia as well as professionals (Chesbrough & Bogers, 2014).

2.3 Corporate Entrepreneurship

All companies around the world exist given the customers they serve for, and usually very shortly said companies have two main concerns: how can they optimize the value creation process to current customers for a better service and profit, and which will be the products and services they will be creating to better serve current and future customers. The latter can be provided from the same company and range of services it offers, or it can be that an existing firm creates another company as the type of product or services it will provide differs from the parent company.

The discipline that addresses these issues is called Corporate Entrepreneurship (CE) and has had profound relevance both in the corporate world as well as in academia the recent years given the movement that was taking place within the startup scene. Some of the earliest academic texts on this field go back to the 1960's, when Knight (1967) coined the term. Peter Drucker and Arnie Cooper (1970) continued the work, when the former published "Entrepreneurship in the business enterprise" at the Journal of Business Policy and the latter "Entrepreneurial environment" at Industrial Research. It was in the 80's when the discipline started to take profound relevance through the work of Rosabeth Moss Kanter with The Change Masters (1983) and Gifford Pinchot with Intrapreneuring (1985).

Guth & Ginsberg (1990) shared that CE embodies two main fields:
(1) the birth of new businesses within existing organizations.
(2) the transformation of organizations through strategic renewal.

CE as a discipline has been evolving and today it is one of the major vehicles that answers to a number of purposes: profitability (Vozikis et al., 1999), strategic renewal (Guth & Ginsberg, 1990), innovativeness (Baden-Fuller, 1995), gaining knowledge to develop future revenue streams (McGrath, Venkataraman & MacMillan, 1994), international success (Birkinshaw, 1997), and the effective combination of resources to develop competitive advantages (Ireland, Kuratko & Covin, 2003). Other researchers place it as growth strategy (Zahra, Kuratko & Jennings, 1999).

As Michael Dell once said, "The only constant in our business is that everything is changing" (Brown & Eisenhard, 1998, P.1), and Schumpeter (1942) already highlighted on the importance of innovation for the business of companies and society.

Often, the professionals who work in the corporate world and face the responsibility to take decisions that will affect organization's business in the long run, share the same perspective: the main challenge is to find the balance between activities that ensure the current viability as well as find the space and energy to envision future opportunities, all at the same time (Levinthal & March, 1993).

2.3.1 Entrepreneurial behavior in corporations

Although entrepreneurship is widely connected with the creation of new ventures (Vesper, 1980), it is equally important for the current and future survival of organizations, territories, and countries. It helps organizations navigate in uncertain times, not only organizational

chaos but also to face unpredictable market behaviors with confidence (Brown & Eisenhardt, 1998). This has been possible thanks to the creation of practices and dynamics that aimed to nurture today's and tomorrow's core competencies (Covin & Miles, 1999).

Dess, Lumpkin and McGee (1999) stated that, "Virtually all organizations – new start-ups, major corporations, and alliances among global partners – are striving to exploit product-market opportunities through innovative and proactive behavior" – the sort of attitude that is expected from the corporate entrepreneurship standpoint. Barringer and Bluedorn (1999) suggested that given the ever changing environment we live in, ". . . entrepreneurial attitudes and behaviors are necessary for firms of all sizes to prosper and flourish."

Firms have been operating in a corporate reality where market behaviors were rather predictable and efficiency could be increased through planning and control. However, turning into the new millennia has dramatically shifted multiple dimensions: markets changing, rapid shift of customers' needs, technology evolving on very high pace, societal values changing from one generation to the next one….a reality that has required firms to become organizations that evolve with responsiveness and adaptation, principles that entrepreneurial behavior embodies (Barringer & Bluedorn, 1999).

2.3.2 Organizational design for corporate entrepreneurship

Years of simply managing the existing reality, optimizing processes and having people facing similar tasks and responsibilities, can lead to inertias that only generate monotony and bureaucracy within the organization. Characteristics that make established firms less agile and innovative than recently created startups.

Continuing doing things how they were done will never bring much change. In fact, it might lead to the death of the organization. Quinn & McGrath (1985) was one of the pioneers on identifying principles and changes in the structure that could help corporations create adequate environment for entrepreneurial behavior to flourish.

The truth is that innovative and entrepreneurial endeavors require having time to explore new ideas, take a look into things from a different angle and break established norms and habits, practices that are not always welcome within organizations (Jelinek & Litterer, 1995). Lumpkin and Dess (1996, p.136) suggested that an entrepreneurial environment could be set up only by "processes, practices, and decision-making activities that lead to new entries", identifying five principles for entrepreneurial culture generation: autonomy, innovativeness, risk taking, proactiveness, and competitive aggressiveness.

Organizations that are fostering the creation of new ventures need to make sure that the existing products and services are being well delivered but also bear in mind how the new ventures can be launched and integrated within the ecosystem.

The truth is that depending how organizations are designed, entrepreneurial spirit to flourish can be easier or more difficult to flourish. When the environment is defined by rules, strict procedures, and a clear authority, the company will be embracing a mechanistic structure (Burns & Stalker, 1961) and for things to change will be more difficult. However, it's been seen that for constant and rapid change of organizations, the needed spirit is rather the opposite. The internal organizational design must embrace a much looser and adaptive

environment, where teams can self-organize, have own authority on goals and tasks, and possibility to continuously adapt to the emerging reality working on their responsiveness (Brown & Eisenhardt, 1997). Burns and Stalker (1961) defined as “organic” this type of management structure, and suggested that the more uncertain the reality is, the more organic organizations tend to become. Which can only be enabled by people embracing a change philosophy and from the management standpoint enabling mechanisms for decentralization.

Brown and Eisenhardt (1998, p. 4) defined those firms that are able to adapt their structure continuously with agility and still rapidly respond to the market needs as firms “competing on the edge.” It was seen that within this firms the internal organization was much looser.

When organizations face uncertainty either fear starts to emerge and with that more control. Or then an organization can be designed in order for management structure to be more organic (Luchsinger & Bagby, 1987), this way decentralizing authority and responsibility to lower levels, open communication, participation in decision making, cooperation, investment in human capital and encouraging risk taking and creativity . This approach seems to be better in order to build resilience, understood as the capacity to adapt to changes in the environment (Hayton, 2003).

Russell and Russell (1992, p. 644) state that “in uncertain contexts such as innovation, norms and shared beliefs become the primary source of guidance because formal organizational procedures become ineffective.”

At least 90% of all radical innovation comes from small and emerging firms, so it could be interesting for large firms to focus on “planting new ventures” through spin-off processes. So the logic might be changing, firms instead of acquiring resources and capabilities, they might be in a position to firms can spin-off new ideas and opportunities. The newly created ventures may not be facing what independent startups face as they can take advantage of the networking and resources of the larger firm.

2.3.3 Human Resources aspects for Corporate Entrepreneurship

During the 80’s there were some concerns on how bureacracy was limiting entrepreneurship within organizations (Morse, 1986), whereas others suggested that it was very needed as a source to increase the performance of a company (Kuratko & Montagno, 1989).

Later in the 90’s some of the largest firms globally started to face certain difficulties and embracing an entrepreneurial attitude throughout the organization, culture and operations became the only way for survival (Zahra, Kuratko & Jennings, 1999, p. 5). And it was understood that entrepreneurship was not happening in a vacuum, but instead within the entire spectrum of actions of an organization (Dess, Lumpkin & Covin, 1997).

Three key dimensions bring together entrepreneurial behavior (Morris & Kuratko, 2002).

1. Innovativeness (the seeking of creative solutions to problems or needs).
2. Risk-taking (the willingness to commit significant levels of resources to pursue entrepreneurial opportunities with a reasonable chance of failure).

3. Proactiveness (doing what is necessary to bring pursuit of an entrepreneurial opportunity to completion)

Organizations that embrace corporate entrepreneurship usually are involved with a set of entrepreneurial actions.

- Top level managers shape strategies so that new businesses can be created or existing ones can be shaped. Will depend on the existing opportunities in the environment and how the company is able to play within the market context. The role of these leaders is to allign visions, empower and guide intrapreneurs (Floyd & Lane, 2000).
- Middle level managers' role usually is to embody the newly-formed strategies and behave entrepreneurially so that other employees' attitude and work is alligned with the entrepreneurial behaviors (King, Fowler & Zeithaml, 2001).
- First-level managers work hand in hand with their employees in order to exploit the entrepreneurial opportunities that might exist in the market (King, Fowler & Zeithaml, 2001).

All three levels to work together is essential and they must encompass the resources needed for the development of the current competencies in order to guarantee the existence in the future.

Professionals within an organizations are usually designed to develop further existing practices rather than paying attention to exploring new ideas. The more successful a firm has been with its products and markets, the more difficult is to drag people's attention into exploring new ideas or market opportunities.

Adding to that, CE is not only about generating innovative and entrepreneurial solutions, but it is also about channeling them into the market as a collective challenge for organizations. And sometimes there is a structural problem in order for entrepreneurship to flourish, as there should be certain ingredients within the environment that should enable it.

Last but not least, managing the context for entrepreneurship is not always easy given the various internal and external interests. Corporate entrepreneurship activities usually transform the structure and practices of these environments.

A decentralized organizational culture is not something that can be created overnight. Floyd & Lane (2000) argued that companies' relevance in the market will be higher when organizations develop internal environments that cultivate the interest and creative capacities of the employees and channel to the market the innovations that can result from it. These principles and the creations of such environments, should be very present in the mindset of all the leaders from all levels.

Those companies that implement corporate entrepreneurship related practices and its employees embrace entrepreneurial behavior, will be the ones assuring their place in the market and best responding to the current rapidly changing competitive environment (Lumpkin & Dess, 1996). Those who strongly commit to these practices have been named as entrepreneurial firms (Mintzberg, 1973).

(Kuratko et al., 2014) Conclude that there are five primary elements that need to be in place for successful entrepreneurial behavior to flourish:

1. The appropriate use of rewards to elicit and then support entrepreneurial actions.
2. Managerial support, which indicates the willingness of managers, especially top level executives, to facilitate and promote entrepreneurial behavior.
3. Available resources, including the time required to continuously engage in entrepreneurial behavior.
4. A supportive organization culture, which is a culture that is organic rather than mechanistic in nature.
5. Work discretion (autonomy and risk taking), the ability or willingness on the part of managers, based upon their job descriptions, to take risks in the pursuit of innovation and to tolerate and learn from failures.

As presented in the previous chapter, it requires a deep and profound awareness to embody this discipline in the day to day of an organization. Andy Van de Ven in his work with Rhonda Engleman at the "Central problems in managing corporate innovation and entrepreneurship" address three important questions:

1. How do entrepreneurial ventures develop over time?
2. What kind of problems will most likely be encountered as the innovation and entrepreneurship process unfolds?
3. What responses are appropiate for managing these problems?

Andy and Rhonda (2004) share that corporate innovation and entrepreneurship should be observed from the following four dimensions over time: People, Process, Industry and Leadership. And four central problems may be encountered in its management: managing attention, developing ideas into good currency, developing the industry infrastructure and managing pluralistic context.

Baum et al. (2001) highlight the importance of people from an organization to spend time together and interact as organization with the surrounding as a great source for venture growth.

2.3.4 Role of the employees

Sharma and Chrisman (1999, p.18) stated that CE "is the process where by an individual or a group of individuals, in association with an existing organization, create a new organization or instigate renewal or innovation within that organization". Other scholars frame CE as an entrepreneurial behavior that commits certain current organizational resources in order to develop multiple value-creating innovations (Jennings & Young, 1990). Damanpour (1991, p556) stated that CE addresses multiple concepts ". . . the generation, development and implementation of new ideas or behaviors. An innovation can be a new product or service, an administrative system, or a new plan or program pertaining to organizational members." This perspective is very much centered around the need of skill development for innovation to flourish. Zahra (1991) highlighted that "corporate entrepreneurship may be formal or informal activities aimed at creating new businesses in established companies through product and process innovations and market developments. These activities may take place at the corporate, division (business), functional, or project levels, with the unifying objective of improving a company's competitive position and financial performance."

Floyd and Wooldridge's (1994) work has been focused on highlighting the importance of continuously involving managers throughout the firm and connect with the collective purpose, in order for corporate entrepreneurship to be succesful.

Block and Ornati (1987) researched how incentives for internal entrepreneurs were provided and discovered that more than 30% of companies were compensating venture managers differently to other managers. More than half that were interviewed shared that there should be variable bonuses based on ROI, but firms highlighted the difficulty on determining venture goals.

When talking about knowledge acquisition, Smilor (1997) shares that "learning is central in entrepreneurship and effective entrepreneurs are exceptional learners. Therefore, successful entrepreneurs are better learners than the general population".

Training individuals of the firm and trusting them on their capacity to detect opportunities, Stevenson & Jarillo (1990) suggested that it could influence positively in a firm's entrepreneurial behavior. And organizational support such as assistance from management, recognition, time availability and loose intra-organizational boundaries (Hornsby et al., 1990) were identified as key elements impacting corporate entrepreneurship.

After all, the human component has been identified as a determining element to the success or failure for innovation and venturing activites.

2.3.5 The role of managers within Corporate Innovation

Done Kuratko, Duane Ireland and Jeffrey Hornsby (2014) have extensively shared their perspective on "Corporate entrepreneurship behavior among managers; A review of theory, research and practice".

According to these scholars, CEOs can talk about entrepreneurship, but until they fully experience and live the process of how that happens, they will be constantly trying to understand those who do. Organizations can aim for entrepreneurial strategies, but it is the behavior of managers that needs to be focused.

In the US only, one entrepreneur in seven is starting a business for or with their current employers. That translates into 150,000 CE initiatives annually, meaning that one quarter of start ups are CE related. Within this context, it can be understood that even though CE projects have superior initial access to financial, human and organizational resources than most of the independently started firms, there is disproportionate surviving rates compared to the independently started startups.

To sum up, organizations are aiming for entrepreneurial strategies, but it is the entrepreneurial behavior of managers that needs to be refocused.

2.3.6 International Corporate entrepreneurship

When corporate entrepreneurship is undertaken internationally, it allows companies to bring together people with diverse ways of thinking and creating, enabling a company to gain radically different new knowledge. If well channeled, it can help firms to create new businesses that generate new incomes that can improve organizational performance.

Internationalization is complex, and can require extra time and energy for a firm to integrate the new knowledge. So it can be that a firm needs to:

a. Develop the absorptive capacity (Zahra & George, 2002);
b. Engage in effective and timely knowledge sharing (Zahra & Nielsen, 2002);
c. Exploit newly acquired knowledge in future innovations and venturing efforts,

These actions might be able to help within the organizational transformation.

Huber (1991) observed that organizations learn when they obtain new knowledge and implement it within the organization's performance. Johanson & Vahlne (1977) suggest that firms learn by doing, and when they implement actions knowledge expands and it can be used in new markets.

Vernon and other researches suggest that firms introduce products in domestic markets, but when starting to mature they expand to other markets. Barkema et al. (1996) suggest that when accessing to markets that culturally speaking are closer to the national culture, companies reduce barriers for access.

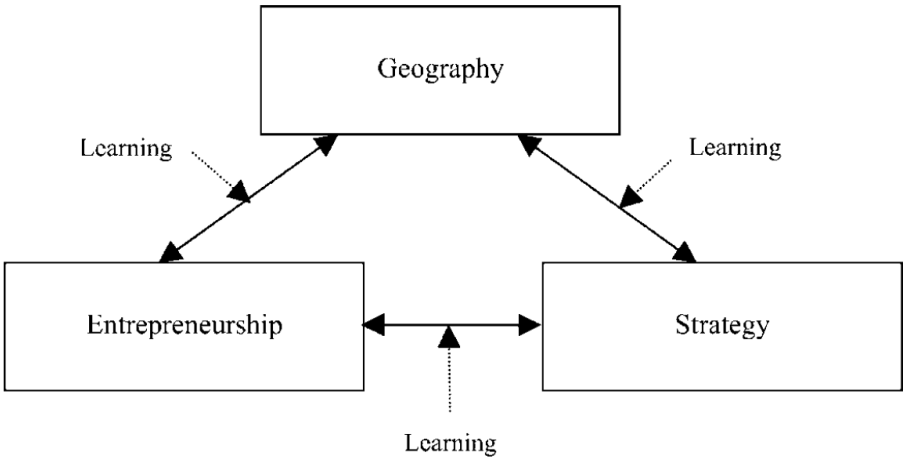

FIGURE 2:
Organizational Learning from International Corporate Entrepreneurship
Source: Barkema et al. (1996)

Playing in international markets may seem as a way to escape domestic competition, or as an opportunity to learn from multiple contexts. And being present in multiple markets does not guarantee a positive economic performance, unless it is done efficiently, creatively or both. Finding a good balance between product newness and market efficiency will help a firm to succeed from the business standpoint, and the more creative and adaptable it will need to become in its behavior the more international it becomes.

Given the global dynamics, firms cannot solely rely on their own knowledge, and internationalization is also a way to gain access to expertise located in other parts of the world. Investments abroad are usually driven with the goal to gain knowledge from other

places, specially from those countries that leaders in some specific technological fields (Shan & Song, 1997).

Networks, both formal and informal, are important sources of knowledge. Formals usually emerge from the ownership relationships between companies, whereas informal ones emerge from frequent interactions among key players in a formal networks over time. In emerging high technology industries, venture capitalists, entrepreneurs, governments and research universities create networks (Shan & Song, 1997). Seeing each other frequently enables to create trust that people are free to share important information that may affect to entrepreneurial opportunities. Porter and Sölvell (1998) suggest that "informal relationships with various stakeholders can generate important knowledge that fuels entrepreneurial discovery".

Nonaka & Takeuchi (1995) highlight that strategic initiatives emerge from the experience middle managers get from being close to the market and customers. Senior executives and middle managers need to find ways to better communicate so that knowledge is better channeled within the organization.

When employees undertake challenges overseas, it's important to get appropriate global training and develop a network of teams that report, reward and have a governance model (Ryan, Wiechmann & Hemingway, 2003). Global teams with representatives from multiple locations can help newcomers have an easy access to the given reality. Within this context, it is important the control and trust of workers, as well as their empowerment, understood as a way to delegate decision making, encourage risk taking and enable both business and people's growth (Spreitzer, 1995).

It's been seen that the necessary skills and organizational capabilities needed to compete are not available under a single firm's roof (Chesbrough, 2003). In fact, companies usually integrate different types of knowledge in order to create new products and access to markets, and this way of observing the value creation sits as the central element of strategic variety (Kogut & Zander, 1996). Also combining resources is an important entrepreneurial process that companies can use to reinvent themselves (Prahalad & Hamel, 1994).

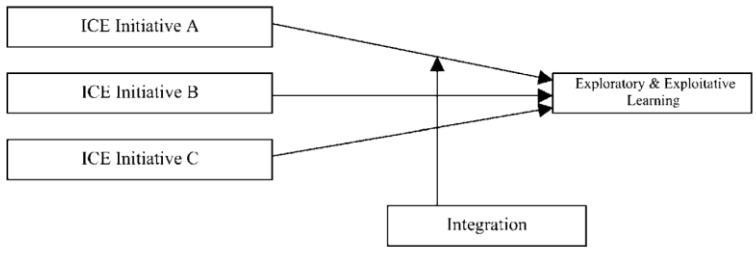

Fig. 4. The Importance of Integration.

FIGURE 3:
The importance of integration
Source: Prahalad & Hamel (1994)

This model of integration has gained tremendous attention the last twenty years within the industry and academia, when Henry Chesbrough coined the term Open Innovation in 2003. However, practices that can be framed within this concept can date back to 1960s.

Next chapter of this thesis will be related to Open Innovation as it has evolved from something being practiced only by companies to numerous stakeholders of the ecosystem (startups, government related agencies…) applying it.

2.4 Open Innovation

Michael Porter (1993) confirmed that the competitiveness of a nation, and as a consequence its economical foundation, remained in its capacity to innovate. According to Porter (1993), “the unique sustainable competitive advantage is the permanent innovation”. However, different driving forces have not only made the environment more competitive, they’ve transformed it. Within this context, the innovation is not understood only as a process to create new products and services, but it’s been understood as a tool or platform to orchestrate the ecosystem where the organization operates in. A space where clients, suppliers and other agents are very connected and interdependent.

Over the last 50 years the innovation models have been evolving from simple linear models to a more complex, sistemic and interactive models (Rothwell, 1992). First references for innovation start with linear innovation models, concept that Godin addresses from its origin to its historic evolution (Godin, 2006). However, this linear model has not been the only one, other models have emerged throughout the XXth century. Hobday (2005) presents five generations of innovation models. When looking into the work developed by different authors, it can be seen that some models are more widely accepted. The innovation models that are named as the fifth generation are the ones that embrace the innovation as a process that integrates systems and establishes networks. The fifth generation highlights the learning that takes place inside and between the companies, and suggests that the innovation is generally and fundamentally a distributed process in a network.

This shift in the understanding of innovation being a process uniquely focused on internal resources, to another one that is much more distributed and connected to different nodes of a network is what can be considered an opening to the innovation process. Open innovation (Chesbrough 2006) is a paradigm that in order to advance in its technologies, companies can and should utilize external ideas, as well as internal ones, as well as internal and external ways to the market. Open innovation as a concept encourages that internal ideas can be introduced to the market through external channels, outside of the current businesses of the company, with the goal to create extra value.

Today the companies that are more sensitive and open to new external ideas obtain better results than those that rely exclusively on internal resources and capacities. The cutting-edge companies are opening to a wide new spectrum of organizations because they obtain high benefits when doing so. The opening instead of generating fear, becomes a source of newness and strength for the entrepreneurial success. According to Tapscott and Williams (2008), the benefits that open innovation brings are among others the increase in the speed of development of products and services, bringing this way faster economic results and market share, reducing the time to market for the new products and services, reducing the R&D expenses and improving the success ratios of new products and services.

In this sense organizations need tools to adopt the paradigm of open innovation when needed, as well as measure the success of its adoption.

2.4.1 The new paradigm of Open Innovation

In this section we will analyze the new paradigm of open innovation, analyzing first of all what closed innovation is to later compare the characteristics of both paradigms. After that key factors related to open innovation will be described as well as the different sources in the existing literature. Finally, different scenarios of open innovation will be identified.

Stephen Shapiro (2002) forecasts that in the future we will see a model of hyper externalization where the internal innovation will be substituted by the external innovation, the integration and the commercialization. Being good internally will be less relevant than to have the capacity to work with others and integrate solutions in order to take them to the market. During the last decades not only the production is being externalized, but even some of the core activities related to R&D (Howells 1999; Engardio et al. 2005).

The practices related to open innovation are rather opposite to the traditional vertical integration of innovation processes in organizations, where R&D activities are developed internally, promoting the development of products that later on are developed and distributed by the organization (Chesbrough 2006). This model, that can be considered as closed innovation, is based on the principle that the success of innovation requires the internal control of the entire process. This means that the entire value creation process needs to be developed internally by the company: from the creation of the idea, development of the product/service and distribution of it there should not be any presence of external agents (Chesbrough, 2003). The “closed” term that accompanies the denomination of this model is based on the characteristics that presents the innovation process in this setting. The new projects take off based on the technology and knowledge that exists within the company - unique entry -, are developed internally and the ones that finally are viable are externalized to the market - unique exit - (Chesbrough, 2006).

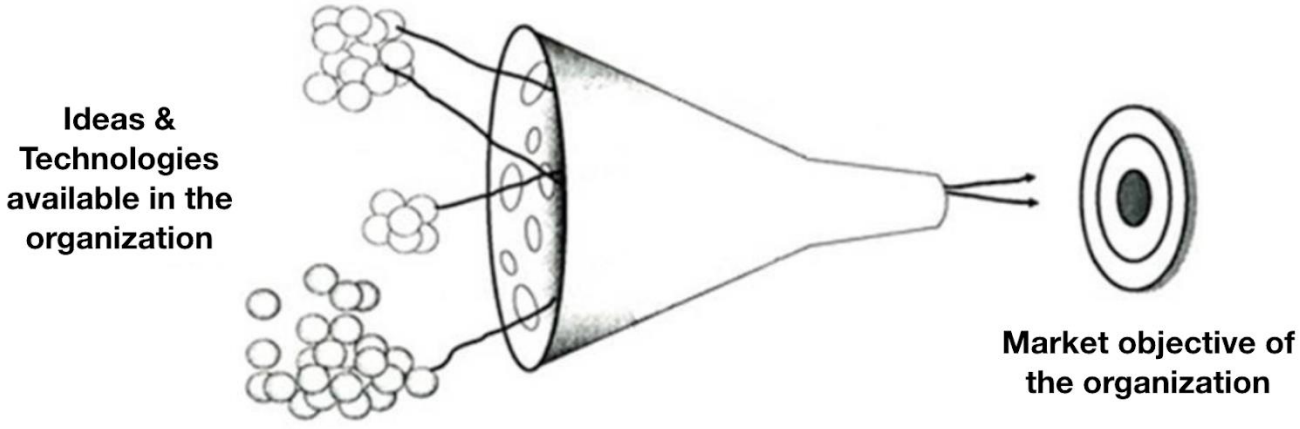

FIGURE 4:
Paradigm of Open Innovation
Source: Own creation based on Chesbrough (2004)

Lindegaard (2010) describes the closed innovation as a paradigm where the discoveries are kept secret and there is an absolute control on all the aspects related to the innovation process. The organizations do not assimilate inputs from external companies and avoid

sharing or selling the intellectual property or obtain benefits from external sources. The classical theories of innovation management as well as the development of products per stages (*stage-gate process*) (Cooper 1990), *chain link model* (Kline 1985) or *the product development funnel* (Wheelwright 1992) respond to this paradigm.

The paradigm of closed innovation and its ideas associated to an industrial organization of an R&D have led in the past to very successful achievements and results. It is a strategy mainly focused on the internal development of the company and served well the knowledge structure of the beginning of the XX century. However, this paradigm has faced bigger difficulties when serving the needs of the XXI century. A number of facts have questioned its utility. Within these facts could be highlighted (Chesbrough, 2003) among others the notorious increase of human capital with high knowledge, that end up moving around and working for different organizations; and on the other hand, the increase of private capital that finances the creation of new companies and the commercialization of its ideas. Therefore, if a company did not have the capacity to take advantage of a discovery on a given moment, people that were involved at it could develop it on their own, creating a new company (spin-off) financing it with private capital.

Adding to this, the scientific research at universities has increased its excellency and the results of these researches are more widely spread. As a result, the knowledge monopolies at the R&D centers of the XXth century have come to its end. Another example within the same contest is how patents are being shared as well as the amount of US patents that are being developed by non-US based companies. Moreover, from 1981 to 1999, the investment in industrial R&D decreased dramatically in companies with less than 10.000 employees. In 1999, most of these investments where taking place in companies with less than 25.000 employees.

It is within this context where a new paradigm starts taking shape, the paradigm of open innovation. As a term it aims to promote an information age mindset toward innovation that breaks with the secrecy and silo mentality of traditional corporate research labs. Term coined by Henry Chesbrough, it is defined as the use of entries and exits of knowledge and technology by organizations with the goal to accelerate the internal innovation and extend to the market the result of it. In other words, it is the paradigm that assumes that companies can and should make use of both the internal and external knowledge, and should use different channels to access the market, without waiting to develop their technology (Chesbrough 2006). According to Thomas Kuhn, society is witnessing a shift of paradigm on how companies commercialize the industrial knowledge (Thomas Kuhn, 2005).

Open Innovation prior to be coined by Henry Chesbrough was already being addressed by a number of authors who were researching on how value was captured and how innovation processes were taking place (Cohen & Levinthal 1990) & (Gerlach 1992) among others. Open Innovation as a term is rather new, but practices that connect with its principles in a number of sectors have existed since long time ago. The film industry of Hollywood for example has operated since long time ago based on collaborative networks. This industry was organized in collaborative networks and alliances among production studios, directors, talent hunting agencies, actors, scriptwriters, specialized companies and independent productors.

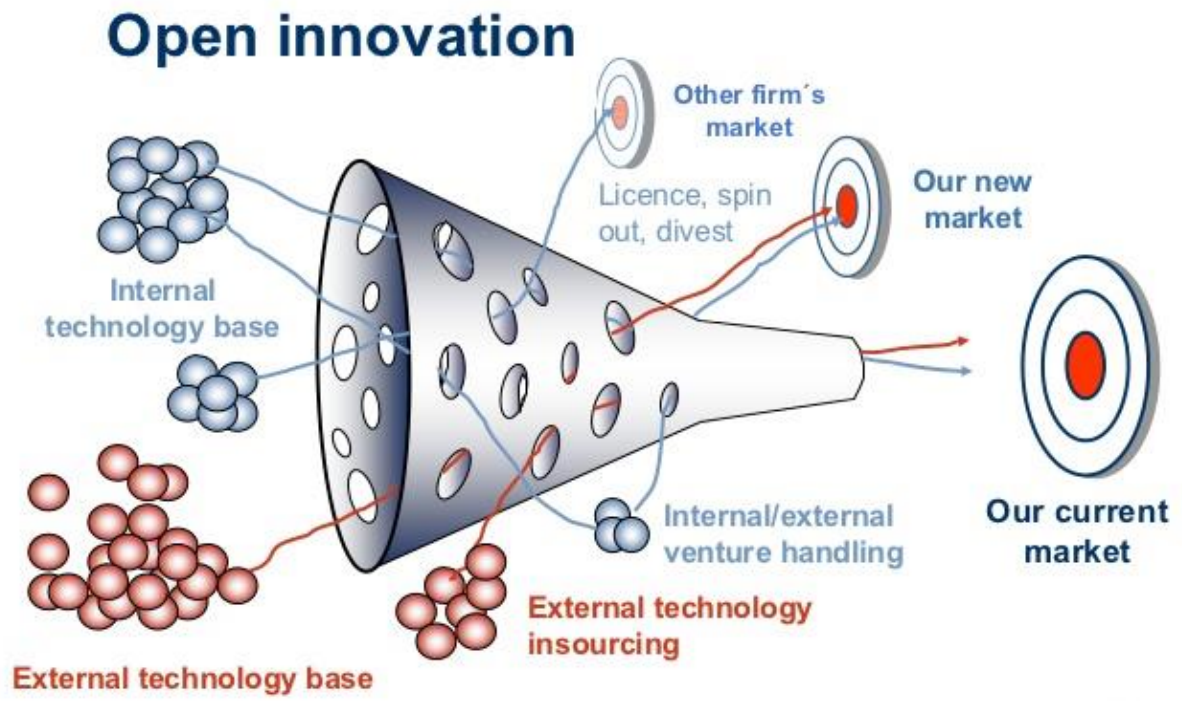

Figure 5:
Paradigm of Open Innovation
Source : Chesbrough (2004)

However, different characteristics can be identified that make the innovation open, given the existing memories till that time (Chesbrough, 2006):
External knowledge and internal knowledge are equally important.

- The business model is key when providing commercial value to the end results of the R&D.
- The knowledge flows and the technologies that are launched are very important.
- There needs to be access to knowledge and to quality information.
- The management of the intellectual property should be proactive.
- There is substantial increase in the amount of intermediaries within the innovation process.
- There should be new ways to measure the capacity of innovation and its results.

Chesbrough made a comparative chart that reflects visually the different paradigms that exist between open and closed innovation:

TABLE 1:
Comparison between the closed innovation and open innovation paradigms
Source: Chesbrough (2006)

Closed Innovation Principles	Open Innovation Principles
The smart people in our field work for us	Not all the smart people work for us, we need to work with smart people inside and outside of our company
To profit from R&D, we must discover it, develop it and ship it ourselves	External R&D can create significant value, internal R&D is needed to claim some portion of the value
If we discover ourselves, we will get it to market first	We don't have to originate the research to profit from it
The company that gets an innovation to market first will win	Building a better business model is better than getting to market first
If we create the most and best ideas in the industry, we will win	If we make the best use of internal and external ideas, we will win
We should control our intellectual property (IP), so that our competitors don't profit from our ideas	We should profit from the usage others do with our IPs and we should buy others' IP whenever it advances our business model.

More recently, Open Innovation has been defined as "a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model" (Chesbrough & Bogers, 2014)

It is important to highlight that Open Innovation does not represent a dichotomy between open and closed, as a continuous act with different degrees of openness (Dahlander and Gann, 2010). In fact, the vast majority of companies lay between the absolutely closed innovation, and absolutely open (Huizing, 2011). Actually, numerous authors support the idea of keeping the innovation development internally as a complementary activity to the external collaborations (Powell et al., 2005).

For Gassmann & Enkel (2004) as well as for Lindegaard (2010) Open Innovation relays on the idea of bridging internal resources with the external ones in order for innovation to happen. Open Innovation needs to be seen as a bidirectional process where organizations have an inbound process where they incorporate ideas, technology and other necessary resources in order to develop its own business, and an outbound process where they licence patents or sell ideas, technologies or other resources.

More concretely, doing inbound activities means that an organization decides to invest to cooperate with suppliers, clients and other agents in order to integrate the external knowledge obtained. This process can be developed collaborating with clients and suppliers (Ragatz et al, 2002), checking with innovation clusters (Gassman & Gaso, 2004), asking information in other sectors, acquiring intellectual property (Almeida, 1996), or collaborating

with the users of the products and services that will be developed (Von Hippel 1988).

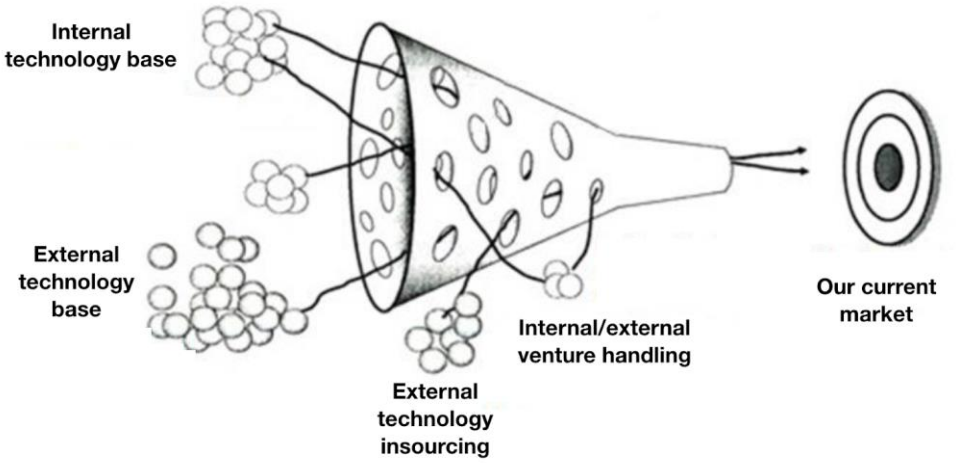

FIGURE 6:
Inbound process of Open Innovation
Source: Chesbrough (2004)

The organization that focus on the outbound process have the goal to externalize the knowledge and the technology created internally, aiming to reduce their fixed costs on R&D, or aiming to become a referent brand, or aiming to make their products or services as market standards. In these cases, benefits are obtained from the licences and patents that these companies set in order to commercialize their assets (Ernst & Omland, 2003).

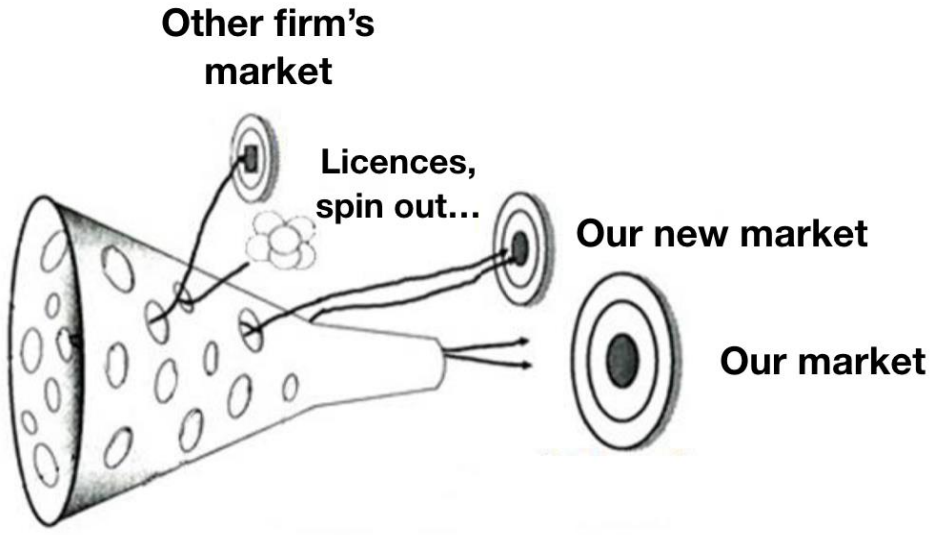

FIGURE 7:
Outbound process of Open Innovation
Source: Chesbrough (2004)

Finally, there are organizations that decide to combine: the entering process benefiting from the external knowledge, and the exiting one, externalizing ideas. In order that to happen,

these organizations co-operate with other participants through strategic networks during a long period of time (Fritsch & Lukas, 2001). They are mainly organizations that aim to get bigger benefits through alliances, either with organizations from another sector as well as with direct competitors or other agents. However, in order for mixed activities to be successful depends mainly on the capacity of the organization for, on the one hand, choose the right partners, or sources of innovation, and on the other hand assimilate and integrate the competencies and knowledge that the different stakeholders can bring in (Gassman & Enkel, 2004).

2.4.1 Key factors within the Open Innovation

There are different studies (Von Hippel 1998 & Powell 2011 among others) that demonstrate the existence of different sources of innovation, starting from where these ideas are built from to the results they will be transformed into. Based on a study developed by Ebert et al. (2008), there is no company big or innovative enough that is the leader in innovation without collaborating with a group of partners. When developing new ideas, the leaders in innovation show that they trust in their clients, partners and competitors in order to complement their internal functions. In fact, as the next figure demonstrates, the organizations that have the best practices in innovation produce nearly half of their innovations from ideas generated outside of their firm. The organizations that adopt the open innovation can obtain their ideas from different sources, understanding that each contributor offers a different and valuable perspective.

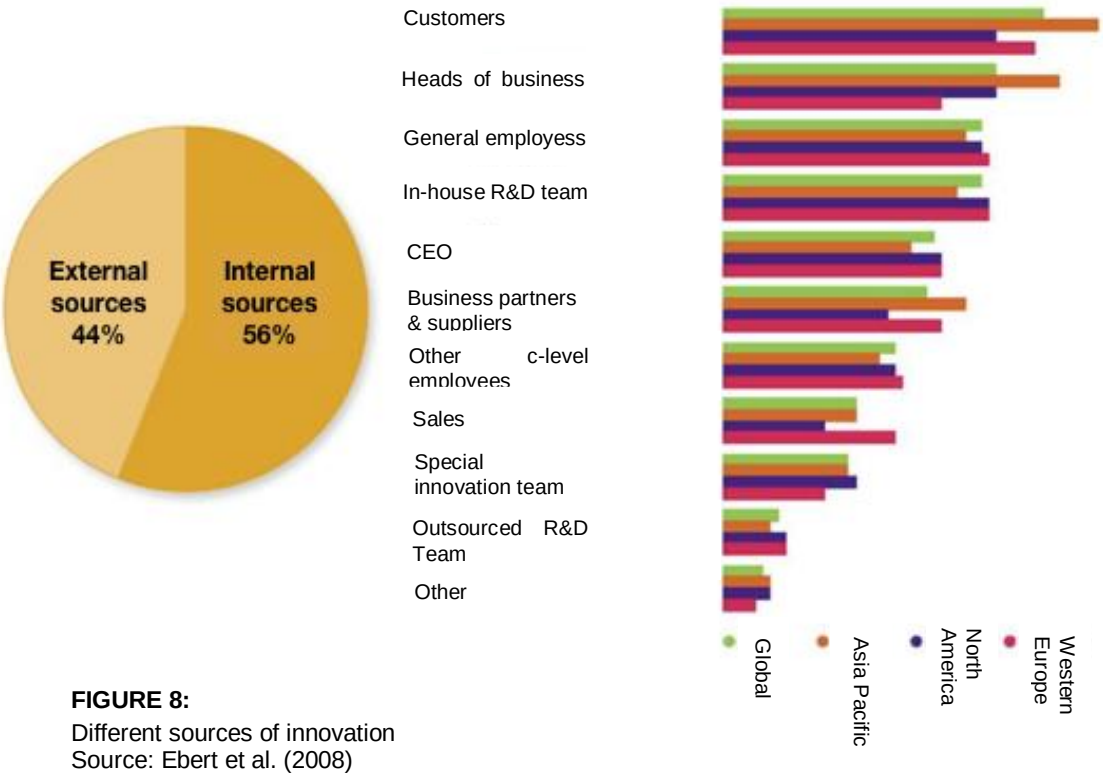

FIGURE 8:
Different sources of innovation
Source: Ebert et al. (2008)

The sources of innovation in an organization could be classified as internal or external. This

classification allows to see that there are relevant sources of innovation outside of the organization. In fact, according to studies developed among others by Eric Von Hippel, in some sectors the external sources count for 80% of the innovations. In others, the main source of innovation are the employees themselves or the R&D department.

TABLE 2:
Analysis of sources of innovation in different sectors
Source: Von Hippel (1998)

	Innovation Developed by					
Innovation Type Sampled	*User*	*Manufacturer*	*Supplier*	*Other*	*NA[a] (n)*	*Total (n)*
Scientific instruments	77%	23%	0%	0%	17	111
Semiconductor and printed circuit board process	67	21	0	12	6	49
Pultrusion process	90	10	0	0	0	10
Tractor shovel–related	6	94	0	0	0	16
Engineering plastics	10	90	0	0	0	5
Plastics additives	8	92	0	0	4	16
Industrial gas–using	42	17	33	8	0	12
Thermoplastics–using	43	14	36	7	0	14
Wire termination equipment	11	33	56	0	2	20

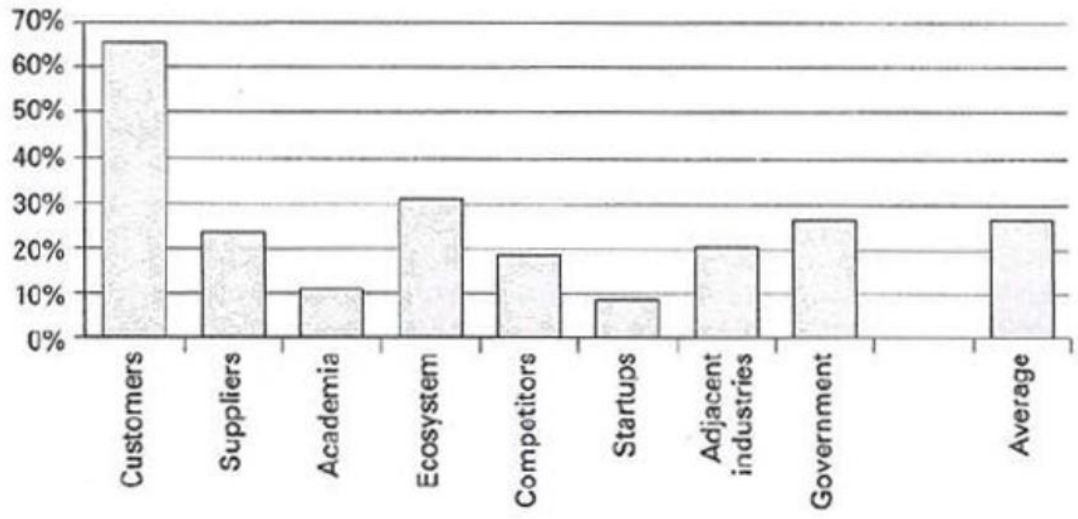

FIGURE 9:
Sources of Innovation in Intuit
Source : Sloane (2011)

In this sense there a number of organizations who prior to developing an accurate strategy of innovation have made an analysis of their sources of innovation. Jan Bosch et al (Sloane

2011) describe the sources of innovation of the organization prior to adopting the paradigm of open innovation.

IBM for example has defined an innovation strategy that allows it to work enhancing both the internal sources as well as the external ones. Next figure shows IBM's innovation portfolio for the different sources of innovation depending on the maturity of the technology.

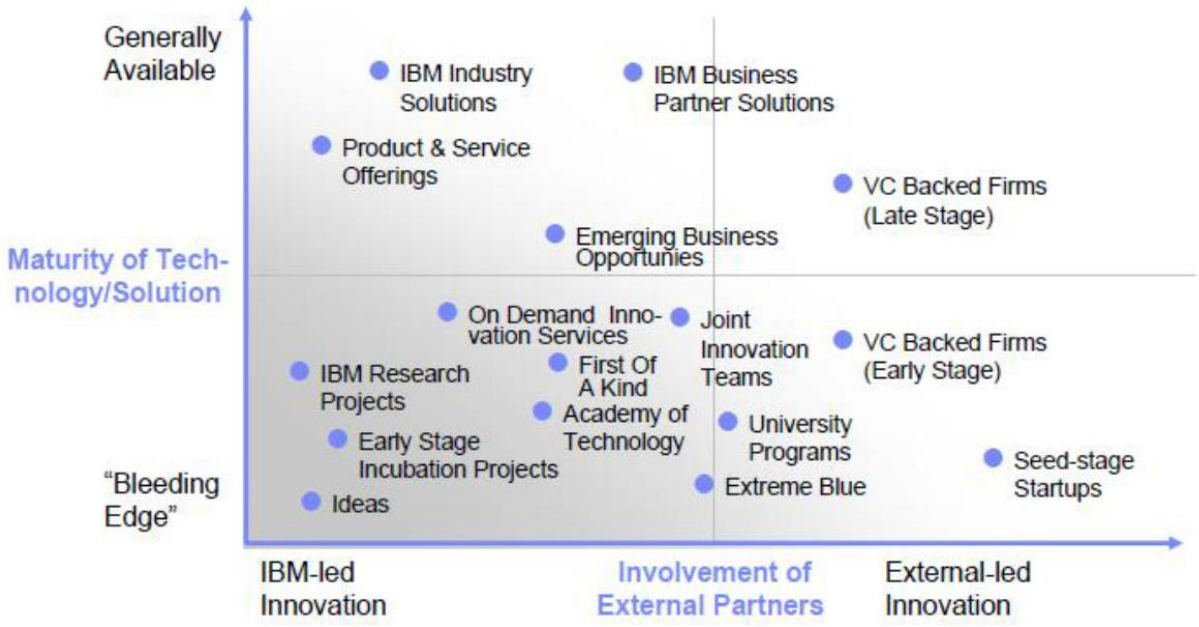

FIGURE 90:
IBM's Innovation portfolio based on the source of innovation
Source : Danmark (2008)

Braun & Herstatt (2009) build on the existing literature around the sources of innovation demonstrating that licences can also be an important source of innovation. Organizations can use licences in order to collaborate with other organizations, but as well as with the users. Users that create prototypes for example, usually provide licences to manufacturers so that they can complete the development process as well as the commercialization of technology. Braun & Herstatt offer a series of developed technology examples after they have been licenced to external agents.

In overall, it can be framed that of open innovation at its core is the capacity to generate an ecosystem where people, organizations and sectors can co-create. It implicates that business models (process of creating and capturing value) outstrip the boundaries of the firms that co-exist within the innovation ecosystem (Bogers et al., 2018).

2.4.2 Open Innovation within the context of the startups

Starting up a new business involves plenty of challenges and it has been proved that three out of four start-ups fail (Blank 2013). This low rate of survival can be attributed to many factors: Lack of resources, size of the firm, entry barriers to the sector, not enough knowledge of the market, financial limitations (Eftekhari and Bogers 2015).

One way to minimize this failure is by engaging in Open Innovation related strategies. Janssen et al. (2014) suggest that relationship related strategies with the different actors of the value chain can be a meaningful way to address the challenges startups may encounter. Another way can be focused on accessing and developing technology (Hidalgo et al., 2020), so that the technology gap is reduced and the competitiveness in the market in comparison with other existing companies can be higher for the startup.

From the technological standpoint, there are two ways how a start-up can get advantage of it. It can be done by acquiring knowledge and technology from partners, customers or suppliers (inbound open innovation) or by bringing opportunities to the market that are outside of the company's boundaries (outbound open innovation) (Chesbrough et al. 2006). Some may also combine the two (Gassman and Enkel, 2004) under the name of coupled innovation, by intregating in the value creation process both inbound and outbound open innovation through collaborations or partnerships.

It's been demonstrated that when start-ups embrace open innovation strategies, they are able to succeed in dealing with the challenges of the initial steps (Bogers, 2011). It is true that most of the Open Innovation related research has been focused on understanding how big firms where using it, whereas little has been explored when it comes to how start-ups take advantage of Open Innovation (Alberti and Pizzurno, 2017; Usman and Vanhaverbeke 2017). As larger firms and start-ups have different needs, why and how they engage with Open Innovation related strategies varies profoundly (Usman and Vanhaverbeke, 2017).

Usually access to resources, being new and unknown in the market and the limited size are the main ingredients that make the entrance to the market more difficult. Eftekhari and Bogers (2015) as well as Battistela et al. (2017) have made it clearly apparent that for a start-up when placed in an open environment it helps to overcome these initial challenges. Van Gils and Rutjes (2017) through their work also suggested that an innovation ecosystem can ease significantly the initial steps that the vast majority of startups face. Collaboration and relationship with stakeholder is another key dimension to work on (Eftekhari and Bogers, 2015) in order to avoid initial challenges, and to develop work with customers is another form of Open Innovation that can tremendously help.

Hasche et al. (2017) identified the importance of trust among partners. Sometimes it's the start-ups who have difficulties or don't understand well the dynamics of larger firms, whereas larger firms tend to have difficulties in believing on the capacities that start-ups may have (Jackson et al., 2015). The main obstacles that emerge in the collaboration among start-ups and corporations are: "restrictive mindset" and "conservative decision making" according to Jackson and Richter. (2017).

The natural ability or tendency to collaborate directly influences in the output that might emerge among startups and corporations (Michelino et al. 2017). The duration of the

partnership can be another element that influences the outcome of the innovation, identifying that non-lasting relationships help but only provide incremental innovation, whereas long lasting partnerships with stakeholders of the ecosystem provide radical innovation (Neyens et al. 2010).

According to Spender et al. (2017) there are four actors that can influence most their development: incubators, venture capitalists, large corporations and universities.

Collaborations among stakeholders can profoundly influence the survival of a start-up (Eftekhari and Bogers, 2015), and being in an open environment influences the performance to dimensions that are related to innovation, finances and economic performance (Spender et al. 2017).

Kask and Linton (2013) state that partnering with external partners is crucial for the survival and long term existence of startups. In fact, it is a requirement to cope with the difficulties that come with the limited size and novelty of the startups (Bogers, 2011). After all, Open Innovation and startup paradox are very much related (Spender et al., 2017)

2.4.3 Directions Open Innovation has taken

Although it is a term developed by Henry Chesbrough almost twenty years ago, it is relevant to understand the different paths it has taken the last few years (Randhawa, Wilden and Hohberger, 2016).

The first and most researched path is the one that has profoundly studied the company itself and the role knowledge, technology and R&D have within the value creation process.

A second path is the one that is related to the role of users and communities of Open Innovation, for example in the integration of users' ideas or experiences into the product/service development phase.

A third path has followed how organizations manage networks and relationships, which is connected with the creation of corporate ventures, spin-offs, partnerships, creation of sustainable business models or ownership and governance of Open Innovation.

Last but not least, a fourth path explores socio-economic regions and how Open Innovation can help policy makers support the innovation performance. In fact, regions can provide a supportive platform so that companies of all types and sectors can participate creating a regional open innovation system (Torkkeli & Ahonen, 2007)

This thesis can be framed within the combination of the third and fourth path, and it is important to understand how existing organizations are managing networks and relationships and the role ecosystems and governments can play in the creation of regional open innovation ecosystems.

2.5 Collaboration between Corporations and Startups

“Large companies have long sought ways to become more entrepreneurial.” “Large corporations and startup ventures are decidedly different organizations. One side has what the other one lacks: the corporation has resources, scale, power, and the routines needed to run a proven business model efficiently. The startup has none of those, but typically has promising ideas, organizational agility, the willingness to take risks, and aspirations of rapid growth. Shouldn’t great things happen if both sides combined their strengths?” (Weiblen & Chesbrough, 2015, p.66)

Although the statement of above may seem simple, it is important to understand the last question Weiblen and Chesbrough present in their work: “Shouldn’t great things happen if both sides combined their strengths?”

Despite Chesbourgh being the pioneer within the field, several other researchers have continued exploring the collaboration between startups and corporations. The extensive literature review carried out by Aggarwal and Wu (2018) reveals that the value creation takes place when the innovations of the startups are combined with the market expertise and consolidated assets of the corporation. Corporations, given their size and experience, can help overcome the startups their novelty and petiteness (Kraus et al. 2020).

The relationship that gets built between the corporations and startups does not always benefit both parties in an equal manner, as some researchers state that often the corporations are the most benefited ones (Huang and Madhavan, 2020), specially when the relationship is formed through corporate venture capital (CVC). However, other forms like when a corporation becomes a paying customer for the startup, it helps grow and open to the market as it does to other suppliers (Kurpjuweit and Wagner, 2020). More skeptical views suggest that corporations set up stages as innovation theatres not necessarily to attract the value proposition of startups but to attract their talent (Minsky 2019).

As it can be expected, although the relationship between the corporations and startups can be very beneficial for both ends it is not always easy. The diversity of motivations to work together as well as their misalignments can sometimes have negative effects in the innovation and value creations (Ricciardi, 2021).

Corporations and startups are decidedly different organizations. Work culture, the way to organize work or the decision making are some of the elements that make them very different from each other and where usually startups encounter biggest discrepancies (Bagno et al. 2020). These causalities sometimes generate misunderstandings and mistrust from the startups towards the corporation as they feel there is unequal power between the two (Aggarwal and Wu 2018)

However, right attitude as well as people related competencies and taking good care of the relationships usually are key aspects that help startups to successfully pursue the collaboration (De Groote and Backmann 2020). Additionally, framing the project correctly in order to find the right match with the startup that can meet the challenge is critical, as usually the scales of the markets that the corporations deal with differ from the startups’ and they need to keep up with it (Hogenhuis et al. 2016).

Framing fair collaboration models among the partners is usually the key for a successful collaboration (Corvello et al., 2021)

2.5.1 Models of collaboration

As the phenomenon of the collaboration between the startups and corporations has been gaining momentum and experience the last 10 years or so, it has developed new models and gained new forms and shapes. From a narrow menu of startup program, incubator/accelerator or corporate venture capital (Enkel and Sagmeister 2020) to a wider set of opportunities of collaboration developed by Steiber et al. (2021 a,b) that outline eight different ways. In both cases they are mainly built from the Corporations' perspective and they are required to choose the model that may fit them best or craft a combination of paths (Enkel and Sagmeister, 2020)

Startups' perspective has not always been given the attention it deserves, as the only main thing measured is usually how their work impacts positively the corporation, without considering what other effects it may have within the startup itself or on a broad way in the entrepreneurial ecosystem (Steiber et al., 2021 a,b).

Some researchers suggest that startups should set clear goals and strategic frameworks so that the collaboration also benefits them profoundly (Bereczki 2019). They should define the intensity and quality they want to engage with as the results will probably differ too (Garidis and Rossmann, 2019). The intensity and quality will probably be influenced by the mentorship, workshops or financial resources that several programs that incubators/ accelerators or innovation hubs may set up prior to starting the program. In their research Simon et al. (2019) found out that startups with technologies that are more mature prefer more baggy relationships with corporations whereas startups with technologies still in testing face prefer more defined collaborations.

Kohler (2016) outlined the following ways to stimulate the collaboration between startups and corporations:

- Pilot project supported by corporation: A startup develops an innovative solution and is funded by the corporation. Instead of doing it internally hires a startup, that will do it faster and at a cheaper cost.
- Corporate becoming startup customer: The corporation gets to interact with multiple startups and chooses to work with the one that may develop the best solution that will fulfill its needs
- Corporate becoming distribution partner of the startup: The startup owns the innovation but the corporation supports with the diffusion through its channels as partner.
- Corporate invests in startup: corporate buy shares of the startup in order to have access to new knowledge and talent.
- Corporate acquires startup: it helps address specific business needs and provides access to new markets (Harrison et al., 2001)

Depending on the resources that the corporate-startup collaboration might require, below can be found some typical ways to engage with each other:

- Innovation/entrepreneurship related events (innovation jams, hackathons…), to

capacity building in entrepreneurial culture and resource sharing.
- Offices in vibrant entrepreneurial ecosystems for trend spotting
- Corporate accelerators
- Hiring services from a startup
- Investing in an startup
- Acquiring an startup

Steiber & Alänge (2020) // (Steiber et al. 2021a, b) came up with eight different models that represent the startup-corporation collaboration frameworks:

1. **Acquisition:** It employs outside-in flow and is equity based. The larger firm acquires the startup usually to capture talent, technology, patents…
2. **Corporate Venturing:** Employs outside-in flow and is equity based. Usually the larger firm invests in startups based on strategic interest.
3. **Internal Corporate Incubator:** Employs inside-out flow. Ideas generated within the larger firm are promoted to become spin-offs.
4. **Internal Corporate Accelerator:** Employs inside-out flow. Internal teams are accompanied to make their concepts reality and possibly become businesses in the future.
5. **Platform:** Employs inside-out flow and is non-equity based. Usually the corporation offers a platform and the startups built on top of it, to offer major innovation and strengthen the corporation's ecosystem.
6. **Corporate Startup Program:** Employs inside-out flow and is non-equity-based. Usually the corporation offers products and services to startups, which eventually leads into the strengthening of the corporations innovation ecosystem.
7. **Co-creation:** Employs outside-in flow and is non-equity based. In this model corporation and startups act as partners and create an end product/service together.
8. **Co-location:** Employs outside-in flow and is non-equity based. Encompasses startups locating their offices within the larger firm's facilities, having both entities within the same environment.

2.5.2 Benefits from the Startups' perspective

Corvello et al. (2021) found out that from startups' perspective usually corporations merely seek out new technologies and not necessarily collaboration or commercial agreements. On the other end startups usually aim for continuous learning, get a paying customer and obtain a deal with a corporation that most likely will help in their brand and future opportunities with other companies. Having access to other skills that may not be within the team or equipment available within corporations' facilities are some other elements they may look for. Meeting up with other entrepreneurs or startup members is also one of the most valued ingredients.

On the other hand, corporations' tendency to focus on short term objectives was seen as a negative aspect and what often drove to perceive low commitment, challenges in

communication or mistrust.

Corvello et al. (2021) in their study narrow down to the following elements what define the collaboration model: Duration of the project, sharing working space or not, participation of intermediaries or not, equity acquisition from the corporation towards the startup or not and remuneration or not towards the startup. These variables make that some projects might be narrowed down to developing a proof of concept or on the other extreme simply to develop an entrepreneurial culture and ecosystem within a corporation. The fact is that geographic co-location cases are more numerous as well as the non-paid collaborations.

2.5.3 Corporate-Startup Co-creation

The co-creation between startups and corporation is gaining its significance but is underresearched (Steiber & Alänge, 2020). As phenomenon is gaining momentum but lacks research specially when it comes to metrics and the impact it generates in corporate innovation, startups' development and the world.

In some circumstances it may help level up the innovation capacity of a corporation (Alänge & Steiber, 2018). However, in some other cases it may help in developing a completely new entrepreneurial ecosystem (Drori & Wright, 2018) or reshape corporation's model of operating.

Given the transformations that are taking place in most industries, startup's role is given tremendous attention and the innovation that may happen in corporations is relied on startups. Weiblen & Chesbrough (2015) and later Alange & Steiber (2018) among others have extensively modeled how corporations and startups can work together, some forms including equity and others not. Non-equity based collaboration is gaining attention from corporations and local governments, as this may help to enhance national industry and foster job creation (Steiber & Alänge, 2020). On the other hand, startups might be as well interested in this type of collaboration as they do not give up equity and enlarges their capacity to commercialize (Autio et al., 2018). Some scholars have framed this model as Venture-client model (Gimmy et al., 2017)

Researchers argue that co-creation among startups and corporations as other form of relationship can leverage the performance of innovation as well as many other organizational benefits (Markovic & Bagherzadeh, 2018). It can also fasten the knowledge creation, innovation and consequently the economy, which will be celebrated by regional politicians.

Technology based startups can also help corporations to become part of the emerging entrepreneurial ecosystem as they would not otherwise be by themselves (Drori & Wright, 2018). On large market demands startups usually face difficulties, contrary to corporations (Autio et al., 2018). Within the co-creation framework seems that the non-equity is the main way for local, regional or national governments to support the collaboration. Whether this is effective and helps to create a stronger innovation ecosystem should be researched (Steiber & Alange, 2020)

(Steiber & Alange, 2020) also suggest that the research that that measures and evaluates

the outcome of this collaboration is almost non existing.

2.5.4 Effects on large firms' business transformation & Venture client approach

CEO's and Innovation Directors of most corporations are aware on how Industry 4.0 and new digital technologies can entirely transform the industries they operate in. In fact, Bill Ruh CEO of GE Digital highlighted that: "If you can't master the idea of digital inside your analog business you open the door to commoditization" (Lopez, 2018). The working culture, processes and resources that are dedicated to optimize the operation model of corporations tend to overlap the ones required for the research of the new businesses (Christensen and Overdorf, 2000). However, as the struggle is real the larger firms tend to make profound efforts on adopting technologies that will support their digital transformation (Jackson and Steiber, 2019).

Corporations have accepted that the knowledge needed does not only exist within their facilities, but in fact many times lies outside and they need to be closer to networks that provides them opportunities for learning (Powell et al., 1996; Chesbrough, 2003). In fact, the latest years larger firms have been paying extra attention to startups as they could be a great source of complimentary resource provider (Spender et al., 2017), and it can benefit in an equal manner to startups as larger firms are usually best at commercializing on a large scale (Autio et al., 2018). However, researches have been highlighting that for larger firms to connect with the entrepreneurial ecosystem they may require other type of approaches, practices and skillsets (Powell et al., 1996; Ojaghi et al., 2019). According to Steiber & Alänge (2019) how the startup-corporate collaboration affects to the larger firm's digital transformation might be a great phenomenon to research.

Several researchers have pushed corporations to be closer to the entrepreneurial ecosystem (O'Reilly and Tushman, 2013) as there will be more opportunities for learning. To truly experience it, requires new skillsets and ways of operating that are not common for corporations and usually involves the need of letting go certain management practices or accepting that not everything can be under their control (Steiber and Alänge, 2013b; Furr et al., 2016)

The engagement with startups can happen in multiple ways and even several of them at the same time as they may serve different objectives (Weiblen and Chesbrough, 2015). No matter the way, as several other change theories this approach also requires the absolute support of the top management (Birkinshaw et al., 2016)

This involves that the larger firms need to develop a strategy of what will be the purpose of each collaboration type with the startups and develop a portfolio that reflects the multiple models.

Venture Client Approach

Gimmy et al. (2017) strengthen the results identified within this research, arguing that although the main model of collaboration between corporations and startups has been Corporate Venturing, it seems it does not reach its primary innovation objectives. Despite the enormous funding and support from leadership teams that corporations like

Volkswagen, Coca-cola, Yahoo… no matter the industry have offered, many have ended up closing down their accelerators or their Corporate Venturing branches as it did not help on solving their strategic innovation objectives.

From Gimmy et al. (2017) there are three main reasons why it quite did not work:

1. Startups with highest potentials are often more attracted by private venture capitalists than they are by corporations. Most talented founders know that private VCs have way more experience in supporting early stage companies and provide better answers to the challenges they often face within the process of becoming more mature.
2. Only 20% of technologies created by startups accompanied by Corporate Ventures are implemented within the business units of the Corporation.
3. Corporate Ventures and accelerators often require heavy investment and need to be managed very differently compared to how a corporation is often run. The bureaucracy that usually reigns corporations makes so that from first contact with the startup to start working on a pilot project, also known as “touchpoint-to-pilot” takes 12 months.

“Startups do not need our mentorship. They do not need our executives to vote on five-minute pitches. They do not need six months free rent in a corporate accelerator that culminates in a fancy demo day where cocktails and PR trump over what drives founders to work 70 hour weeks: their invention. Startups need us to be their clients, their paying clients.” Gregor Gimmy (2017)

Gimmy et al. (2017) within their work in BMW identified that startups require three ingredients to grow: Funding, Coaching and Clients. The first two can be offered by independent VCs but Clients can only be offered by Corporations and that is where their strength shines. This new model was called “Venture Client” model and it is framed so that the startups that have market leading solutions can benefit from clients of corporations that can purchase orders.

This new approach has attracted a lot of startups, increased integration rates very fast and involves very little running costs. Instead of equity, the corporation purchases technology and a solution to its challenge, the startup becoming suppliers from day one of the program.

Generally, startups can get advantage of this approach once they have participated at an incubation program and have developed a technology-based solution. It is through a “Minimun viable purchase” where a business unit of a corporation can test startup’s solution, which allows at the same time the startup to validate its project in a real environment.

This model emphasizes the fact that collaboration between startups and corporations can bring in tremendous innovation, it is only how the collaboration takes place that can be improved. Venture Client model is a way to co-innovate with startups, but needs a shift in leadership teams’ mindset and what is the best thing corporations can offer compared to other agents in the ecosystem.

Many corporations are shifting into this model and Gregor Gimmy created this model within BMW’s Startup Garage to later create 27 pilots, an independent agency that helps corporations and governments create their own Venture Client Units.

2.5.5 A government perspective

Governments are in the constant lookout on how to maintain the competitiveness of their regions, and this usually comes by promoting the creation of innovation ecosystems that spark prosperity and job creation. As corporate-startup collaboration became a trend, governments made their bet by launching initiatives that would promote it, helping start ups to grow and existing organizations freshen up Steiber & Alänge (2020).

Given the globalized world we live in and the challenges we are already facing as humanity, governments understand that supporting innovation ecosystems and bringing together actors from all kinds of backgrounds is their role (Mazzucato, 2018a). Corporations have often provided biggest amount of jobs in different regions, however, to keep their competitiveness in the years to come their innovation capacity needs to speed up. Startups have been better on that, so bringing them together may sound like a natural move. From pharmaceutical to automotive industries European governments have been bringing together multiple stakeholders in order to provide answers to most pressing needs by promoting innovation ecosystems both locally and globally (Mazzucato, 2018b; Mazzucato et al., 2020).

Governments have been promoting innovation through funding research in universities or research centers, however, finding applicability in business to the developed technology may be the next leap forward and that can be done through the creation of startups (Munari & Toschi, 2021). Additionally, funding the collaboration between startups and corporations has also gained its support from the government, aim to consolidate the startups, freshen up the corporations and contribute this way to the national economy as well its competitiveness within the global scene (Steiber & Alänge, 2020a, 2021).

How this support benefits society is hard to measure (Steiber & Alänge, 2021). However, to understand the results and what triggered them from the learning perspective for all the stakeholders involved (Chen, 2015) might be most adequate framework when it comes to understanding publicly funded startup-corporate collaboration.

Corvello et al. (2021) suggest that the government supported programs of startup-corporation collaboration need to:

- Be specific in a context
- Have various and recent program theories
- Explore results from multiple stakeholders' standpoint
- Keep a learning mindset based on cycles

They also suggest that future research could focus on understanding if evaluation can start prior to the start of the program and till what extent is needed to keep a learning approach so that it has profound effects in all stakeholders involved and ultimately the ecosystem and society.

Steiber & Alänge (2020) suggest that governments have dramatically increased their support by launching initiatives towards the startup-corporate collaboration, and inviting researchers to understand the effects this might have generated within the local or regional ecosystems.

2.6 Ecosystems

2.6.1 Defining Ecosystems

Term coined by English ecologist Sir Arthur George Tansley (1871-1955) in 1935, ecosystem has been defined as "A system, or a group of interconnected elements, formed by the interaction of a community of organisms with their environment. Any system or network of interconnecting and interacting parts, as in a business." (Houghton Mifflin Harcourt Publishing Company, 2005)

Although its origins are mostly related to ecology, ecosystem as a term has been vastly used in the fields of industry, government and academia, specially when it comes to topics related to strategy, organizational learning, innovation and entrepreneurship.

Peter Senge, senior professor at the MIT and founder of the Society for Organizational Learning, was named by the The *Journal of Business Strategy* as one of the 24 people who has had the greatest influence on business strategy over the last 100 years. California born thought leader has been one of the pioneers on encouraging people and businesses to have a systems thinking approach to their work. (Senge, 1990)

Initial literature in this field has been connected with business ecosystem. Term proposed by Moore (1993), it was mainly focused on how companies could capture value from the environment. Later literature, turned its focus into the network of actors involved in elaborating and distributing innovations, framed as Open Innovation (Chesbrough, 2003) or Innovation networks (Lee et Al., 2015) among others.

Some scholars (de Vasconcelos Gomes et al., 2018) have recently stated that the business ecosystem relates mainly to value capture, while innovation and entrepreneurial ecosystems relate to value creation. The former pays attention on how a corporation can get stronger through its partners, whereas the latter model identifies the different stakeholders as peers and sees the importance of engaging with all of them for the benefit of all.

Throughout this chapter the different ecosystem models and their developments will be outlined.

2.6.2 Business Ecosystem

This model started to gain importance in the 90's when James F. Moore, former president of GeoPartners Research Inc., as one of the pioneers in the field encouraged corporations to have close relationships with organizations that could provide capital, suppliers, partners and customers. This would help in the creation of cooperative networks. Moore at the time was suggesting a change in the mindset, inviting companies to be flexible and adaptive to new circumstances by establishing strategic alliances with all the stakeholders involved in the value creation of a product or service (Moore, 1993).

Business context of the 1980s was highly influenced by the happenings in the manufacturing industry, as it would employ more workers than in any other sector. Although the automotive industry started in the US in the 1890s, due to the size of the domestic

market and the use of mass production, it rapidly evolved into the largest market in the world. However, US industry got caught up by Japan as the largest producer in the 1980s due to some innovative practices Japanese companies where applying in the production, knowledge and business management fields.

By the late 1980s IBM and other IT companies had already experienced sky rocketing growths by creating entirely new business realities. However, by 1991 and 1993, IBM already experienced big economic declines and loss of its hegemony. It's been stated that this rapid up and downs in the market have been created usually due to having a competitive mindset in an industry battling for market share, instead of having a mindset of leading in collaboration a community of value creators.

Most of the work published in literature related to business, strategy and innovation was strongly linked to the automotive industry, and best practices that would help companies stay competitive come from that industry. Knowledge management practices developed in Japanese manufacturing companies and captured in The Knowledge Creating Company book have been widely acclaimed (Nonaka & Takeuchi, 1993) , staying relevant ever since the 1990s.

Japanese learned the fast way on how to create business ecosystems. The magic formula would consist on a combination of: customer-focused design, adaptative engineering, flexible manufacturing, committed workers, and suppliers as partners. Companies that co-evolve not only need to satisfy customers, but also need to engage the community towards a shared future with constant innovation loops.

Usually the companies that employ biggest amount of people are the leaders of the business ecosystem. While the environment may change over time, the role of the leader is respected by the rest of the community, and a healthy leadership will inspire all ecosystem members to invest toward a co-evolution that will help all of them to grow together.

Moore identified what the evolutionary stages of a business ecosystem are:

TABLE 3:
Evolutionary stages of a business ecosystem
Source: Moore (1993)

	Cooperative Challenges	**Competitive Challenges**
Birth	Work with customers and suppliers to define the new value proposition around a seed innovation	Protect your ideas from others who might be working toward defining similar offers. Tie up critical lead customers, key suppliers, and important channels.

Expansion	Bring the new offer to a large market by working with suppliers and partners to scale up supply and achieve maximum market coverage	Defeat alternative implementations of similar ideas. Ensure that your approach is the market standard in its class through dominating key market segments
Leadership	Provide a compelling vision for the future that encourages suppliers and customers to work together to continue improving the complete offer	Maintain strong bargaining power in relation to other players in the ecosystem, including key customers and valued suppliers
Self-renewal	Work with innovators to bring new ideas to the existing ecosystem	Maintain high barriers to entry to prevent innovators from building alternative ecosystems. Maintain high customer switching costs in order to buy time to incorporate new ideas into your own products and services.

Business ecosystem as a concept in its origins and defined in stages, is very much focused on value capturing and have practices like competition, bargaining and corporate silo mentalities very present as the only way for survival. However, IBM already in the 1980's experimented some practices that would break from its historical approach of vertical integrations by opening its computer architecture to external suppliers and adopting a microprocessor from Intel that would allow infinite more possibilities for others. Other practices such as investing in suppliers started to happen with the goal to grow the interrelationship among the different stakeholders. Moore (1993) already identified that the innovation processes required practices and a culture that was very different from the traditional corporate culture, sensing it as a limitation.

2.6.3 Innovation Ecosystem

Anthropologists and Biologists, have for years compared how both in natural and social systems species that are interdependent with each other evolve in endless reciprocal cycles, inviting leaders to do so with business (Bateson, 1979). Other thought leaders (Gould, 1990), observed that natural ecosystems collapse when environmental conditions change too radically, and as a consequence dominant combination of species possibly lose their leadership. New ecosystems may emerge, with previously marginal plants and animals at the center.

Connecting with the thoughts of the anthropologists and biologist of the late XXth century, strategy and management practices of the 2000s have positioned corporations not as isolated agents, but actors and consequently peers of an ecosystem (Iansiti & Levien, 2004). Companies with this mindset work both cooperatively and competitively with other stakeholders to create new products, satisfy customer needs co-evolving in capabilities around a new innovation.

The last decade there has been a strong debate or dilemma around the organization of activities inside and outside the boundaries of the company (Kapoor and lee, 2013), whereas historically most of the attention would go on the outsourcing of production related activities (Rong et al., 2013). That is why in order to better understand the process of value creation through multiple stakeholders, various scholars came up with the concept of innovation ecosystem (Adner, 2006, Adner and Kapoor, 2010), strongly contributing to spreading it as a term. This concept builds on top of the former concept of business ecosystem (Moore, 1993), given as well the new practices that were taking place in the industry from the strategic and management standpoint.

Innovation ecosystem as a term has been overused in multiple contexts (politics, academia, business), even varying its meaning and purpose depending on the authors: digital innovation ecosystem (Rao and Jimenez, 2011), hub ecosystems (Nambisan and Baron, 2013), open innovation ecosystem (Chesbrough et al. 2014), platform based ecosystem (Gawer, 2014). Some scholars started to use both business ecosystems and innovation ecosystems as similar concepts (Overholm, 2015, Gawer and Cusumano, 2014, Nambisan and Baron, 2013), while others suggested that both terms were radically different (Valkokari, 2015). Oh et al (2016) found out that there is not a consensus or solid definition of what innovation ecosystems are, although based on keywords, innovation appears a central focus from 2006 on (De Vasconcelos et al., 2018), and as a consequence innovation ecosystem. But it is clear that the work developed by Moore (1993) has been the foundation for business ecosystem and innovation ecosystem, as well as innovation management (Chesbrough, 2003).

Carayannis & Campbel (2009) suggests to focus beyond the technological aspects of innovation ecosystems, to see the importance of non-technological elements (strategy, cultures, organization, and institution) when building up the competency of the innovation ecosystems.

Adner and Kapoor (2010) have argued that complex innovations tend to involve a series of actors. In fact, no one has ever generated a game changer or market disruptive business from an isolated location, it's been seen that successful entrepreneurial endeavors are generated by an environment that supports that.

Gawer's (2014) work suggests that literature on platforms was divided into two perspectives: innovation (technological) and competition (economics). Ritala et al. (2013, p5) defined value creation as "the collaborative processes and activities of creating value for customers and other stakeholders", while value capture "refers to the individual firm-level actualized profit-taking; that is, how firms eventually pursue to reach their own competitive advantages and to reap related profit"

In the work developed by authors such as Adner and Kapoor (2010), Priem et al. (2013)

and Ritala et al. (2013), it can be understood that innovation ecosystems place the value creation to the center stage, whereas previous literature was focused pretty much on value capturing over value creation.

De Vasconcelos Gomes et al (2018, P.16) suggest that “An innovation ecosystem is set for the co-creation, or the jointly creation of value. It is composed of interconnected and interdependent networked actors, which includes the focal firm, customers, suppliers, complementary innovators and other agents as regulators. This definition implies that members face cooperation and competition in the innovation ecosystem, and an innovation ecosystem has a lifecycle, which follows a co-evolution process.”

Local Innovation Ecosystems

MIT’s D-Lab unit hast for decades worked on designing environments for more equitable worlds and it is one of the only models that takes into considerations the limits may exist from the environmental standpoint.

Local Innovation Ecosystems “refer to the complex, dynamic systems within which innovators separate – systems characterized by an array of interacting actors, resources, relationships, and conditions that work together to either enable or impede innovation” (Hoffecker, 2018).

FIGURE 101:
Local Innovation Ecosystems by MIT D-Lab
Source: MIT D-Lab

Through the work Hoffecker and her team from the MIT D-lab have been doing, they have developed a model in order to understand local innovation ecosystems:

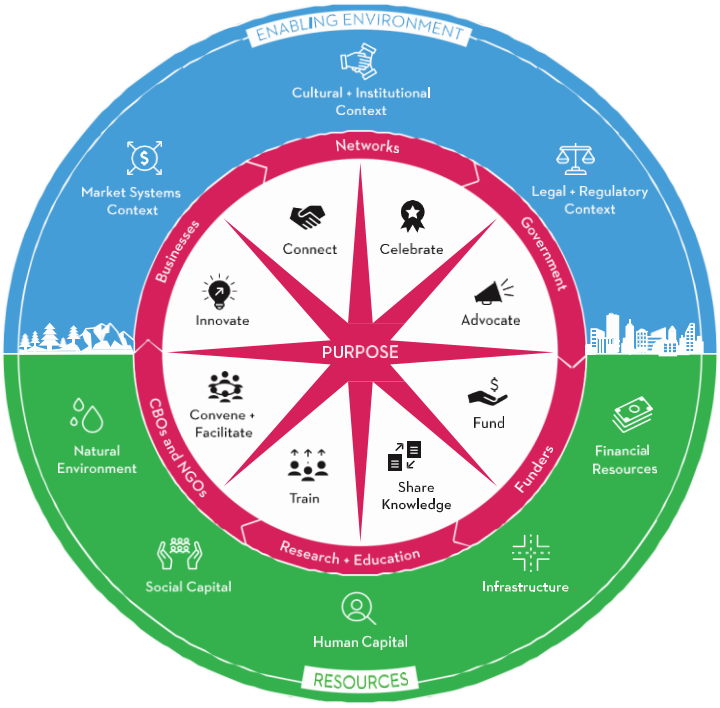

FIGURE 112:
Understanding Innovation Ecosystems: A Framework for joint Analysis and Action
Source: Hoffecker, E. 2018

Within their model, they propose the following pillars:

1. **Purpose:** All systems, including local innovation ecosystems have a purpose. It can be explicit or driven by the results the system produces. It usually represents the vision, values and motivations different actors of the ecosystem may carry through their work.
2. **Actors:** They are the entities that create and enable innovation through their work. Within their model they are defined from the role they play (in white: Celebrate, Advocate, Fund, Share Knowledge, Train, Convene + Facilitate, Innovate, Connect) instead of labelling what type of institution they are, as well as the type of actor (in pink: Government, Funders, Research + Education, CBOs and NGOs, Businesses, Networks) they belong to.
3. **Resources:** This part outlines the essential resources the ecosystem needs in order to work. From natural environment to infrastructure, financial resources as well as human and social capital.
4. **Enabling Environment:** It shapes the context for creativity and entrepreneurship, influencing productivity as well as its ability to produce, diffuse and scale innovation.

From the experience gained, according to Hoffecker local innovation ecosystems share the following criterias:

1. They have a purpose that is shared, focused and clear
2. They grow from the identity and strength of the region
3. They are inclusive: they bring in diverse actors
4. They foster and enable collaboration
5. They go beyond creating connections, they generate community among the different actors.

2.6.4 Entrepreneurial and Startup Ecosystems

Economic studies from around the globe consistently link entrepreneurship (particularly the fast-growth variety), with rapid job creation, GDP growth, and long-term productivity increases (Isenberg, 2010). And startups are considered key players when talking about economic development, talent attraction, innovation or job creation (Kane, 2010). In fact, Weiblen & Chesbrough (2015) state that disruptive innovation only comes from startups and it will be them who will disrupt industries and come up with the next big thing.

As described by literature, generally speaking two types of ecosystem coexist in any given region (Thomas et al., 2018): Innovation Ecosystems and Entrepreneurial Ecosystems. The former is mainly focused on the creation, dissemination and commercialization of new technologies, mainly innovation created from universities, public research institutes and centers for technology transfers (Bramwell et al., 2012). Entrepreneurial ecosystems that are technology based and have a more of a commercialization purpose, look more the entrepreneurial community, access to private capital, culture and locally available networks that enable it (Spigel, 2015).

The ecosystem approach to entrepreneurship has been developed from the System thinking perspective, as innovation by nature requires a rather systemic vision to it, involving institutions, public policies and regional particularities. However, what helps a given region to exchange the knowledge created and entrepreneurship to flourish is when locally based networks collectively take advantage of the existing resources and reach an alignment within the multi stakeholder reality involved (Flanagan et al. 2011)

Entrepreneurial Ecosystems and Startup Ecosystems are focused on their promotion and as concepts are intertwined. Startup Ecosystems set Startups at their core and generate an interdependent system of resources, organizations and service providers that promote the creation and growth of startups in a given region. Entrepreneurial Ecosystems provide the context so that Startups can access to resources (Gueguen et al., 2021), but they are also systems of interdependent actors that support the creation and growth of new ventures in the wider sense.

Startup Ecosystems

Cukier et al (2016) defined a startup ecosystem as “a limited region within 30 miles (or one-hour travel) range, formed by people, their startups, and various types of supporting organizations, interacting as a complex system to create new startup companies and evolve the existing ones.”

Startups and startup ecosystems are rather new topics in academia, and a work that has been systematically developed to meet the standards and discipline of scholars within these topics is rather limited (Paternoster et al., 2014). Tripathi et al. (2019) mention that a deep academic review of the startup ecosystems has not been done yet and that interesting work could be to explore further research on comparing and contrasting startup ecosystems and entrepreneurial ecosystems.

An in depth research is developed by Tripathi et al. (2019), where they conclude that “a startup ecosystem operates in an environment located in a specific region. It includes actors

that can act as stakeholders, such as entrepreneurs, investors, and other people with some self-interest in the ecosystem. It also collaborates with supporting organizations, such as funding agencies, governments, academic institutions, and established companies, to create an infrastructure in which a common network that could support and build startups on a smaller scale, as well as increase a country's domestic product development and job creation on a larger scale, is established."

Kristian Andersen, thought leader, designer and entrepreneur has developed a model that resonates well when it comes to modelling the ingredients an Startup Ecosystem should have. Andersen (2012), in the model he created called "Anatomy of a startup ecosystem: 10 critical components of a vibrant startup scene" he identifies the following 10 elements:

FIGURE 123:
Anatomy of a startup
Source: Andersen (2012)

Entrepreneurs & leaders: Group of committed leaders, heavily biased toward action, combined generation of young energetic doers to experienced professionals.

- Community: Pursuing diversity, expand network, formalize the sharing of ideas, get the uninitiated & first timers on board, stage a variety of regular events, commit to supporting other startups // be a customer.
- Talent: Focus on net talent gain, Always be recruiting, communities need loyalty programs.
- Terroir: Identify the points of difference // Unfair advantages, Embrace what is unique and indigenous to the area, develop an "insider language", stop apologizing.
- Corporate patrons: Understand the business community's family tree, provide early revenue & serve as reference customers, source for mentors, become talent trading partners, provide supportive but honest feedback, find the intrapreneurs.
- Mentors: Identify the top 10-15 in your market, startup mentors typically come from the startup world, important what you don't posses, provide environments for them to connect, always be looking to grow the fraternity.
- Services & support: clearly communicate how they can help, clearly communicate what's in it for them, start spreading the love...and equity, help them help you - then make them a star, map the genome and reward loyalty, educate yourself on opportunity - ignorance is no excuse
- Access to Capital: Crisis of capital y greatly exaggerated, become fluent in the language of investing, always have the scene's pitch tunes up, know who is interested in what, build bridges with other communities.
- Spaces & Places: Place is secondary to community, If you build it - they might, very well, not come, If they've come however, you should go ahead and build it, place

can serve as a powerful symbol of unity and momentum, provides a platform for connecting & story telling.

- Communication Platforms: Formal communications strategy // The big idea, Dedicated media site // E.G. - Silicon praire news, Multiple content creatros // Diverse perspectives, Every startup business is a publisher, Every startup citizen is a journalist, Be an educated evangelist

Within the research of Tripathi et al. (2019), eight important elements that affect startups have been identified : entrepreneurs, finance, market, technology, human capital, education, demography, and supporting factors (incubators, accelerators, co-workings and events)

As the report provided by Startup Genome (2015), suggest how startup ecosystems evolve, grow and mature, as all of them have the goal to grow. It is also here stated that the responsibility or results are not only due to the creation of number of startups, but it is the collaboration of several ingredients from access to private capital, corporations, customers interested in innovation, talent and more who enable this.

Lifecycle Phases

Startup ecosystems go through the following four phases, each with distinct characteristics such as size, strengths and challenges, what triggers them to the next phase, and more importantly, what should be the objective of local leaders.

1. **Emergence**

The Emergence phase is the first phase of the Startup Ecosystem Lifecycle. The Emergence phase begins when a city gathers or assembles the necessary resources for a startup ecosystem to come to life. For a startup ecosystem to successfully emerge, the inception process requires crossing a threshold of critical mass, where usually at least a few dozen startups are founded within a few blocks or within a small neighborhood.

The most important ingredient for a successful startup ecosystem at this phase is a community of tenacious, visionary entrepreneurs who won't let the lack of support and resources get in the way of creating successful high-growth tech startups.

One of the best ways to foster a vibrant, entrepreneur community is to nurture it with many types of events: conferences, meet-ups, and events such as Startup Weekends. These events are powerful because it is critical that entrepreneurs meet each other face-to-face, form bonds, share tips and challenges, and feel the support and camaraderie of their fellow entrepreneurs on their journey. Having a social support structure composed of other entrepreneurs who can empathize and commiserate through the vicissitudes of the entrepreneurial journey is critical for the success of startups, especially in a newly forming ecosystem.

2. **Activation**

In the Activation phase of a startup ecosystem many of the core components have begun to ripen and solidify. The startup ecosystems that complete this phase with the most speed

and success utilize a process we call “Catch Up Growth”, where local startup community leaders and policy makers engage in a concerted effort to increase interactions between their stakeholders and those of top ecosystems to import the explicit and implicit structures, knowledge, and culture that made Silicon Valley successful. In doing so they increase the productivity at which they utilize local resources, leading to more startups reaching a successful exit, and in turn fostering an increase in local entrepreneurship.

Startup ecosystems in the Activation phase cannot grow exponentially fast like startup ecosystems in the Integration phase, but as both entrepreneurship and resource productivity increase, they grow faster than startup ecosystems that have leveled off in the Maturity phase.

3. **Integration**

The Integration phase of the startup ecosystem lifecycle is all about the startup ecosystem generating success stories and exits in order to establish a gravitational force that attracts resources from across the region, nation, and global economy.

4. **Maturity**

Over time an ecosystem in the Integration phase grows to a larger size than was possible from its organic resources only. The trigger for a startup ecosystem to enter the Maturity stage is when the growth of its resource attraction has begun to level off and its relative growth rate, calculated on a larger and larger denominator, inevitably slows down. Broad resource attraction has lead to the ecosystem building a fairly balanced set of resources across all factors

In a later document, Startup Genome (2017), makes the following classification:

1. **Activation**

- Low Output (number of startups), around 1,000 or fewer, limited local experience, and generalized resource gaps causing resource leakages.

- Main Objective: grow and build a larger and more connected community by activating local entrepreneurs, talents and investors

2. **Globalization**

- Large exits (over $100 million) placed the ecosystem on the map as one of the best places in the state, province, or nation to build a startup, attracting resources and startups from nearby regions.

- Growing towards 2,000 startups (and more in very large metropolitan areas) through National Resource Attraction, but important resource gaps still exist across several factors.

- Main Objective: foster connections with global ecosystems so local startups can develop world-leading startups and unicorns.

3. **Expansion**

- Several multi-million dollar exits and unicorns have elevated the ecosystem to the global stage and made the world its pool of resources.

- Growing past 2,000 startups, with more abundant resources but still some gaps in Funding and Global Connectedness, ability to produce a rhythm of billion-dollar startups.

- Main Objective: expand, ll remaining resource gaps and increase global connectedness by enabling and taking advantage of Global Resource Attraction.

4. **Integration**

- Grown past 2,000 startups or many more, resources are balanced and competitive with other top ecosystems.

- Main Objective: Integrate the ecosystems within the global, national and local ows of resources and knowledge inside and outside of the tech sector, optimizing laws and policies to sustain its competitiveness and growth, and spread its benefits (e.g. culture, source of competitiveness, wealth, innovation) to other sectors of the economy and parts of the nation.

Early-stage startups are highly dependent on their surrounding startup ecosystem, and so if a healthier startup ecosystems can be created, more successful startups can be generated. This can be done by:

- Codifying how ecosystems function and evolve,
- Quantifying the factors that shape their performance, and
- Identifying the public policies and private practices that can accelerate growth.

According to Startup Genome 2017, “Those places that fail to boldly and immediately invest in startup ecosystems, and thus fail to produce startups, will experience economic stagnation”.

Entrepreneurial Ecosystems

Roundy et al (2018) based on complexity-based definition state that “An entrepreneurial ecosystem is a self-organized, adaptive, and geographically bounded community of complex agents operating at multiple, aggregated levels, whose non-linear interactions result in the patterns of activities through which new ventures form and dissolve over time. Roundy et al. (2018) highlight how entrepreneurial ecosystems are dependant on the social and cultural behaviors of a given region, and the process of its bringing into existence follow unpredictable patterns, but are yet smooth and chaordic emerging creations. These scholars have explored the emergence of entrepreneurial ecosystems, analyzing the elements that enable its formation as interrelated ingredients within complex adaptive systems.

Entrepreneurial ecosystems as complex adaptive systems

Roundy et al (2018) based on complexity-based definition state that “An entrepreneurial ecosystem is a self-organized, adaptive, and geographically bounded community of complex agents operating at multiple, aggregated levels, whose non-linear interactions result in the patterns of activities through which new ventures form and dissolve over time.” When Roundy et al. (2018) explore entrepreneurial ecosystems they identify that they share the properties of complex adaptive systems:

TABLE 4:
Entrepreneurial Ecosystems as Complex Adaptive Systems
Source: Own Development

Property	Concept	Proposition
1.- Emergence through "self"-organization	Entrepreneurial ecosystems are not governed by a global controller, a single leader, or an organization (Isenberg, 2010). They are formed through un-coordinated, semi-autonomous actions of individual agents that when aggregated build the complex system	Entrepreneurial ecosystems exhibit self-organization: order that emerges does so without a global controller
2.- Open-but-distinct boundaries	Entrepreneurial ecosystems boundaries defined by network connections with external agents and systems. Establishing and promoting an EE helps attract resources to the region in which ecosystem is embedded (Mason & Brown, 2014). Socio cultural characteristics will influence in the the membership within an Entrepreneurial Ecosystem, the more aligned an agent is with the dominant forces shaping the EE, the greater the effect of the EE on the agent (Feld, 2012; Tödling & Wanzenböck 2003).	Entrepreneurial ecosystems exhibit open-but-distinct boundaries based on geographic and socio-cultural characteristics
3.-Complex components	Agents that comprise an EE are heterogeneous in their attritutes, their interactions with the external environment and their relationships with other agents. Based on similarites in intentions, behaviors, and activities of agent-types they can be categorized. The features of an EE will operate differently depending on multiple size - and time-scales.	Entrepreneurial ecosystems exhibit complexity in their components
4.-Nonlinear dynamics	The interdependent components of an EEs lead to nonlinear dynamics and feedback loops (Cilliers, 1998). Positive feedback processes can also lead to the emergence of new activities, which then lead to other activities, whereas negative feedback loops between two components causes one component to move towards an equilibrium or steady state.	Entrepreneurial ecosystems exhibit nonlinearity in the relationships among ecosystem components
5.-Adaptability through dynamic interactions	Non linear interactions can also produce adaptability (Cilliers, 1998; McKelevey, 2004). Interactions produce modifications in the system, which adapts to changes morphing and evolving (Messier & Puettmann, 2011)	Entrepreneurial ecosystems exhibit adaptability: the actions of individual agents produce continuos modifications to the ecosystem that allow it to adapt to changing conditions
6.-Sensitivity to initial conditions	As with an organization, the past provides the foundation upon which an EE is built, thus, is an important source of its identity, reputation, and culture (Walsh & Ungson, 1991)	Entrepreneurial ecosystems exhibit sensitivity to initial conditions

The emergence of entrepreneurial ecosystems

The emergence of entrepreneurial ecosystems as complex adaptive systems is influenced by three forces: (a) entrepreneurs' intentionality and adaptive tensions, (b) coherence in entrepreneurial activities, and (c) injections of resources.

TABLE 5:
Development of Entrepreneurial Ecosystems as Complex Adaptive Systems
Source: Own Development

Stages	Processes	Key insights	Steps
The micro-foundations of entrepreneurial ecosystem emergence	1.- The intentionality and adaptive tensions of entrepreneurs	Although there are numerous types of actors in EEs, entrepreneurs are the agents driving the creation of the complex system. Entrepreneurs' intentionality acts as a motivating force in an ecosystem and contributes to EE emergence. (Kruegeret al., 2000) Internal states of tension are triggered by an external source and motivate a creative response by the entrepreneur (Lichtenstein et al., 2007)	Entrepreneurs and other agents are engaged in uncoordinated "business as usual", and entrepreneurs may develop action plans during this stage based on their intentions.
The aggregation of individual entrepreneurial actions to entrepreneurial ecosystems	2.- The coherence of entrepreneurial activities	Anything that strengthens the association between agents, such as sharing common intensions, narratives, patterns of thinking, or values, will increase the coherence of an EE and act as a force that creates the complex system, structures it, and acts against disordering tendencies (Roundy et al., 2017)	System-level characteristics that create coherence among entrepreneurial activities
The coalescene of entrepreneurial ecosystems	3.- Injections of resources into the ecosystem	They can increase system coherence by stimulating forces inside the EE that further influence agent and system behaviors	Continued injection of resources will begin to be met by more coordinated responses, as the entrepreneurs' behaviors and outcomes influence and are adopted by other agents in the system.

The ecosystem look to the innovation and entrepreneurship that takes place in a region catches “the complex relationships formed between actors or entities whose functional goal is to enable technology development and innovation” (Jackson, 2011, p.2).

Frankly speaking startups or new ventures are not born out of the blue. The entrepreneurial environment where they grow plays a key role during their development and the ingredients that support their growth must play orchestrated so that the success rate can increase. In the long run, many stakeholders must benefit in order for an entrepreneurship ecosystem to be self-sustaining.

Entrepreneurial ecosystems are framed as organic learning environments that represent all the players that foster and promote innovation and entrepreneurship in a region, as they specialize in exploiting a shared set of resources and capabilities (Gobble, 2014). Even though the particularities of each region vary depending on the existing conditions, it is said that referent ecosystems share certain ingredients (Isenberg, 2011). That includes: A local culture that promotes entrepreneurship and innovation, easy access to talent and human capital, access to private investment, leadership, access to market, as well as public policy and infrastructure that enables it (Durst & Poutanen, 2013). Having an ecosystem perspective, helps to map out the actors involved, the knowledge that is exchanged among them, the culture as well as the relationship that is built and breaks with the usual linear commercialization perspective. Roundy et al. (2018) at their work underline the potential that exists at the intersection of entrepreneurial intentions, experimentation and actions in an entrepreneurial ecosystem where entrepreneurs operate.

Unfortunately, this perspective has had its own critics as many times its been seen more of a theoretical perspective rather than the true reality (Stam and Spigel, 2017). In fact, not many have been able to cristallize the magical sauce that helps connect all the present ingredients in an entrepreneurial ecosystem (Balland et al. 2015, p. 169).

Role of the government within the development of Entrepreneurial Ecosystems

According to CIPE (Center for the International Private Enterprise) and its report on Creating the environment for entrepreneurial sucess (2014), Entrepreneurship is a powerful force that many strive to harness. Countries around the world aspire to make their economies more competitive by boosting entrepreneurship. Yet in most countries entrepreneurs still struggle with the basics of operating and growing their businesses because the attention and resources devoted to entrepreneurship promotion tend to focus on singular interventions, not systemic change.

All different actors of many geographic locations have been for more than a decade working on developing initiatives that will lead into entrepreneurship related results. it has required the collaboration and alignment of all agents present in a given area in order the ecosystem to flourish, be known and position as a competitive and attractive entrepreneurial hub. In fact, it seemed entrepreneurship was the only focus for a lot of agents. From governments, education, service providers and corporations among others have been working on developing environments that would enable to foster entrepreneurship as a result. Creation and positioning entrepreneurial ecosystems in the world has been key focus for a lot of territories during the decade of the 2010s.

Aside of the ongoing macroeconomic policies, it was seen that a successful exit from the crisis needed R&D related initiatives. These initiatives needed to be according to local particularities. This approach to Entrepreneurship Ecosystem development is called Entrepreneurial Discovery Process, where governments or policymakers hand in hand with entrepreneurs and intrapreneurs build entrepreneurial ecosystems (Bramwell et al. 2019). The collective setting for a meaningful strategy to exit an economic crisis usually involves the engagement of the public and private sector, academia, R&D Labs and the civil society. When it comes to policy making It can be said that innovation cannot be dictated but it can be cultivated (Sallet et al., 2009)

This new reality required for governments and policy makers to play a new role, where rather than interfering they needed to shift to identifying the underlying potential that existed in their own region and act as catalysts by generating interaction dynamics among the existing agents (Müür, 2021).

This regional awareness can only take place when governments have clarity on what should be the regional goals for development or what is it that region could accomplish, and identify the agents that would be needed for innovation to flourish. It is clear that in the current reality knowledge can be accessed by anyone, but in order to evolve the individual and collective capabilities it is required that learning evolves from being focused on product development to process development

Beyond the agents that may be present in an ecosystem, not only context and culture play a key role, but the public policy and the instruments chosen and utilized by the local

government are equally important. The experiments carried out to bring together publicly funded infrastructures, projects that aim knowledge transfer as well as programs to foster entrepreneurship require an important role to orchestrate (Clarysse et al. 2014).

The orchestration and matching of the ingredients that interact within the ecosystem is extremely important, specially when a region aims to project concrete outcomes. It takes certain strategic vision and no necessarily very businessy outcomes, but a long term perspective instead. Aside of providing the usual services of business incubators such as training, access to private funding, networks and mentoring, these intermediaries can act as "coordinators with strategic innovation capabilities" (Katzy et al., 2013). When an intermediary has clarity on the existing knowledge, strengths and weaknesses, as well as promotes the knowledge exchange beyond organizations' boundaries and "seeing each other" within the region or with organizations from outside the region, can develop a capacity for the region through strategic planning, public policy and learning (De Silva et al., 2018, p. 70).

The reality is that generally speaking the financial results of these initiatives are not immediate and are even many times difficult to measure in the long run. Therefore the private sector has usually difficulties or neglects to fund these sort of integration initiatives. After identifying the underlying opportunities that may exist, many regional and even nation wide governments have started to fund intermediary actors that strategically support the integration of functions that enable regional innovation and tech based entrepreneurship (Breznitz et al., 2018). These organizations are generally funded either fully publicly or may respond to a public-private collaboration, but are not looking for immediate profit. Generally speaking they are rather autonomous organizations, respond to the overall perspective of the government and are usually labeled as economic development agencies, clusters, centers that support innovation and entrepreneurship and act as "system integrators" by coordinating infrastructures and enable connections within the ecosystem of the region (Kivimaa, 2014, p. 1731).

The role these public organizations are playing have complemented the previously used instruments and have found the way to be part of the ongoing development. They play a key role within the ecosystem and have enabled entrepreneurship to flourish (Stam, 2015, p.1767).

However, as previously identified it is not easy to measure the economic impact they generate or even model how they operate or integrate in the ecosystem (Kivimaa et al., 2017).

Innovation related policies get introduced in regional ecosystems by the work institutional intermediaries do to promote regional innovation, as well as shape it through strategic coordination. This process requires a profound learning attitude from policy makers as generally speaking there is no a modeled way and they need to implement initiatives respecting and acknowledging the local context. This is labeled as policy learning and usually applied to the government but can be amplified depending on the governance model and relationship between the public and private sector (Gertler and Wolfe, 2002). Policy learning requires new practices of participatory leadership and engagement across networks and actors from private to public institutions in order to generate a strategic vision towards the regional economic development. In order this to happen, politicians who

generate new politics must be aware and acquire knowledge of what is happening and what could happen in the future. As all learning, policy learning is also a constant evolution that builds on knowledge, experiences and expertise of the past and adapts to new eras (Koschatzky, 2009).

The reality is that there are more amount and more diverse agents working towards the development of entrepreneurship and that requires new practices of leadership and alignment, otherwise there are more opportunities for conflict and alignment failure (Asheim et al., 2016). This gets even more difficult in contexts where not only private and public sector of a region must get aligned but politics from wider regions also influence a given territory. From all the actors that are involved in entrepreneurship and represent regional policymakers and community-based practitioners' perspective, state that innovation ecosystem policy is not fully a top-down implementation process neither a bottom-up movement, but a rather chaordic mix of both (Flanagan et al., 2011; Autio et al., 2014). The true nature of innovation comes as the result of a non-linear exchange of knowledge, and regional ecosystems develop as the different agents present provide solutions to new challenges and opportunities, and do it in collaboration with other agents present. Public intervention could possibly come into place as well when there are not responsible or fair outcomes.

To increase productivity in a long run often is considered the result of good economic development effort. But it does not come autonomously, it requires the creation of an innovation friendly environment crafted by states and regions as the key drivers of competitiveness exist there (Porter & Rivkin, 2012). In fact, instead of identifying individual talents recognizing the collective nature of individual productivity (Chang, 2010) is the cornerstone to see where public policy can leverage an innovation-friendly environment and the development of state and regional innovation ecosystems.

Mariana Mazzucato, in her book "The Entrepreneurial State" (2018), recognizes that innovation requires courageous entrepreneurship and the actor that takes heroic risks is not only the private sector, but the government too. Often, the role the government plays for innovation to flourish is underestimated and not recognized, but doing that according to the author might be the biggest threat for prosperity to rise.

For public policies to succeed the most important thing is to have an structure and an entrepreneurial public sector that dares to experiment and takes risks, hand in hand with a system that is professional, responsible and has the right system of incentives always having the public good in the centre. It is important that practices from the past inherited from the industrial era, such as rent seeking or the inertia of being dependent of the state are left behind (Landabaso, 2012).

In the new reality, the public sector should play a leadership role that enables to take risks, provide vision and leadership instead of control, and catalyze opportunities for economic development hand in hand with the private sector. These opportunities should sooner than later be available for SMEs too, and it has been seen that challenges related to microeconomic competitiveness cannot be tackled by macroeconomic related policies but regional based innovation policies instead. Innovation is contextual and is connected to the particularities of the territory, therefore there is no "one size fits all" policy solution. The different versions that each region has is an opportunity for growth through innovation.

In Entreprenurial Discovery Processes (EDP), learning happens when knowledge is shared, strategic actions are collectively prioritized and partnership and collaboration are strategically built (Todeva & Ketikidis, 2017). In these processes, the vision that each stakeholder promotes must be taken into consideration (Roman & Nyberg, 2017) and it is absolutely necessary that collective intelligence and action takes place in a trustworthy, open and transparent environment (Rodríguez-Pose & Wilkie, 2015).

EDPs can be developed with the available resources, “light and shadows” of each region (McCann & Ortega Argilés, 2014) and the role of the government and policy makers is to facilitate learning processes that enable the development of new capabilities.

Learning is a change in behavior and habits and it is important that also the public administration experiences processes of self-discovery in order to understand and empathize with what it means to go through an EDP process, as well as experience what it means to go through the challenges of bureaucracy (Morgan, 2017). A continuous monitoring of the steps taken as well as evaluate the process is intrinsically included in the role of policymakers (Müür, 2021)

One of the key features of Entrepreneurial Discovery Processes or Smart Specialization strategies is that entrepreneurs (agents of the quadruple helix) are at the core of the policy process. One barrier that policy makers face in this context is that they need to design learning processes that not only they learn, but entrepreneurs as well. That involves that all stakeholders are able to reflect, think and take action.

Within this reality, trust must be at the core of these processes, alongside spaces for dialogue and shared vision. Transparency and openness are key pillars to build trust (Brekke, 2020). Ansell and Gash (2008) defined collaborative governance as a process where a government led process non-state stakeholders take part in a decision-making process that is collective, consensus-oriented and aiming for results in order to implement public policies.

2.7 Revitalization of the Industry: Digitalization and Industry 4.0

Given the social changes that are already happening, from lower birth rates to aging society or migration, the welfare system models that specially developed countries had gained through their manufacturing industries are being questioned. As a consequence, the manufacturing sector has been the pioneering sector in applying exponential technologies to their industry with the goal to catch up with its competitiveness and significance in the economy (Mariani and Borghi, 2019).

Boston Consulting Group (2014) identified that China, Germany and USA were the three largest manufacturing exporters in the world. They also identified that exponential technologies such as Internet of Things, Big Data or Cloud Computing were bringing opportunities for a global transformation on value chain dynamics and manufacturing. This also generates development on the knowledge economy as well as innovations on servitization, competitive intelligence and platform centralization.

In the increasing need of being innovative within the global competitiveness landscape, the investments made are rather uncertain and the risks are usually rather high, specially when we talk about integration systems or high technology products. Within this context, the role of governments become crucial so that they can provide a wider infrastructure, developments can happen on a wider scale and technology based economy can flourish.

Most relevant results on industry transformation and innovation generally have taken place in countries where democracy is guaranteed, national innovation systems are properly developed and proper public services are regulated by the government (Shyu & Chiu, 2002). Governments' role is to actively foster the creation of science and knowledge, guarantee a healthy functioning of the market economy as well as make sure that R&D activities do not overlap with the interest of the public.

To ensure a fair competition among companies in a given country is responsibility of governments and that can be enabled by developing policies that promote cooperative competition, exchange of knowledge and creating regulations that can influence in the economic, trade, industrial innovation and development, education and labor dimensions.

When it comes to science and technology resources, governments enable it through policy tools, whereas R&D is promoted through industry development. The policy implementation of science and technology affects not only to industry and knowledge development, but it also impacts the industrial competitiveness. Governments aim to strengthen the national innovation systems with the goal to increase the knowledge diffusion and implementation, with the ultimate goal to assist to traditional industries and help in their development. When right policies and resources are placed for industry development it influences directly in the social progress. These assets help on the one hand to plan mechanisms for the market so that they enable industrial innovation and on the other end manage activities to dynamize the competition within the industry. How governments assist in the development of science and technology will influence in the industry development, and depending on the invested resources, R&D and market regulations will impact on companies and industry (Porter, 1990)

According to (Schwab, 2016), throughout history Industrial revolutions have taken place the following way:

- 1st Industrial Revolution: From manual work to mechanization
- 2nd Industrial Revolution: From one by one to mass production processes powered by electricity
- 3rd industrial Revolution: From mass production to production assisted by electronics, automation and information technologies
- 4th industrial Revolution: Supported by Exponential Technologies, it represents the introduction of innovations that blend physical, digital and biological domains affecting how organizations operate as well as business models. (Schwab 2016)

Driven by the rampant creation of technology that was born within the exponential technologies framework and the effects it started to generate, Industry 4.0, or more specifically "Industrie 4.0" and the 4th industrial revolution, was originally a term generated by the strong network of manufacturing firms of one of the leading countries in the sector: Germany.

After foreseeing the unprecedented social, economic and technological changes this movement was going to bring in, the Federal Government identified that in order to catch up with what was called the 4th Industrial Revolution a new consortium needed to be created. From the very beginning, the idea was to leave no one behind and provide in an inclusive manner the opportunity for not only private firms but also employees, unions, research centers and government to join forces towards the digital transformation of the manufacturing industry in Germany.

All the actors involved from each inception, have seen the "Industrie 4.0" consortium as an strategic opportunity to leverage Germany's competitiveness and preserve its manufacturing power. From the consortium's founders' perspective, digitalization has the potential to be a learning process for the entire society. The consortium as a concept was born in 2011 but kicked off officially at the Hanover Fair of 2013 and included the business associations BITKOM, VDMA and ZVEI, which account for over 6000-member companies.

The consortium is led by the Federal Ministry for Economic Affairs and Climate Change as well as the Federal Ministry of Education and Research, together with other stakeholders from industry, science and unions. As a learning space, the group taps into future challenges in the fields of security of connected systems, legal frameworks, standardization, research and business models. How they operate is that they start developing concepts and put them in practice, support companies in their implementation processes (including SMEs) and bring outcomes to international forums.

FIGURE 134:
Industrie 4.0
Source: Federal Ministry for Economic Affairs and Climate Action,Federal Ministry of Education and Research

2.7.1 Industry 4.0

Industry 4.0 spins around the concept of the smart factories that are connected horizontally and vertically and produce smart products (Kagermann and Whalster, 2013). From the manufacturing standpoint, exponential technologies enable the connectivity among devices, decentralized decision making and access to transparent information, generating this way smart systems (Hermann et al., 2016). Implementing Industry 4.0 related resources, requires gigantic transformations within the organization (Sony & Naik, 2020) as well as upskilling trainings for the employees (Pejic-Bach et al., 2020). As the interconnectedness enables the possibility to connect with other organizations, in this new reality the value creation happens in co-creation with others and as a consequence that affects to the business model (Weking et al., 2020).

Industry 4.0 as a concept is commonly being used to define what a digital factory would be. According to Hofmann (2017), it can be imagined as a setting from a science fiction movie, where manufacturing processes are assisted by robots and are automatic, end up being connected to a supply chain and humans interfere only when it is absolutely necessary.

Given the relevance digitalization has gained the last twenty years or so, The European Commission as it does with other fields that can be the cornerstone for development of the future, developed a framework called the Strategy for the Single Digital Market (EU Commission, 2015). This framework has been developed with the goal to shape the digital society, and it covers multiple fields of the society including the digitalization of manufacturing industry (EU Comission, 2015).

Although as a denomination “Industry 4.0” comes from a German entity that promotes industry development, today it is globally used when it comes to manufacturing that is made by the capacity of machines to communicate among them throughout the value chain. Additionally, the denomination also takes into account new ways of manufacturing and even though its entire features still need to unfold, huge potential and unlimited possibilities can already be foreseen (Brettel et al., 2014).

The digitalization of the manufacturing industry involves a vertical and horizontal integration and the factory is no longer the central element but becomes part of a larger ecosystem. In addition, having an open understanding of the Industry 4.0 allows the engagement of a wider audience that at the end of the day are part of the ecosystem: policymakers, private companies and academia. Generating the term enables the democratization and a wider adoption of the movement, as governments can better communicate the generated policies and SMEs can also jump into the opportunities that emerge (Smit et al., 2016).

Given the early stage Industry 4.0 finds itself and the numerous approaches to it that exist

within the global scene, some authors suggest that its definition is not clear and concrete enough (Hermann et al., 2016). Throughout the years several authors and institutions have tried to build an identity to it, but as technology evolves there might be a more amplified version of it. The Acatech report of 2013 is one of the pioneers and it identified the drivers, needed conditions, benefits and potential outcomes, but does not clearly propose a definition (Kagerman et al., 2013). Some other authors suggest to define Industry 4.0 based on the elements that help it to happen (IoT, Big Data or cyber-physical systems); Herman et al. (2016) have identified several ambits that leverage its potential: technical assistance, interconnectedness, decentralized decision making and transparency. Smit et al.(2016) define it as technical elements that serve the production process and are connected among each other not only in the manufacturing process but in the entire value chain, and should fit the following principles: interoperability, virtualization, decentralization, real-time capabilities, service orientation and modularity.

Industry 4.0 related academic literature is primarily centered around the technology that has been developed, business models and market analysis. However, some scholars have pushed these boundaries and have explored how the unfolding of Cyber-Physical Systems has taken place (Lee et al., 2015). These systems allow to monitor all the information related to the manufacturing and supply chain process, combining data generated at the factory's physical floor to the cyber computational arena.

Although across countries it might take different meanings, Industry 4.0 is related to a System of Systems. It is not a single factory, but how the entire industrial chain is structured and resembles more with the ecosystem concept.

Involvement of the government in its implementation

The increase in the technology available and the growth of competition among the countries have pushed governments to support the modernization of the industrial sector and engage in the Industry 4.0 movement. However, the initiatives and strategies that each global region will follow varies drastically (Lin, 2015).

The World Economic Forum (WEF) is a referent arena for governments and private sector to discuss global matters, and already in 2016 addressed the Industry 4.0 as a topic as some countries had already implemented certain initiatives and some others instead did not know even where to start from.

Some studies have shown that through healthy politics, Industry 4.0 can help in fostering a sustainable development. And policies to develop science and technology not only support the development of the science, but also enrich the industrial environment as well as its competitiveness (Kuo et al., 2019). Additionally, the policies that have been led by governments aiming to support the innovation of industry have proved they can help to mitigate business challenges (Brief, 2014) and enable managers to take more risks to innovate (Yang et al., 2019)

Those countries that are aiming to stay relevant and competitive specially the economies that have industry and manufacturing sector as key source of income, to invest in policies and democratization of Industry 4.0 is indispensable (Kuo et al., 2019).

Standardization within the European and Global level

Today digital technologies lack a shared standardization, it is crucial for future democratization of these resources and it is responsibility of governments to do it. As the society faces more connection and interoperability among devices and humans interact more than ever with machines policies must accompany the integration of the technology within the different countries and sectors. This will only ease the integration of technologies and therefore democratize the access to it.

Europe has always been considered as referent market when it comes to technology and ethics, and following that path and taking action fast will help that local companies will have access to technology faster and easier, and will help to connect in new ways with suppliers and customers. This can't wait long and this policy development must take place by policy makers, research institutes and private firms creating together overseeing its development both in Europe and globally.

Innovation policy framework in industry 4.0

Researchers have concluded that science and technology policy can trigger the innovation and economic as well as social development of a country, and through systems and mechanisms that sustain it, maintain innovation activities in the long run.

Within academia it's been identified that the types of innovation policies countries unfold are radically different because policy catalysts work differently across countries. However, some referent scholars warn that innovation policy needs to be taken very seriously specially from the national innovation system viewpoint (Dogson et al., 2011). No matter global matters or global competition, these policies need to be upfront so that policies guarantee a steady development.

Innovation is not only the creation of new technologies or methodologies, but it is also the commercialization of it. Scholars agree that both science and technology and industrial policy are both innovation related policies (Rothwell et al., 1984). Building up on this understanding, science and technology policies aim to support companies in their invention activities, whereas industrial policies are focused towards supporting companies in their commercialization challenges. According to the work developed by Lin (1995), when looking into the work governments have done in the US, Japan, Germany and France, following approaches have been modeled: promoters of environments that enable, innovation pushers and adjusters of structures.

Some referent scholars suggest that policy is built combining policy tools (Rothwell et al., 1984), which are split into: Financial support, human support and technical support. Depending on their functionality, they can play as an innovation resource within the technology development or production process.

It is given for granted that fruitful innovation is a match of both technology development and market demand. From the supply side perspective, product development should englobe the following dimensions: science and technology as well as human resources, innovative

working methods to guarantee a proper development, manufacturing and marketing, and lastly access to funding.

From the supply perspective, governments can support by taking part in the scientific and technological process, either by leveraging the elements mentioned above or altering the political, economical or regulatory frameworks.

From the demand standpoint, governments can alter the demand conditions by modifying the domestic market, betting to shift the international trade environment or by setting up national sales agencies overseas.

Considering the radical changes and transformation Industry 4.0 will bring in, it will place firms and governments in risks and uncertainty levels probably not known before (Andreoni and Chang, 2016). But it might also bring the opportunity to cultivate a togetherness level between the public and private sector, it might bring the chance to share resources, risks taken, infrastructures or support services. Finances will play a key role as well and require a holistic vision so that they can play a key role in the long run for the conservation and development of the manufacturing ecosystem, as well as support business investment or creation of new firms.

Innovation policy development

When it comes to developing economies, as private companies usually do not have access to Industry 4.0 related technologies, it is essential to create policy towards revitalization of industry using demand-side policy.

On the other end, when it comes to developed economies might make more sense environment side policy where Industry 4.0 is usually properly set and government should guide the development of technology and skill development.

US, Germany and China are large countries with ample resources and already have generous demand within the domestic context. According to the research developed by Kuo et al. (2019), it can be identified that these 3 countries have different approaches to innovation policy probably given that the state of manufacturing industry is different. From the research the following can be concluded:

Based on these conclusions, policymakers working in the Industry 4.0 can improve the quality of their implementation as well as the outcomes. When it comes to innovation policy of Industry 4.0 it should have a flexible approach to its implementation as well as be open for changes at each stage. If including this approach to revitalization of Industry 4.0 policy design, needed resources and possible outcomes can be improved.

Co-ordination of policies

Some scholars claim that European Commission’s today’s approach to policy development is not helping but in fact making it more difficult for Industry 4.0 to advance (Unido 2018). From their perspective, as the digitalization and the growth of the Industry 4.0 is so rampant, Europe should be developing a framework to develop standards and certain rules that could

set the bar for the global scene. This could go hand in hand with criterias that can support the design of educational programs that will feed and equip citizens with the skillsets that will be required for the jobs of the future.

The complexity Industry 4.0 is generating is pretty remarkable, and that requires the generation of a platform that can encompass an active participation of governments (European, nationals and regionals) as well as other relevant stakeholders. These partners will need to define an overall framework for policy development and more concrete fields like data access/protection among others.

A sensible approach to smart specialization is to generate spaces where government, private companies, universities and research centers can come together to identify the strengths a given region may have from the business, skillset, governance and technological perspective, and build a strategy of growth from there. However, the industry 4.0 allows to connect businesses with consumers on a global level, so this allows firms to have a global outreach (Vezzani et al., 2017).

2.7.2 Trends, effects in the workplaces and marketplace, opportunities and risks

In the report of the Digital Transformation of European Industry following trends and insights in the Industry 4.0 are identified (EIT, 2021):

When it comes to Trends:

- Automation and digitalization are yet in its early stages and only adopted by pioneers. Additionally, its negative economic effects are not yet so evident. European companies are behind other referent countries and must invest annually €90 billion in order to catch up (Buhr, 2017).
- When it comes to technology adoption, European firms still have ample room for development. A recent survey suggests that 75% see the opportunity but over 41% had nothing done on technology adoption (EU Comission, 2017a). Adding to that, the existing limitation in resources, amount of disengaged SMEs and differences between government and private firms are some of the limitations. It is considered that in Europe only 6% of IT and professional services companies are making profound use of data and less than 1% of employees in organizations are data specialist.
- US and Asia are at the forefront of the Digital Platforms, and even though Europe has made some attempts on platform development on the industry 4.0 level, the old continent is coming behind in the end-user platform development. However, there are a significant number of project initiatives and policy interventions ongoing at the European level, mainly related to manufacturing, health or agriculture. For the industrial growth of the old continent, it might be relevant to create programs based on open innovation. This approach may bring endless opportunities as it will help match its industrial strength with the opportunities new technologies bring.

When it comes to the workplace:

- There is tremendous fear that exponential technologies will dramatically reduce the amount of jobs, as it is expected that most repetitive tasks will be replaced by robots and other technologies. Data is various here, globally known Mckinsey consultancy firm estimates that by 2030 from 400 to 800 million jobs will be lost (Manyika et al., 2017).
- The increase in productivity and growth automation will bring in is very compelling. However, in the short term it is expected that there will be serious negative effects when it comes to unemployment and salary inequality. On the other hand, in the long run it is expected that new jobs and roles will be generated and people with new skills will be required.
- There are some other concerns that come along with the industry 4.0, especially in Europe:
    - Many regions that were focused on industry or manufacturing have gone through a de-industrialization process.
    - Growth in productivity has not brought equal growth in wages, in fact, it's been more the opposite
    - To date it has brought conflicts, decline in employee participation and inequality
    - Working full time for a firm, including the belonging and safe nest that could provide, looks like will stick to the past. Recent trends glimpse that driven by digitization more and more jobs will be fragmented and people will be hired per hours, as freelancers or project based.

When it comes to the marketplace:

- Having platforms that integrate the entire value chain can certainly bring huge easiness in the manufacturing or service delivery process. It can leverage Just in Time production, mass customization or inventory management among other key processes. However, it will require new governance models, integrating blockchain for example for traceability, or otherwise it can lead into the creation of new monopolies.
- Platforms that serve to actors from across the globe may encounter certain difficulties when it comes to legal frameworks as they will vary from certain countries to others. That already happens when it comes to data usage and management.
- Usually when it comes to firms that dominate a market is because they are preferred ones by the customers. They create standards and consumers demand that, but needs to keep up innovating in order to maintain its position in the market. Applied that to platforms, means that they can capture more data. If able to capitalize that, they get a robust competitive edge.

When it comes to opportunities:

- Usually, when combining productivity and efficiency, that brings along more revenues and global competitiveness. Digitalization can inform real-time the manufacturing status, make production more efficient and cheaper as well as directly incorporate insights of customers for mass customization and radical innovation.

- Innovation that is Data-driven will leverage considerably the economic benefits. It has been proved that decision making processes that are data-driven have 5-6% more of productivity.
- Humans will have the chance to really explore what is it that they can provide that robots can't, and make the working environments more humanistic and friendlier. Ideally and catching up on the idea of Multiplicity of Ken Goldberg, humans can work together with machines to solve and provide answers to problems (Goldberg, 2017).

When it comes to risks:

- One of the biggest negative outcome that digitalization has brought is the tremendous wage difference: salaries of top managers, investors and employees of leading firms have increased, whereas regular workers' salary has not changed much or is even declining. It's been also seen that platforms reduce intermediaries, therefore the experience provider taking it all.
- The new flexible labour contracts will challenge the sustenance of the tax collecting system and the Social Security System as we know today. Public expenditure in social security might be seen reduced, and how platforms pay taxes will need to be designed in order to maintain the current welfare. Work and access to jobs provides frameworks for living to people and communities, and if large amount of them lack it, the inequality may increase dramatically.
- Digitalization will require from people new skill sets and even educational centers will need to adapt and upgrade their offerings. The reality is that these sorts of transformations usually take longer than what especially private sector would wish. As a consequence, in the short term there will be a shortage of talent and skilled labor.
- Companies must leverage their current digitalization strategies, no matter what is the sector they operate at. They must integrate data-driven strategies, otherwise they won't be able to provide users future markets will demand. SMEs might be the most affected ones, either because they do not have the needed resources to invest or they simply don't know how to do it.
- Platforms operate in countries with very diverse policies on Data protection and individual liberty. This is a topic that will definitely bring tons of discussions in the future and will have geopolitical implications.

2.7.3 Implementation of Industry 4.0

Why and how does Industry 4.0 or digitalization happen?

Even though that often corporations are considered part of the wider society, it is difficult to find studies that address or explore the existing digital gap within the corporations of different countries. As a matter of fact, the experiences that have been shared from some companies, have all in common that digitalizing the activities of a corporation is a convoluted process that requires governance, management, infrastructure, analytical capabilities and technology (El Sawy et al., 2020). It can also be considered that there is no deep quantitative research that would allow to generate the awareness till what extent Industry 4.0 is being implemented in different countries or sectors.

This reality might be result of the difficulty that exists on concretely framing the particularities of the term Industry 4.0, and the lack of data within these features. The truly harsh reality is that the rapid pace of technology development and its adoption goes much faster than the capacity to build surveys that help gather consistent data for statistics.

However, most scholars and professionals in the field agree that the level of adoption of Industry 4.0 within the manufacturing sector among countries narrows down to two basic pillars:

- **Industry 4.0 Infrastructure:** it goes beyond hardware, software and cables and embraces the information sharing and connected technologies that influence the way companies create their business strategies (Bharadwaj et al., 2013).
- **Big Data Maturity:** It defines the capacity to manage the data captured by the infrastructure. This capacity, which mainly refers to the capability to take advantage of the generated information, helps mainly when it comes to predictability and error management (Wang et al., 2016).

It has been proved that combining networks and platforms that enable manufacturing and supply chain processes and the data generated within the process, is key when it comes to efficiency. The generic platform that combines interconnectivity, interoperability and virtualization help to gather granular data in large quantities. If having the capacity to interpret this data through advanced techniques, it helps to generate extremely valuable information. Therefore, it can be acknowledged that only when combining the two resources manifest wholeheartedly the underlying potential (Agarwal, 2015).

Castelo-Branco et al. (2022) in their research work identify that why, how and till what extent digital transformation happens depends on three main pillars:

- Firms' resources on Information Technologies (IT)
- The industry environment
- Last but not least governing policies.

How they affect to firms is in multiple ways, they can change the value proposition, positioning and competitiveness in the market, or even how firms interact with their employees and their customers (Dery et al., 2017).

However, according to them, there has not been research done on the level of Industry 4.0 implementation beyond the manufacturing sector (Castelo-Branco et al., 2022). They designed a model considering the conditions that made the implementation of Industry 4.0 possible and analyzed how they were affected throughout the entire value chain, acknowledging the connection between the smart factory, value proposition and the user experience. The creation of this model is pretty significant as it brings together the resources and capabilities that must be present when implementing Industry 4.0 processes, something that goes beyond the technology or manufacturing process, but actually taps into its effects in the business model.

Castelo-Branco et al. (2022) in their research identify 6 models to measure the implementation level of Industry 4.0. Except one of them, all the rest explore the impact Industry 4.0 has from the organizational perspective, meaning areas such as Strategy, Culture, Human Resources, Processes or Technology. On the other hand, the model

developed by Schuch et al. (2017) measures the implementation from the perspective of capabilities that enable its implementation.

Implementation within the EU:

The adoption and application of Industry 4.0 by manufacturing firms generates such bewilderment but at the same time is so strategic, that in many realities the familiarization has been carried out not on individual manner but at country or even regional level. The adoption of industry 4.0 resources is expensive, and customers may not necessarily appreciate the value created yet (Davies, 2015)

European Commision's H2020 has been the flagship program to support R&D and more specifically the development of technologies that support the Industry 4.0 development. The allocated budget of € 80 billion has been focused towards the promotion of inclusive growth, implementation of awareness programs about what opportunities and risks Industry 4.0 may bring and development of prototypes.

According to the research developed by Castelo Branco et al. (2019), it can be seen that as it was expected the difference among the European state members is pretty radical. It is not new as a movement but both the private sector and public institutions are doing strong efforts to keep up the fast changing pace and stay relevant and competitive in the long run.

In countries where Industry 4.0 infrastructure scores high, means that its industrial sector enjoys a high-quality communication network and the machines are connected to it. Additionally, a high score in Big Data Maturity means that its industrial sector is able to analyze data.

When having both aspects, this scenario brings together all ingredients that are required within the Industry 4.0: connectivity and capability to operate among the machines, virtualization and transparency of information. Having both aspects does not mean that there will automatically be a strong Industry 4.0 implemented, but provides at least the foundation.

Castelo-Branco et al. (2019) within their research divide two main ambits: On the one end comes the infrastructure of Industry 4.0, that brings together the interconnectivity, interoperability and virtualization. On the other end comes the Big Data Maturity and defines the capacity to manage the generated information by the infrastructure of Industry 4.0.

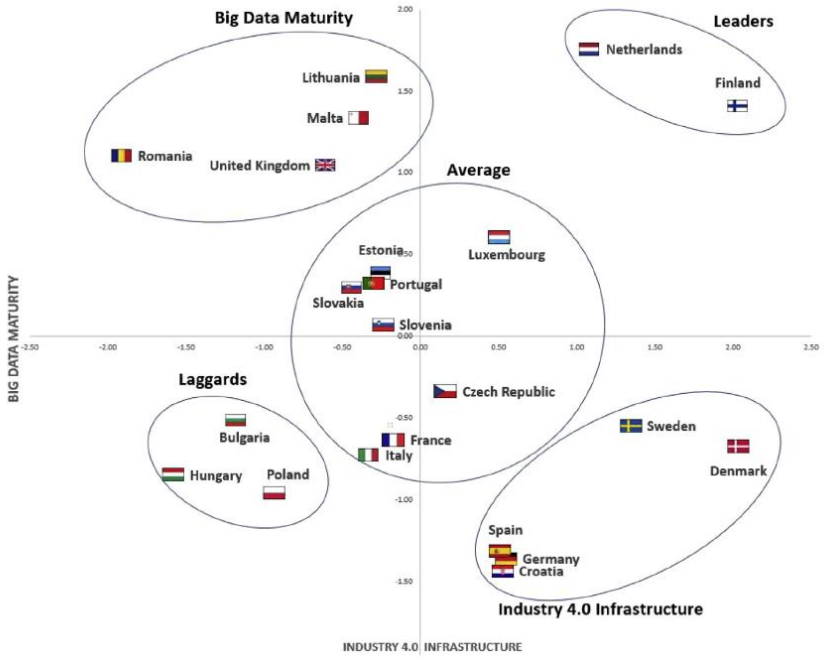

FIGURE 145:
Computers in Industry
Source: Castelbranco et al. (2019)

Countries that operate on the right of the vertical axis mean that their Industry 4.0 infrastructure is bigger. On the other end countries that perform above the horizontal axis have bigger capacity to manage information of Big Data Maturity.

- Finland and Netherlands can be fitted as “Leaders”, given that their Industry 4.0 Infrastructure as well as Big Data Maturity goes beyond the average.
- On a second group Croatia, Spain, Germany, Sweden and Denmark can be found, where Industry 4.0 Infrastructure can be considered as high, but the Big Data Maturity on the other end pretty low.
- On the third group stand Romania, UK, Malta and Lithuania, where Big Data Maturity is higher than the average but the Industry 4.0 Infrastructure is lower, specially in the case of Romania.
- Fourth on the list stand Hungary, Poland and Bulgaria, where neither Industry 4.0 Infrastructure nor Big Data Maturity are relevant compared to other countries.
- Last but not least, Luxembourg, Czech Republic, Estonia, Portugal, Slovakia, Slovenia, France and Italy integrate a group whose both factors are among the average.

Generally speaking, it can be identified that Nordic countries manage pretty well in the adoption of both Industry 4.0 Infrastructure and Big Data Maturity. Although not all of them are in the same level, Finland can be identified as the leader and Sweden and Denmark go after. However, these two countries perform among the best within the group they belong to.

Hand in hand with Finland, both Luxembourg and The Netherlands enjoy of both Industry 4.0 Infrastructure and Big Data Maturity. Previous studies proved that within the EU, these two have been the best on reducing the digital divide gap.

In overall, and not only when it comes to manufacturing sector, it can be observed that the countries that have put more effort on digitalization and closing the digital divide gap are at the forefront also in the implementation of Industry 4.0.

This analysis that Castelo-Branco et al. (2019) carried out, can share some light on what strategy and next steps should be taken keeping in mind the Single Digital Market. Policies and investment strategies should be defined taking in mind these conclusions, so that all countries that are part of the EU can move forward and also SMEs can step up with the advancements that larger corporations take within the digitalization.

Last but not least, in order to better understand the elements that trigger the Industry 4.0 development, the characteristics of each country, the particularities of its industrial sector as well as the management culture should be studied.

Global landscape

When it comes to the global scene and understanding the reality beyond the European Union, the approach to investment in policies by different governments for the promotion of Industry 4.0 has been carried out in multiple manners. However, some late comers have dared to create their own approach when they've seen their own competitiveness in risk (Tay et al., 2018).

Within the coming pages can be identified the steps different governments have undertaken (Tay et al. 2018):

China's Industrial Revitalization Plan:

During the 80's and 90's China became the leading manufacturing country for international corporations. However, its capacity is big but lacks efficiency when it comes to resource usage, innovation ability, data quality or industry infrastructure. As of May 8th 2015, China reveals its plan "Made in China 2025" which aims by that time to be of higher quality, with more innovation capabilities, more labor productivity and digitalization within the industrial sector already having taken the first steps. However, the next milestone is 2035, year when China is expected to be already competing with the leading countries in the Industry 4.0. By 2045, China's goal is to be the leader when it comes to industrial and technology systems. Main fields of manufacturing will be highly innovative and competitive and by then China will have most advanced technology and industrial system. The path that has been draft aims to leverage China to shift from manufacturing quantity to manufacturing quality (Kuo et al., 2019).

China promotes environmental-side policy, political, legal and regulatory and public service policies (Kuo et al., 2019).

United States of America and its industrial revitalization plan:

The massive migration of US companies to manufacture in China during the 80's and 90's, lead to tremendous unemployment rates within the traditionally manufacturing cities of the US. In 2011, Barack Obama as president launched a government led program called

“Advanced Manufacturing Partnerships” (AMP) with the goal to promote collaboration between government, industry and academia to tackle the most pressing challenges within the manufacturing industry through improving technologies, processes and product designs (Swenson, 2015). As additional objective, it aimed to make US companies braver to invest in advanced technology.

In 2014 a second edicion of AMP called AMP 2.0 is launched in order to continue promoting innovation, access to training and fostering modern manufacturing. With the goal to catch up the new manufacturing wave industry 4.0 was offering and recover US’s hegemony, the government started publicizing the “Made in the USA” with the goal to regain the high quality and properly-paid jobs it used to offer (Kuo et al., 2019).

USA’s policy promotes demand-side, public services, political and skill development policies. (Kuo et al., 2019)

Germany and its industrial revitalization plan

Germany is for obvious reasons a referent country in machinery and equipment manufacturing. As global competition gets more competitive in the machinery and equipment development, not only USA picking up but also Asian countries, the German companies have been under thread.

German Federal Government became the first country to launch a policy initiative targeting concretely the Industry 4.0. And as it was the first one, it is also the country that best has represented the quantitative estimates. Germany placed an Industry 4.0 strategy program in order to develop software and internet technology, industry that Germany at its beginning was weak.

However, already Müller et al. (2018) suggest that Industry 4.0 is already generating changes in the business models of specially the SMEs, and these types of organizations are rather relevant for the manufacturing industry of Germany.

Germany promotes demand-side policy, public services, scientific and technical development and political policies. (Kuo et al., 2019)

Japan and its industrial revitalization plan

In 2013 Japan created a plan to modernize its industry, with the aim to make Japan the best place for industries to develop services that would revitalize its manufacturing sector (Kantei, 2013). This plan contemplated investments in machinery and R&D (Kuo et al., 2019). However, the country of the rising sun has drafted a plan named “Future Vision 2030”, which targets specific strategies in concrete fields such as mobility, healthcare and supply chain among others. Within the plan there are 7 concrete dimensions that the country aims to address: Innovation ecosystems, economic rejuvenation systems, development systems, human resources use, social security systems, regional SME systems and companies abroad (Yang et al., 2019).

United Kingdom and its industrial revitalization plan

The United Kingdome has been promoting the shift towards high-end manufacturing services understanding that state-of-the-art technology is being used in the development of products, manufacturing and social services (UK Research & Innovation, 2012)

South Korea and its industrial revitalization plan

South Korea in 2014 launches a program named as Industry Innovation Movement 3.0, to foster the revitalization of the manufacturing industry of South Korea (Korea Chamber of Commerce, 2014) .

Taiwan and its industrial revitalization plan

Taiwan launched in 2015 the Productivity 4.0 plan to update its manufacturing industry (Taiwan, 2015).

Private Industry

On top of that, the private industry started developing its own programs through private consortiums. AT&T, General Electric, IBM, Cisco and Intel created in 2014 the Industrial Internet Consortium (ICC) in order to coordinate and set up policies on technology application on the Industrial Internet (Evans; Annunziata, 2012). On the other end, Hitachi, Panasonic, Bosch, Siemens, Honeywell, Mitsubishi Electric, Schneider Electric, Emerson Electric and ABB have also come together to invest in strategic projects related to IoT and Cyber-Physical Systems (CPS) (Liao et al., 2017)

Future of Industry 4.0

Keeping in mind all the initiatives shared above, the importance and focus governments around the world are providing to level up their manufacturing industries is obvious. However, Kiel et al. (2017) suggest that to differentiate from competitors and play a step faster, an industrial value creation that is sustainable requires to embrace the following dimensions:

- Technical integration
- Data and Information management
- Public context

As a long term strategy, governments are heavily investing in educating and training its citizens towards adopting technologies that can be related to Industry 4.0. Access to qualified workers has been the main barrier to not implement Industry 4.0 related technologies according to some researchers (Aulbur & Bigghe, 2016). Those countries that do not do it, will be lacking behind in the future (Wobeto et al., 2018).

Unfortunately, some emerging countries are still discovering the Second Industrial Revolution, given that the access to electricity is still limited or non existing at all. And those

who do have access, might not have started experiencing the third industrial revolution as they do not have access to internet yet (Anggusti, 2019). Sadly, it seems that emerging countries will have difficulties to adopt Industry 4.0 related opportunities as the main foundations for it to develop are not in place (Dalenogare et al., 2018)

The countries that are at the forefront of innovation in manufacturing or industrial sectors, are usually countries where democratic principles have long existed and the government has worked for years on developing plans to foster innovation (Shyu et Chiu, 2002). Governments in order to keep a dynamic economy, need to vividly promote the diffusion of science and the generated knowledge by research centers. Additionally, they can play a key role for regional collaboration by promoting policies that can help generate environments where private firms can collaborate within a healthy framework of competition (Kuo et al., 2019).

In order for innovation to flourish in the context of Industry 4.0, new ways of engagement among the stakeholders of the value chain must be created, generating ecosystems that are open and interconnected through strategic partnerships (Bachtler et al., 2017). The truth is that innovation and new knowledge will most effectively come when different actors come together instead of relying on a single organization (OECD, 2016; 68). The generation of these spaces will be more fertile when the agents that come to it have the capacity to cultivate relationships both regionally and internationally (Amison & Bailey, 2014)

One key element the Industry 4.0 provides is the Data that is being generated. It can provide very valuable information, can help in manufacturing processes to predict, improve or correct (Osterrieder et al., 2020), as well as generate new incomes as other services that add value can be provided (Weking et al., 2020). That is also why is being considered the new gold or oil. However, companies and governments have very different manners and policies to manage it and for some it is becoming a new source of income influencing in the business model innovation (Frank et al., 2019). Keeping this in mind, it is important to reach certain standardization on the automation equipment as well as the digitalization of factories, so that the generated data can be compatible and readable across the entire supply chain.

The adoption of the new emerging technologies makes sense only if the way companies work evolve too, as the new Industry 4.0 technologies also require new way of working. It will be highly important that agile and smart production processes are also implemented within the entire value chain, a skillset development that could be promoted by policy makers.(Calabrese et al., 2020).

As users can be a tremendous source of innovation, services can be created from the relationship built between the suppliers and consumers through the collaboration among the two (Vargo et al., 2008). Today a customer interacts with a brand in the digital, social and physical dimensions, delivering memorable experiences that aim a long term engagement (Lemon and Verhoef, 2016). Therefore, the latest trends suggest that customization is a highly valued feature by customers and industry 4.0 will help towards that.

2.8 Region where the research takes place: Context and background of the Basque Country

The Basque Country or officially The Basque Autonomous Community is a region and an autonomous community in northern Spain. It got granted the status of nationality within Spain through the Spanish Constitution of 1978. Its foundations are based on the Statute of Autonomy of the Basque Country, a document that provides legal framework of co-existance of the Basque people in Spain.

With a bit over 2 million citizens, its GDP exceeds 74 billions € and it's the 5th largest economy within Spain. When it comes to GDP per cápita, in 2019 it was 34.142€ per citizen, whereas on average in Spain was 23.690€ (Expansión, 2021). Both Basque and Spanish languages are official languages in the Basque Autonomous Community.

FIGURE 156:
Basque Country
Source: New Media Services Inc.

Historically and economically speaking, it has been a region where the industrial sector has developed together or not much later that in other leading regions of Europe. Organizations that work towards human and regional development such as the OCDE, know well and manifest that the Basque Country is a successful model of sustainable development (OECD, 2011, p. 42).

Since 1939 until 1975, Spain was isolated under the dictatorship of Francisco Franco, who strongly limited both social and economic development of entire the country but strongly the Basque Country. After the approval of the new constitution of 1978, the Basque Country through the Basque Government did tremendous work on setting up the foundations of the new emerging liberal era.

1980's were turbulent times in the Basque Country. There was a tough economic, social and political crises. The unemployment was of 25% and there was a collapse of basic industries. Infrastructures were obsolete and there were no industrial policies, but it was when the Basque self-government started to emerge and started to collaborate hand in hand with the private sector.

According to Markuartu (2015), economist and former president of the Basque Country, the 1980's Basque economy underwent through a process of integral restructuring. It was the moment when Basque industry started to look for opportunities in the global market as they felt they had both the technical knowledge to develop and capacity to deliver solutions to customers worldwide. It was the decade when the Basque industry started to "Learn to compete" by competing with other countries and companies both in quality and pricing, as well as developed a national knowledge transfer system. The 1990s served as the era to "Learn to compete and cooperate" in a global market by competing and helping other firms of the Basque Country, through cluster creations and collaborating for mutual benefits. The 2000s instead served as the era of "Learn to innovate in cooperation", where various companies would come together to develop offers collaboratively for third companies. This entire development lead to the Basque Country to reinvent itself. In 30 years the GDP grew above EU and Spain's average, 75% of production was exported and 50% were medium/high technology products. Adding to that unemployment diminished dramatically: 25% in the 1980s, 6% in 2008 and even 14% in 2013 after the global economic crisis. It also became the first economy in the Spanish State and among the leading region in EU in terms of incomer per capita.

The Basque Country in terms of development has become referent mainly due to three ingredients. On the one hand, from the socio-economic standpoint, the cooperative group MONDRAGON has become one of the best example of worker owned business in the world. Secondly, from the urban reality, the regeneration that has taken place in the city of Bilbao through the starting point of building the Guggenheim Museum, can be compared to any large city of Europe. Last but not least, from the cultural standpoint, the defense of the historical Basque Language and conservancy of the Basque heritage have made this region referent in the world (Markuartu, 2015).

It is important to highlight that the foundations of what we know today the Basque Economy were stablished in the 80's. Reagan's and Thatcher's perspectives were globally the most admired ones, where driven by neo-liberal ideas they promoted: (i) it was not going to be possible to become a referent economy through manufacturing (ii) industry should be shifted by services (iii) services offered by the state involved too high costs and low productivity, therefore key infrastructures needed to be privatized (Morgan, 2016). The Basque Government at the time identified the strengths the Basque Country had and tried to leverage its value proposal, which couldn't go more against the driving strategies of Reagan and Thatcher. Having present the decline of steel and shipbuilding industries and the unemployment rate that could generate, the Basque Government acted twofold: focus on modernizing the manufacturing sector and reimagine the politics and programs for a balanced socio-economic development based on solidarity (Cooke & Morgan, 1998; Valdaliso, 2015).

Internal industrial modernization balanced with cultural values and social development was

the only available path, as foreign investment was nearly impossible to obtain due to the ongoing violent scene.

Markuartu (2015) sums up the following way the radical transformation the Basque Country has had during 30 years (1980-2010) and considers it as referent model for Sustainable Human Development, outlining it the following order:

1. Building the concept of national identity
2. Shared public-private leadership
3. Commitment to the real economy
4. Economic growth hand in hand with social balance
5. Self-governance

Markuartu (2015) also argues that the defense of the Basque identity, culture and language is not only a political fact in todays globalized world, it is essential for the achievement of a successful Sustainable Human Development context in any given region. Helen Clark (2013) from her role at the United Nations Development Program, she highlights that Culture is a vital aspect of human development. To live a live they appreciate, people must feel free to choose their identity, and therefore define who they are.

NESTA, UK's innovation agency for social good published in 2014 a report (NESTA, 2014) that aimed to model the lessons learned by highly-innovative smaller countries. The identified countries were: Finland, Estonia, Singapore, Israel and the Basque Country. The report highlights that simply being small does not guarantee success, and that each of these regions have done their work and not copied the strategies larger counterparts developed. In the research work five themes emerge:

1. The importance of downstream innovation
2. Openness to the world
3. A sense of national mission
4. A government whose wider policies support innovation
5. Strong but flexible institutions that back up all the principles stated above

The financial crises that started in 2008 and lasted approximately until 2014 and the more recent COVID 19 pandemic have also influenced both the global and Basque economies. Partly influenced by that, the Basque Government has had the need to review its regional budget for innovation, leading into a budget reduction as well as aiming to make it more effective (Morgan, 2013).

Beyond budget constraints, some researchers concluded that more could be accomplished with less resources. Even though that the Basque entrepreneurship model is promoted as "collective entrepreneurship", one key conclusion is that the interaction and collaboration among the different actors needs to improve (Orkestra, 2013, p.86). "Collective Entrepreneurship" refers to a model where public and private sectors operate in a coordinated manner benefitting both ends and companies sit together to explore solutions to similar challenges they might be facing (Morgan, 2016).

It must be acknowledged that few regions have invested both financially and people wise as much as the Basque Country in building a region capable of generating an innovative ecosystem that fosters collaborative learning. It is also true that there is a history of collaboration and geographic proximity that facilitates the process.

Research mentions that in the long run it is essential to diversify into new activities and sectors building on its existing knowledge base. On top of that, to increase the effectiveness of knowledge sharing organizations need to connect and "see each other", but that process needs to be facilitated so that they can have spaces for co-learning.

For historical reason, Basque Country together with Navarre are the only regions that among the 17 existing autonomous communities in Spain operate under a model that is of almost near fiscal autonomy. In practice this means that both regions collect taxes and manage their own budget, negotiating the amounts every five years with the central government of Spain. This system helps to keep the generated wealth within its own region.

Since the end of the dictatorship era in the late 70's in Spain, the regional development of the Basque Country has been considered to be one of the most equal ones in term of social and economical balance. This development has helped it to be considered very inclusive and among the top in Europe when it comes to the GDP per capita as well as the lowest when it comes to the population that lives in poverty or risk of social exclusion.

The Basque Nationalist Party (PNV), has been the main governing party since the early 80's. Considered to have created rather liberal or right wing economic politics, combining with social politics, the region has aimed to be competitive on a global scale of the economy but socially inclusive when it comes to the local reality. These perspectives are not only embodied by the regional government but also from the local governments' standpoint.

Being autonomous from the fiscal perspective is not the only reason it has helped to become one of the referent regions in Europe. The pioneering cluster policy creation in the 1990s with the support of Michael Porter (Porter, 1990), has helped the Basque region to generate a solid multi-level governing system characterized by strong public-private collaboration. Although when it comes to territory development in the global scene each region has its particularities, this reality is pretty unique when it comes to the Basque region.

According to Dr. Caroline Gray and few other panelists taken place at an event at the Aston Centre for Europe and Foreign Policy Centre on November 29th of 2021, the following particularities of the Basque Country have helped to be where it is at the moment:

- **Financial model that is reliable and foreseeable for local government:**

This approach has helped the government to carry out social policies that aim for inclusion. Additionally, it has helped to build long lasting relationships among the different actors that aim for inclusive regional competitiveness.

- **Shared leadership and local perspective are key when it comes to strategy design and development:**

In the Basque Country, the leadership model that has unfolded for the strategy design and development, has been focused on working with actors and stakeholders from several levels. It has been seen that working with government from local municipalities and regions, as well as with other public and private institutions such as clusters and Basque technology centers, helps to build a strategy that responds to the needs of all the stakeholders. This approach requires new forms of leadership as well as innovative governance solutions that

involve decent amount of work in coordination.

- **Local and regional empowerment conjointly with responsibility:**

Having the burden to collect taxes, requires incredible accountability and good governance models in order to smartly and responsibly manage the collected funds.

- **Discover the area-specific strengths and deepen as well as diversify from there:**

In the early 80's, the Basque Country focused a lot on identifying which were the strengths of the existing industry and promote its economic transformation through it. This happened in an era when the political and academic reality was not the friendliest one. To focus on a positive industrial strategy has been the cornerstone, and it is still today, what helps the Basque Country to be a referent region.

- **Collaboration among the political parties in order to avoid short-term impact:**

On certain matters related to region's economic and social strategy, the support and collaboration among the different political parties has been critical in order to facilitate a long term planning and implementation. Additionally, the Basque National Party (PNV) has been the main party ruling the region since the 80's but has never really won elections by majority. In fact, most of the times has had to govern in coalition with the Basque Socialists.

- **Inclusive strategies for growth require the engagement of a wide diversity of actors and stakeholders:**

Its relatively small and manageable size both in population and territory extension have helped to build and implement its strategy for growth. However, it should continue developing alliances among the existing public and private sector, academia and civil society to add new actors and stakeholders that can better help on being a referent region on social innovation.

Through the work Porter and others did, Basque region and other parts of the world have been focused on developing an strategic focus on industrial "clusters" (Porter, 1990). Nonetheless, decade of late 2000s and early 2010s has ignited the need to update strategies and foster regional entrepreneurship and develop the required infrastructure and resources that could enable that. In this sense, multiple initiatives have taken place among OECD countries in the field of public policies that could enable the creation of ecosystems that would bring together publicly funded research and knowledge transfer initiatives, as well as programs to support entrepreneurship based on local capabilities and reality (Bradley et al., 2013).

It is important to recognize that these sorts of public initiatives have an experimental approach to it as they are constantly adapting and changing given the results and learnings they obtain as they go (Wright, 2014). An economic growth that is intensive in innovation drafts a very unique path in different markets as it might help to improve some regions but disadvantage others. These consequences are among the most worrying policy challenges for economies that subsist on industry (Rodríguez-Pose, 2018). This creates the question among the policy makers if the state can really provide innovation-intensive growth and how they can handle the social disparities generated as a consequence. When economic

competitiveness is promoted by the state has consequences in market dynamics, and that can generally bring socio-economical differences that can be more shallow or severe depending on the public policy that is adopted.

The Basque Country, Industry represents a very significant weight in the GDP. According to EUSTAT it consistently sustained at about 24.2 % in the period of 2015-2020 (EUSTAT, 2020).

2.9 Summing up the state of the art

The literature review carried out in the state of the art of this thesis aimed on the one hand to understand from the literature perspective the latest discoveries in the fields of entrepreneurship, Open Innovation, collaboration between Corporations and Startups, Innovation ecosystems and Industry 4.0 and on the other hand provide a theoretical perspective of the steps the EU has taken within these fields in order to provide solutions to some of the challenges turning into the new millennia has brought in.

The increase in the technology available and the growth of competition among the countries have pushed governments to support the modernization of the industrial sector and engage in the Industry 4.0 movement. However, the initiatives and strategies that each global region has followed varies drastically (Lin, 2015).

The European Commission with a wider vision and regional governments with a more local perspective, have explored new ways to embrace Open Innovation in order to leverage innovation performance. In fact, regions have been creating supportive platforms so that companies of all types could participate in a regional open innovation platform (Torkkely & Ahonen, 2007)

It is obvious that Open Innovation has evolved since its conception in 2003 and that it has taken very different paths. One of them, which is explored within this thesis, is the one related to innovation ecosystems, corporate innovation and new models of corporate accelerators where a large number of scholars suggest to explore new models of corporate-startup collaboration (Shankar & Shepherd, 2018; Richter et al., 2018; Moschner et al., 2019). Also, whether national culture plays a role was suggested to research.

Being aware of the radical changes and transformation Industry 4.0 has brought and will bring in, it has set governments and firms in uncertainty levels probably not known before (Andreoni and Chang, 2016). The increase in the technology available and the growth of competition among the countries have pushed governments where manufacturing sector is strong and public-private collaboration solid to support the modernization of the industrial sector and engage in the Industry 4.0 movement, bringing togetherness in public-private collaboration as it helps to reduce risks, share resources and evolve together.

To invest in policies and democratization of Industry 4.0 is indispensable (Kuo et al., 2019). Governments that targeted the innovation of the manufacturing industry have proved they can help to mitigate business challenges of firms (Brief, 2014) and engage leaders to take more risks to innovate (Yang et al., 2019). However, the strategies and initiatives each global region has pursued vary drastically (Lin, 2015).

According to Mariani and Borghi (2019), acknowledging that global competitiveness is obtained from productivity and efficiency, the manufacturing sector has been the pioneering in applying exponential technologies to their industry.

To strengthen national innovation ecosystem is what governments constantly aim for with the goal to increase the knowledge diffusion and implementation within the existing traditional industries and help in their development. It has been seen that when right policies and resources are placed for industry development it influences directly in the social

progress. According to Bachtler et al. (2017), governments should be able to capture trends from regional, national and international dimensions and create new environments where startups and corporations can interact on a regional level in order to radically shift supply chains, sectors and potentially markets.

The report of Digital Transformation of European Industry (EIT, 2021) highlights that for the industrial growth of the old continent, it might be relevant to create programs based on open innovation in order to catch up with the 4th Industrial Revolution. The European Institute of Innovation and Technology believes that this approach may bring endless opportunities as it will help match Europe's historical industrial strength with the opportunities new technologies bring. On top of that, one key characteristic of Industry 4.0 is that the value creation happens in co-creation with others (Weking et al., 2020).

Gimmy et al. (2017) argue that although the main model of collaboration between corporations and startups has been Corporate Venturing, it seems it does not reach its primary innovation objectives. Huang and Madhavan (2020) state that often the collaboration built between corporations and startups does not always benefit both parties in an equal manner, as corporations are often seen the most benefited ones.

Aggarwal and Wu (2018) reveal that the value creation takes place when the innovations of the startups are combined with the market expertise and consolidated assets of the corporation. Kohler (2016) identified that a corporation to fund a pilot project developed by a startup or to become customer of a startup can be a significant way to stimulate the collaboration between corporations and startups.

Gimmy et al. (2017) identified that startups require three ingredients to grow: Funding, Coaching and Clients. The first two can be offered by independent VCs but Clients can only be offered by Corporations and that is where their strength shines. This approach to collaboration was named "Venture Client" model and framed so that the startups that have market leading solutions can benefit from corporation as clients or clients of corporations who can purchase orders. This new approach has gained a lot of attention from startups as they can get paid for testing and validating their project in a real environment. Additionally, the collaboration can happen really fast as startups become suppliers of the corporation and is the best thing they can offer compared to other agents of the ecosystem. It is a model that allows to co-innovate with startups, but requires a shift in leadership teams' mindset.

Kupjuweit and Wagner (2020) mention that when a corporation becomes a paying customer for the startup, it helps grow and open to the market as it does to other suppliers.

Corvello et al. (2023) argue that startups usually aim for continuous learning, get a paying project and obtain a deal with a corporation that most likely will help in their brand and future opportunities with other companies. Having access to other skills that may not be within the team or equipment available within corporations' facilities are some other elements they may look for. Meeting up with other entrepreneurs or startup members is also one of the most valued ingredients.

During the corporate-startup or startup-corporate collaboration boom governments also wanted to have their say and started to create their own version of corporate-startup collaboration open innovation programs (Steiber & Alänge, 2020a, 2021). They wanted to

create the environment for startups to grow and existing firms freshen up. Funding the collaboration between the two aimed to contribute in the long run to the national economy as well as to its competitiveness within the global scene.

Although there have been very different approaches, how this governmental support benefits the society is hard to measure but might be relevant to understand the effects it may have had in the local or regional ecosystems (Steiber & Alänge, 2021). However, to understand the result and what triggered them from the learning perspective for all the stakeholders involved (Chen, 2015) might be most adequate framework when it comes to understanding publicly funded startup-corporate collaboration.

Corvello et al. (2023) suggest that the government supported programs of startup-corporation collaboration need to:

1. Be specific in a context
2. Have various recent program theories
3. Explore results from multiple stakeholders' standpoint
4. Keep a learning mindset based on cycles

Keeping in mind the work Gimmy et al. (2017) carried out under the concept of Venture-client model, within this thesis SPRI's BIND 4.0 program has been analyzed. BIND 4.0's project team has taken it into a new level and created a regional open innovation platform (Torkkely & Ahonen, 2007) by easening the collaboration between local corporations and startups from all over the world, aiming to consolidate the startups, freshen up the corporations and contribute this way to the national economy as well its competitiveness within the global scene (Steiber & Alänge, 2020a, 2021).

This approach in many ways reflects the national culture of public-private collaboration that has long existed in the Basque Country and within the coming chapter the objective is to:

- Better understand the motivations and characteristics that foster the development between startups and corporations.
- To value the degree of coincidence in the behavior of the theoretical proposals and the companies participating in SPRI's BIND 4.0 corporate-startup collaboration program
- Analyze a unique case that takes place within the Basque cultural and business context in order to contribute to the knowledge body.

CHAPTER 3

Methodology

3. Methodology

3.1 Foundations for the methodology

The research carried out by Richter et al. (2018) in their article “Outsourcing creativity: An abductive study of open innovation using corporate accelerators” and the methodology applied has been the main foundation for the research developed in this thesis, as they apply a research methodology to understand the features of several open innovation programs in the form of corporate accelerators.

Richter et al. (2018) in their work try to identify the key features of accelerators run within corporate contexts and evaluate how they were intended to function. A program evaluation framework was used to offer information for stakeholders (Chen, 2006) and had two main research questions:

- What are the essential characteristics of corporate accelerator programs?
- What is the program theory behind this approach to Open Innovation?

The researchers carried out a literature review as well as 22 semi-structured interviews with the key stakeholders involved in corporate accelerator programs (11 organizations, six accelerator program managers and 5 startups involved). Based on Chen’s (2006) and Pawson & Tilley’s (2004) work the authors suggest that Program Theory is suitable in the initial phases of program planning and implementation, and they apply that in order to provide accuracy on the features of corporate accelerator programs and model theoretically why some of the corporate innovation related challenges can be addressed this way. It can be considered as well that Program Theory also clarifies how an intervention in the format of a program can help on reaching to a concrete result. Pawson & Tilley (1997) argue that certain mechanisms and structures in given conditions can bring desired outcomes.

Richter et al. (2018) during the data collection of their work asked to participants questions related to: objectives to use the accelerator, how it worked from structure and process perspective and the offered/received resources. The obtained data was later classified within the key features of program management of taxonomy of Gomm (2000).

According to Gomm (2000), this way of theorizing is highly speculative, arguing that it can be wrong and that it can come with no much effort. However, Gomm (2000) suggests that theorizing is inevitable and that it should be published as soon as possible so that others can inspect and authenticate its credibility. Lastly, Gomm (2000) states that this way of modelling helps develop explanations of how things are connected and why interventions have effects.

The conceptual framework of Program Theory

Chen (2006) argues that when a key organization develops an intervention program, usually has preconceived ideas on how the program should be implemented and why it may work. Program Theory contains a list of assumptions identified by an organization about what actions might be needed to solve a challenge and why the problem may respond to these actions (Chen, 2005). Program Theory can be considered the organization’s or

stakeholders' theory. Chen (2005) offers a conceptual framework for program theory that is helpful when facilitating stakeholders' clarification of their program theories.

Chen (2006) suggests that a Program Theory consists of an action model and a change model:

1. The change model consists of:
    - Intervention: Which consists of a set of activities that aim to change the determinants and outcomes.
    - Determinants: Mechanisms that conciliate between the intervention and outcomes
    - Outcomes: Refers to expected effects of the program.

    The change model gives for granted that when the intervention takes place it will affect the determinants, which consequently will shift the outcomes.

2. The action model consists of six components:
    - Implementing organizations: Responsible to organize staff, arrange resources, coordinate activities to implement a program.
    - Program implementers: The team responsible for delivering the services.
    - Associate organizations and community partners: Programs often require cooperation from the implementing organizations or community partners.
    - Ecological context: Programs often may need support from their environment, such as social supports or norms to ease the success of the program.
    - Intervention and service delivery protocols: A document that defines all the characteristics of the activities of the intervention and a step-by-step protocol to deliver the intervention.
    - Target population: The people that the program is intended to serve.

The action and change model are very linked to one another and are fundamental for the success of the program. First of all, a change model helps to select an intervention to achieve the objectives and lays the foundation to frame the action model. Secondly, the action model creates a framework to program activities that will ignite the change model and ultimately achieve the program goals.

3.2 Methodology for this thesis

Keeping in mind that the BIND 4.0 was designed and launched as a program with the goal to provide answers to pre-identified challenges, the theoretical framework applied in the research is Program Theory (Chen, 1990, 2006; Pawson & Tilley, 2004), also named as Program Logic (Funnel, 1997), Theory-based Evaluation (Weiss, 1998), Theory-driven Evaluation (Chen, 1990), or Program-theory-driven Evaluation Science (Donaldson, 2005). This theoretical framework reveals how by implementing a program in a specific context can help to shift from a given scenario to another one. In this case it would mean that in a scenario where radical innovations are being developed by startups rather than large

organizations but startups struggle to consolidate and grow, explore how a program could mediate and change that.

Astbury and Leeuw (2010) state that “For the theory-driven evaluator, programs are embodiments of theories in at least two ways. First, they comprise an expectation that the introduction of a program or policy intervention will help ameliorate a recurring problem. Second, they involve an assumption or set of assumptions about how and why program activities and resources will bring about change for the better.” (p.364)

Additionally, building on Chen’s suggestion (2015), the key features of this publicly run program has been carried out from all stakeholders' perspectives and learning standpoint. When mentioning multistakeholder, it means all the agents that are involved in the program: startups, corporations and SPRI as the organization that promotes it. This has been done considering the diverse nature of each stakeholder.

The research model aimed to understand and critically assess how the BIND 4.0 program intended to function, as well as its key features and particularities. However, it did not aim to measure satisfaction rates, achieved outcomes or effectiveness.

Using a program evaluation framework, which is a methodological approach, the aim was to provide information based on a specific taxonomy to identify the action model of the BIND 4.0 program (Chen, 2006). Also known as program features, a standard taxonomy for programs that covered strategy, resources, procedures, structures, the environment and metrics were used (Gomm, 2000).

On the other end, the change model is the foundation to develop the action model. Based on the hypothesis identified in the change model, there will be interventions included in the action model, an effect usually expected to happen assuming that a contribution will create a desired scenario. Understanding the features of BIND 4.0 program will help understand what drove its implementation and how it will contribute to the opportune outcome.

According to Pawson & Tilley (1997), specific mechanisms in given conditions may drive to the creation of a pertinent scenario. Mechanisms “describe what it is about programmes and interventions that bring about any effects” (Pawson & Tilley, 2004, p. 6) and they are real and objective, they act beyond the beliefs of individuals (Bhaskar, 1978). Mechanisms of a program “thus explicate the logic of an intervention; they trace the destiny of a programme theory, they pinpoint the ways in which the resources on offer may permeate into the reasoning of the subjects” (Pawson & Tilley, 2004, p.7)

Often, these mechanisms are observed by its effects instead of looking into them directly. This means that the usual “observability criterion” of empiricism does not apply. If willing to research the effects, we must implement procedures that allow us understand causes we do not directly encounter.

When theory building, they are usually fed from phenomena and need to be understood observing and interpreting in a new conceptual framework (Eastwood et al., 2014, p.3)

The Chen (2006) explication of the change model as “Intervention-Determination-Outcome” to prove how the different parts of the BIND 4.0 program (Strategy, resources, processes)

worked was useful. On top of that, it can be considered that it will be taking place due to certain organizational mechanisms (leadership, trainings) that confidently will improve corporations' innovation capacities and startups' development (improvement of innovation culture or improvement of the branding of the startup among others).

Within this thesis, state-of-the-art literature and data from interviews, to outline the mechanisms that an intervention might be based on was collected. On top of that, Gomm's (2000) taxonomy has been used to frame the particularities of the BIND 4.0 program.

Collection of data and analysis

For the data collection, the first three editions of BIND 4.0 were analyzed. As seen in the image below, it can be identified in each of the edition: the number of startups that have applied to participate (Applying startups), the number of corporates who are ready to work with startups (Corporations as partners), the number of startups that get selected to participate and close a contract (Participating startups), the number of actual projects carried out between startups and corporations (Industry 4.0 projects developed)

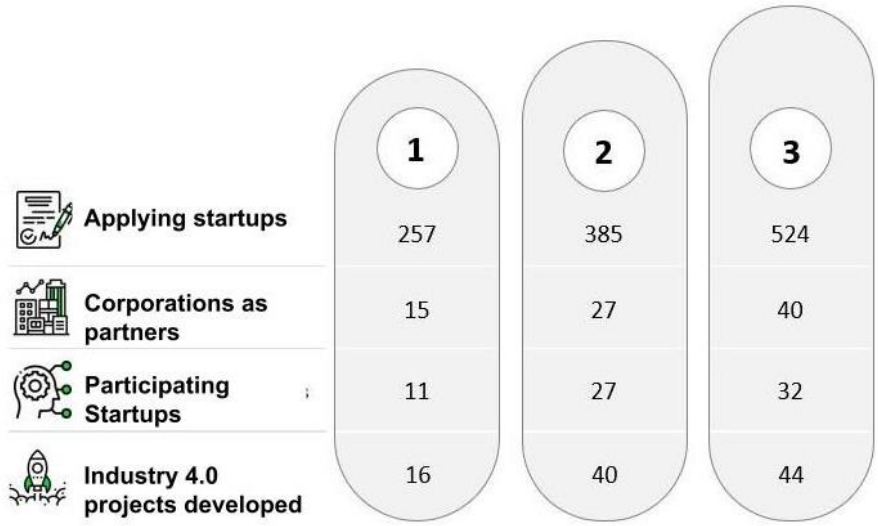

FIGURE 17:
Startups and Corporations participating during the first 3 editions of BIND 4.0
Source: BIND 4.0

Aside of the literature review, 8 corporations and 8 startups participants of the first three editions of BIND 4.0, as well as its project leaders were interviewed. Interviews lasted from 30 minutes to 90 minutes.

TABLE 6:
Interviewed participants
Source: Own creation

Interviewed participant	Role within the organization	Type of organization	Industry	Number of Employees	Province
1	CEO	Startup	Software Development & VR	4	Araba
2	CEO	Startup	Data Analytics	2	Araba

3	Project Manager	Business Incubator	Business Incubator	2	Gipuzkoa
4	Founding Partner	Startup	Data Analytics	4	Bizkaia
5	CEO	Startup	Data Analytics	4	Bizkaia
6	Service Manager	Startup	IT solutions	2	Araba
7	Industry 4.0 Lead Researcher	Corporation	Automotive Industry	3500	Gipuzkoa
8	Public Administration Project Manager	Corporation	Automotive Industry	40	Bizkaia
9	Co-founder & Managing Director	Startup	Networks & IT solutions	3	Bizkaia
10	Knowledge and Innovation Chief Officer	Corporation	Automotive Industry	1200	Bizkaia
11	Automation & ICT Researcher	Corporation	Manufacturing Industry	1400	Gipuzkoa
12	Managing Director	Business Development Center	Cooperative Association that operates in Finance, Industry, Retail and Knowledge.	70	Gipuzkoa
13	Factory Manager	Corporation	Biomedicine	400	Araba
14	CEO	Startup	AI & IT Solutions	12	Gipuzkoa
15	Corporate Development	Corporation	Mobility	13	Gipuzkoa
16	CEO	Startup	IT solutions	16	Nafarroa
17	Head of Digitalization	Corporation	Energy	24.5	Bizkaia

Within the interviews, questions that would help frame the Strategy, Resources, Procedures, Structures, Key roles, Environment and Metrics of each organization were asked (Gomm, 2000). The collected data was transcribed and analyzed through the Atlas TI software.

Atlas TI is a leading Qualitative Data Analysis (QDA) software that offers a wide range of tools to organize all the text data obtained through the interviews. Through an in depth analysis of the interviews in the ATLAS.TI platform, meaningful information has been highlighted in quotes, these quotes have been labeled through codes and lastly displayed in networks. As the questions carried out to both Startups and Corporations were the same, the generated codes come together in the same network.

After identifying the main features of each field, some key findings were outlined and will be described in the next chapter.

TABLE 7:
Research Summary
Source: Own Creation

Research objectives	1. To understand the motivations and characteristics that foster the development of relationships between startups and corporations.
	2. To analyze a unique case that takes place within a concrete geographical, cultural and business context in order to contribute to the knowledge body.
	3. To value the degree of coincidence in the behavior of the theoretical proposals and researched companies within the field of open innovation and corporate-startup collaboration.
Research questions	What is the underlying reasoning, or "program theory" behind this approach to open innovation?
	What are the essential and non-essential features of this particular public-private accelerator program?
Methodology for the research	Through a program evaluation framework the aim was to provide information based on a specific taxonomy to identify the action model of the BIND 4.0 program from a multistakeholder perspective (Chen, 2015). Also known as program features, a standard taxonomy for programs that covered strategy, resources, procedures, structures, the environment and metrics were used (Gomm, 2000).
Sample	1. Exploratory study within the firms that have participated in the first 3 editions of Bind 4.0 program
	2. An in depth interview with the coordinator of the BIND 4.0
Methods to collect evidences	1. Internal: Documentation (reports and internal studies), files (websites, slides, images and sound), in depth interviews (questionaries)
	2. External: specialized journals, SPRI and BIND 4.0 websites, official organizations.
Key information sources	1. Exploratory study
	2. In depth case studies: At least 1 person per organization (CEO or Innovation Director)
Methods to analyze evidences	Qualitative through ATLAS.TI Software:
	- Identification and structural classification of strategical dimensions
	- Search of key explanatory facts (theoretical proposals)
	- Search of patterns that reflect shared behaviors (theoretical proposals)
	- Creation of theoretical explanation (theoretical sistemic comparison)

	- Identify causal relationships (if possible)
Scientific Focus	Search of transferable elements versus the representability
	Analytic induction based on the logics of replicability
	Deductive processes given that everything starts from theoretical proposals that come from reviewing theories
Rigour and methodological quality	- Validity (constructive, internal and external)
	- Relyability
	- Consistency (theoretical - interpretative & contextual)

CHAPTER 4

Results

4. Results

4.1 Introduction

Within this chapter main results of the fieldwork as well as some unanswered questions will be outlined.

The research has been completed in four different stages:

1. First of all, this work explores the literature available in the field of Entrepreneurship, Open Innovation, Ecosystems, The collaboration among Start-ups and Corporations and the evolution the 4th Industrial Revolution or Industry 4.0 has been experiencing.
2. Secondly, several meaningful initiatives were identified globally and guided by professionals in the field, it was considered that the BIND 4.0 program was one of the most ground-breaking program for Startup-Corporation collaboration in the global scene. Given its nature of public-private collaboration, access to working with leading corporations in a specific industry and region as well as the support provided to startups made it worth analyzing it.
3. Thirdly, a research plan was designed through case studies and a Taxonomy of Gomm (2000), where 17 participating agents from the first three editions of BIND 4.0 were interviewed: 8 Startups and 8 Corporations, as well the project leader of BIND 4.0.
4. Last but not least, all data obtained from the interviews has been analyzed through ATLAS.TI (qualitative data analyzing software) in order to uncover all the insights obtained from the fieldwork and a comparison has been made with the literature available within the topic.

The coming chapter will be focused towards analyzing what was found, what was not found or what was found that was not expected from the fieldwork.

Following the Taxonomy of Gomm (2000), the discoveries from the field of Strategy, Resources, Processes, Structures, Roles and the Environment will be highlighted.

4.2 Strategy

Which have been the main drivers to take part in the BIND 4.0 program? To which strategy of the organization does it answer to participate in the BIND 4.0 program?

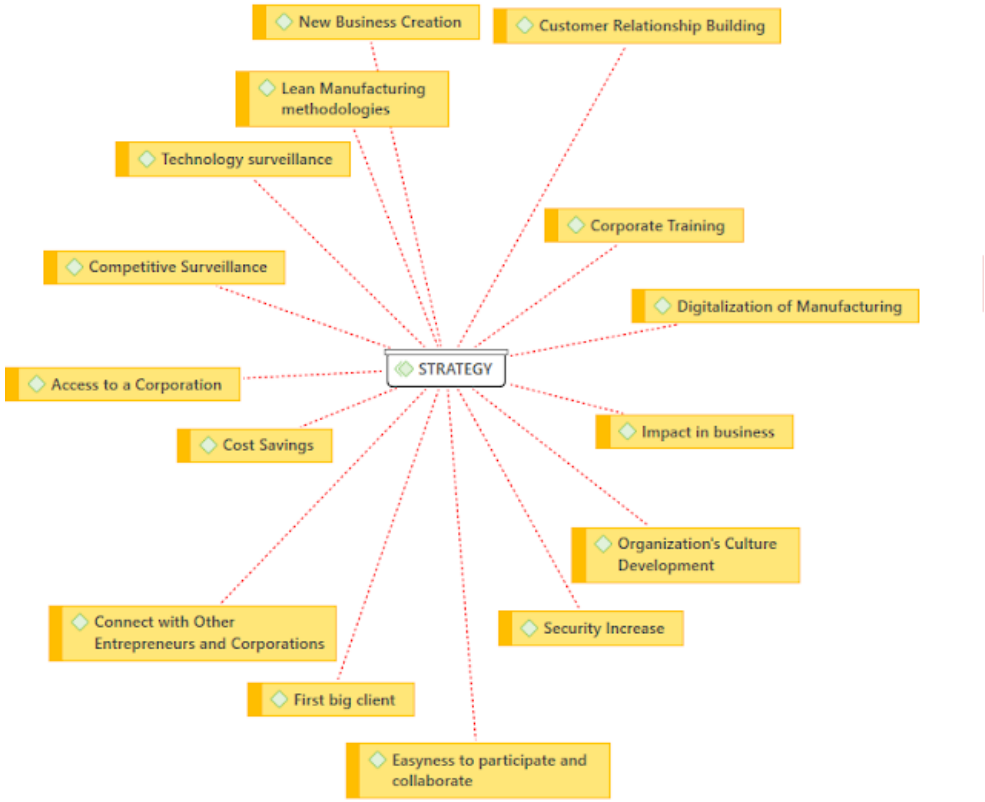

FIGURE 18:
Strategy
Source: Own creation through the ATLAS.TI software

When it comes to **Corporations**, the following reasons were the main drivers to participate in the program:

- Technology Surveillance: to understand what new technologies might be available to improve corporations' value creation process.
- Competitive Surveillance: to understand what technologies might disrupt the value proposal of the corporation and it's worth understanding.
- Lean Manufacturing methodologies: to develop a manufacturing culture that is based on trial, error and learning.
- Corporate Training: by inviting startups to work in house creates the opportunity for the technicians of the corporation develop a working attitude that is more entrepreneurial and for the startup to know more about the sector the corporation operates at.
- Digitalization of Manufacturing: Incorporate Industry 4.0 related technologies in their manufacturing processes.
- Impact in business: Incorporate Industry 4.0 related technologies so that it helps reduce manufacturing costs and improve business results.
- Organization's culture Development: Having members of the startup visiting the premises of the corporation helps to develop the working culture of the corporation.
- Security Increase: Incorporation of new cybersecurity related technologies as Industry 4.0 involves connectivity (IoT) of elements and machines of the manufacturing chain.
- Easiness to participate and collaborate: to engage and work with startups is easier thanks to the framework BIND 4.0 program offers as it speeds up bureaucracy.
- Connect with other Entrepreneurs and Corporations: The pitching events enable the

opportunity to connect with representatives of other corporations and meet up with startup founders.
- Cost Savings: The work with the startups and implementation of new Industry 4.0 related technology reduces manufacturing costs.
- New business creation: The work with startups helps to identify the development of new technologies.

When it comes to **Startups,** the following concepts were the main drivers to participate in the program:
- First big Client: The opportunity to work with a corporation and under a paid contract that opens the doors from the branding standpoint for future opportunities.
- Access to a Corporation: The opportunity to work with a corporation and implement a solution in a real environment. Also, prior attempts to connect with a corporation would lead to no much results whereas BIND 4.0 became a highway to connect with representatives of corporations who lead the way to a collaboration.
- Customer relationship building: The opportunity to validate and grow as a startup through the work developed for the corporations of BIND 4.0 as they became the first customers.
- Connect with other Entrepreneurs and Corporations: The opportunity to get to know different professionals from both corporations and startups.

The reason or strategy for which a corporation or a startup may take part in the BIND 4.0 program is very different.

Most of the startups shared the same reason to participate in the program: work with a big client (corporation) that provides the opportunity to work on a concrete challenge and get paid for it. Additionally, it helped to get the needed credibility and brand to work with other corporations in the future.

One relevant discovery throughout the interviews was that prior to the participation in the BIND 4.0 program startups would try to open conversations with corporations but in most cases would not lead to much. They would often found difficult to contact the right person of the corporation to open up the first conversation, or even gain the needed trust to explore opportunities of collaboration.

However, the participation in the program would lay the right foundation for the corporate to trust the startup and engage to work together on a concrete case. The pitching events would often serve as the space where startups would pitch their capabilities and audience would be filled with responsibles of corporations with concrete needs. This environment would ease the opportunity to frame an opportunity of collaboration and also unfold that for future deals would make more sense to approach via the manufacturing or business development departments.

This discovery in certain way provides a contradictory result as in most of the cases the person participating in the pitching from the corporation side would be the innovation director.

The process of becoming supplier of a corporation is usually burdensome and in most cases the participation in the program would save the startup from facing the usual bureaucratic

work to become supplier of the corporation. Adding to that, as a requisite of the program, every contract signed through the BIND 4.0 needed to be economically recognized by the corporation.

On the other hand, the main reason for the corporations to participate was twofold:

- For competitive surveillance: what could be done better, faster, cheaper and with which technology within the corporation's value creation process
- For market surveillance: what technologies from other sectors could disrupt the market where the corporation operates and needs to be introduced in the value creation chain.

Surprisingly, one corporation (a cooperative) went beyond the work in the specific project and saw the opportunity to develop an entrepreneurial culture within their own teams as they would often invite startups to work physically within the premises of the corporation hand in hand with the factory employees. Startups would also find this collaboration and way of working optimal. In certain way this also goes aligned and reflects the cooperative principles.

Except for Interviewee number 12, none of the corporations had the preconceived idea to invest in the startups, it was driven more towards the development of a supplier-customer relationship. Interviewee number 12 would act more as connector between the business group and the startups, connecting needs of different businesses with the offering of startups and possibly investing on them in the long run.

4.3 Resources

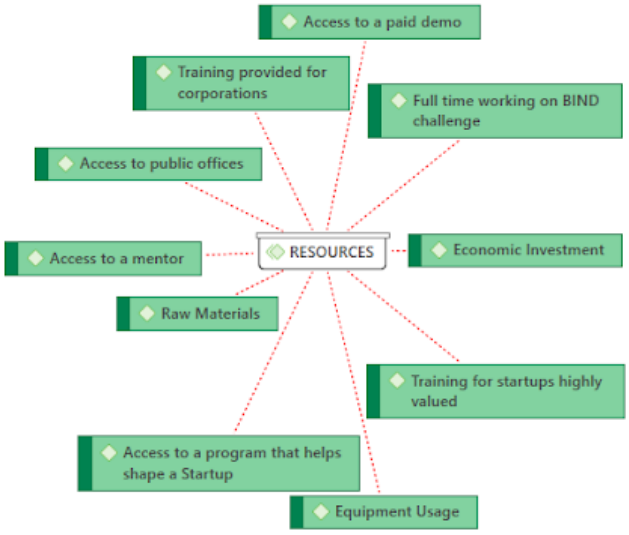

FIGURE 19:
Resources
Source: Own creation through the ATLAS.TI software

Which have been the resources invested from the organization and offered from the BIND 4.0 to participate in the program?

When it comes to **startups**, the following resources were identified:

- Access to a paid demo: The startups would get paid by the corporation to implement their solution, the average contract being of 42.000€ according to BIND 4.0's website.
- Access to a program that helps to shape a startup / Training for startups highly valued: The startups would get to participate in an acceleration program that helped shape the startup through the different trainings.
- Access to a mentor: High impact mentoring was offered from the network of mentors of BIND 4.0.
- Access to public offices: Most of the startups were in the BIC business incubation centres of SPRI or would get access to it through the program.
- Full time working on BIND challenge: Startups would usually devote 100% of their time during the implementation phase, usually from January to June.

When it comes to **corporations**:

- Economic investment: The corporation would pay for the development of the solution to the startup, average contract being 42.000€ according to BIND 4.0's website.
- Equipment usage: The corporation would allow the startup to have access and use their technology and machines, which would be essential to validate their solutions as they should be able to integrate it within the entire value chain.
- Raw Materials: The corporation would provide access to raw materials so that they could be processed in machines where startups' solutions would be implemented.
- Training provided for corporations: BIND 4.0 provided different trainings related to trends in the sector as well as know-how on how to work with startups.

When it comes to startups, to have a concrete challenge to work on in a given timespan and economically recognized on a contract was the resource that startups most valued. Secondly, the mentorships were also of tremendous value and general training on a third position as nice to have. Generally speaking, the participation in the BIND 4.0 program from the startup standpoint would include various members of the team as many would attend trainings, mentoring sessions, meetings with corporation and participation in events. They also suggested that the BIND 4.0 program helped shape the startup through the multiple ingredients that were being offered aside of the project they work on.

During the interviews it was identified as well that most of the startups were already part of the SPRI ecosystem as vast majority of them have their headquarters in BIC's offices, incubators run by SPRI. Additionally, those startups that were closer to Mondragon also had access to resources and ecosystem of Mondragon through the Garaia Innovation Centre as well as Mondragon's Business Development Centre.

Each of the startups would close contracts with deals between 15.000€ and 120.000€, average being 42.000€ according to BIND 4.0's website. Startups believed that quantities were tight but enabled the portfolio creation and would challenge the startup to deliver good work. However, not everyone felt comfortable talking about the specific amounts and when it comes to this research it was not possible to get the information of all the contracts closed.

On the other hand, according to the interviewed corporations it would usually each invest between 25.000€ and 30.000€, and could lead to more depending on software licences. Usually that would be the starting point. These numbers in certain way provide contradictory results, but being frank it seems they did not feel comfortable or open talking about the amounts.

During the interviews it was identified that the working hours from both members of Startups and Corporations were not truly measured. Some startups would be working full time in a concrete project for a corporation during the 6 months or so of the lasting of program and it became hectic for the corporations specially during the week where startups would pitch.

4.4 Procedures

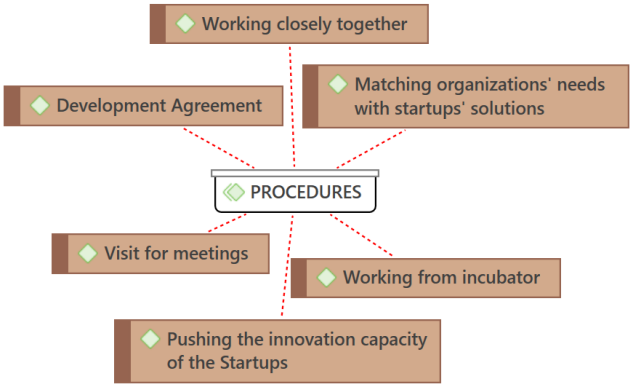

FIGURE 16:
Procedures
Source: Own creation through the ATLAS.TI software

Which have been the applied procedures during the participation? (Methodologies, trainings, habits, follow up methods…)

When it comes to **startups**, the following procedures were identified:

- Working from incubator: Most of the startups would work from BIC's business incubation centres

When it comes to **corporations**, the following procedures were identified:

- Development agreement: The corporation and startup would create a working plan so that the solution would be built for the Demo Day.
- Working closely together: Corporations often prefered to work closely together with the startup although not always was possible as some were located abroad.
- Matching organizations' needs with startups' solutions: Corporations often prior to getting to know startups would do an internal work on identifying needs. Having that in mind they would participate in the different pitchings with the goal to identify solutions that could answer organizations' needs.
- Pushing the innovation capacity of the Startups: Corporations would often challenge startups to solve challenging problems of the corporation in order to foster their

innovation capacity.
- Visit for meetings: Corporations and startups would have regular meetings to follow up the work developed.

When it came to startups, it would usually be various members of the startup who would benefit from the ingredients of the BIND 4.0 program: work with clients, mentorships, trainings and events. Aside of the concrete project to work on during a timeframe that would end on a Demo Day, mentorship was also very valued element.

When it came to Corporations there would usually be someone who would identify the needs within the corporation and based on that would attend certain pitchings or others, with the goal to identify the startups that could truly answer the needs of the corporation. In the case of corporation seeing the opportunity to identify a startup that could answer its needs, conversations would open and a framework within a contract would be landed.

Once the contract would be signed, except for cooperatives who would usually invite the startups to work in-house, there were not structured follow ups, meetings would be held every once in a while and the shared goal would be to have the project completed by the Demo Day.

A discovery that was not expected to find was the approach concretely a cooperative would have to work together with startups. As identified earlier, as part of the working culture of a cooperative, they would usually spend more time with the startups as their way of operating was to engage their employees and technicians with the members of the startup in order to develop a working culture that is more entrepreneurial.

Within corporations there would usually be someone (usually innovation or business development director) who identified and collected different needs within the organisation and having them in mind would take part in the pitching events, with the goal to identify the startups that could truly answer the identified challenge.

4.5 Organizational Structures

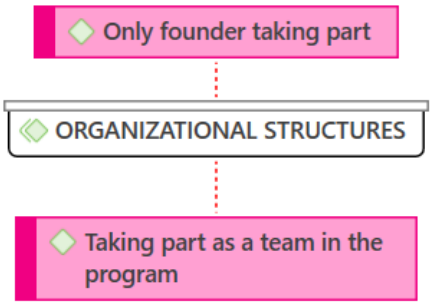

FIGURE 17:
Organizational Structures
Source: Own creation through the ATLAS.TI software

How has the participation in the program taken place?
What sort of structures or teams have taken part in the program?

When it came to startups, the following structures were identified:

- Only founder taking part: Only founder would take part in the program and meetings with the corporation
- Taking part as a team in the program: Different members of the team, or even all, participate in the trainings as well as in the meetings with the corporations.

When it came to corporations, the following structures were identified:

- Taking part as a team in the program: Usually the innovation director would be a shared member and cornerstone in the corporations participating in BIND 4.0 but other members participate as well depending on the moment, if the solution presented by the startup requires deep technical understanding (IT, engineering…).

When it came to startups, usually various members if not the entire team benefited from the BIND 4.0 program, through the exposure to work with clients, mentorships, training and events. They would strongly highlight the work with the clients. In the majority of the cases, the work on the project was carried out from the offices of the startup and only attend the facilities of the corporation for certain meetings. except in one cooperative where startups would usually work more time in house. However, in the trainings it would usually only the founders of the startup who would take part.

When it came to corporations, the participation process was more defined. The innovation director or business developer would identify the needs of the different teams, participated in the concrete pitches that could provide answers to the pre-identified challenges and open up the conversation with the startups.

4.6 Roles

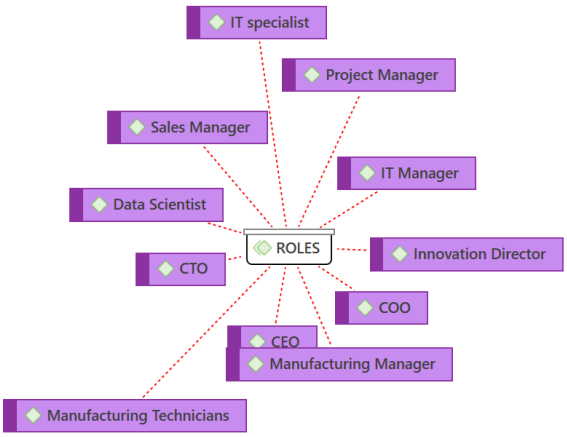

FIGURE 18:
Roles
Source: Own creation through the ATLAS.TI software

Which have been the different roles that have taken part in the program?

When it came to **startups**, the following roles were identified:

- CEO: Usually the founder or Chief Executive Officer represents the startup
- CTO: Chief Technical Officer has the deepest understanding of the most technical aspect of startup's solution
- COO: Chief Operating Officer who manages the daily operations of the company
- Sales Manager: Responsible for the sales of the startup
- Data Scientist: Designs processes to extract, analyse and interpret large amounts of data to take business related decisions.

When it came to **corporations**, the following roles were identified:

- Innovation Director: Responsible to understand and implement solutions that will help the firm continue innovating and engage startups of the BIND 4.0 to help them do so
- Manufacturing Technician: Help startup to implement their solution within the manufacturing process
- Project Manager: The person who makes sure that the startup's solution gets implemented within the corporation.
- IT Manager: The person that has the understanding of the IT ecosystem of the corporation.
- IT specialist: The technician that helps the startup implement their solution within the ecosystem of the corporation.
- Manufacturing Manager: The responsible of the manufacturing processes of the corporation who has the understanding where could the startup add value within the manufacturing process.

In the case of startups, it would usually be the CEO who would lead the startup as well as manage the relationship with the corporations. Also, the one that would take most participation in the BIND 4.0 program.

In the case of Corporations, generally it would be the Innovation Director who would lead the conversations with the technicians of different teams of the organization. They would also usually be the ones who would close the deal with the startup as well as make sure from start to finish the collaboration.

4.7 The environment

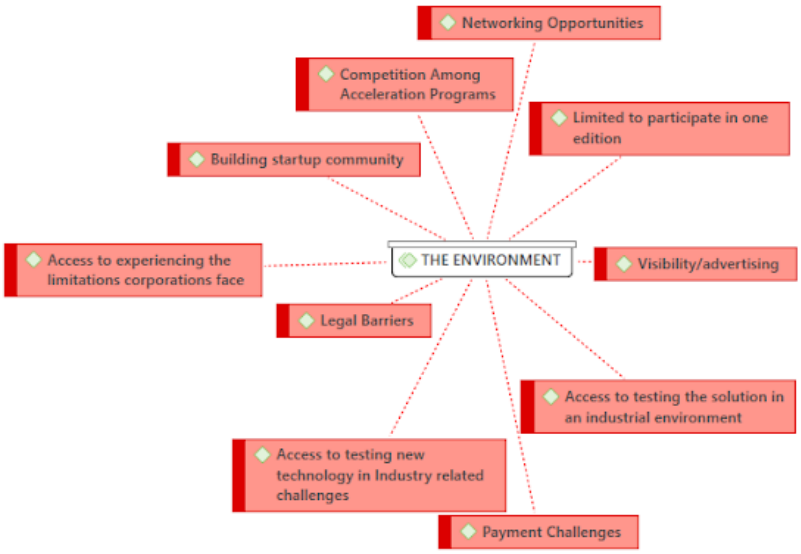

FIGURE 19:
The Environment
Source: Own creation through the ATLAS.TI software

Which might have been the environmental factors that may have helped or made the the process more challenging?

From the Startup perspective:

- Positive
  - Visibility/Advertising: Participating in the BIND 4.0 provided access to corporations who were willing to work with startups and first contract would build the trust so that others in the future could work with them.
  - Access to testing the solution in an industrial environment/Industry related challenges: The developed solutions would often be found in prototype phase and the opportunity to work with a corporation enabled the startup to validate the solution.
  - Building startup community: The startup members would get to know other entrepreneurs.
  - Access to experiencing the limitations corporations face: The startup members got to experience firsthand the technical limitations corporations face.
- Negative
  - Limited to participate in one edition: Startups could only participate in one edition of the BIND 4.0 program.
  - Building startup community: Startups missed that BIND 4.0 could put more

effort on cultivating the startup community.

From the Corporation perspective:

- Positive
    - Networking Opportunities: Corporations got to connect with other representatives of other corporations, understand challenges each faced and learn from each other.

- Negative
    - Legal barriers and payment challenges: The process of closing the contract between the corporation and a startup and for a startup to become a supplier of a corporation often took more time than both parties would wish, given the bureaucracy corporations often embody.
    - Competition among acceleration programs: Startups often participate in different incubation/acceleration programs at the same time, and that sometimes limits the opportunity to work hand in hand between the corporation and startup of those participating in BIND 4.0.

From the startup standpoint, the potential identified within the community of entrepreneurs was immense. In fact, some startups had identified opportunities to work together aside of BIND 4.0 program and develop projects in collaboration for a third party. The entrepreneurs interviewed from the first 3 editions of BIND 4.0 identified the need to dynamize the community of entrepreneurs as from their perspective there was no clear strategy in that sense. Or at least they did not find it. It was also mentioned that from their standpoint corporations were better taken care of by BIND 4.0 so that their participation in the long run would be guaranteed and future startups would continue benefitting from participating in the program. The competitiveness of the corporations and job maintenance was probably the main concern of the SPRI and some startups shared their concern on the fact that corporations would sometimes talk from superiority.

When it came to corporations, it was identified that once a corporation took part, there was no turn back and all would continue in future editions.

4.8 Metrics

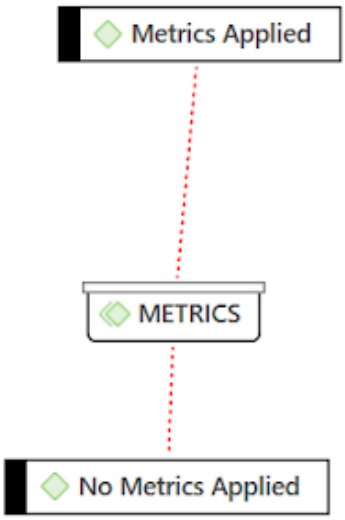

FIGURE 20:
Metrics
Source: Own creation through the ATLAS.TI software

Have there been indicators that have been measuring the work developed during the program?

From the startup perspective, no one would apply metrics beyond having the project complete by the Demo Day. However several mentioned that it would be beneficial and that they would need in the long run. On the other end, they mentioned as well that BIND 4.0 did not follow up on the development of the startups after the completion of the program.

From the corporation standpoint only three corporations (three of them being cooperatives) mentioned they had their own way to follow up the implementation of innovation and they were using the same model for the work carried out with the startups coming from BIND 4.0. This model was different for each of them but rest of the corporations did not applied metrics.

4.9 Validating results

After interviewing 8 startups and 8 corporations, an interview was carried out with the project leader of BIND 4.0. The goal of this interview was to validate and contrast findings discovered through interviewing corporations and startups of the first three editions of BIND 4.0.

Strategy

During the interview, it was identified that the Basque Government through the SPRI (Basque Agency for Business Development) and its BIC centers did an in-depth research on what were the latest trends that other regions around the world were carrying out in the

field of talent attraction and Industry 4.0. BICs are the business development centers that the SPRI runs in order to develop an ecosystem that helps startups get the skills, knowledge and resources needed to develop and grow.

Parallel to that, corporations located in the Basque Country who knew that BIC attracted and hosted startups, were getting closer to the business centers of BIC asking and curious about the solutions startups of their ecosystem were developing. On the other end, according to the findings of the project team of BIND 4.0 startups that were incubating in SPRI's centers were not in need for more funding, but it was access to market, having the chance to work with a referent corporation and the opportunity to try their solutions what they desired most.

It was within this space where global trends and corporations' and startups' needs came together to create a program named BIND 4.0, taking off in 2016. The organizing team's commitment was to equally help both to corporations and startups, and a Venture-client approach where a corporation hired the services of a startup with the purpose of getting a strategic benefit seemed to be the best way to serve the need.

Resources, Organizational Structures and Roles

The BIND 4.0 program provided the following resources:

- Two people working full time on it.
- The first edition was run on a budget of approximately 90.000€, and the 4th and 5th edition have a forecast of 600.000€
- Work with an agency for communication strategy development and implementation
- Training provided by experts and mentors.
- Tutor for each collaboration between startup and corporation who follows up the collaboration

Procedures

When it comes to conditions for a corporation to participate the following were required by the BIND 4.0:

- Having a branch in the Basque Country
- Provide employment at least of 250 people
- Address one of the following verticals: Advanced manufacturing, Energy, Health or Food.

Additionally, it was highly important that the corporation would pay for the work developed by the startup. And the work being developed by the startup to be something that would truly answers a certain challenge of the corporation. On the other end, the corporation would get 0 equity but the participation in the program would be free.

Each edition of the BIND 4.0 followed the same structure:

- PULL period usually from September until December, which consisted on:
    - Startups would sign up to participate in the BIND 4.0 program. The project team analyzed them depending on the degree of innovation, team, market introduction and customers and were ranked according to high, medium or low potential. Those on high potential directly participate in the pitching event

and the ones that fit in the medium category were passed along to corporations so that they could evaluate their interest on them. Those in low potential could not continue in the process.
    - Pre-selection of Startups: Those with highest potential according to the BIND 4.0 project team would go directly to a Pitching event where Corporations would also participate. Startups that would fall in the medium category would also participate in the pitching if a corporation saw interest in them.
    - The pitching process would usually last around a week and each day would be focused on a different technology: additive manufacturing, big data, cybersecurity…
    - The corporations would make a list with the top 3 startups based on the pitching events they participated at. These startups would be notified they were finalists and it would be then when the selected ones would start defining the work they could do for a given corporation. After these exploratory meetings it was then when a contract with the corporation would be closed.
- When a corporation closed a collaboration deal with a startup, they would communicate to the BIND 4.0 team and it was usually in January when the work would start and also the trainings and mentorings for the startups. When the work started there would be a technician from BIC who would follow up the collaboration between the startup and the corporation.
- The Demo Day would usually take place in the beginning of July.

Metrics

Metrics used were the following:
- Amount of startups signing up for each edition of BIND 4.0
- Amount of startups and corporations participating in the pitching week
- Amount of closed contracts.

Side notes from the interview:

Either in SMEs or Corporations one of the most difficult challenge would be to frame correctly the challenge, as the capacity of the startup to meet a challenge would often depend on that. Additionally, whether it came to corporations or SMEs, not all were evangelized on the opportunities that may exist within the collaboration between the larger organization and the startup and BIND 4.0's work was also often focused on that.

Although the project leader of BIND 4.0 mentioned that their ultimate goal was to equally support startups and corporations, from the interview it cannot be identified the work BIND 4.0 puts in looking after the entrepreneurs beyond the training programs. Additionally, some entrepreneurs mentioned that there tend to be some informal gatherings within the community of entrepreneurs but more effort could be provided from BIND 4.0's side to make it more enriching. However, most value highly the work BIND 4.0 project team puts in helping the startups to develop.

Future working opportunities that the BIND 4.0 foresees:
- Enable the startup-SME connection so that the solutions developed by startups can

also be implemented in SMEs and they don't lack behind in the 4th Industrial Revolution. That connection could be carried out through the clusters, traditionally a well stablished business relationship model in the Basque Country. This model would be slightly different as the operating model would be more based on identifying shared challenges in the clusters and develop solutions that could be implemented in several SMEs in similar way.

- Once corporations would start working with startups from BIND 4.0 the experience would be so positive that their will was to continue working with them in future editions. However, the collaboration with startups was easier said that done and therefore BIND 4.0 helped corporations through a methodology to create their own systematic method to work with startups. This new approach was being developed through a new program called BIND 4.0 +, which also aimed to create a community of corporations. In a nutshell, the purpose was to help the corporation to develop their own venture-client unit. It usually embodiedthree phases:
    - Awareness: Raise awareness among the employees regarding the challenges that might exist and see how by Industry 4.0 related technologies startups could help mitigate the challenges.
    - Training: Capacity building on what might be the best way for the collaboration between the corporation and startup to happen smoothly.
    - Implementation: Work on adopting projects and making them happen.
- Continues improvement so that the trainings and resources provided to startups could have more impact in their development.
- Global demand from multiple countries requesting opportunities to collaborate.

From the interview it can be highlighted as well that a lot of work was put on behalf of BIND 4.0 on generating trust among corporations so that they could trust the opportunity to work with startups could provide. Startups sometimes observe unlimited technical opportunities, but to translate these solutions to corporations usually encountered challenges related to both technology connectiveness and constraints related to culture differences.

Importance of the work startups do must impact in the business of the corporation. When reaching out to innovation departments, results and long term relationship building gets usually limited. The impact startups generate in the corporation must be quantified.

Corporations that were in the pitching sessions could also contact later the start ups and even explore opportunities of collaboration outside of the program. And foreign Startups may possibly set up subsidiaries in the Basque Country if the ecosystem provides opportunities.

CHAPTER 5

Conclusions

5. Conclusions

After a deep literature review when it comes to Open Innovation and Corporate startup collaboration, a unique case of corporate-startup collaboration program was analyzed. More concretely, a program that helps develop relationships between corporations and startups through public-private collaboration in a concrete geographical, cultural and business context that is the Basque Country.

Followed up by the literature review, 17 organizations were interviewed and the knowledge obtained was deeply analyzed, outlining a model based on the Taxonomy of Gomm (2000). Within the coming chapter each of the research objectives will be analyzed and some key conclusions will be highlighted.

The conducted research within this thesis aimed to:

1st Objective: To understand the motivations and characteristics that foster the development of relationships between startups and corporations.

2nd Objective: To analyze a unique case that takes place within a concrete geographical, cultural and business context in order to contribute to the knowledge body.

3rd Objective: To value the degree of coincidence in the behavior of the theoretical proposals and researched companies within the field of open innovation and corporate-startup collaboration.

Having said that, within the following chapters firstly motivations and characteristics that foster the development of relationships between startups and corporations will be analyzed, mainly from the existing literature. Secondly, the program theory behind BIND 4.0's approach to Open Innovation as well as the essential and non-essential features of this particular public-private accelerator program have been revealed and modeled. Last but not least, the data obtained from the fieldwork will be compared with the literature review.

5.1 Motivations and characteristics that foster the development of relationships between startups and corporations

Corporations have for long time wondered how to become more entrepreneurial and deeply marveled at startups' capacity to identify needs and launch solutions rapidly (Chesbrough & Bogers, 2014). It's been identified that corporations' have resources, size and integrated habits to run a proven business model effectively. Startups, instead, have ideas, quickness to adapt to new realities and eagerness to take risks (Weiblen & Chesgrough, 2015).

The Digital Transformation of European Industry report (EIT, 2021) highlights that for Europe's industrial strengthening might be relevant to create programs based on an open innovation approach that bridges existing corporations with solutions that startups develop with new technologies. In fact, Aggarwal and Wu (2018) reveal that the value creation takes place when the innovations of the startups are combined with the market expertise and consolidated assets of the corporation.

Heinemann (2015) researched extensively the Corporate Accelerator model, where

Corporations would run their own accelerators with an Open Innovation approach to engage with Startups. However, Gimmy et al. (2017) argued that although it has been one of the most used strategy, it has not reached its constitutional innovation objectives. Kohler (2016) suggested that when a corporation funds a pilot project developed by a startup and becomes a customer of the startup is one of the best way to foster collaboration between corporations and startups.

Gimmy et al. (2017) through their experience at BMW and later at 27pilots, discovered that startups need three main ingredients to grow: Funding, coaching and clients. The first two can be provided by VCs or accelerators, however, corporations have extensive access to clients and that is one of the best thing they can offer.

Gimmy et al. (2017) within their work have named this approach to collaboration between startups and corporations "Venture Client", framing so that the startups that have meaningful solutions can benefit from a corporation as a client or clients of a corporation who can purchase orders. It is the corporation who runs the program but this new approach requires a shift in the mindset of the leadership teams that design open innovation initiatives to engage with startups.

This new model has attracted many startups as they can get paid for testing and validating their project in a real environment and can lead to more clients in the future. This is one of the most appealing value proposals that the entrepreneurial ecosystem can offer and allows corporations to co-innovate with startups. Corvello et al. (2023) argue that startups usually aim for continuous learning, get a paid project with a corporation and take advantage of the effects this will have in their branding for future opportunities with other clients. Access to other skills, equipment and engaging with other entrepreneurs is also aspects that startup founders' value.

Although the Venture-Client model has gained significant attention, governments also have promoted corporate-startup collaboration related open innovation programs (Steiber & Alänge, 2020a, 2021). Funding the collaboration among the two targeted to contribute to the national economy and its competitiveness in the long run. However, to understand the results and what triggered them from the learning perspective for all the stakeholders involved (Chen, 2015) might be the most appropriate framework to understand publicly funded startup-corporate collaboration.

5.2 Analyzing a unique case: Program Theory behind BIND 4.0 government led corporate-startup collaboration program.

Acknowledging the information outlined within the previous pages, it can be said that the program theory behind BIND 4.0's approach to Open Innovation as well as the essential and non-essential features of this particular public-private accelerator program is relevant to model and understand how it contributes to the existing literature.

Aside of the initially identified research objectives, the following questions were addressed:

- What is the "program theory" behind this approach to open innovation?
- What are the essential and non-essential features of this particular public-private accelerator program?

Acknowledging the Program Theory approach used within this thesis, based on Chen's (2005) work the change model and action models will be outlined.

1. The change model consists of:
    - Intervention: Which consists of a set of activities that aim to change the determinants and outcomes. Within BIND 4.0, the participation in the corporate-startup collaboration program brings along access to a paid demo for startups and training, as well as access for a corporation to a startup that will contribute to the integration of innovation.
    - Determinants: Mechanisms that conciliate between the intervention and outcomes. It can be identified that as BIND 4.0 takes place within a specific timeframe, the responsibility to deliver the implementation of a demo acts as a mechanism among the partners to deliver a concrete outcome.
    - Outcomes: Refers to expected effects of the program. It is expected that through the program startups will gain confidence and market recognition to continue growing and consolidating and corporations will integrate innovations.

    The change model gives for granted that when the intervention takes place it will affect the determinants, which consequently will shift the outcomes.
2. The action model within BIND 4.0 can be outlined within the following six components:
    - Implementing organizations: Responsible to organize staff, arrange resources, coordinate activities to implement a program. Within this role the SPRI and the project team of BIND 4.0 has been the responsible to implement the program.
    - Program implementers: The team responsible for delivering the services. The project team of BIND 4.0 has been the main team to implement the program.
    - Associate organizations and community partners: Programs often require cooperation from the implementing organizations or community partners. Within this component, the associated 40 corporations and 70 startups that participated in the first three edition of the BIND 4.0 were the main partners.
    - Ecological context: Programs often may need support from their environment, such as social supports or norms to ease the success of the program. The public-private culture of collaboration within the Basque context plays a key role when it comes to facilitating the implementation of the program.
    - Intervention and service delivery protocols: A document that defines all the characteristics of the activities of the intervention and a step-by-step protocol to deliver the intervention. This has been developed by BIND 4.0 project team in partnership with 27 pilots, a leading venture client consultancy firm.
    - Target population: The people that the program is intended to serve. It mainly targets to serve corporations of the Basque Country as well as local or startups from abroad.

The results obtained in the research outline that the Program Theory has made sense within the business and cultural context of the Basque Country. Also its contribution to the business environment and knowledge body can be considered to be relevant.

Additionally, through this thesis, the goal was to contribute to the knowledge body and some essential and non-essential features of this particular public-private accelerator program will be distinguished within the following paragraphs:

1.- Public support to modernize the industrial sector and join the Industry 4.0 movement:

As it can be identified within the data obtained in the fieldwork, the project team of BIND 4.0 and the SPRI has continued the work the government started in the 80's with their willingness to continuously uplift the manufacturing sector (Markuartu, 2015). BIND 4.0 has been committed to support the modernization of the industrial sector and engage in the Industry 4.0 movement by funding a program that brought together public and private sector where startups and corporations could evolve together.

This approach that the project team of BIND 4.0 outlined within its strategy, matches and echoes what the literature review suggests: BIND 4.0 has invested in policies and democratization of Industry 4.0 (Kuo et al., 2019), helping mitigate business challenges of firms (Brief, 2014) and engage business leaders to take more risks to mitigate (Yang et al., 2019)

2.- Understanding trends and program creation to bring startups and corporations together:

Following Bachtler et al. (2017)'s perspective, where governments should be able to understand trends both globally and locally and create new environments where startups and corporations can interact to reinvent supply chains, the project team of BIND 4.0 understood from the very beginning that bridging corporations' capabilities and challenges with the opportunities Industry 4.0 related startups were offering was what made sense given the business environment of the Basque Country and the national culture public-private collaboration plays.

Additionally, the capacity for the BIND 4.0 project team to act as catalysts to generate interactions among the different agents of the innovation ecosystem (Müür, 2021) as well as to orchestrate them (Clarysse et al. 2014) with a learning approach to it (Gertler and Wolfe, 2002) is second to none.

3.- Open Innovation approach to Startup-Corporate collaboration:

Weking et al. (2020) identified that one key characteristic of Industry 4.0 is that the value creation happens in co-creation with others. Following this nature and with the goal to unleash its full potential, BIND 4.0 program has an Open Innovation approach where industrial strength of the Basque Country connects with the opportunities new technologies developed by startups bring. This takes place by periods of the program where startups from the global landscape can apply to provide solutions to manufacturing challenges related to advanced manufacturing, Energy, Health or Food.

4.- Success formula = corporations with market expertise pay to implement the innovations developed by startups:

Within the global business landscape although the initial approaches for Corporate-Startup

collaboration were Corporate Venturing and Corporate Accelerators, it provided the perspective that did not quite reach the expected results and did not benefit corporations and startups in an equal manner (Gimmy et al., 2017; Huang and Madhavan, 2020). Kohler (2016)'s initial proposal for a corporation to fund a pilot project developed by a startup or to become customer of a startup to stimulate the collaboration between the corporation and startup itself became the foundation for the model Gimmy et al (2017) created as "Venture-client" framework.

The BIND 4.0 program encompasses the three elements that Gimmy et al (2017) suggest startups need: Funding, Coaching and Clients. Funding comes in the early stages of the startup through BIC's Incubation centers. Once they are accepted and participate in the BIND 4.0 program, they get coaching and training as well as the opportunity to work for a corporation who acts as a client.

Startups get paid for testing and validating their project in a real environment and the collaboration can happen really fast as startups become suppliers of the corporation. This helps startup to grow and open to the market (Kupjuweit and Wagner, 2020).

5.- Continuous learning, access to equipment and other skillsets and entrepreneurial communities:

From the interviews carried out to startups participating in the BIND 4.0 program, it can be identified that the main benefit for them is to get a paying corporation that will also help in the development of their brand. Additionally, access to equipment or other skills that may not be within their organization is also a plus. These elements match with the findings of Corvello et al. (2023), who also suggest that meeting with other entrepreneurs is highly valued by participating startups. Startup founders participating at BIND 4.0 agree with the latter but would wish more dynamization of the entrepreneurial community from BIND 4.0 project team.

6.- Model to understand publicly funded startup-corporate collaboration:

This research aimed to understand how Open Innovation is taking new forms and shapes, especially when it comes to corporate innovation and corporate accelerators and the opportunities for collaboration that exist between the start-ups and corporations, as well as if national culture plays a role (Shankar & Sheperd, 2018). As research methodology it did keep a multistakeholder perspective and understand the results from the learning perspective for a publicly funded program where startup-corporate collaboration is analyzed (Chen, 2015).

Additionally, the BIND 4.0 as a government supported program for startup-corporate collaboration is analyzed within a specific context (Basque Country), embodies program theories, explores results from all the stakeholders involved and as it's run annually keeps a learning mindset (Corvello et al., 2023)

7.- BIND 4.0 impact as a brand:

Creating a brand as BIND 4.0 allows as Smit et al. (2016) suggest the democratization and a wider adoption of the movement as the SPRI and BIND 4.0 project team can better communicate the generated policies.

The BIND 4.0 brand has allowed that future versions can also be focused towards SMEs or provide new services to corporations so that they can create a systematic way to implement startups' solutions within their firms.

5.3 Value the degree of coincidence in the behavior of the theoretical proposals and researched companies within the field of open innovation and corporate-startup collaboration.

The following chapter will be focused on comparing the available literature with the findings obtained during the fieldwork in order to identify if data found through the interviews coincides with the theoretical proposal. Additionally, this research has aimed to provide a practitioner wisdom perspective as it has blended the phenomenological experience of the users' situation with the use of scientific information.

After a quick review of the literature available, it is important to highlight the weight industry has within its GDP, reaching 24.2% in the period of 2015-2020 (EUSTAT, 2020). Acknowledging this reality, it is easy to understand why the Basque Government through the SPRI set up a program to upgrade Basque Corporations' competitiveness and catch up with the latest trends in Industry 4.0.

From the interviews, the following data was obtained:

Strategy: The main reason for startups to participate is the opportunity to get paid for the development of a project and have a corporation who has trusted as a client within the branding. On the other end the corporations participate for competitive surveillance and for market surveillance: what technologies from other sectors could help within its value creation chain or could disrupt the market where the corporation operates at.

These insights coincide with the theoretical proposals, where corporations in their pursue to become more innovative and startups get access to a paid client, startups become suppliers of corporations and corporations their clients. This is one of the most relevant value proposals that the innovation ecosystem can offer, allowing corporations to co-innovate with startups (Gimmy et al., 2017) and startups get paid, obtain learning and branding for future opportunities (Corvello et al., 2023). It seems that although previous attempts to engage corporations and startups with an Open Innovation approach did not reach its constitutional objectives (Heinemann, 2015), Gimmy et al. (2017)'s approximation to Open Innovation satisfies better the needs of both sides. Kohler (2016) also argues that this approach is a better way to promote collaboration between corporations and startups.

Resources: The paid demo, for the startup requires to showcase its highest version and for the corporate an economic investment. It is this resource within their framework of collaboration that engages them most. Also access to training and equipment of the corporations was highly valued by startups.

When comparing BIND 4.0's resources with those identified in the theoretical proposal, it can be identified that Gimmy et al's (2017) proposal of Funding, Coaching and clients matches with what BIND 4.0 offers, except for the startup funding but within the Basque context that can be obtained from the SPRI itself or other agents in previous stages of the

startups' development. Additionally, startups get access to equipment and skills from the teams of the corporations, as well as get the chance to connect with other startup founders (Corvello et al. 2023).

Procedures: Once the contract is signed and the day for which the project should be finalized set, the way to operate might be different. Some startups may work from separate offices and only meet up with the corporation for certain meetings, others may regularly work from corporations' offices in order to learn more and develop an entrepreneurial culture within the corporations' employees.

Within the theoretical proposals, there has not been information found how procedures can help or guarantee a better collaboration between corporations and startups. Aggarwal and Wu (2018) suggest that the value creation takes place when the innovation of the startups are combined with the market expertise and consolidated assets of the corporation. However, there is no further detail on how the relationship or the relationship could be better looked after to increase the degree of innovation or the outcome.

Organizational Structures: In some cases it was the entire startup team taking part, whereas in others only the startup founder. In the case of the corporation the Innovation Director would have a key role, but also some others would often participate depending on the moment of the process.

Given the early stage that the Venture-client model remains at, there has not been information found on how organizational structures could be adapted to this new approach to corporate-startup collaboration. However, Gimmy et al. (2017) suggest that it is responsibility of the corporation to guarantee the well-functioning of the relationship an that it requires a shift in the mindset of the leadership teams that design open innovation initiatives.

Roles: It would often be the CEO of the startup and the Innovation Director would have the biggest involvement in the program.

When it comes to programs of Startup-Corporate collaboration, according to Richter et al. (2018) CEOs of Startups and Innovation Managers are the main roles who lead the participation in these type of programs, which coincides with the roles found in BIND 4.0

The Environment: The opportunity to get to know other entrepreneurs and representatives of other corporations was highly appreciated, as well as the opportunity to implement a solution in a real environment. The process of becoming supplier of a corporation sometimes challenging and entrepreneurs would wish further cultivation of the community of entrepreneurs.

Richter et al. (2018) identify in their work that the cultural shift needed from corporations towards embracing an Open Innovation perspective is tremendously crucial. This might match as well with the need startups have to become suppliers from day one and the corporation should ease its processes to make them more amenable.

Metrics: Most of them would not measure or use metrics to measure their work. Few corporations, all three cooperatives, did use their regular framework to measure implementation of innovation.

Richter et al. (2018) suggest that to create measures that match the purpose and strategy is important, and that they should be communicated to partners. This reflects the culture that may exist of not defining metrics and matched with BIND 4.0's reality where only few are in an early stage of implementation.

Last but not least, as the BIND 4.0 program has been analyzed through the Taxonomy of Gomm (2000) and Richter et al.'s (2018) work named "Outsourcing creativity: An abductive study of open innovation using corporate accelerators" has been a key paper to understand other corporate open innovation strategies a comparison has been crystallized within the following table:

TABLE 8:
Comparison between recommendations provided by Richter et al. (2018) and Findings obtained from the BIND 4.0 program
Source: Own Creation

	Recommendations by Richter et al. (2018)	Findings obtained from the BIND 4.0 program
Strategy	Define a clear strategy for open innovation activities with startups and specify concrete goals	Startups and corporations have concrete goals when joining BIND 4.0 program: get access to a paid demo and market/competitive surveillance
Resources	Take cooperation with startups seriously and commitment from senior management is key.	Getting paid for a demo requires professionality (startup) and investment of resources (corporation). Usually it is the innovation director (Corporation) and CEO (startup)participating together in the program
Procedures	Adopt key success factors such as selection process, mentoring and fixed duration.	The selection process is open but only 4%-7% of applying startups get selected. Duration is fixed and mentoring is provided
Structure	Adopt innovation as it becomes marketable	BIND 4.0 program only accepts solutions that can be implemented within 6 months.
Roles	Engage with startups as partners	The relationship varies but it is often very close
Environment	Make sure corporation's culture and processes are receptive to open innovation	The opportunity to get to know other entrepreneurs and representatives of other corporations highly appreciated. The process for startups to become suppliers of corporations could be improved.
Metrics &	Create measures that match	The culture of applying metrics

Outcome	the purposes and strategy. Communicate them.	rather poor and only few applied other innovation related metrics.

When analyzing this table, it can be identified that the BIND 4.0 program embodies most of the recommendations suggested by Richter et al. (2018), except for the Metrics as it seems there is ample room of improvement when it comes to measuring, implementation, impact and effectiveness BIND 4.0 has within the innovation development and implementation.

CHAPTER 6

Limitations & Future lines of research

6. Limitations & Future lines of research

6.1 Limitations

Keeping in mind that the BIND 4.0 was designed and launched as a program with the goal to provide answers to pre-identified challenges, the applied theoretical framework reveals how by implementing a program in a specific context can help to shift from a given scenario to another one. In other words, the implementation of the program in a specific context aimed to enable corporate-startup collaboration so that the Basque industry could benefit from the innovations developed by startups to continue its path of competitiveness and startups could benefit from their market expertise to validate their value proposals and grow.

The key features of this publicly run program have been analyzed from all stakeholders' perspectives and learning standpoint: startups, corporations and SPRI as the organization that promotes it. This has been done considering the diverse nature of each stakeholder. It can be mentioned that when carrying out the research in the first three editions, only corporations could repeat annually whereas startups were allowed to take part only once. According to Chen (2015) to understand the results and what triggered them from the learning perspective for all the stakeholders involved might be most adequate framework to understand change models. That is why this has been the model used to understand this publicly funded startup-corporate collaboration.

The theoretical framework does not aim to generate universal results, and they cannot be generalized for all government supported corporate-startup collaboration programs. However, with the inquiry carried out with the participating corporations and startups, and the triangulation with the information obtained from the BIND 4.0 project team, it can be considered that information saturation was reached answering this way the research questions.

Last but not least, the obtained results through the research should be carefully used as they have been obtained within a specific timeframe and from a very concrete cultural, geographical and business context that the Basque Country offers.

6.2 Future lines of research

Digitalization is changing our lives in ways that are yet to be discovered. It definitely is bringing profound transformations not only in our lifestyles, but also how value creation takes place within today’s globalized and connected world.

Building up on De Vasconcelos Gomes et al (2018, P.16)’s statement who suggest that “An innovation ecosystem is set for the co-creation, or the jointly creation of value. It is composed of interconnected and interdependent networked actors, which includes the focal firm, customers, suppliers, complementary innovators and other agents as regulators”, “ An innovation ecosystem has a lifecycle, which follows a co-evolution process” it can be considered that the Venture Client model and SPRI’s BIND 4.0 program can be reflected on that statement and that it was a model worth studying.

BIND 4.0 is a program that embodies a new form of Open Innovation that supports a fairer

model of collaboration between startups and corporations and where national culture of public-private collaboration plays a role. In certain way this also answers suggestions of Shankar & Shepherd (2018). However, although BIND 4.0 and the Venture Client model seems a bit fairer, the focal firm or the corporation seems to get still more attention that startups do according to the findings. Huang and Madhavan (2020) suggest that the collaborations built between corporations and startups does not always benefit both parties in an equal manner, and within the carried-out research similar pattern can be identified so fairer models might be worth developing and studying.

How these initiatives support benefits society is hard to measure (Steiber & Alänge, 2021). However, as Steiber & Alänge (2020) suggest governments have dramatically increased their support for startup-corporate collaboration, the effects this might have generated within the local or regional ecosystems is worth studying.

This thesis aimed to understand and critically assess how the BIND 4.0 program intended to function, as well as its key features and particularities. However, it did not aim to measure satisfaction rates, achieved outcomes, effectiveness or generated impact, but future research could focus towards that. This also matches with the comparison carried out within the Table 8.

Research often is focused towards the impact programs have on corporations. However, in which way does it impact the startup, SMEs or in a broader way the regional ecosystem (Steiber et al., 2021 a,b) might be relevant to study too.

Gimmy & Schäfer (2023) argue that Venture client as a term is still new. In the coming future, whether carried out by corporations or as BIND 4.0 through public-private collaboration, some new models are expected to emerge and might be worth understanding how the movement evolves.

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