UNIVERSITA' DEGLI STUDI DI PADOVA

DIPARTIMENTO DI SCIENZE ECONOMICHE ED AZIENDALI

"M. FANNO"

CORSO DI LAUREA MAGISTRALE IN
ENTREPRENEURSHIP AND INNOVATION

TESI DI LAUREA

"Open Innovation in Business Incubators"

RELATRICE:
CH.A PROF./SSA SILVIA RITA SEDITA

LAUREANDO: DAVIDE MARCON
MATRICOLA N. 1238900

ANNO ACCADEMICO 2021-2022

Il candidato dichiara che il presente lavoro è originale e non è già stato sottoposto, in tutto o in parte, per il conseguimento di un titolo accademico in altre Università italiane o straniere. Il candidato dichiara altresì che tutti i materiali utilizzati durante la preparazione dell'elaborato sono stati indicati nel testo e nella sezione "Riferimenti bibliografici" e che le eventuali citazioni testuali sono individuabili attraverso l'esplicito richiamo alla pubblicazione originale.

The candidate declares that the present work is original and has not already been submitted, totally or in part, for the purposes of attaining an academic degree in other Italian or foreign universities. The candidate also declares that all the materials used during the preparation of the thesis have been explicitly indicated in the text and in the section "Bibliographical references" and that any textual citations can be identified through an explicit reference to the original publication.

Firma dello studente

_____

To my family, for their care and support.

Index

Figures Index

Tables Index

Introduction

In the past, companies had an incentive to innovate their products to maintain a leading position in the market. The new technologies and prototypes developed in the research and development (R&D) laboratories were jealously guarded because a company's profits and position in the industrial sector could be endangered if competitors became aware of the new technology and copied it. Universities and governments did not participate in the co-creation of innovation, thus placing the burden and risk of scientific research on individual companies.

However, over the years, external factors have emerged and radically changed the situations in which companies operate, thus necessitating a change in the strategy used for maintaining a leading position in the market. In addition to phenomena such as globalization, development in telecommunications, and the success of other disruptive technologies, new players in the innovation sector have also emerged, such as the technology transfer offices of universities, centers dedicated to R&D on behalf of third parties, and business incubators.

With this thesis, I want to focus precisely on the latter, delving into their role in economic development, their structure, and how they relate to external actors, with particular attention on open innovation methodologies.

This thesis is divided into three chapters in which I define the concepts of open innovation, business incubator and provide an in-depth description of the incubator I participated in during an internship.

In the first chapter, I describe the closed innovation and open innovation methodologies and then move on to the three characteristics underlying open innovation, as defined by Chesbrough: knowledge generation, dissemination, and absorption. Then, I illustrate the main inbound and outbound techniques with which open innovation can be applied. After that are described the improvements that the open innovation can develop in public and private organizations and the changes in society that have made it necessary.

In the second chapter, I outline what an incubator is and compare the definitions from different studies to highlight the common points. Then, I describe the importance of this type of organization for local economic development. Finally, I analyze four relevant metrics in the first moments of the transition between closed innovation and open innovation and describe the structures and methods used by five Italian incubators on this issue.

In the final chapter, I dive deeper into the case study of Bio4Dreams, an Italian incubator that kindly allowed me to participate in its activities and collect the documentation necessary for this thesis. I describe the incubator's structure in depth and two of its activities executed with the specific objective of creating and strengthening connections with third parties existing in the territory.

1 What is Open Innovation?

1.1 Definition

According to Chesbrough, “open innovation is 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, 2013, p.12). Thus, it concerns managing a company’s outflows and inflows of information and knowledge. It is a concept similar to "spillover," "whereby investments in knowledge creation by one party produce external benefits by facilitating innovation by other parties” (Jaffe et al., 2000, p. 215).

In both cases, the focus is on the economic effort that a company sustains when undertaking R&D activities. In the spillover literature, the knowledge transmitted to the external is a cost for the company because it does not provide an economic advantage and, indeed, could result in a disadvantage if competitors decide to use this knowledge generated to create their own advantage without the use of the huge resources that scientific research needs.

"Spillovers are likely to lead to increased competition and as result reduce the payoffs of the innovating firm and boost the payoffs of the imitating firms" (Karlsson et al., 2004, p. 94).

In the paradigm of open innovation, these spillovers are taken for granted and unavoidable, but companies attempt to take advantage of them as much as possible.

However, a simple change in the resources used for the search for scientific material is not enough; instead, a profound change is needed in how companies approach the creation of new knowledge or innovation in general.

"Open innovation processes combine internal and external ideas together into platforms, architectures, and systems. Open innovation processes utilize business models to define the requirements for these architectures both external and internal ideas to create value, while defining internal mechanisms to claim some portion of that value” (Chesbrough, 2003, p. 24).

In fact, Chesbrough emphasized that with this methodology, internal and external ideas and knowledge are recombined into defined processes to create a system. The company's business model must also change.

Taking the example of a company's spillover, if it was initially seen as a negative event that must be eliminated, it is now instead seen as an opportunity for profit. Using the out-licensing,

the company can create new revenue and have a market proof of the technology and the demand that it can generate. It could create new opportunities that otherwise would not have been discovered, collaborations with companies from different sectors, or new technologies.

"Open innovation assumes that internal ideas can also be taken to market through external channels, outside the current businesses of the firm, to generate additional value" (Chesbrough, 2006, p. 1).

Kenneth listed three ways (Munsch, 2009) open innovation can give real benefits to the companies that apply it:

- New ideas can be contributed from a much larger range of parties and from different perspectives than what might be contributed internally.
- Business and financial risks can be mitigated by the participation of one or more third parties, and a greater market scale can be achieved by joining forces.
- Speed to market may be accelerated by the particular contribution made by partners or contributors in the ecosystem.

Moreover, the advantages are not limited to the acquisition of new ideas from external sources, albeit more specialized and with more capabilities; they can also be relative to lowering the risk linked to innovation and streamlining the internal research processes.

Risk reduction is achieved through specific partnerships with external actors. Companies can share resources related to R&D to reduce losses in case of failure. They can also collaborate with specific actors that hold complementary skills.

For example, external companies with proven market experience can sell their distribution capabilities to smaller companies that have not yet reached this level of maturity. Thus, from the larger company’s perspective, there is the sale of a specific capability and, therefore, a source of profits, whereas from the perspective of the less mature company, there is the purchase of a complementary service, which makes it possible to access a larger market without the need to allocate time and money in the creation of the distribution network.

The same example also includes the advantage of speeding up the time-to-market of a product or technology. Using specific external and already consolidated skills, it is possible for a company to focus and specialize on its activities where it forecasts to create the greatest economic value.

1.2 Open vs. Closed Innovation Model

This section discusses the differences between the closed and open innovation models.

1.2.1 Closed Model

The closed innovation model was used in the twentieth century by most companies to secure a leading position in the market.

A substantial difference from modern times is "the lack of involvement of both universities and governments into industrial and commercial applications of scientific research. This lack of involvement lead companies to create their own department of Research & Development (R&D) to be able to perfectly control new product development cycles" (Meige, 2009).

This means that it was the individual companies, or at least those that could bear the costs, that conducted the R&D activities necessary for the creation of new products and services. In this way, they could ensure a dominion over a specific sector thanks to the technological superiority difficult to imitate by those who did not have the opportunity to invest in R&D.

Thus, companies could only rely on themselves. According to the closed innovation method, the research has, as a direct consequence, a strong vertical integration between the R&D departments and the sales and after-sales departments. Therefore, not only was the research supported internally, but all the findings that did not come from their own laboratories were seen with suspicion, giving shape to the so-called "Not Invented Here" syndrome (Katz & Allen, 1982).

Closed innovation needs some prerogatives to be applied, such as strict control over intellectual property (IP) and highly specialized people remaining within the company. However, over time, some erosion factors have emerged. For instance, new technologies, the ability to collaborate and communicate instantly with people living in other parts of the world, cheap means of transportation, and specific search engines for scientific articles or patents have made possible new methods of value creation that were not considered before. These factors will be discussed more widely in the next chapter, which explains the various reasons why open innovation can be profitable for companies, startups, or even public institutions.

1.2.2 Open Model

Given the modern changes that have weakened the closed innovation model, many companies have sought new ways to remain competitive and innovate their products and services. They have begun to look outside their limits, giving life to the open innovation method.

The term “open” refers to “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, 2013, p. 12).

This new model differs from the previous one in the possibility of exploiting opportunities from outside the company. In fact, it is possible to not only use knowledge generated outside of one's own R&D laboratories but also sell a private discovery that has not reached its stage of maturation.

It should be noted that this model accounts for not only companies and research institutes but also the phenomena of co-creation with end consumers or with communities of innovators.

Table 1 highlights the main differences between this new approach and closed innovation.

Table 1 – Differences between Closed and Open Innovation

Closed Innovation Principles	Open Innovation Principles
The smart people in the field work for us.	Not all the smart people work for us, so we must find and tap into the knowledge and expertise of bright individuals outside 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 that value.
If we discover it ourselves, we will get it to the market first.	We don't have to originate the research to profit from it.
The company that gets an innovation to the market first will win.	Building a better business model is better than getting to the market first.
If we create the most and the 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 others' use of our IP, and we should buy others' IP whenever it advances our business model.

Source: (Chesbrough, 2003)

Smart People: The assumption is that it is impossible to internalize all the most specialized human resources in the fields necessary for technological advancement. Therefore, companies look for a strategy that can compensate for this weakness and intercept the knowledge that these people generate.

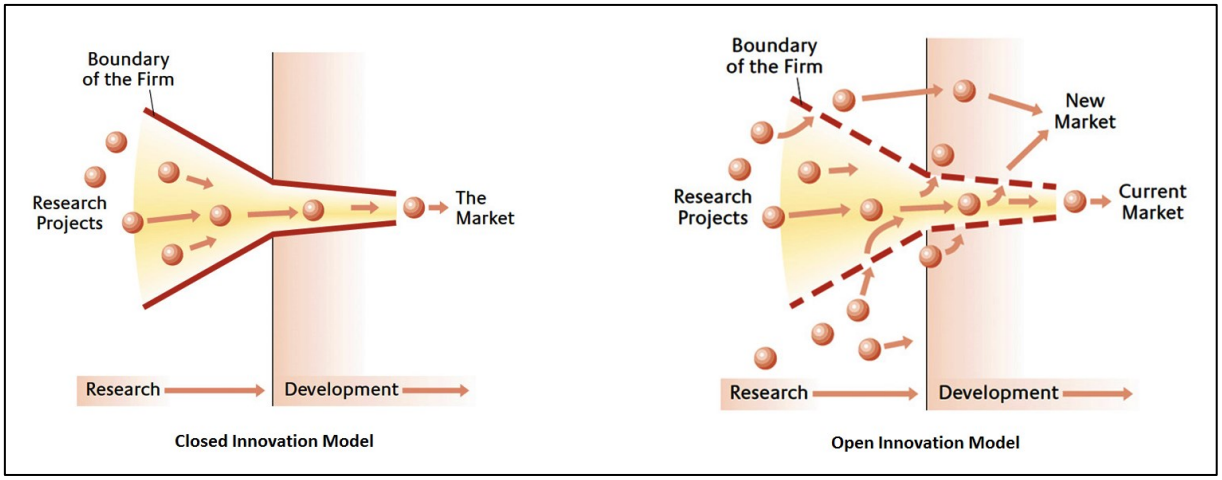
Profit from R&D: Instead of relying only on discoveries created internally within the company, new sources are found outside, using the results of other companies' R&D. Once companies have found and assimilated the external concept, they can still originate profit lines from it, for example, by using it to improve their products or services.

Be the First: There is a shift in the company focus here. Less importance is given to the timing of entry into the market and more to the creation or improvement of the business model. Instead of entering the market first but with a technology that could still prove immature, companies focus on the use that is made of the knowledge generated or acquired and the creation of value for the customer.

IP Management: Finally, there is greater flexibility in the use of IP. The value and advantage that the purchase of patents or licenses can bring to the company is recognized, and the sale of IP or services that had remained for internal use only can bring new sources of profit and their diversification.

Figure 1 also illustrates these differences.

Figure 1 – Closed Innovation Model and Open Innovation Model



Source: (Chesbrough, 2006)

Clearly, the company not only draws on external knowledge sources to create products but also sells internal knowledge before it even becomes a finished product or service.

"The business model utilizes both external and internal ideas to create value, while defining internal mechanisms to claim some portion of that value. Open innovation assumes that internal ideas can also be taken to market through external channels, outside the current businesses of the firm, to generate additional value" (Chesbrough, 2003, p. 24).

1.3 Generation, Dissemination, and Absorption

In his book *Open Innovation Results*, Chesbrough defined three characteristics of the infrastructure that makes open innovation possible and useful. These are generation, dissemination, and absorption (Chesbrough, 2019).

Generation: Obviously, the creation of new knowledge is vital to make open innovation possible. This definition includes all institutions or investments, private and public, that have as their objective the deepening of particular technologies or exploratory basic research.

Dissemination: Assuming that new technologies or discoveries were actually studied, but that the fruit of these investments remains private and used by a few actors, the paradigm of closed innovation returns. Therefore, this knowledge must also be disseminated in ways that may nevertheless be profitable.

Universities play a key role in this case because they help substantially in the dissemination of knowledge through publications, conferences, and yearly graduation of many students who are then absorbed by other companies in the labor market (Chesbrough, 2019).

Furthermore, there are specific technologies that have favored knowledge dispersion. The Internet in this respect has created unprecedented possibilities. In modern times, with a simple Internet connection, it is possible to deepen knowledge, even up to the state of the art, about any topic of interest for an almost negligible cost. Likewise, the technologies related to the mobility of people and goods have favored the spread of technologies and information, such as trains or airplanes.

Finally, there are also legal aspects that have contributed to this. A prime example is pension reforms, which have made it possible for workers to receive their pensions even in cases of dismissal and future employment in a new company.

In this way, employees are no more obliged to stay in the same company for the entire duration of their working life.

Another element is the anti-trust policy. Dividing a monopoly into smaller entities leads to greater competitiveness and lower prices for final consumers, as well as the spread of important patents and knowledge.

"The decision to force AT&T to license its patents in the 1950s powerfully aided the nascent electronics industry" (Chesbrough, 2019, p. 24).

Absorption: Finally, the last factor is to put people in a position to absorb, apply, and transform this knowledge into products and services useful for the society.

Both in the case of companies and research institutions, the ability to understand and integrate spillovers from external sources is essential.

1.4 Inside-out and Outside-in

The possible implementation methods of open innovation can be divided into two subcategories: Outside-in (or inbound) and Inside-out (or outbound). Both and their relative methods are described below.

1.4.1 Outside-in or Inbound

This category aroused the most interest among students and companies. In his book *Open Innovation Results* (Chesbrough, 2019, p. 30), Chesbrough stated that "the outside-in part of open innovation involves opening up a company's own innovation processes to many kinds of external knowledge inputs and contributions."

New sources for business innovations are therefore sought. Instead of relying only on their own resources, companies intercept relevant information that can be used to improve products or services. It is not only about opening up the company to external factors but also about creating specific partnership agreements with other structures with complementary skills or needs with the aim of having access to technical-scientific knowledge (Bianchi, Cavaliere, Chiaroni, & Frattini, 2011).

The methods belonging to this category are as follows:

- **In-licensing**: The firm purchases the right to use a particular technology discovered by another firm.
- **Minority equity investments**: In this case, the company has access to complementary technologies or capabilities or buys part of a startup or pre-existing company, but without becoming the owner.
- **Acquisitions**: A project, startup, or external company is purchased to have access to its intellectual properties, specific assets, or capabilities complementary to the company.
- **R&D contracts and research funding**: The company supports external research institutions, such as universities or even specific companies, by financing them. Thus, it is an outsourcing of the R&D department.
- **Purchase of technical and scientific services**: The company externalizes specific tasks to specialized personnel. Here, there is the requirement of a well-defined contractual agreement.
- **Joint ventures or non-equity alliances**: The firm establishes relationships with selected firms or organizations to purse a common objective.

1.4.2 Inside-out or Outbound

"Inside-out open innovation requires organizations to allow unused and under-utilized knowledge to go outside the organization for others to use in their businesses and business models. This could result in licensing out a technology, or spinning off a new venture, or

contributing a project to an open commons, or forming a new joint venture with outside parties" (Chesbrough, 2019, p. 31).

With this method, the company exploits unused or little-used ideas and makes them available to external actors who can use them in their business models or products. The consequences are the creation of new sources of revenue and their diversification. Projects that have not been judged as promising can find a second life and, in any case, market validation through open innovation's inside-out methods.

The methods belonging to this category are:

- **Licensing out**: The firm sells the right to use specific technologies that it discovered.
- **Spinning out of new ventures**: This method includes not only the transfer of knowledge but also the sale of at least part of the rights of disposal of a unit of the firm. Thus, it also includes physical assets (Lichtenthaler, 2005).
- **Sale of innovation projects**: In this case, the firm does not sell an operational part of the company and the related assets but limits itself to the design phase of the idea. Looking to the funnel scheme of open innovation, they outsource the project directly from the initial phase.
- **Supply of technical and scientific services**: The firm provides specific services or consultations to other firms.
- **Corporate venturing investments**: This is the practice of directly investing corporate funds into external startups. This is usually done by large companies who wish to invest in small, but innovative, startups. They do so through joint venture agreements and the acquisition of equity stakes. The investing company may also provide the startup with management and marketing expertise, strategic direction, and/or a credit line. The main goal of corporate venturing is to gain a competitive advantage and/or access to new, innovative companies that may become potential competitors in the future (Corporate Finance Institute, 2019).
- **Joint ventures or non-equity alliances**: The firm establishes relationships with selected firms or organizations with complementary capabilities or assets (as production capacity or distribution channels).

1.5 Why Implement Open Innovation?

This section answers the question of why a company should implement a structure or methods related to open innovation.

As already mentioned in the previous chapter, in recent years, the available technologies have made it possible to collaborate and organize in ways that were not previously considered profitable.

Moreover, some new factors have come into play, with the consequence of decreasing the advantage of a closed approach regarding business innovation. These factors have been defined by Chesbrough as "erosion factors" (Chesbrough, 2003). They are listed and explained below.

1.5.1 Erosion Factors

Mobility of skilled people. Given the strong focus on internal research and the lack of confidence in technologies from outside, experienced scientists with years of accumulated studies were treated with jealousy by the company that hired them. In fact, the implementation of patents and their control served to prevent other companies from taking advantage of the internal research conducted by the individual company.

One method used to diminish this competitive advantage was to hire scientists and engineers belonging to a competitor or industry leader.

In both the twentieth and twenty-first centuries, the mobility of these people has increased. With reduced travel costs, the possibility of remote collaboration created by the Internet and more favorable contractual conditions have led the most educated people to see the labor market as more fluid than at the beginning of the twentieth century, with the possibility of leaving a company without strong repercussions.

Increase in the number of venture capitals. Venture capital companies are individual investors or investment funds whose objective is the creation of new startups. These entities provide capital, networking, and specific knowledge to people who want to create a company based on an innovative product or service. The possibility for scientists and engineers to raise capital from external sources and use the complementary expertise with theirs provides a strong incentive to abandon the closed innovation system to fund their own startups.

A recent phenomenon is crowdsourcing. Thanks to these platforms, even people who have a small capital can participate in investments in these startups, thus increasing the capital that can be raised for an innovative project.

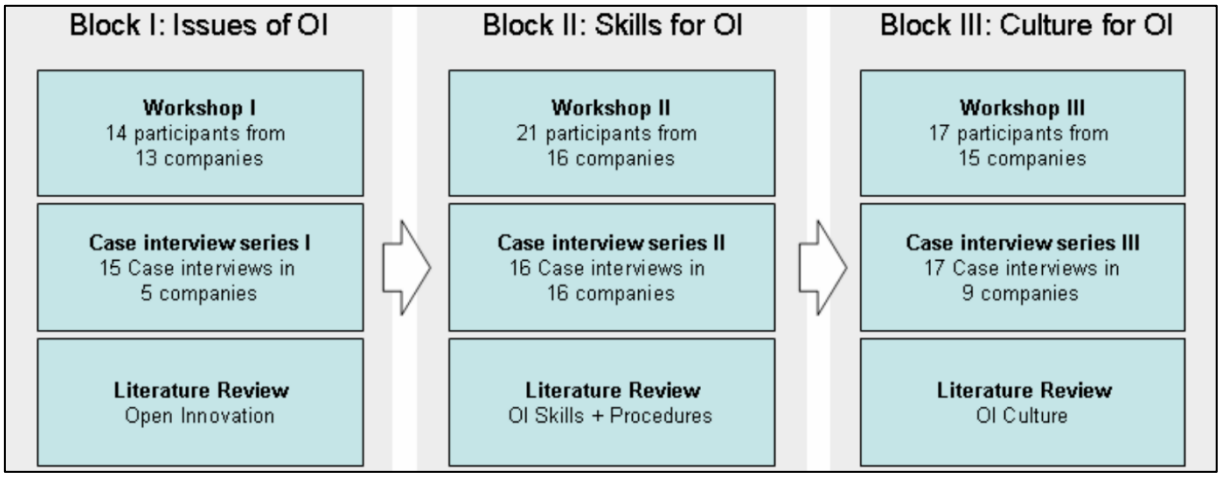
Increase in the number of qualified suppliers. This factor is a consequence of the previous ones. Given the possibility of highly qualified people to be able to change companies or found one, bringing with them the experience gained, and the ease with which it is possible to raise

capital for innovative projects, the possibility arises for larger companies to make agreements with suppliers or highly specialized external research centers. In this way, the cost and risk of the research are borne only by the specialized body that will then resell the knowledge to the outside.

1.5.2 Open Innovation for the Private Sector

(Mortara et al., (2009) reported five macro-sectors on which, through interviews, they studied the main characteristics of companies and the advantages that open innovation can create.

Figure 2 – Description of the Mortara et al. (2009) Study



Source: (Mortara et al., 2009)

The study was divided into three distinct parts, each consisting of a workshop attended by representatives of the companies examined, in-depth interviews with some of the individual companies, and specific literature review on the interview topic.

The topics analyzed were as follows:

1. Key challenges faced by the companies examined
2. Structures and skills for implementing open innovation
3. Cultural issues and incentives during the implementation

Table 2 – Benefits of Open Innovation for the Private Sector

	Industry characteristics	What form does open innovation (OI) take?
Electronics and telecoms	Strong need to adapt to growing demand from consumers and keep up to date with the rapid pace of technology development. Importance of collaboration to create industry standards. Reducing costs is a priority.	New technologies sought with increasing speed to anticipate competition, follow fast moving markets, and reduce costs. Standards are both an opportunity to work openly and a "constraint" for innovation
Energy/oil	Business is changing because of sustainability issues (declining oil supplies, global warming).	OI is an opportunity for identifying new technologies to improve oil supply and ways to change the industry and increase its sustainability.
Aerospace and defense	Traditional engineering businesses. Long technology lifespan and long lead times for adoption. Strong confidentiality issues, especially for defense. Strong influence of policy-makers and government on innovation strategies.	OI is a new concept, especially for defense companies who are wary of information leaks. However, OI activities exist in response to technology complexity and R&D and innovation costs.
FMCG	Need to reduce time to market and find new ideas to generate new products. Strong marketing influences innovation strategy.	OI is an opportunity to innovate and increase competitive advantage. Most FMCG companies are currently developing their OI strategies (more formalized OI).
Software and media	Software companies have almost always been open due to the nature of their technology.	Open-source software and Internet 2.0 have revolutionized the innovation processes so that users (customers) can themselves contribute to innovation.

Source: (Mortara et al., 2009)

Table 2 above illustrates how each sector tries to achieve its specific goals. Therefore, open innovation is to be framed as a tool with which the company can support R&D operations. In more developed industries, such as electronics, partnerships with other companies or other

outside-in techniques are mainly used to speed up time-to-market, especially where the advantages of being a first mover are more pronounced or where the creation of industry standards can ensure a position of advantage.

On the other hand, some sectors suffer more than others with regard to the disclosure of corporate information. For instance, in the aeronautics sector, which also includes defense, there is a greater fear of risks that can be created by uncontrolled disclosures.

Nevertheless, even in this case, open innovation is used to cope with the growing complexity of the technologies used.

Finally, the example of the software sector is cited. Here, a special situation has been created thanks to the so-called "open-source software." Companies can contribute with their own software or benefit from other people's software. Likewise, individual users also have the opportunity to contribute according to their own expertise.

During the study, the researchers interviewed managers about the benefits they expect to gain from implementing this new methodology. Figure 3 illustrates the opinions of these companies' managers on where open innovation can achieve the greatest impact in their companies.

Figure 3 – Managers Answers Concerning Benefits of Open Innovation

Source: (Mortara et al., 2009)

The figure shows that the open innovation methodology is not used to solve a specific problem but rather as an approach to finding a solution to a wider range of questions. Mortara et al. observed that roughly the same importance is given to several factors:

- Reducing time to market for products (particularly for fast-moving consumer goods (FMCG) companies and electronics companies who seem to require the fastest rate of innovation)
- Availability of new technologies (especially important for chemical industries)
- Access to competencies (especially important for FMCG companies)

Therefore, the respondents of this interview gave more importance to the inbound part of open innovation than the outbound. In fact, it does not seem that the exploitation of internal technologies is a general concern, as more importance is given to issues such as obtaining complementary technologies or skills or an optimization of business processes.

1.5.3 Open Innovation for the Public Sector

(Pedersen, 2020) analyzed in his research various projects related to public sector organizations in which open innovation methodologies have been used. However, there are important differences from what was described in the previous section.

The problems being solved in the public sector are different from the private sector. In fact, speaking about the research present in the literature of this topic, the author wrote list of the main targets:

- Reduce costs and become more efficient
- Improve relationships with citizens and other stakeholders
- Collaborate with other public sector organizations
- Deal with difficult challenges such as climate change, ageing societies, and increase in chronic diseases

Open innovation in the public sector is directly linked to e-government since the proposed solutions almost all refer to IT technologies applied to those that are already assets or services for citizens. There are also political pressures that see these solutions as opportunities for improving the structures of public organizations (Lee et al., 2012), such as the Obama administration's Open Government initiative in the United States.

In Section 1.4, a differentiation was made between inbound and outbound approaches.

In the context of the public sector, they are interpreted as follows:

- Inbound/Outside-in: The organizations in the public sector collaborate with citizens and companies in smart city projects or involve citizens in policy development through crowdsourcing.

- Outbound/Inside-out: Open data projects and publishing data that can be used and exploited by citizens and companies.

The concepts of value and value creation are also different (Pedersen, 2020, p. 2):

"Value creation differs; for example, private sector organizations are concerned with how to create value that can be protected in order to create a sustainable competitive advantage, which is less relevant for public sector organizations."

For the public sector, value creation is perceived as "a process through which IT investments, such as the development of a new app, and non-IT investments, such as organizational change, are combined in a co-specialization process to change one or more objects, such as organizational process or citizen behaviour." (Pedersen, 2020, p. 2) .

The objective of these investments is to improve the outcome of the services offered by public organizations and the efficiency and effectiveness of the structure that makes them possible and to solve problems of various magnitudes that may require a discontinuity of the methods applied in the past.

Pedersen conducted his research through an in-depth analysis on the subject in the literature and through an evaluation of project descriptions in this area.

He then coded the information found according to the following scheme:

- **Purpose:** Why do public organizations use open innovation?
    - **Object of change:** What do you want to change or influence through the application of this methodology?
    - **Value:** This metric refers to the types of value defined before.
- **Value Creation:** How do the projects evaluated create value for society and its citizens?
    - **IT investments:** Information and telecommunications systems used to implement the desired change and thus create value for society
    - **Non-IT investments:** Investments in changes related to the organization of resources
    - **External innovative assets:** The typology of innovative assets used in the open innovation processes, such as citizens in the case of crowdsourcing.
    - **Contextual factors:** Other factors that impact value creation during open innovation

- **Lag effects:** There is a delay between the moment in which the open innovation project is realized and the moment in which the metric designated for change varies. This category includes all projects that aim to reduce this delay.

Table 3 shows the results of the first bibliographic analysis conducted by Pedersen.

Table 3 – Pedersen's Bibliographic Analysis Results

Purpose	Object of change and values
Innovation of democracy	Objects of change: The political decision-making processes and democracy in general. Values: The identified values belong to the "engagement" and "professionalism" categories. For example, citizen engagement, transparency, and accountability.
Innovation of public sector organisations	Objects of change: The organisational output in terms of services and products, the processes used to produce and deliver the outcome, the technology that supports the processes, employee capabilities, and organisational culture and structure. Values: The identified values belong to the "efficiency" and "service" categories. For example, operational performance and responsiveness.
Innovation of the relationship between public sector organisations	Objects of change: The relationship between public sector organisations. Values: No solid findings due to the limited number of articles.
Innovation of the relationship between public sector organisations, citizens and other stakeholders	Objects of change: The way that external stakeholders and public sector organisations collaborate, the way they understand and perceive each other, and the way power and work is distributed between them. Values: The values are predominantly related to "engagement", but also to "service" and "efficiency" in the way that some articles advocate for new relationships between government and citizens where citizens provide some of the services previously delivered by government.
Innovation in society	Objects of change: Citizens, neighbourhoods and regions. Values: The values are difficult to categorise using Rose et al. (2015). They are, for example, related to citizen health, the quality of life in specific neighbourhoods or the innovation capabilities in a region. The values could be perceived as indirectly linked to "service" and "efficiency". For example, trying to improve citizen behaviour regarding health could be perceived as a service that might have an impact on "efficiency" by lowering future healthcare costs.

Source:(Pedersen, 2020)

Two types of possible changes emerge:

1. **Optimize Within:** Referring to the definition of value given previously, this category includes all the possible solutions that aim to optimize the resources already present in society but without entailing a drastic change for citizens or the technologies used.
2. **Radical Change:** In this case, there is a change in the business model (Feller et al., 2011). The available assets are not only used during the implementation of the project, but there is also a permanent change for the duration of the provision of the new service. However, no significant results have been found within this category. (Mergel, 2015) argued that radical changes are rare of public organizations precisely because of their nature of operation, while projects for incremental innovations are promoted.

As for "how" organizations try to create value through open innovation, Pedersen evaluated projects present in the literature or currently used by public organizations.

Below is the frequency recorded for each project objective:

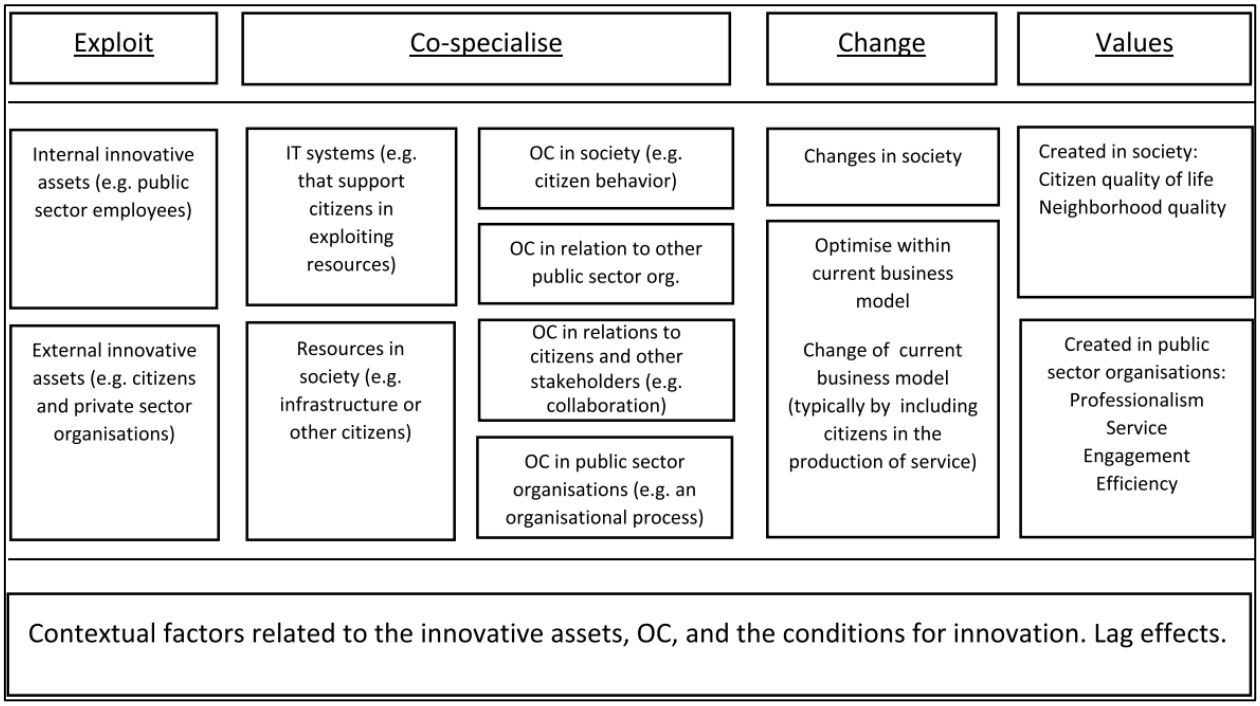
- Innovation of democracy, regulations, and policies (6%)

- Innovation in public sector organizations (8%)
- Innovation of the relationship between public sector organizations (0.4%)
- Innovation in the relationships between public sector organizations, citizens, and other stakeholders (2%)
- Innovation in society (83%): This is where the majority of the cases observed reside. Given the amount of data present, the "value" values found have been divided into three general categories:
    - Citizen behavior
    - Citizen capability
    - Citizen experience

In the methods used to create value for society and citizens, the impact that IT investments exert on open innovation projects is predominant. This is in line with what was discussed in Section 1.5.1, where one of the erosion factors is precisely the possibilities that computer science and telecommunications make possible. Therefore, as stated by (Pedersen, 2020, p. 8), "Public sector organizations place resources, and regulate and protect resources in society, and the IT systems seem to support these activities and to provide public value by optimizing the value of new existing resources."

The framework presented in Figure 4 summarizes the results of the Pederson's research.

Figure 4 – Pedersen's Research Results



Source: (Pedersen, 2020)

Therefore, open innovation is generally used by the public sector for innovation in society. Organizations seek to create value for their citizens by improving the quality of their lives. This is done through investments in IT that then strengthen other structures, with the aim of changing the citizens' behaviors, capabilities, and experiences.

More inbound or outside-in methods are applied, whereby organizations use external sources of knowledge or technology to solve problems they have faced. This contrasts with the low presence of outbound or inside-out techniques, where citizens would be more involved in public decisions. In any case, the improvements found and sought by the public sector are incremental, not disruptive.

1.6 How to Implement Open Innovation

As stated by Eelko Huizingh (Huizingh, 2011), the open methodology in the innovation field is not completely new. In fact, some of its characteristics, such as absorptive capacity, complementary assets, and the discussion of exploration versus exploitation, can be found in some older research than those of Chesbrough, (Cohen & Levinthal, 1990), and (Teece, 1986) (March, 1991).

In that case, why has the concept of open innovation described by the aforementioned author been so successful, so much that his book published in 2003 has received over 24,000 citations?

According to Eelko, there are three reasons for this:

1. Chesbrough gave a name to this theme. This has led many researchers and practitioners in this field to use the same term to define the set of methods and approaches that distinguish open innovation from closed innovation.
2. The second reason is related to timing. The author began this trend thanks to his research at the beginning of the 2000s, at a time of growing interest in issues such as outsourcing, collaboration, and the internet.
3. Finally, the third reason relates to the possibility of the expansion of these studies. Chesbrough laid the foundations on which many other researchers contributed, orienting themselves toward different objectives: theories integrated with other methods of innovation management, tools for measuring innovation processes, and techniques to implement them.

In this and the next chapter, I would therefore like to dive deeper into the methods that various companies and incubators have adopted and adapted to better adhere to open innovation concepts.

Huizingh identified two different moments that a company goes through when it wants to implement this type of practices:

1. **Opening up the company**: Making the organization ready for a transition to more open methods. This concerns the four organizational dimensions identified by (Chiaroni et al., 2010) and refer specifically to networks, knowledge management systems, organizational structures, and evaluation processes. They will be described in more detail in the next section.
2. **Practices of open innovation**: Effective creation and implementation of new methods. The examples cited in Section 4.2.1 will be taken from the in-depth analysis carried out by Marika Macchi, Ugo Rizzo, and Laura Ramaciotti (Macchi et al., 2014). I will describe how different Italian startup incubators differ in their structure and in the strategies adopted in managing the relationships between startups and external actors.

1.6.1 Organizational Dimensions

In the research published in 2010 in the journal *R&D Management*, Davide Chiaroni, Vittorio Chiesa, and Federico Frattini investigated the properties a company must satisfy to successfully attempt the transition from a closed innovation model to one more integrated with resources outside the organization (Chiaroni et al., 2010).

Their work focuses on research conducted through interviews with four large Italian companies belonging to mature and asset-intensive sectors, such as cement, steel pipes, sealant for buildings, and automotive brake systems. These companies were characterized by the closed innovation approach and by:

- Strong but very narrow scientific and technical competencies in their own areas of interest.
- R&D executed in an unstructured fashion, inside organizational units devoted to technical assistance activities.
- A focus on markets where customers are relatively low demanding in terms of product innovations and where competition is rather weak.

Finding it reasonable to frame the transition between the two approaches to innovation as an organizational change process, they used tools specific to this field to study their research object.

Taking up the work done by Lewin Kurt (Lewin, 1947), they outlined three stages that the company goes through when it must make changes to its structure:

1. **Unfreezing**: This phase is characterized by the creation of a "sense of urgency within the company" and then moves to the creation of a “guiding coalition” (Kotter, 1995) assigned to this specific initiative and finally the communication of this change both inside and outside the organization.
2. **Moving**: In this phase, the actual implementation of open innovation techniques is emphasized. Here, the approach is still experimental. New procedures and behaviors are aligned with the objectives set for this activity.
3. **Institutionalizing**: This last phase is related to the standardization of the norms and procedures of the previous phase. After various experiments and iterations, those that are the most suitable for the individual enterprise are then adopted and institutionalized to prevent a possible return to the previous status quo.

The researchers then identified four different dimensions through which the change toward open innovation happens and that can be stimulated to for adequate transition. These dimensions are as follows:

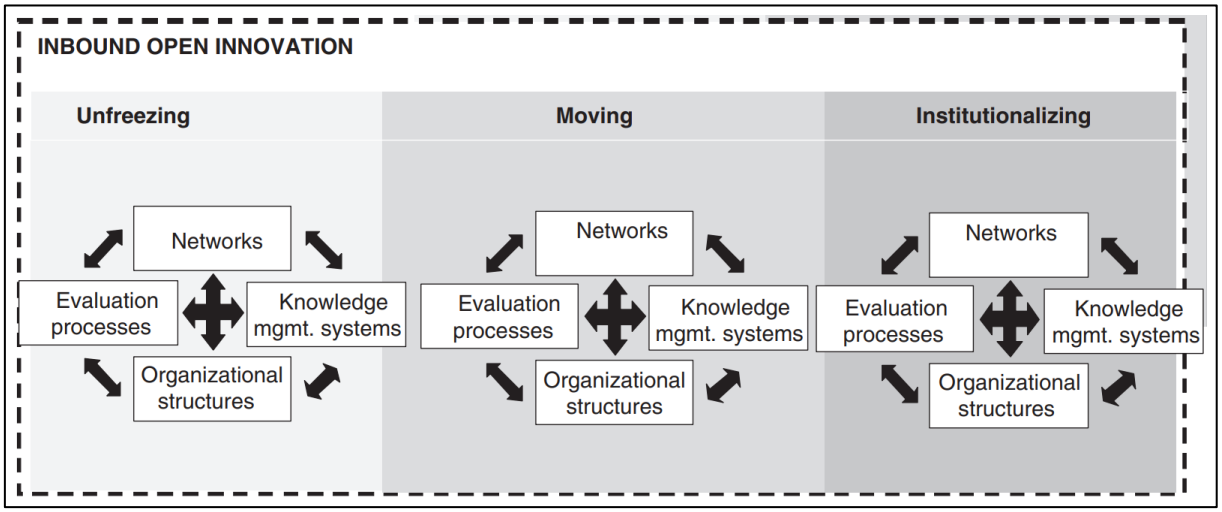
- **Networks:** This dimension refers to the extension of networking already present at the level of the company or of the individual personalities who were commissioned to create it. The effect that new employees, the managers hired for this transition, cause in bringing with them the social contacts gained in other previous work experiences is also considered. The division proposed by (Laursen & Salter, 2006) is considered here too. Two variables are defined:
    - **Search breadth**, related to the number of connections with actors outside the company that it owns and on which it can act as a partner
    - **Search depth**, related instead to the multitude of possibilities that can be used with regard to each individual connection

  According to the authors of this research, by "Working on these variables, increasing both search breadth and depth, firms are able to implement inbound Open Innovation" (Chiaroni et al., 2010).
- **Organizational Structures**: This dimension is applied to the creation of absorptive capacity. With the aim to acquire external resources, the structure of the company must be able to maximize the benefits it can derive from these resources. A reorganization to this effect may refer to:
    - **Organizational structures**: The definition of an independent unit dedicated to open innovation activities (Kirschbaum, 2005).

    - **Organizational roles**: Highly motivated managers who can act as leaders for this transition (Chesbrough & Crowther, 2006).
    - **Rewarding and incentive systems**: Systems suitable for the promotion of behaviors in line with the predefined objectives. This also implies a series of objectives and metrics aimed at implementing the correct methodologies (Chesbrough, 2003).
- **Evaluation Processes**: Procedures and metrics suitable for the evaluation of opportunities and projects from external sources. This means that situations and technologies characterized by a strong uncertainty will have to be evaluated, given that they have been developed outside the company and, therefore, with different standards. Processes in this sense are instead related to the continuous search for possible stakeholders or innovations that could be useful to business objectives.
- **Knowledge Management Systems**: With open innovation methods, the aim is to use both the internal and external knowledge to create an advantage or profits for the company. This must be supported by an adequate structure that makes possible "the diffusion, sharing and transfer of knowledge within the firm and the external environment" (Chiaroni et al., 2010, p. 226). Both the use of ICT technologies and IP management systems are considered here. Moreover, the IP protection systems are used as a defense from the competitors or also from the collaborating companies that can exploit the knowledge (Chesbrough, 2003).

The researchers then created a matrix using the three stages presented by Lewin and the four dimensions mentioned above. This is illustrated in Figure 5 below.

Figure 5 – Union between the Four Dimensions and the Three Lewin Stages



Source: (Chiaroni et al., 2010)

The authors then noted that a change in one of the four dimensions can have or require repercussions in the others. An example could be the request for a more refined ICT structure in the case of the expansion of the company's network of contacts.

In the results of their research, constant and significant characteristics that have led the analyzed companies to complete the transition from closed innovation to open innovation are identified. Using the three moments identified by Lewin, these characteristics are detailed below:

1. **Unfreezing**: At this stage, the need for the organization to create a separate entity with specific personnel roles so that it is possible to modify this knowledge management system is clear. In particular, the characteristics found are:
    a. A crucial role is played by the top management of the company. It is this role that initiates the process of change, thus suggesting a top-down approach. This feature proved to be constant even if the difficulties that led to the adoption of the new approach were different for the four companies.
    b. Re-design of the organizational structure. To encourage the project, units independent of the rest of the organization were created. These units were either R&D or IP offices. According to the researchers, these changes in the organization were effective because (Chiaroni et al., 2010, p. 240):
        i. "they made the change immediately visible to everyone within the firm"
        ii. "they did not interfere with the basic process and routines of the firm"
    c. Creation of specific roles for managers dedicated to the transition. The jobs created by the establishment of the new R&D or IP offices were filled by both

internal and external managers. This has created a sense of urgency and an environment with motivated staff to drive change forward.

d. Use of contacts of new managers. The research showed that in this first phase of the project, it is not the company's own networking contacts that create an advantage but rather the personal contacts of the hired managers. Precisely, this networking has allowed access to new technologies or opportunities for partnerships with external actors in the cases studied.

2. **Moving**: The creation of an independent unit is also made necessary by the growing network of contacts being created. In this second phase, the methods of open innovation are put into practice, although still not permanently. The characteristics found are as follows:
    a. To test the new approach, projects and experiments are created. These must be separate and distinguished from the normal organization of the company. In this way, it is possible to measure its results and see whether the new strategy actually leads to gains for the company.
    b. Creation of a company network. Starting from the already mentioned personal network of managers dedicated to these projects, the contacts are formalized to make them corporate. Initially, these contacts are exploratory; therefore, using the terminology of Laursen and Salter (Laursen & Salter, 2006), the search breadth component prevails rather than the search depth. At this stage, the preferred partners are the universities (Chiaroni et al., 2010). The companies in the research consider it less risky to have relationships with universities rather than with suppliers or customers regarding the possibility of unwanted spillovers. As the authors stated, "Focusing on universities as external sources of technical knowledge is therefore consistent with the low attitude of the companies towards IP protection" (Chiaroni et al., 2010, p. 241).
    c. More formalized evaluation system. At this stage, a critical role is that of the company's IP office, as it tends to outline procedures for evaluating projects or opportunities that emerge outside the organization.
3. **Institutionalizing**: In this last phase, the processes and metrics used and deemed significant are standardized and made the norm. In detail, at this stage the following are noted:
    a. **New roles:** In this phase, new roles are defined for management, in particular, the gatekeepers, who deal with the external scouting of opportunities, and the innovation champions, who manage specific projects and evaluate their progress

according to specific indicators. Therefore, in this phase, new roles are institutionalized, defining their tasks and consequently abstracting them from the individual people who cover them.

b. **Metrics:** As mentioned above, the metrics used for the evaluation of projects and technologies regarding open innovation are standardized.

In this phase, the target is to normalize the changes made. In the authors' words, "in order to avoid a quick slip back to the traditional, Closed Innovation approach, it is useful to establish new organizational roles in charge of managing the evaluation and development process of innovation opportunities generated in an Open Innovation environment" (Chiaroni et al., 2010, p. 242).

Below is the summary outline of the structural changes made in the transition from closed innovation to open innovation:

Figure 6 – Changes in Transitioning from Closed Innovation and Open Innovation

	Inbound dimension		
	Unfreezing	Moving	Institutionalizing
Networks	Exploitation of individual social networks, particularly for developing relationships with universities and research centres.	Creation of an exploration network, through a switch of existing individual social networks to the firm level.	Establishment of long-term forms of collaboration with universities and research centres.
Organizational structures	Achievement of a strong commitment from the firm's top management. Separation of R&D activities from existing technical assistance. Creation of an independent Intellectual Property Office within the firm Identification, eventually through a jump in-approach, of an Open Innovation champion.	Establishment of a dedicated organizational unit for managing collaborations with universities. Identification of a pilot project (well defined and separate from the rest of the firm's innovation activities) to serve as experimental field for the implementation of Open Innovation.	Creation of the role of gatekeepers for monitoring the development of technologies and scientific advances in the areas of interest for the firm. Identification of the main areas of research and establishment of innovation champions for each of them.
Evaluation processes	Establishment of regular meetings for validating and monitoring innovation projects developed within the firm.	Introduction of explicit evaluation procedures to assess the potential for accessing external sources of knowledge, particularly within the existing exploration network.	Adoption of general indicators and eventually of derived innovation performance measures for project managers.
Knowledge management systems	Start to file patents leveraging knowledge already existing within the firm.	Adoption of ICT systems (videoconference, project management tools) for increasing project team interoperability.	Assessment of patenting activities, eventually explicitly included into the firm's strategic plan.

Source: (Chiaroni et al., 2010)

2 What is an Incubator?

In the words of Hackett Sean and Dilts David, a business incubator is a shared office space facility that seeks to provide its incubates (i.e. "portfolio-" or "client-" or "tenant-companies") with a strategic, value-adding intervention system (i.e. business incubation) of monitoring and business assistance (Hackett & Dilts, 2004).

However, this definition is not univocal in the literature, and the researchers mentioned have listed the many alternatives they have encountered during the study of the topic.

The definition given alternately focuses on different aspects of the incubator, but all important and central in the role it plays in economic development.

Generally, almost all definitions give weight to the function of the incubator to reduce the "failure rate" of incubated companies. These are interested in the functions of the incubator precisely because of their inexperience in creating and managing a company. This type of definition includes that of Raymond Smilor: "Reducing the rate of failure in small business by assistance in the critical stage of business development—the early years" (Kuratko & LaFollette, 1987, p. 49).

Within an incubator, services are offered to fill the gaps that the startups' teams have, offering complementary skills. According to Candace Campbell, this is done "By providing a variety of services and support to start-up and emerging companies, the incubator seeks to effectively link talent, technology, capital, and know-how to leverage entrepreneurial talent, accelerate the development of new companies, and thus speed up the commercialization of technology" (Hisrich, 1988, p. 229).

Other definitions found in the paper wrote by Hackett and Dilts emphasize the local aspect of incubators: According to (Mian, 1996), the main role of a business incubator is to encourage and support the business development in the place where it is based. Therefore, the role of the incubator is also to develop local economies by supporting entrepreneurial projects in the area.

Linked to this, university incubators have been identified. These aim to transfer the knowledge, created within their university of belonging, to the market through the creation of startups and small companies that, by innovating, create useful products or services. (Mian, 1994) identified the university technology business incubator as a tool used by universities that aim to support the birth of new startups or technology-based firms in general.

In these and many other definitions that the literature assigns the term "business incubator," two elements are recurrent:

- Support of entrepreneurial projects through the offer of workspaces (co-working), equipment, management services of the startup, and the provision complementary skills to those possessed by the startup team.
- The objective to strengthen the local economies in which the incubator is present. This is done through the aforementioned services as well as with networking activities with specific local partners, such as universities, companies, or organizations.

2.1 Local Development

As early as 1989, the importance of small businesses in creating new jobs in declining economies and sectors was noted (Campbell, 1989). It is such companies that generate most of the new jobs (Birch, 1980). However, most of them lack the actual growth prospects toward more mature business stages, with only 10–15% of these classifiable as "growth firms" (Campbell, 1989). Therefore, services such as the assistance in finding sources of financing for projects and the geographical concentration of technology-based companies are necessary.

Incubators, by providing low-cost co-working spaces, business development activities, and assistance in financing, can contribute to the economic development of the area in which they are located. By helping small businesses to develop, they consequently lower their failure rates, thus contributing to the creation of new jobs positions. According to Campbell, "Business incubators are a sensible strategy for economic development only if they can accumulatively assist in the survival and accelerate the growth of new enterprises" (Campbell, 1989, p. 57).

The main goals that these organizations try to achieve are (Moleiro Martins et al., 2020):

- The creation of employment in the community
- The creation—or acceleration of growth—of a local industry
- Diversification of the local economy

Incubation can be both physical or virtual (examples are given in Chapter 4). Physical incubation has the possibility to use all the services of the organization and the possibility to be in appropriate offices and labs as a workplace. Generally, the rental price in incubators is lower than the average of the local market thanks to the effects of public funding provided to support local entrepreneurship. The result is the advantage of being able to create a closer network of

networking and exchange of services with other incubated startups or with the staff physically present in the building.

On the other hand, virtual incubation offers all support services, as in the physical case, but without the occupation of spaces. However, meeting rooms and a credible address for the market for professional contacts remain available (Moleiro Martins et al., 2020).

2.2 Effects of Business Incubators on Startups

Startups by definition cannot invest heavily in R&D (Paternoster et al., 2014); therefore they need external funds or even external sources of knowledge. Moreover, there are cases where they need specific skills that are complementary to those they already have, such as marketing and logistics.

In these aspects, incubators can help startups in two ways: The first is to provide skills to startups to help them manage their network of knowledge or specific skills; the second is by providing scouting on possible external partners that would be useful for the startup.

Through a quantitative approach, Sedita, Apa, Bassetti, and Grandinetti (Sedita et al., 2019) analyzed 243 startups and SMEs present in the territory of Northern Italy in the mechanical and service sector to verify whether and how much the incubator is actually useful in increasing the innovation performance of the startup as well as whether this partnership has significant effects on the internal skills and external collaborations of the incubated company.

The startup's performance was measured by creating a variable (INNO_PERF) formed by the amount of the turnover related to products new to the market. This has made it possible to analyze the mechanical and the service sector even though they are clearly different.

The following figure displays all the variables used by the statistical model.

Figure 7 – Variables Used in the Model Creation

Type	Name	Label	Description
Dependent variable	INNO_PERF	Innovation performance	Fraction of firm's turnover from products new to the market
Independent variables	INCUB	Incubation	Dummy variable (1/0), assumes value 1 if the firm passed through an incubator (either public or private) and 0 otherwise
	COLL 0–5	Collaboration breadth	Number of types of collaborations for innovation (factor variable ranging from 0 to 5)
	BUSINESS	Business capabilities	Principal component for marketing and managerial capabilities
	TECHNICAL	Technical capabilities	Principal component for technological and ICT capabilities
Control variables	PROT	IP Protections	Number of types of IP protections
	R&D	R&D expenditure	Percentage of turnover in R&D in the firm first year
	GEO	Geographical area	Dummy variable (1/0), assumes 1 if the firm is located in the North-Western part of Italy, 0 if the firm is located in the North-Eastern part of Italy
	INDUSTRY	Industry specificity	Dummy variable (1/0), assumes value 1 if the firm is a KIBS and O if the firm is a MEF
	AGE	Firm age	Years from firm foundation, calculated in 2012, spans from 3 to 7
	SIZE	Firm size	Number of active founders and employees in 2012
	TYPE	Type	Dummy variable (1/0), assumes value 1 if the company is a spin-off and 0 otherwise
	EXPORT	Internationalization	Dummy variable (1/0), assumes value 1 if the company report foreign sales and 0 otherwise
Variables used to construct BUSINESS and TECHNICAL	TECH	Technological capabilities	Firms evaluation of technological capabilities after 3 years from the foundation
	MKTG	Marketing capabilities	Firms evaluation of marketing capabilities after 3 years from the foundation
	MAN	Management capabilities	Firms evaluation of management capabilities after 3 years from the foundation
	ICT	ICT capabilities	Firms evaluation of ICT capabilities after 3 years from the foundation

Source: (Sedita et al., 2019)

The model produced by the researchers consists of two standard regressions, shown in the following figure.

Figure 8 – Tables Describing the First Model's Tests

	(1)	(2)
INCUB[1]	0.574**	−0.612
	(0.243)	(0.544)
BUSINESS	0.173	0.114
	(0.144)	(0.127)
TECHNICAL	−0.001	0.093
	(0.132)	(0.122)
INCUB*BUSINESS[1]	−0.264	
	(0.258)	
INCUB*TECHNICAL[1]	0.418**	
	(0.227)	
COLL 1	−0.591	−0.693
	(0.553)	(0.533)
COLL 2	−0.602	−0.766
	(0.515)	(0.490)
COLL 3	−0.177	−0.193
	(0.390)	(0.403)
COLL 4	−0.082	−0.093
	(0.432)	(0.455)
COLL 5	−0.158	0.118
	(0.484)	(0.554)
INCUB*COLL 1[1]		1.516
		(1.550)
INCUB*COLL 2[1]		1.770**
		(0.951)
INCUB*COLL 3[1]		1.154**
		(0.651)
INCUB*COLL 4[1]		1.161*
		(0.713)
INCUB*COLL 5[1]		0.324
		(0.770)
PROT	0.017	0.003
	(0.098)	(0.105)
R&D	0.029***	0.029***
	(0.006)	(0.006)
GEO	0.238	0.270
	(0.240)	(0.244)
INDUSTRY	−0.461*	−0.485*
	(0.258)	(0.263)
AGE	−0.247**	−0.218*
	(0.116)	(0.124)
SIZE (log)	−0.056	−0.084
	(0.167)	(0.167)
TYPE	0.234	0.322
	(0.281)	(0.297)
EXPORT	0.238	0.199
	(0.232)	(0.246)
Observations	243	243
Pseudo R^2	0.079	0.079
Log-Likelihood	−359.870	−360.070

	(1)	(2)	(3)
INCUB[1]		0.614***	0.516**
		(0.238)	(0.242)
COLL 1[1]			−0.382
			(0.583)
COLL 2[1]			−0.375
			(0.498)
COLL 3[1]			0.025
			(0.405)
COLL 4[1]			0.127
			(0.442)
COLL 5[1]			0.015
			(0.503)
BUSINESS[1]			0.094
			(0.123)
TECHNICAL[1]			0.117
			(0.119)
PROT	0.034	0.026	0.019
	(0.094)	(0.094)	(0.100)
R&D	0.029***	0.028***	0.028***
	(0.005)	(0.006)	(0.006)
GEO	0.115	0.094	0.230
	(0.231)	(0.233)	(0.242)
INDUSTRY	−0.382	−0.433*	−0.474*
	(0.240)	(0.242)	(0.254)
AGE	−0.265**	−0.272***	−0.265**
	(0.104)	(0.104)	(0.115)
SIZE (log)	0.001	0.021	−0.076
	(0.158)	(0.158)	(0.166)
TYPE	0.325	0.183	0.253
	(0.262)	(0.260)	(0.275)
EXPORT	0.215	0.200	0.223
	(0.226)	(0.227)	(0.232)
Observations	248	248	243
Pseudo R^2	0.058	0.065	0.075
Log-Likelihood	−375.619	−372.780	−361.629

Source: (Sedita et al., 2019)

In the first column of the first table in Figure 8, the model was tested without independent variables in it. Two variables were significant:

- Initial R&D expenditure, positively correlated with INNO_PERF
- AGE, negatively correlated with INNO_PERF. However, this result is due to the lower number of companies founded in 2009.

In the second column, it is instead tested whether belonging to an incubator affects the innovative performance of the startup. The result is positive: "incubators facilitate the return from the innovation process" (Sedita et al., 2019).

The third column of the first table tests the hypothesis of which internal business skills or technological skills of the startup are important for its performance. This hypothesis is not confirmed, but it should be noted that during the research, entrepreneurs were directly asked to assess their gaps in the internal skills of their organization. This exposes the hypothesis of overestimation of internal competences. Precisely in this topic, however, the role of the incubator could be useful, as it could more adequately estimate the skills present in the incubated persons and therefore also understand the complementary skills needed.

Even the variable related to collaboration breadth is not significant in influencing the startup's performance. One possible explanation mentioned by the researchers is that the startups under consideration are still too young to have developed a profitable network of contacts.

The correlation with the initial R&D intensity variable is positive. According to the researchers, "This result paves the way to a more careful debate on the role of open innovation for start-ups, since the phenomenon has been prevalently looked under the lenses of the large corporation, which often 'uses' start-ups for knowledge exploration through acquisition processes, corporate incubators, crowdsourcing platforms and online competitions" (Barkema & Vermeulen, 1998) (Becker & Gassmann, 2006) (Lampel et al., 2012).

Proceeding with the second table, the first column tests the hypothesis of which technical or management skills are significant only for those startups that have gone through an incubation process. INCUB*TECHNICAL is in fact positive and significant.

Finally, in the second column of the second table, the relationship between the dummy variable of incubation and the types of collaboration outlined in the research is tested.

The collaboration types two and three are significant. However, the authors noted: "Given our specification, the coefficient for the sole variable INCUB captures the average innovation performance of firms that have been incubated but are not engaged in any type of collaborations. Notice that, despite the number of these firms is too small to draw any reliable conclusion, their performance does not significantly differ from that of firms engaged in all types of collaborations" (Sedita et al., 2019, p. 10).

The explanation for these values could lie in the quality of the collaborations that incubated startups have and from which they can therefore receive value. One of the purposes of startup

incubators is precisely to provide support in relations with other external actors. As previously mentioned, the incubator can help the startup to develop its network, as well as provide new quality contacts. Help can also materialize in providing services and skills that are not present within the startup team.

Therefore, this advantage can be translated into a better performance of the incubated company, leading it to generate greater profits from the marketing of new products.

2.3 Services

Rice Mark, in a study published in 2002 (Rice, 2002) analyzed the services that incubators offer and develop with a co-creation method. In this case, the main actors in the phenomenon of co-creation are the incubated entrepreneurs and incubator staff. Through the interaction between the two parties, specific activities can arise that the organization offers to cope with a lack or problem encountered by startups.

Therefore, both the entrepreneur and the incubator managers participate in the development of these activities, but it must be noted that the startup team chose incubation precisely to obtain the advantage that the greater experience and knowledge of the incubator can bring to the project.

The services offered can be divided into the various functional areas, such as risk management, marketing, finance, legal and intellectual protection, product development, business planning, and team building. These needs can be filled by the staff or with the possibilities that the incubator proposes, as well as by its networking abilities. The subsequent sections will explore how open innovation firms try to leverage the resources outside them to create an advantage to internal processes. Especially in the case of laboratories or specific instrumentation, the incubator may not have such assets internally or consider it inconvenient to purchase for too specific needs, thus preferring the rental of this equipment from external sources, such as universities or already established companies.

In Figure 9, the services offered by the incubators that participated in Rice's study are shown, with the count of incubates that requested them.

Figure 9 – Types of Services Provided by the Incubator or Incubator's Network

Type of business assistance	Via counseling (# of cases reporting)	Via networking (# of cases reporting)
Group medical/dental insurance	0	4
Other types of insurance	4	7
Accounting/tax assistance	3	6
Legal/patent services	2	8
Business plans/strategic planning	17	6
Advice about team building	12	1
Cash flow management/general financial management	9	4
Sales/marketing/international trade	8	5
Government procurement contracts	3	3
Employment assistance[a]	0	4
Assistance with government grants and loans	9	6
Incubator revolving loan fund	0	0
Incubator seed capital fund for tenant companies	0	1
Assistance to gain outside debt financing	5	7
Assistance to gain outside equity financing (v.c., angel or investment banking	7	9
R&D/product completion	2	1
Access to labs, shops, lab equipment, computer processing, libraries, etc.	0	8
Others. Please list.	0	0

[a] Includes labor issues related to the Job Training and Procurement Act, access to students and faculty, resume flow, etc.

Source: (Rice, 2002)

The co-creation modes are divided into three categories:

1. **Passive environmental intervention**: This category concerns all the cases in which the service is provided without the direct intervention of an incubator manager. For startups, the advantage here comes from the simple belonging to the structure of the organization and thus with the possibility of coworking, the use of special rooms for meetings, and above all, the proximity to other startups.
2. **Counseling**: "Counseling refers to the actual dissemination of knowledge and advice to entrepreneurs in the domain of business start-ups" (Rice, 2002, p. 174). In this case, the consultancy can be substantially different from the one offered by external parties, such as chambers of commerce or consulting companies, because the manager is present within the organization together with the entrepreneurs of other startups, with the possibility of monitoring the progresses daily. Moments of "peer-to-peer review" between the incubated teams are therefore also possible, with the incubator staff as mediators.
3. **Networking**: If the incubator does not have the resources or knowledge to support the incubated enterprise, it must be able to leverage its network of knowledge to respond with the right resources. Therefore "developing and managing a networking

infrastructure is a critical function of the incubator" (Rice, 2002, p. 176). The absence of an entrepreneurial past for the startups makes them risky actors, with an unproven reliability, whom external companies may not want to work together with. Therefore, there is a lack of credibility that can be compensated by the interceding of the incubator, who acts as guarantor and mediator for the relationships that the teams have with the outside world.

2.4 Italian Incubators

2.4.1 The Relevance of the Open Innovation Structure

In a 2014 study, researchers Marika Macchi, Ugo Rizzo e Laura Ramaciotti deepen “strategies business incubators adopt in respect to the creation of incubates intellectual capital, with particular focus on the link between business incubators structural capital and the creation of incubate relational capital” (Macchi et al., 2014, p. 554).

The authors considered incubators as gatekeepers for the contact network needed by the startup to acquire the resources it needs. In their paper, they are defined as intermediaries of innovation and their structure, the motivations underlying it, and how this influences the exchanges of knowledge are studied.

Five of the major Italian incubators were then examined, and then analyzed the methods used to increase what is defined as relational capital of incubated startups, that is, their external connections with suppliers, partners and other bodies and organizations that are relevant to the company's activities (Suciu et al., 2012).

(Provan & Kenis, 2007) outlined two dimensions to measure how the incubator implemented techniques related to open innovation:

- **Management centrality-structured strategies**: This is the degree of specialization of the social connection that an incubator can and want to offer to the incubates. Only a highly specialized staff has the capacity to decide ex ante the type of connection that better fits with the startup’s needs.
- **Existence of bottom-up-based strategies versus top-down decision-making**: This the type of structure that the incubator has adopted or obtained from its decisions. Specific networking activities that are conducted are also included, as well as co-working areas and regular meetings.

The five different structures analyzed will be briefly presented below, as well as the results of the research. Table 4 provides additional features on each of them, such as sectoral specialization, which will then be useful in the conclusions.

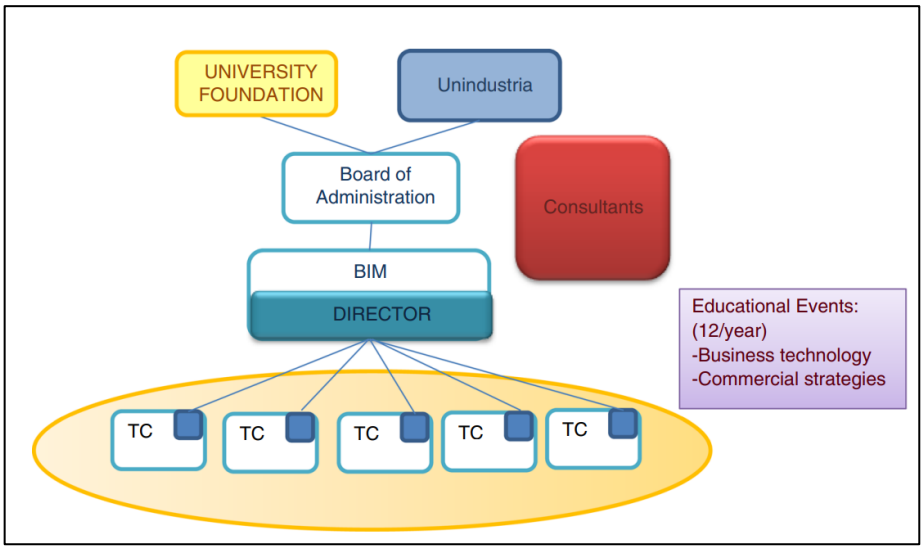
Table 4 – Characteristics of the Incubators Examined

	Property	Sectoral specialization	Multisectoral incubatees	University linkages
Alpha	Public (private from march 2013)	Non sectoral specific but majority of firms are in ICT and web based	Yes	Owned by university and external linkages
Beta	Public	Non sectoral specific	Yes	Owned by University
Gamma	Private	ICT with manufactured goods	No	No
Delta	Private	ICT web-based only	No	External linkages
Epsilon	Public	Non sectoral specific but large share of firms in ICT and web based	Yes	Owned by university

Source: (Macchi et al., 2014)

2.4.1.1 The First Incubator

Figure 10 – Alpha Incubator Structure



Source: (Macchi et al., 2014)

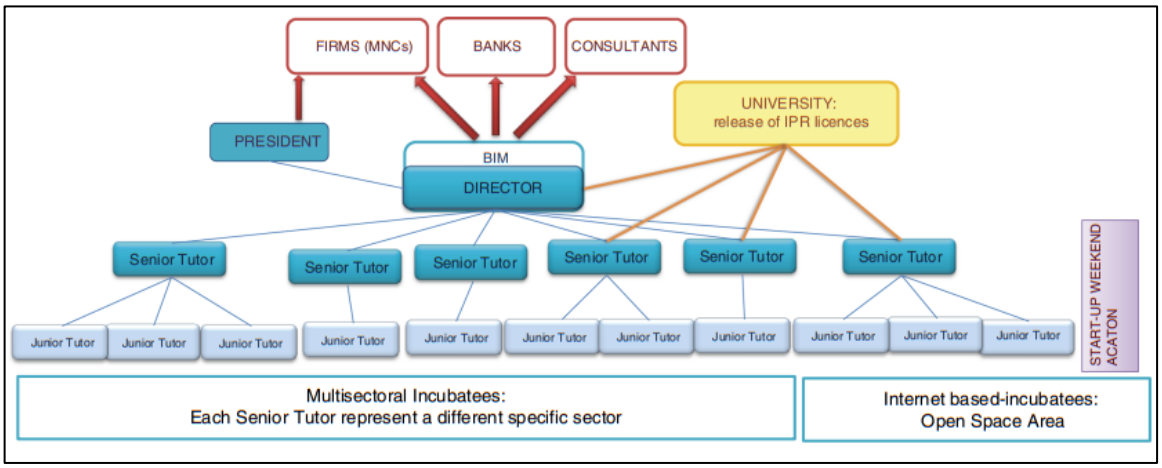
The first incubator was defined by its administrator as a "light incubator," as the goal is to let the knowledge streams be created autonomously. This simplicity in the structure can also be caused by the few staff numbers, in turn caused by the difficulties that the incubator faces in appropriating funds from the finances of the university to which it is connected.

Regarding the knowledge flows, the administrator commented: “Within the incubator there are companies. Their aim is to produce and sell. Companies and entrepreneurs interact when they identify a common objective and when the collaboration will bring advantages to both of them. If these preconditions are in place, an exchange of information and knowledge will take place and they will develop some joint project; or in supply chain logic there will be some exchange. This is a normal way of interaction, daily, and mostly linked to the sharing of the same workplace" (Macchi et al., 2014, p. 559).

Therefore, it is the startups that autonomously take action to search for the contacts they need, even directly to the incubator. In fact, these are still provided if the startup requests them. The only activity that the incubator of its own initiative provides to the incubates is an annual training event. The topic of this event changes from year to year according to the startups’ needs.

2.4.1.2 The Second Incubator

Figure 11 – Beta Incubator Structure



Source: (Macchi et al., 2014)

The second incubator is affiliated with a university and is among the 15 best university incubators in the world (Ubi Global, 2022). It has 40 startups inside, but for 10 of these, it operates as a virtual service for their support. Although it does not have a specific sector of reference, the incubator has prepared ad hoc spaces for startups operating in the ICT world.

The activities are supervised by senior tutors, people with previous experience in the working world, also directly in the creation of a startup, who advise according to their specific skills. Below these are the junior tutors, graduated in engineering management and working there with post-graduate scholarships.

The organization of this second incubator focuses essentially on tutors, as they provide the social contacts that the startup needs, as well as the specific consulting aspect for the sector in which it finds itself operating.

As stated by the authors, “They provide the large majority of contacts and help answer the firms’ needs: they recognize needs and advocate solutions" (Macchi et al., 2014, p. 561).

Knowledge management is centralized in the roles of the tutors and in the incubator itself, both as regards the contacts between the various startups and in case of contacts with the outside world.

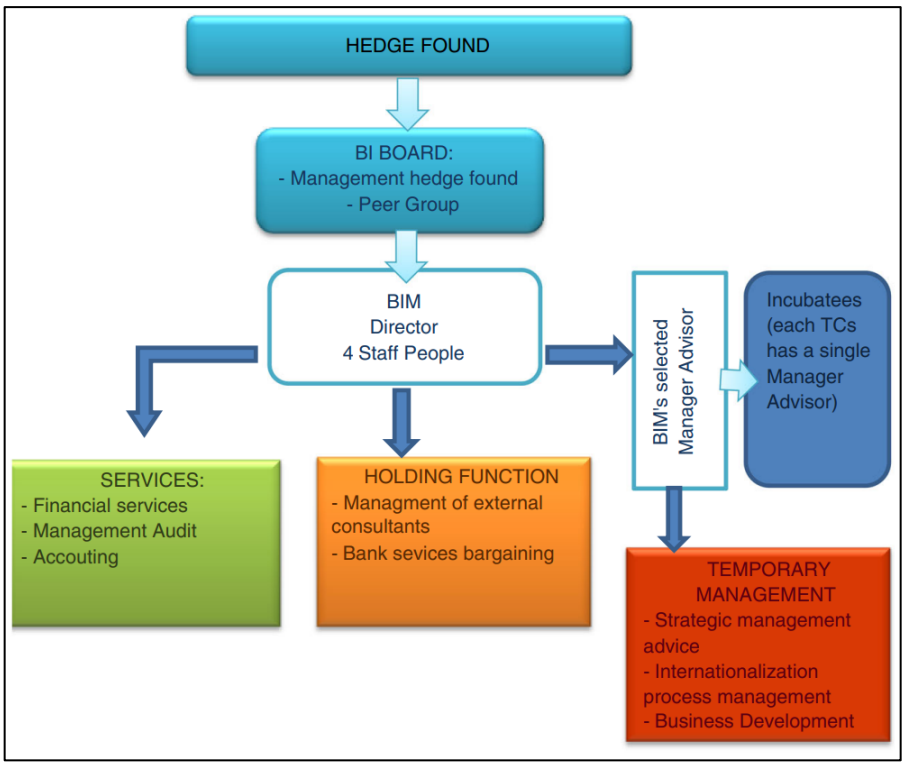
"[in the second incubator] structural capital effectiveness depends substantially on human capital involved" (Macchi et al., 2014, p. 561).

In this case, ad hoc events for incubates are not organized. However, there are small events, not recurring from year to year, that emerge when necessary. The administrator's answer to the question of whether or not meetings were organized for startups was thus: "No, no, they simply emerge, we know them. There are some kinds of mini-meetings which we have when necessary, where we discuss various issues, etc" (Macchi et al., 2014, p. 561).

However, the incubates belonging to the ICT sector are managed differently. In fact, these have a dedicated co-working space, and consequently, the contacts between the startups happen more spontaneously. The incubator then organizes events for the latter. In any case, the figure of the tutor remains of central importance, offering their skills in identifying needs and solving problems. The role of the administrator and president of the incubator is also relevant when looking for external contacts for financing or partnerships with large companies.

2.4.1.3 The Third Incubator

Figure 12 – Gamma Incubator Structure



Source: (Macchi et al., 2014)

The third incubator has seven startups, all belonging to the ICT sector, and all still incubated at the time the research was carried out. Initially, they were organized in an open space, and then the workspaces were located in offices close to the startups but with the possibility of being independent of each other.

How the collaborations between startups are seen is interesting. In the words of the administrator and founder:

"Consultancies among our firms happen and we like them […] So yes, there are spontaneous deals, but there is never the joint production of a product, because problems may arise about its management, its property, and so on. This may lead to complications in terms of investments of intellectual property rights, and so on and so forth. […] So, we do not favour them, but sometimes they happen and we do not hamper them" (Macchi et al., 2014, p. 563).

The relationships of mutual help are therefore left to emerge spontaneously, as in the previous incubator, while the relationships that also underlie a co-development of a product are seen in a more problematic way.

In this incubator, the consultancy for the startup is done by an expert designated by the organization, who enters the incubate directly as a shareholder—this allows them to have a key role in the management.

It is therefore this person who provides the first social contacts, even outside the incubator, to the startup.

As for the relationships between startups, below is the administrator's response:

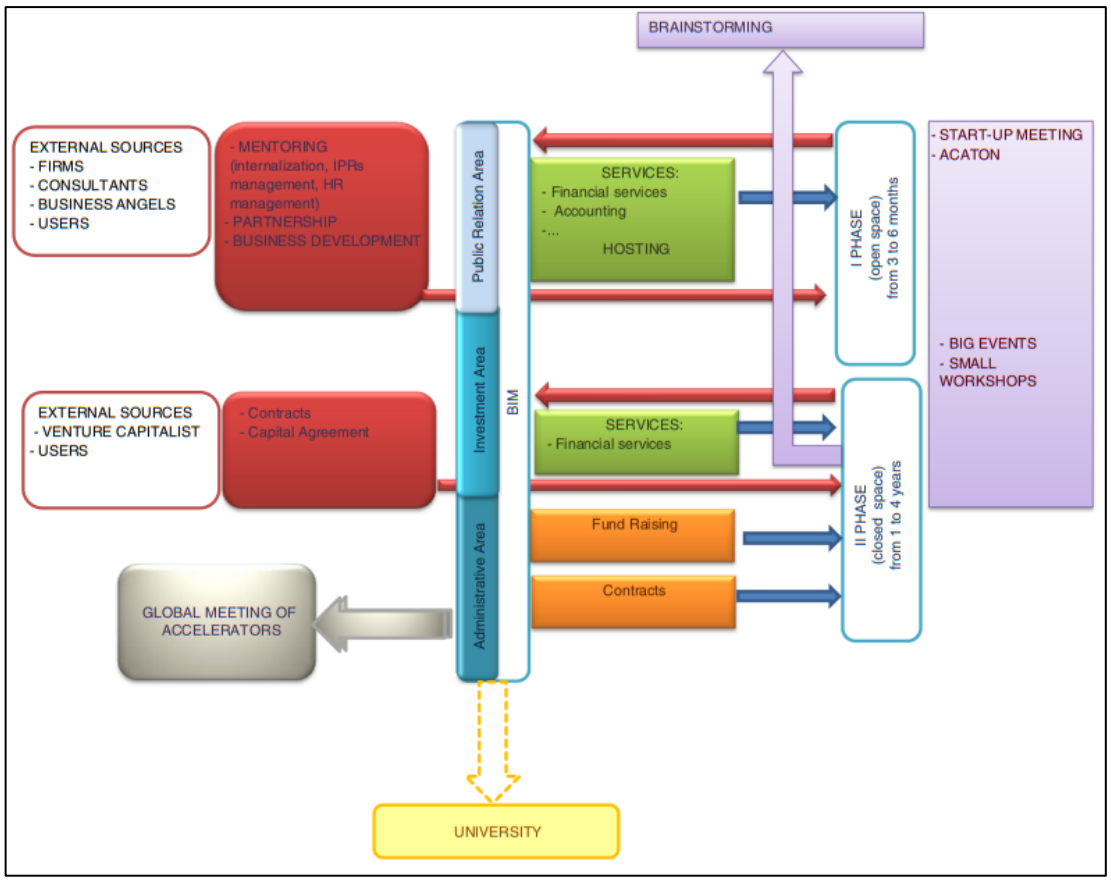
“Well, there is a great deal of discussion, especially at the beginning. Obviously there is gradually less discussion as the company sets itself up. Dialogue is also fostered by us. Every 3 months we have a meeting which we call the CEO meeting; this is a meeting with the incubates CEOs, our staff, and some external experts are invited, always in attractive locations. [y] Here strategies are shared. [y] Often ideas stem from these meetings” (Macchi et al., 2014, p. 563).

A robust top-down strategy emerges, where it is the incubator staff, together with the expert who joined the startup, who influence its decisions, especially in the early phase. The figure of the CEO of the startup remains clearly central, and it is up to them to make the final decision. In the words of this incubator’s administrator:

“The strategy to be adopted is firstly discussed both with myself and with others, that is to say that the contribution played by this figure is the result of a group decision. It is clearly this person alone, however who holds responsibility in so far as he is part of the CDA, and therefore it is up to him to make the final decision. At the same time, we always discuss, exchange opinions, etc.” (Macchi et al., 2014, p. 563).

2.4.1.4 The Fourth Incubator

Figure 13 – Delta Incubator Structure



Source: (Macchi et al., 2014)

Similarly, this incubator hosts only startups belonging to the ICT sector. They are initially arranged in an open space, where they remain for a period of three to six months and then move into a space more separate from the others incubated for three or four years.

Contrary to the previous case, here, the startup must request the services of the incubator, if it deems it necessary:

"The philosophy of the incubator is to let the firms create ab shape relationships both within the incubator and with the external environment. The incubator offers space and some initial funding, and series of consultancy services, if and when the firm requests it" (Macchi et al., 2014, p. 563).

Companies can request the intervention of the so-called "investment team." It helps in strategic decisions, but without a strong link with the rest of the incubator staff.

Therefore, the top-down approach is absent in this case. However, the investment team can elect a mentor for the specific problem that has emerged from the startup. This mentor will then act as a consultant with their specific skills. A mentor helps multiple startups, and a startup can be helped by more than one mentor at once. These figures are professionals outside the incubator since they are not part of its ordinary staff.

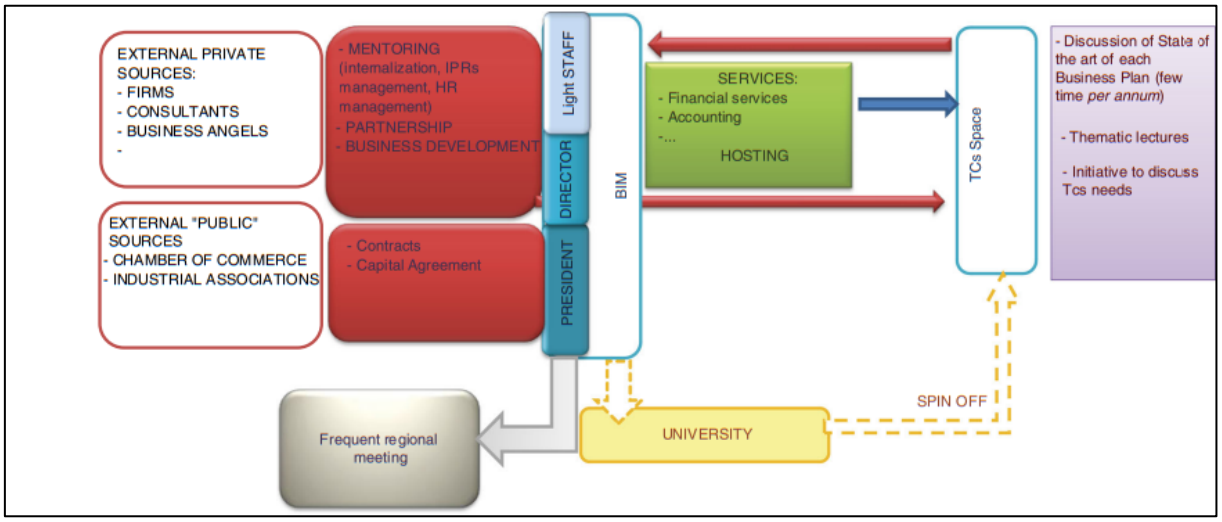
This, in this case, there is a more bottom-up approach, as it is the startup that requests the services that the incubator can provide or for advice such as those of mentors.

Once the startup has reached a higher level of maturity, both as a business model and as a social contact, it is moved to a more independent office but still maintains the services and contacts provided by the investment team.

At this point, there are events in which the incubate can participate, organized by the incubator. These are the moments when there is a greater exchange of ideas and more possibilities for creating networking. In fact, there are six international events organized every year, each on a specific theme with the invitation of experts in the field. There are also minor events organized monthly.

2.4.1.5 *The Fifth Incubator*

Figure 14 – Epsilon Incubator Structure



Source: (Macchi et al., 2014)

The last incubator is also of the university type. Like the second incubator on this list, this one also operates as a virtual incubator for some of its startups.

According to the researchers, the approach in this case is as follows: “[the incubator] tends to let the firms exchange information and knowledge among themselves and the external environment in a natural way, supporting them mostly through the provision of space and through the organization of events” (Macchi et al., 2014, p. 565).

In this case, the events are repeated throughout the year, even in the topics. The staff of the organization then participates in many events, mainly regional, to create a network of contacts that can be useful to startups.

Moreover, this incubator is characterized by a "local" approach: It tends to establish contacts with geographically close actors—not only universities but also the chamber of commerce, industry associations, business Angels, and more.

Many consulting services are offered to incubates, and generally, partnerships are activated at the request of these, or even by an initiative of the incubator staff when it is believed that the startup lacks the necessary skills.

Each six months, an event is organized where startuppers describe their achieved objectives and those still in progress. The administrator of this incubator described these events as follows: “We created this biannual initiative, with the formal aim of discussing the balance sheet state of the art, and to force the firms to explain their activities, their advancement and their plans. With the excuse of asking them to prepare a sort of mini -balance sheet, we force them to explain the details of their activities and strategies. We have to do this if we want to monitor and help the firms that lack their own initiatives as needed” (Macchi et al., 2014, p. 565).

With a view to open innovation, this incubator therefore adopts both bottom-up methods, originated from the initiative of startuppers, and top-down methods, with a control over the results and skills present in startups.

2.4.2 Conclusions

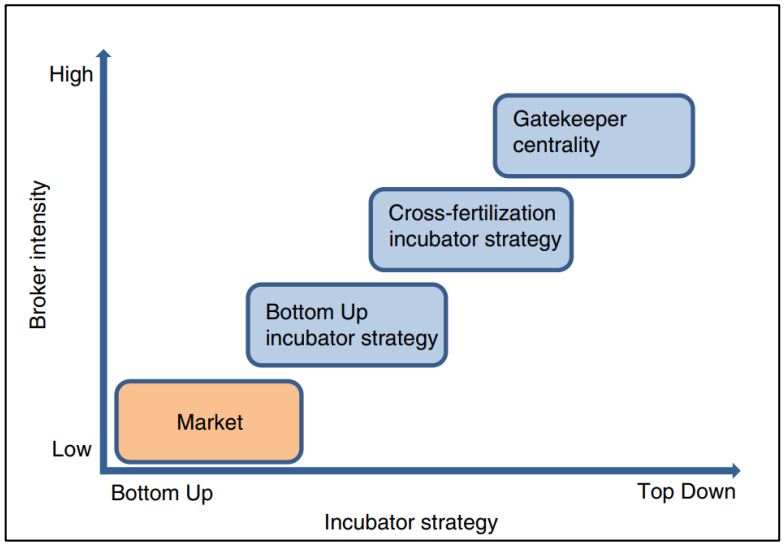
From the examples seen, three different types of organizations used for knowledge management within startup incubators emerge:

- **Bottom-up strategy**: As in the first case examined, maximum freedom is left to startuppers. In fact, they are the ones who request the intervention of the incubator staff when they deem it necessary. In this case, the gatekeeper role played by the incubator is in the early stages of the startup, helping it with its business contacts. The organization therefore needs technical skills to evaluate which are the best projects to incubate.

- **Cross-fertilization strategy**: This is the second and third cases analyzed. The incubator manages the events and creates the right tools to make the startups communicate with each other or with external actors. The staff then facilitates networking with other relevant actors but does not exert a strong influence on the startuppers' decisions. The incubator in this case does not need in-depth technical skills but much commitment to the management and coordination of activities.
- **Gatekeeper centrality strategy**: This is the last two cases presented. This is the method that requires the most structure from the incubator. The strategy is in fact top-down, and the incubator manages the interactions that startups have both between each other and with external actors. Therefore, in-depth management skills and technical skills in the sector to which the startup belongs are necessary.

Below is a summary image of the methods analyzed with reference to the gatekeeper role (*y*-axis) and the incubator strategy (*x*-axis).

Figure 15 – Incubator Strategy and its Role as Gatekeeper



Source: (Macchi et al., 2014)

Table 5 – Incubator Strategy. Bottom-up vs. Top-down

	Incubator's strategy	Intensity of BIM's guide	Bottom up strategies
Alpha	Bottom-up	Low	High
Beta	Gatekeeper centrality	High	Low
Gamma	Gatekeeper centrality	High	Low
Delta	Cross-fertilization	Medium	Medium
Epsilon	Cross-fertilization	Medium	Medium

Source: (Macchi et al., 2014)

The researchers then identified three other variables that characterized the structure of the incubators and have consequences on the open innovation strategies adopted by each of them:

- **Sectoral specialization**: It has been found that some sectors naturally develop networking activities (ICT, software, etc.).
- **Co-existence of startups from different sectors in the same incubator**: Some previous studies revealed a positive correlation between innovation performance and mono-sectorial incubators (Schwartz & Hornych, 2010). On the contrary, other studies showed evidence of a positive correlation between innovation performance and multi-sectorial incubators (Stuart & Podolny, 1999). Finally, "technology brokering offers a perspective on innovation and innovators that recognizes the value not only of invention but of inventive combination" (Hargadon & Sutton, 1997, p. 748).
- **University involvement in the incubator structure**: There are advantages to being an incubator linked to a university, as well as disadvantages, such as cognitive lock-in and low commitment in managerial approach.

Finally, we explore how the generation of relational capital (the networking) changes according to the strategy adopted by the incubator:

- Relationships between startups
    - Bottom-up: The initiative must be incubated
    - Gatekeeper: Relationships generally discouraged, if not for simple advice
    - Cross-fertilization: The incubate initiative is essential, but the incubator prepares events or procedures for this purpose
- Relationships between startups and external actors:
    - Bottom-up: The initiative must be incubated
    - Gatekeeper: The incubator leads the startup completely
    - Cross-fertilization: The incubator encourages such links through the organization of networking events

3 Open Innovation at Bio4Dreams

3.1 Yin's Qualitative Case Study

To bring greater value with this thesis to the literature on the topic of open innovation in startup incubators, I decided to link to this paper a first-hand practical experience within a startup incubator present in the area.

A case study is described in the next pages in which I analyze various aspects described above regarding open innovation and how they were applied.

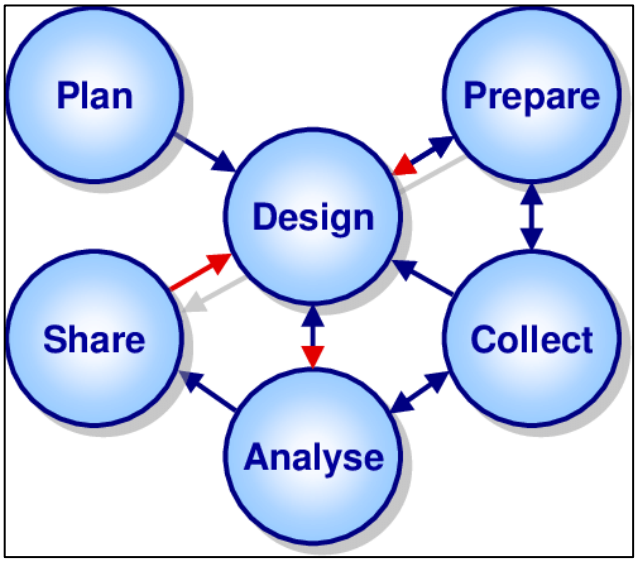
A case study is defined as an "intensive study of a single unit for the purpose of understanding a larger class of similar units [...] observed at a single point in time or over some delimited period of time" (Gerring, 2004, p. 342).

This possibility has allowed me to better understand the activities that are conducted and what is perceived as valuable within a business incubator. By interacting both with the staff of the organization and with other actors, I was able to describe in more detail the activities executed by giving an in-depth explanation in this thesis.

In conducting this research, I followed the representative scheme of (Yin, 2009) related to the structuring of complete and exhaustive case studies. In the subsequent sections, I will describe the six sub-topics that characterize this scheme and include them in the examples that I report in these pages.

The image below shows the structure of a case study.

Figure 16 – Case Study Structure



Source: (Yin, 2009)

3.1.1 Plan

This first step is related to defining the research demand, deciding on the research method, and understanding its limitations (Yin, 2009).

In the case study literature, there are no unanimously agreed definitions of the types of case studies. Thus, the main ones of the authors Yin and Stake as well as more detailed ones of the General Account Office of the United States are examined here.

According to Yin, case studies can be of three types:

- **Exploratory:** In this case, the study of the event or subject can occur before the actual definition of the research question. They are generally used for theory building.
- **Descriptive:** In this case, the main objective is to give shape to a theory, but the studies focus on describing in the most in-depth way possible different characteristics of a phenomenon. Precisely for this reason, they can be used in cases where we try to create a classification of the phenomena or subjects studied.
- **Explanatory:** These cases study are used to investigate the relationships of causes and consequences between two or more phenomena.

They are well suited in cases where the research question refers to *how* or *why* a specific phenomenon happens and where the researcher has little control over the surrounding environment and the events that happen. Thus, this method is suitable in situations where a phenomenon is studied in the real context and at the precise moment in which it happens.

Yin then explained that it is not in the objectives of the case studies to generalize to the entire population (statistical generalization) but rather to generalize by creating a theory (analytical generalization). This happens "if two or more cases are shown to support the same theory" (Yin, 2009, p. 38).

(Stake, 1995) divided case studies according to these categories:

- **Intrinsic:** These studies are conducted when one wants to acquire more information, in general, about an event.
- **Instrumental:** This type of case study is used to investigate a specific problem or characteristic and for the refinement of a theory.
- **Collective:** This is the case when there are more instrumental case studies.

Finally, listed below are the types of case studies according to the classification of the (General Accounting Office (GAO;), 1990):

- **Illustrative:** This case study is descriptive and intended to give realism and in-depth examples to other information about a program or policy.
- **Exploratory:** This is also a descriptive case study but is aimed at generating hypothesis for later investigation rather than for illustrating.
- **Critical instance:** This examines a single instance of unique interest or serves as a critical test of an assertion about a program, problem, or strategy.
- **Program implementation:** This case study investigates operations, often at several sites, and often normatively.
- **Program effects:** This application uses the case study to examine causality and usually involves multi-site and multi-method assessments.
- **Cumulative:** This brings together findings from many case studies to answer an evaluation question, whether descriptive, normative, or cause-and-effect.

In the case study I analyzed, the research subject is a startup incubator based in Venezia-Mestre. The goal I set myself to achieve is to have a greater understanding of the creation of value for the actors involved in the open innovation activities that the organization has implemented. Therefore, according to the descriptions of Yin, Stake, and GAO, this case study falls into the categories of exploratory, intrinsic, and illustrative.

3.1.2 Design

The design phase of the case study focuses on the definition of the unit of analysis and on the aspects that will be deepened, the development of theories or hypotheses regarding the studied element, and the development of procedures for maintaining quality throughout the duration of the study (Yin, 2009).

Thus, according to the GAO and Yin, a case study could be an event, a process, an individual, a group, or an organization.

Here arise some problems given by the orientation of the researcher. According to (Dubé & Paré, 2003), in many studies, there are difficulties in selecting the right subject due to several reasons, which are listed in the following table:

Table 6 – Selecting Different Subjects

Selection Basis	**When to use and what questions it can answer**
Convenience	Case selected because it was expedient for data collection purposes.
Purpose	
Bracketing	What is happening at extremes? What explains such differences?
Best Cases	What accounts for an effective program?
Worst Cases	Why isn't the program working?
Cluster	How do different types of programs compare with each other?
Representative	Instances chosen to represent important variations.
Typical	Instance chosen to represent a typical case.
Special Interest	Instances chosen based on an unusual/special attribute.
Probability	What is happening in the program as a whole, and why?

Source: (Dubé & Paré, 2003)

Moreover, in another research elaborated by (Flyvbjerg, 2001), problems that can be encountered in the selection of the case study were highlighted.

Table 7 – Problems during the Case Study Selection

Selection Basis	Description
Extreme/deviant case	Extreme or unusual case.
Maximum variation cases	Cases which are very different on one dimension.
Critical case	A case with strategic importance to the general problem.
Paradigmatic case	A prototypical case.

Source: (Flyvbjerg, 2001)

As mentioned above, the case study I selected to investigate the open innovation techniques applied within a business incubator is a startup incubator in which I had a direct experience of the tasks performed. For this reason, it is to be classified as a paradigmatic case, as an example, or prototype, whose general rules can be generalized to a wider spectrum of companies.

According to Edmonds and Kennedy (Edmonds & Kennedy, 2012), there are four metrics that can be used to measure quality in empirical research:

- **Construct validity:** This concept is related to that of operationalization, that is, the process of defining a research subject through attributes and variables so that empirical observation can then be used to measure them. However, in this research, no ex ante variables have been defined, so future studies will certainly bring value by improving this point. In this case, interviews were conducted, which will be described in more detail later. According to (Yin, 2009), there are three strategies that can be used to improve the construct validity:
    - Using multiple sources of evidence
    - Having key informants review the case study report
    - Maintaining a chain of evidence

  In this case, I used multiple data sources to verify the variables that are affected to increase the value produced for both the incubator and the incubated startups.
- **Internal validity:** This concerns the justification of cause and consequence relationships that arise during the analysis of the case study (General Accounting Office(GAO), 1990). Precisely for this reason, this metric is applicable only to the case studies of the explanatory type but not descriptive and exploratory.
- **External validity:** This concerns the assumption that the results found in a study are also generalizable to other study subjects. The fact of having used a single subject as a case study does not allow me to generalize or refute hypotheses that may or may not have been reflected in other business incubators. Limiting myself to the description of

a single case, greater contributions to the literature can be pursued precisely by increasing the number of business incubators involved in the same research.

- **Reliability:** This last metric is related to the possibility that the results are the same in case the search is repeated in the future. As will be deepened in the next sections, I have analyzed several aspects of the same incubator. The results can also be found from future research if the incubator maintains its structure and some of its activities remain unchanged. In conducting interviews, the results may change if the respondents are different.

3.1.3 Prepare

The prepare phase regards the developing of skills as a case study investigator, training for a specific case study, developing a case study protocol, conducting a pilot case, and gaining any relevant approvals (Yin, 2009).

As already mentioned, I personally conducted a study on a single case, so there were no pilot case studies.

Before conducting the interviews or other insights, I studied the literature on open innovation with special regard to that on business incubators. This allowed me to have already schematized what would have been the situations of greatest interest and the main topics to be explored. In addition to this, during the internship period within the incubator, I was able to request a check on the analysis conducted several times to the reference staff who, as a task, dealt with open innovation and managed its related activities. Using their feedback, I was then able to calibrate my questions in the interviews and my requests regarding the documents examined.

3.1.4 Collect

The collect phase involves following the case study protocol, using multiple sources of evidence, creating a case study database, and maintaining a chain of evidence (Yin, 2009).

As already mentioned in the previous sections, I used multiple sources to analyze the open innovation activities that a single case study offered. This allows case studies to "likely to be more convincing and accurate if [they] are based on several different sources of information" (Yin, 2009, p 116). Confirmation of the importance of using diversified sources of information comes from the GAO (General Accounting Office (GAO), 1990, p. 21): "examining consistency if evidence across different types of data sources is akin to verification."

As a first source of information, I used interviews with incubated subjects or those who collaborate with the startup incubator. Interviews can be of three different types:

- **Structured interviews:** In this case, they have questions already defined ex ante and a limited range of admissible answers. In this way, it is possible to categorize the answers according to a predefined scheme (Miles & Huberman, 1994).
- **Semi-structured interviews:** This is also called focused interviews (Dane, 2010). In this case, there is more variability in the questions that can be asked, but the reference scheme for the answers remains.
- **Unstructured interviews:** The interviewer has more freedom, as there is no need to stay within a predefined scheme. Therefore, the answers can be more varied and flexible, and the questions can change as topics deemed relevant to the study emerge.

In the case study for this thesis, interviews were made according to the unstructured interviews mode. To better understand the phenomenon of open innovation, I gave priority to the possibility of investigating in the most varied way possible, both vertically and horizontally, any topic considered valuable by the interviewees, obviously remaining relevant to the research topic.

3.1.5 Analyze

The analyze stage relies on theoretical propositions and other strategies, considers and employs analytic techniques, explores rival explanations, and displays data (facts) apart from interpretations (Yin, 2009).

As mentioned above, quantitative research is more prone to analytical generalization than statistical generalization. Analytical generalization involves the extraction of abstract concepts from each unit of analysis (Yin, 2009).

The subjects interviewed are of different natures and will be described in more detail in the subsequent sections. Having more qualitative answers opens up the possibility of making a comparison. Moreover, according to (Tesch, 1990), the most used tool in qualitative analysis is the comparison tool, as it give the possibility to group the objects of study into themes and find differences and similarities.

It follows that the main objective of the qualitative data that can be obtained from one-to-one interviews is to identify similarities or differences between the respondents' answers (Belk et al., 1990).

In this case study, I then categorized the interviews according to the type of interviewee. This allowed me comparisons in both categories whose similarities and differences will be explained and mentioned in the subsequent sections. In interpreting the data, I then followed the previously in-depth literature and feedback from the incubator staff.

3.1.6 Share

The share phase focuses on defining the audience, composing textual and visual materials, displaying enough evidence for a reader to reach their own conclusions, and reviewing and re-writing until done well (Yin, 2009).

To better understand the case study analyzed in the context of this thesis, I have, in this section, described the phases in the conception of the case study, the choice of the same, and the structure followed. In the next section, I will describe in all its parts, and the data collected will be interpreted and compared with each other.

In the part relating to the interviews, quotations taken directly from the transcribed text were showed directly and repeatedly. This will help readers gain greater understanding and the ability to form their own opinion about the answers given. Quotations of the interview participants should be used to support the arguments exposed(Eisenhardt & Graebner, 2007).

3.2 Introduction of Bio4Dreams

Bio4Dreams is a startup incubator founded in 2018 in Bresso (MI). They define themselves on their website as "certified incubator fully dedicated to very early stage innovative startups in Life Sciences" (Bio4Dreams, 2022a).

They were born as a spinoff of Sanipedia in collaboration with F3F.

The first is a company founded in 2007 that has the networking between companies and organizations specialized in the scientific sector of life sciences as its core business. The services offered to their partners are "scientific research, project consulting, support for innovative startups, clinical trials, bioinformatics and digital applications for health" (Sanipedia, 2022).

On the other hand, F3F is an investment vehicle founded by Laura Iris Ferro, current president of Bio4Dreams, after having founded the startup Gentium, leading it to an IPO on the NASDAQ.

The specialization in life sciences is maintained by the incubator, which provides services to startups that operate mainly in the following sectors: biotech and pharma, medical devices, diagnostics, and AI and e-Health.

At the time of writing, the company has 12 active subsidiaries in various Italian cities, including Milan, Rome, Turin, Genoa, and Venice, with 31 incubated startups, 10 of which are directly financed through corporate capital. There are also partnerships with specific innovation hubs in the rest of Europe (Pecs, Krakow and Ljubljana) and in other countries in the world (Japan, China and the USA).

Between August 2021 and January 2022, I was hosted by the Venice-Mestre office for an internship experience to develop my thesis.

In this chapter, I will describe in detail some of the open innovation activities in which I participated directly, designed and implemented by the incubator's staff. Within the organization, great importance is given to collaborating with local actors, given the difficulty that is encountered sometimes in meeting the demands and needs of startups, especially in the life sciences sector.

In addition, specialized laboratories and equipment are needed, and it would be too expensive to develop internally. Therefore, it is preferred to involve partners with complementary resources and knowledge, with whom the incubator could collaborate to provide a complete solution to startups' needs.

3.3 Startup Meetup

Startup Meetup is an event that was held in Venice-Mestre on November 19, 2021. The objective was twofold: To present the Bio4Dreams's reality and the incubated startups to new possible partners and investors present at the event and to create a moment of networking in physical presence not only between startups and external actors but also among the startups themselves.

With this in mind, the day was organized in two different moments:

1. In the morning, there was a frontal presentation, also broadcast live on Bio4Dreams' own channels. Initially, the staff of the incubator opened the presentation with a summary on its network and ecosystem, the results achieved, and future objectives. Then there were the startups that described their projects and their needs to continue to develop it with a pitch of three minutes each.

2. In the afternoon, one-to-one meetings with startups were organized inside the incubators' offices. Each of them was arranged with its own dedicated desk, and the interested people could dialogue directly with the founders present, deepening the possibility of a collaboration.

This type of event has been seen several times in the previous chapter, in other Italian incubators. In all cases, the importance that networking with external actors has in finding the resources that the project needs, be it funding, consultancy, or the acquisition of services, is highlighted. The meetings between CEOs of startups were also found in the examples described above, with benefits regarding the sharing of advice on project management or as a simple psychological support to cope with the different problems that this type of activity entails.

To investigate the motivations that lead startuppers and local entities to participate in these events in more depth, I conducted four interviews.

The people interviewed were a CEO of a startup, the marketing and communication manager of a second startup, and two representatives of the technology transfer offices (TTOs) of two universities in the region.

Both TTOs highlighted how these networking-friendly events are perceived as valuable to the activities they perform. The opportunity to meet the managers of the incubator makes it easier to understand the challenges that can be resolved.

"Regarding the moment about the Bio4Dreams ecosystem, was extremely important [...] because our work is based on having a network and having a partner for each phase of this project" (TTO1, Startup Meetup Interview, 10/12/2021).

From the second part of this statement, one can guess that the TTO has sought partners with which collaborate to draw services for the development of the university's projects.

It is therefore a case of inbound open innovation, given that an internal lack of skills is resolved through a collaboration activity with a third-party actor.

His point of view on collaboration with startups is also interesting:

"with some of these you can find synergies for perhaps European planning, access to funds and maybe solve the needs that a researcher has or that a company has" (TTO1, Startup Meetup Interview, 10/12/2021).

In this case, university researchers who collaborate with this TTO can, in turn, collaborate with a startup to obtain institutional funds, which it would otherwise not be able to win. This type of

collaboration would lead to a situation of inbound open innovation from the startup's perspective because, in this way, it can acquire the skills of the researcher while playing the role of gatekeeper about the participation in national or international calls with the aim of obtaining funding.

In any case, the preference of both TTOs to interact with the incubator, rather than with individual startups, remains evident. This allows them to simplify the network while keeping it efficient in scouting for opportunities. Regarding the Startup Meetup event, it is the first part of the presentation that is perceived as the most useful.

Both TTOs then showed interest in the other participants in these events, so that they could trace new synergies with other partners in the sector:

"Then it is also useful because if maybe these events are attended by people for example from Confindustria or other investors who may be interested, or in any case stakeholders in this area. Clearly, we are universities but we have spin offs and we have spinoff projects, therefore groups that have intentions at an entrepreneurial level" (TTO2, Startup Meetup Interview, 15/12/2021).

"If the activities that Bio4Dreams carries out with other actors similar to us, or with other universities had been deepened, it would have been more interesting, always with the aim to creating networks and having a pull of actors with which I can interact directly to offer my products and services" (TTO2, Startup Meetup Interview, 10/12/2021).

Interest was shown in meeting other players in the area, as well as other TTOs, but also investors and industry associations. In this way, the TTOs would have more sources of demand for the research projects they manage.

As for the people of the TTOs participating in these events, in both cases, it was found that the choice lies with the directors of the offices or on delegated representatives, supported when necessary by technical staff with specific skills on the subject of the event.

"Where it is most important to be there is always the director of our office [...] near to this figure there is always the project manager, who in the specific case is following the project or has more skills or more sensitivity on the issues that are addressed at the events" (TTO1, Startup Meetup Interview, 10/12/2021).

"At most it is either the director or a representant [...] if it is not a technical event. Otherwise the technicians participate, but normally the technicians are flanked by research characters" (TTO2, Startup Meetup Interview, 15/12/2021).

I then tried to understand whether in the creation of networking they preferred generic events, on presentations of organizations or on the theme of innovation in a broader sense, or more specific events focused on well-defined sectors.

In this sense, the actual difference in the contacts that are going to be created and the types of collaborations possible in the different events have been identified, but they remain profitable in both cases:

"The things you bring to home are different. Maybe from a more generic event you come home with some ideas, who is working on what. You are a bit on the surface. In the most vertical events, we have the pro that if they are on issues that interest us and on which we are ready, that we have skills to spend, they are very fruitful. Imagine that if there is the specific event on hydrogen, if it were tomorrow, we would have already left the office knowing anyone in the university who dealt with hydrogen" (TTO1, Startup Meetup Interview, 10/12/2021).

"The more general event is more interesting because we can put in place more transversal skills and also on the other hand it can happen that there are collaborations that operate in the same field. But it is equally possible that putting in communication or finding opportunities for communication between startups operating in different areas is useful for everyone precisely for a matter of skills. Maybe a startup that works in the medical field could find it useful maybe some contact with people who deal with marketing communication or management when the business begins to grow and needs to organize itself a little inside. So, I think the generalist event can also be useful" (TTO2, Startup Meetup Interview, 15/12/2021).

The possibility of participating in a more specific event, as in the example of hydrogen in the first quote, is therefore linked to the need to support technical staff with the director or representative of the TTO participating in the event. Precisely, the possibility to understand each other more deeply thanks to the technical knowledge on both sides increases the possibilities of a profitable collaboration.

I then asked two startups that were present at the event to tell me the usefulness they found by participating in Startup Meetup and other events in general.

"The first part of the morning was not very relevant, as the presentation of the Bio4Dreams ecosystem did not bring new information to the startups that were already part of it, while the opinion returns positive with the various pitches of presentation of the startups. […] The moment with the intervention of the startups, was very useful to know the other startups of the network because some I had never known" (Startup1, Startup Meetup Interview, 06/12/2021).

In the specific case of the quote above, the startup came from outside the region, so thanks to this event, the CEO present was able to know other projects of the Bio4Dreams network that he would otherwise not have known.

The second startup interviewed also came from outside the region, specifically from Trentino. She mentioned the lunch as a very constructive time for social contacts.

"It was an important moment for me because it allowed me to meet people I would not have known otherwise since our startup is located in Trentino [...]" (Startup2, Startup Meetup Interview, 03/12/2021).

The same startup then highlighted how the afternoon played an important role in creating a link with another startup in the network:

"I'm developing a relationship with another startup thanks to that networking moment" (Startup2, Startup Meetup Interview, 03/12/2021).

Both startups have been present at other events organized by Bio4Dreams and outside its network. There are many occasions during the year in which they are called to do a presentation. In one of the two cases, the project won a cash prize by participating in a call promoted by the region. This led the startup to be summoned to other events related to this appointment, where it was able to get to know the teams of the projects that had won the previous editions.

On these occasions, more institutional, it had the opportunity to forge links with non-technical actors, belonging to regional, national, and European organizations, as well as possible investors and representatives of the TTOs of the universities.

I then asked the two startups if they had found more benefits in participating in industry-specific or generalist events. Similarly, in this case, as in the interviews with the TTOs, the difference between the two types of events is recognized, and the benefits derived from them are different from each other.

From the most vertical event on a topic, it is easier to communicate the added value of the startup because one can go into detail, knowing that the public can understand a more technical vocabulary.

"When an event is more vertical the audience is more into the industry and therefore it is easier to interact" (Startup1, Startup Meetup Interview, 06/12/2021).

Instead, the event with a more general audience, belonging to different functions, can bring to the startup complementary links that can satisfy the non-technical needs of the project. Therefore, connections can arise with other startups, territorial subjects, or financial actors.

As for the people involved in attending this type of event, in the first case, it is the CEO who represents the project, both in the case of pitches and when they are invited as guests.

However, in the second case, a person specializing in marketing and communication has been included in the team who presents the project and represents it in case it is part of the guests. If the event is more vertical and therefore technical aspects or product demonstrations are necessary, a project manager with the necessary skills is supported, similar to what is reported above in the case of TTOs.

Therefore, from the interviews conducted, the tendency of the CEO to participate in all events emerges if the staff of the team is still reduced, while there is a tendency to delegate this aspect with the growth of the startup, with the possibility of having technical staff in place in those situations in which the public also proves to be well prepared in the issues of that sector.

Speaking instead about the incubator, it is present through representatives in various events, both digital and physical and local and international.

The manager at the head of the department of technical evaluation of startups has held the role of judge in various events, whose goals were the award of a cash prize. Precisely, these experiences make it possible to recognize possible problems already at the beginning of the evaluation process, thus using previous experience as the first filter. These events were held both in physical and online locations, thus making it easier to promote the professionalism of the incubator in foreign countries.

There are also events organized by the network's own partners, such as the TTOs. For instance, the manager of an incubator’s subsidiary was invited to be present at an event organized by the university's TTO, where the presentations of the partners belonging to this network followed. Each of them then described what its objectives and functions were.

In addition, the TTO staff repeatedly proposed arguments on which the participants could then discuss with each other, having been divided into small groups of 10 people. Precisely, the choice to structure the event in this way was thought with the aim of encouraging the birth of collaborations between people who did not know each other before.

Finally, the incubator managers, both the headquarters representatives and those in charge of a specific function, participate several times during the year in virtual meetings where startuppers

from various nations and staff from other incubators can request one-to-one meetings of 15 minutes each. Thus, there is a similarity with the one-to-one meetings proposed in the Startup Meetup event, but with the limits of the interaction that video calls impose.

In the interviews conducted, both startuppers and TTO representatives considered the meetings that can be done online profitable, but their limitations are also recognized. The lack of human contact makes the connection that is established more fragile, and in many cases, the interaction is limited by time and by the material that can be uploaded or shown within the platform used:

"From my point of view the online pitch could work, but if you want to deepen with the networking part it is better in presence. I also tried to attend online networking events but the relationship is colder" (Startup1, Startup Meetup Interview, 06/12/2021).

The startupper indeed recognizes the advantages of physical presence:

"It is very useful because 1: people can approach you as in a fair but also 2 because you can bring material to show and place it on your desk" (Startup1, Startup Meetup Interview, 06/12/2021).

3.3.1 Similarities with Other Incubators

Given the examples of incubators in Chapter 2.4, and regarding the events, Bio4Dreams has chosen to adopt a strategy similar to the incubators Epsilon and Beta, the latter in the activities dedicated to ICT startups.

It is the incubator that organizes and hosts the networking event and asks for the participation of startups. Therefore, even in less-structured projects, it is the incubator staff who helps and guides the team to present the project and promote it within the network. The important role that the incubator managers play in creating the first social contacts of the project and creating collaborations, at least for the first moments of the startup's life, is clear.

Similar to the Epsilon incubator, the companies incubated at Bio4Dreams participate in recurring meetings with the startup manager to analyze the project’s past performance, take stock of the situation, and predict the possible corrective actions to be taken. Therefore, the request for a service provided by the incubator can be made directly by the CEO of the startup, according to the bottom-up mode, or by the startup manager who is following the project and who considers this service useful.

At the time of writing this thesis, there is no evidence that the incubator had organized training events for startups, such as the Alpha incubator.

Advice is given, including managerial advice, both by the experts belonging to the incubator staff and by the participants of the board of directors. They have many years of experience in the field of innovation and health and are therefore able to guide the choices of the teams. In any case, it is the CEO of the startup who has the last word on a project choice.

3.4 Innovation Circle

In 2020, the Bio4Dreams project called Innovation Circle was born. It is defined as a "physical space where the players of the innovation and technology transfer chain can meet and work together, combining resources, networks and skills to enhance and promote the most promising startups in Life Sciences" (Bio4Dreams, 2022b).

With a quarterly deadline, within the platform theinnovationcircle.com, the participants in this initiative can evaluate the startups and projects that Bio4Dreams selects and express their interest through financial contributions, participation in the capital of the startup, and the request for specific services that the startup can offer or give availability for the productive assets, logistics, or skills that the project needs.

Partners belonging to Innovation Circle can also present their own projects, thus activating a collaboration network and thus corporate companies, professionals, and the Bio4Dreams incubator.

A project of this type embodies the essence of open innovation. Clearly, the situation that will be created by involving various types of actors and innovative projects already evaluated by Bio4Dreams is favorable to almost all the open innovation methods described in Chapter 2:

1. The technology of a startup may be of interest to the corporate company that operates in the same sector or that has a product to associate with it; Or the startup can manifest the need for a technology that an external actor can provide (licensing-out, in-licensing, supply or purchase of technical knowledge).
2. Investment foundations or already structured companies can invest directly in the startup through the capital increase, finance its research, or directly acquire the project, creating the opportunity of an exit for the startup (sale and acquisition of innovative project, corporate venturing, joint ventures, R&D contracts, and research funding).
3. Startups may need a service, such as logistics or large-scale manufacturing or specific labs, that they do not have. A company that owns these assets can then provide them to the project (non-equity alliances).

The organizations participating in this initiative are:

1. Corporate companies: Companies of various sizes that can offer specific consulting services or that may be interested in the development of products deriving from startups (IBM research and business, Chiesi, Dedalus, Dompè, Janssen, rnbgate)
2. Investment funds, specialized in supporting startups or in the life sciences sector (Biovalley Investments, Value Italy, Liftt)
3. Offices of technology transfer and enhancement of the territory (Hub Innovazione Trentino, Friulia Finanziaria)
4. Real estate companies (Landlease)

Therefore, the heterogeneity of the components of the Innovation Circle can be observed, a feature that makes the initiative more profitable given the complementarity of the know-how and services that can be offered. The value of the diversity of the actors involved was also recognized by one of the two TTOs interviewed:

"The larger and more varied the pull of customers, the more we can match what is the university counterpart. [...] Already the community is heterogeneous, the more it continues to be, the more it is an advantage" (TTO1, Startup Meetup Interview, 10/12/2021).

There are two categories of partners within Innovation Circle:

1. **Executive partners**: They can be public or private entities. In addition to an annual membership fee, each partner provides its own representative who is available at least once a month to participate in the meetings. The partner then makes available its skills, expertise, or network to develop activities promoted by Innovation Circle.
2. **Research partners**: Likewise, in this case, they can be both public and private companies, which conduct R&D activities in the life sciences field. These partners select internally the technology transfer projects to be presented to an executive partner for the structuring of the project and for the possible presentation within Innovation Circle. Finally, the research partners offer their skills and scientific and clinical networks for the development of startup projects.

Bio4Dreams in this case also plays the role of gatekeeper because it evaluates the projects presented by the research partners and decides whether or not to introduce them in Innovation Circle. In addition to this, it is also the responsibility of the organization to manage the interactions between partners and startuppers.

As also seen in the previous chapter, this approach is part of the top-down methods with which the incubator tends to control and influence the contacts and collaborations that external actors stipulate with incubated startups.

3.4.1 Similarities and Differences with Other Incubators

The only incubator that offers a service similar to Innovation Circle is the Delta, with its Investment Team: "This team, composed of three people, represents the starting point of all the strategic consultancies the firms need: firms ask for it, and there is no particular top-down directional suggestion by the incubator staff" (Macchi et al., 2014, p. 564).

The similarity can only be perceived by those startups or projects that Bio4Dreams chooses from those it has available to present them to other partners. Moreover, as already clarified above, the incubator plays the role of gatekeeper for these teams, given that through Innovation Circle, one can obtain contacts or build valuable collaborations for startups. However, only the most promising projects or startups fall into this process. The evaluation is also based on the possibility that these connections occur based on the expertise and assets of the other executive and research partners.

The investment team of the Delta incubator was instead a central organ of the incubator that managed collaborations both between incubated startups ands between startups and external actors:

"With respect to the build-up of relationships both within and across the incubator boundaries the central role is played by the so called investment team" (Macchi et al., 2014, p. 563). Therefore, from the startups' perspective, Innovation Circle and Bio4Dreams as gatekeepers can be a solution similar to the methodology used by the Delta incubator with its investment team, but with the addition of the exclusivity resulting from the selection made by the Bio4Dreams staff.

Clearly, all the other methods that the incubator possesses and uses for the construction of social contacts remain in place, such as the specific offices for the search for funding, the direct contacts that the incubator has with other partners present in the territory, and the personal contacts that the incubator staff can employ if necessary.

Another difference in the functioning of Innovation Circle compared to the investment team of the Delta incubator is that its functions can also be used in a specular way. In fact, even executive partners can present projects and seek collaborations. This would make Bio4Dreams

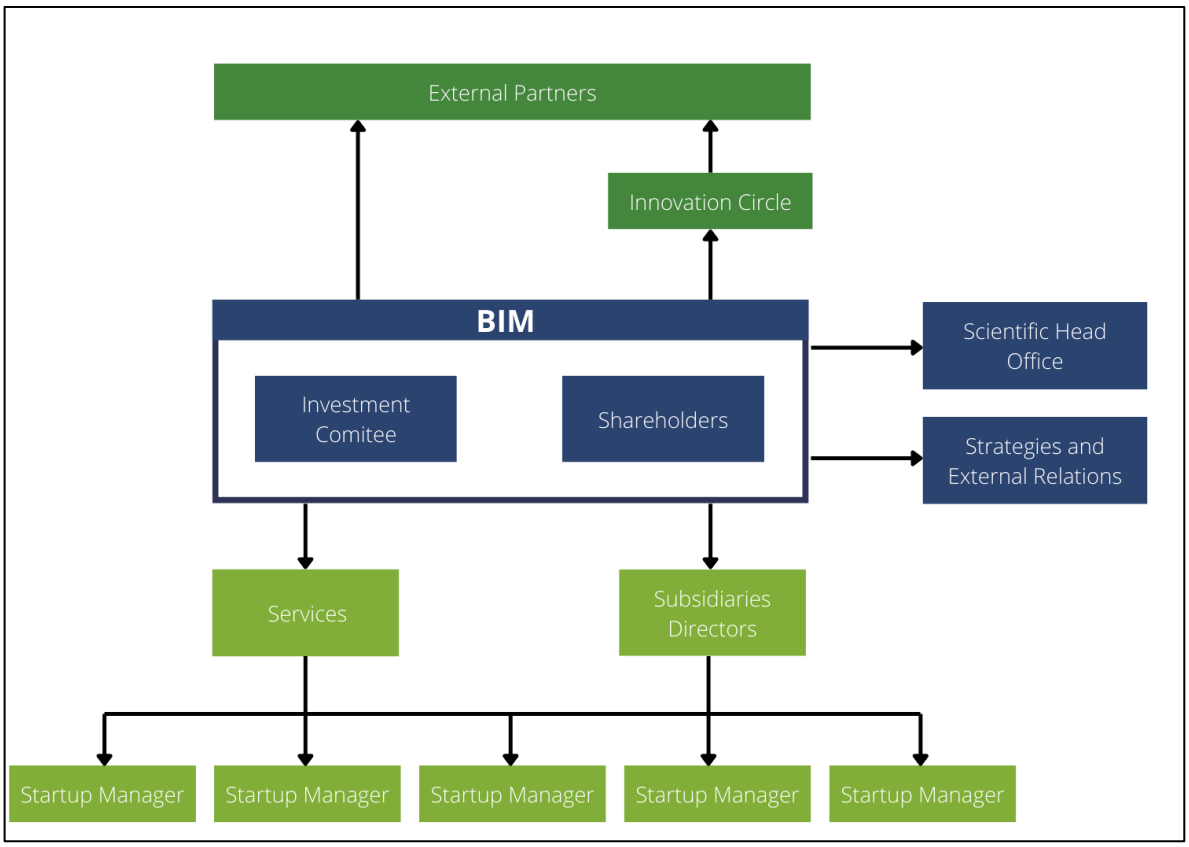
a partner from whom one can request a qualified service to develop an external company's project, such as a company spin off.

In addition, a partner may require a startup's specific technology as a complementary resource for their project's needs. The presentations of the startups participating in Innovation Circle are deposited within the platform and therefore visible to all the organizations that are part of it. This allows the incubator to be exposed to possible collaborations thanks to the research that other organizations support.

Therefore, there would be a case of out-licensing, a method typical of outbound open innovation.

3.5 Business Chart

Figure 17 – Bio4Dreams Structure



Source: own elaboration

Taking up the variables that Macchi and other researchers used to classify the incubators analyzed in their study (Macchi et al., 2014), it is possible to have a first look at the characteristics of Bio4Dreams.

Table 8 – Bio4Dreams's Characteristics

	Ownership	**Sectoral specialization**	**Multisectoral incubatees**	**University linkages**
Bio4Dreams	Private	Life Sciences	No	External Linkages

Source: own elaboration

The incubator is a private company and operates in the life sciences sector, a specialization also maintained by its incubated companies. Startups fall within the fields of chemistry, biology, medicine, and bioinformatics.

It has connections and collaborations with various Italian universities. Precisely, the geographical diversity of the various Bio4Dreams locations allows the incubator to more easily create links with local public entities.

In its corporate structure, the role of incubator management is of central importance. It has an active role in the management of the startup and in the search for possible contacts with which the startup can create partnerships.

In this case, it is the experience and past career of the members of the board of directors and the investment committee that creates the added value. The experience in its own startups and projects related to the life sciences sector makes it efficient in identifying and assess the needs of incubated teams.

As stated by (Macchi et al., 2014), for the creation of social contacts in incubators, especially when the project is in the early phase, the social network owned by the managers and tutors who cooperate for the development of the project is of primary importance.

These links are then extended to Bio4Dreams incubates.

For each startup that is incubated, an analysis is initially made of what its needs are and possible collaborations. As stated by a staff member:

"For each of them, regardless of the source, an analysis process is activated aimed at framing the project from a technical/scientific, market, clinical need, intellectual property and stage/development plan point of view. This analysis, which can last even a few months, is divided into steps in which the depth of the due diligence is gradually increasing and in which, you begin to identify the needs of the startup interacting immediately with the ecosystem." (Bio4Dreams Staff Member).

Each project is then assigned to a "startup manager." This person, chosen for their expertise and for the geographical proximity to the project team, is part of the Bio4Dreams staff and plays the role of intermediary between the incubator and the incubated company. This manager does not enter into partnership with the other participants in the project, but brings know-how and social contacts and helps in interfacing with the services of the incubator.

“The feedback from the various players in the innovation chain is central to outline the direction and objectives of the project already on day 0. In addition to this, [...] the startup manager identifies, with the support of the entire Bio4Dreams team, the points where he can bring value to the startup and shares them with the startup itself.” (Bio4Dreams Staff Member).

As for contacts with external actors, these can be implemented through direct partnerships, or through Innovation Circle.

The first case refers to the identification of a collaboration between the startup and any other external actor. The incubator staff then evaluates the possible partnership with the external actor and the advantage that would be created.

Innovation Circle (described in depth in the previous sections) allows one to connect with a subgroup of the actors present in the Bio4Dreams ecosystem, considered more appropriate for the types of services they offer. Moreover, in this case, it is the incubator staff who selects and presents the project to the research and executive partners of Innovation Circle.

In both cases, the role of the incubator staff is of central importance. Therefore, there is a top-down approach in the relations between startups and external actors, while the incubator also plays the role of gatekeeper in case the project passes through Innovation Circle.

Regarding participation in events, the incubator periodically organizes events, such as Startup Meetup (described in depth in the previous sections), as well as meetings with more frequent recurrence between the startup manager and the project team to discuss progress made, any needs that have emerged, or possible changes to be made.

Moreover, in this case, it is a top-down approach where the organization manages the occasions in which it is possible to network and helps the startup in the preparation of its presentation to obtain the maximum advantage.

3.5.1 Differences and Similarities with Other Incubators

For the characteristics presented in Table 4, it is clear that the incubator that comes closest to the bio4Dreams case study is the Delta, presented in the study by (Macchi et al., 2014).

The so-called "Investment Team" present in the Delta incubator can be reviewed in the investment committee and board of directors of Bio4Dreams. In fact, it has a strong role of guide and advice for the activities of startups and the services provided to them. The previous experience of the members of these groups plays a crucial role in the interpretation of the needs of the teams and in the satisfaction of the same.

However, the investment team, when deemed necessary, designates a mentor who guides the incubate in its choices. This does not happen in this incubator, where already at the beginning of the incubation process, the startup manager is called.

This means that necessarily in each team, there is a reference person who exerts an influence on the processes in place. In Delta, it is the startup that must request the intervention of the investment team, while in Bio4Dreams, the startup manager can intercede in this sense.

In Gamma, the consultancy is done through an external expert designated by the organization who enters and takes over a share of the startup. This is a strong difference compared to Bio4Dreams because startup managers do not actively participate in the social capital of the incubate, potentially giving up a tool for the alignment of interests.

Similarly, the Beta incubator uses senior tutors, also with a working past in the reference sector directly with the company's start-up. There are no junior tutors in Beta in Bio4Dreams.

A further resemblance to this incubator is when referring to the initiative in organizing events for its ICT startups. The incubator of this case study organizes meetings both between incubated startups and opportunities for contact with external actors. Therefore, the approach is also top-down in this case.

As proposed by (Macchi et al., 2014), one can finally divide the approach of Bio4Dreams in creating relational capital into the two strategies that characterize it:

- **Relationships between startups:** Cross-fertilization. The incubate always has the opportunity to take the initiative and participate in events, even outside the ecosystem, or to find new business partners. On the other hand, the incubator prepares a series of tools and organizes ad hoc events to increase the possibilities of contact and advantageous cooperation.
- **Relationships between startups and external actors:** In this case, there is a double path, based on whether or not one participate in Innovation Circle.
    - **Non-participation:** Cross-fertilization. Bio4Dreams organizes events or uses the knowledge of its staff to create social contacts that can benefit the startup

- **Participation:** Gatekeeper. In this case, the incubator also plays the role of gatekeeper because there is also a project selection process and is then presented by the incubator to the partners participating in the initiative. In case a partnership is born from this meeting, it is regulated according to precise rules defined ex ante between Bio4Dreams and the partners.

The incubator strategy of this case study can then be summarized according to the scheme of Table 5, presented by (Macchi et al., 2014) for other organizations.

Table 9 – Bio4Dreams's Strategy

	Incubator's strategy	**Intensity of BIM's guide**	**Bottom-up strategies**
Bio4Dreams	Cross-fertilization	High	Medium

Source: own elaboration

Conclusions

In this thesis, I addressed many issues related to open innovation and business incubators, thus contributing to the literature that concerns them.

First, I have extensively described the phenomenon of open innovation, grouping several authoritative sources to give a presentation in several aspects, from the most abstract to the types of applications that companies can implement. I then described the various causes that made this approach necessary and the benefits derived from it.

This has been done both for the private sector, where most of the studies are concentrated, and the public sector. I then traced similarities and differences between the two aspects.

In addition, I described the concept of the business incubator. In the literature on this subject, the definitions are not completely concordant. Thus, I took them from different studies and grouped them by their common characteristics. In this way, it was possible to have a clearer idea of what the research papers called "Business Incubator."

Next, I listed the services that provided by these organizations, focusing on the co-creation activities between the incubator and the incubated startups. These are activities that approach the concept of open Innovation, as they base their value on the collaboration of the actors present in the ecosystem of companies, helping the incubated through open innovation methods.

Furthermore, this thesis contributes to the literature on open innovation and business incubators through a case study that I had the pleasure of following personally.

Thanks to a six-month experience in which I took an active part in the activities executed, I was able to investigate and collect data relating to Bio4Dreams, an incubator active in Italy in the life sciences sector. There are three aspects that I have deepened the knowledge of:

1. Description of the event organized ad hoc as an open innovation method.
2. Description of Innovation Circle, a digital platform to facilitate the exchange of services, know-how, and IP between startups and corporate companies in the life sciences sector.
3. I compared the activities and structure of this incubator with those described by (Macchi et al., 2014), revealing differences and similarities.

However, there are also some limitations that can serve as a starting point for the research questions of future studies.

In this thesis, I have described and compared Italian incubators. This can certainly lead to biased data, as all organizations can be influenced by regional issues, such as laws, policies, or particular cultures that affect them. It would therefore be appropriate to repeat the same analyses for incubators in other nations of the world or conduct a comparative analysis of the methodologies implemented by the various locations of an international incubator.

The open innovation activities present in the literature can be of various types, even very different from each other. Those actually implemented by the incubators examined are similar to each other, but they are certainly not exhaustive with respect to the possible paths that could be taken. Therefore, future studies may focus on peculiar open innovation activities that are not described here. This can be done through both qualitative and quantitative research. The first, as demonstrated in the case study analyzed in this document, allows an in-depth description of the phenomenon, investigating its causes and consequences, while the second could be based on the frequency of adoption of a given open innovation technique.

In the examples reported by (Macchi et al., 2014), the Gamma incubator uses mentors for its startups, but it enters directly into the corporate structure of the project. This method is certainly particular compared to the other cases described here. Thus, future research could explore deeper, in the startup sector, whether this could positively influence the final outcome.

Finally, regarding the public sector, it is possible to note how the paradigm of open innovation approaches that of open data. By making public administration data available to anyone who wants to analyze them, extremely fertile situations of innovation and improvement for the citizen are created. As with the activities of the incubators described above, also in this case, new studies can address this issue both qualitatively and quantitatively.

References

Barkema, H. G., & Vermeulen, F. (1998). International Expansion Through Start-Up or Acquisition: A Learning Perspective. *Academy of Management Journal*, *41*(1), 7–26. https://doi.org/10.5465/256894

Becker, B., & Gassmann, O. (2006). Corporate Incubators: Industrial R&D and What Universities can Learn from them. *The Journal of Technology Transfer*, *31*(4), 469–483. https://doi.org/10.1007/s10961-006-0008-6

Belk, R. W., Jorgensen, D. L., & Denzin, N. K. (1990). Participant Observation: A Methodology for Human Studies. *Journal of Marketing Research*, *27*(3), 368. https://doi.org/10.2307/3172594

Bio4Dreams. (2022a). *Bio4Dreams - About Us*. Https://Www.Bio4dreams.Com/En/about-Us/.

Bio4Dreams. (2022b). *Innovation Circle*. (Https://Www.Bio4dreams.Com/Innovation-Circle/.

Birch, D. (1980). The role of small business in New England. *MIT Program on Neighborhood and Regional Change*.

Campbell, C. (1989). Change agents in the economy: business incubators and economic development. *Economic Development Review*, *7*(2), 56–59.

Chesbrough, H. (2003). *Open innovation: The new imperative for creating and profiting from technology* (Harvard Business Press, Ed.).

Chesbrough, H. (2006). *Open Innovation. Researching a New Paradigm*.

Chesbrough, H. (2019). *Open innovation results: Going beyond the hype and getting down to business* (Oxford University Press, Ed.).

Chesbrough, H., & Bogers, M. (2013). *Explicating Open Innovation: Clarifying an Emerging Paradigm for Understanding Innovation*. http://ssrn.com/abstract=2427233Electroniccopyavailableat:http://ssrn.com/abstract=2427233

Chesbrough, H., & Crowther, A. K. (2006). Beyond high tech: early adopters of open innovation in other industries. *R and D Management*, *36*(3), 229–236. https://doi.org/10.1111/j.1467-9310.2006.00428.x

Chiaroni, D., Chiesa, V., & Frattini, F. (2010). Unravelling the process from Closed to Open Innovation: evidence from mature, asset-intensive industries. *R&D Management*, *40*(3), 222–245.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly*, *35*(1), 128. https://doi.org/10.2307/2393553

Corporate Finance Institute. (2019). *Corporate Venturing: Directly investing corporate funds into external startup companies*.

Dane, F. (2010). *Evaluating research: Methodology for people who need to read research*. Thousand Oaks.

Dubé, & Paré. (2003). Rigor in Information Systems Positivist Case Research: Current Practices, Trends, and Recommendations. *MIS Quarterly*, *27*(4), 597. https://doi.org/10.2307/30036550

Edmonds, A., & Kennedy, T. (2012). *An applied reference guide to research designs: Quantitative, qualitative, and mixed methods*. Thousand Oaks.

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory Building From Cases: Opportunities And Challenges. *Academy of Management Journal*, *50*(1), 25–32. https://doi.org/10.5465/amj.2007.24160888

Feller, J., Finnegan, P., & Nilsson, O. (2011). Open innovation and public administration: transformational typologies and business model impacts. *European Journal of Information Systems*, *20*(3), 358–374. https://doi.org/10.1057/ejis.2010.65

Flyvbjerg, B. (2001). *Making social science matter*. Cambridge University Press.

General Accounting Office (GAO). (1990). *Case study evaluations*.

Gerring, J. (2004). What Is a Case Study and What Is It Good for? *American Political Science Review*, *98*(2), 341–354. https://doi.org/10.1017/S0003055404001182

Hackett, S. M., & Dilts, D. M. (2004). A Systematic Review of Business Incubation Research. *Journal of Technology Transfer*, 55–82.

Hargadon, A., & Sutton, R. I. (1997). Technology Brokering and Innovation in a Product Development Firm. *Administrative Science Quarterly*, *42*(4), 716. https://doi.org/10.2307/2393655

Hisrich, R. D. (1988). New business formation through the Enterprise Development Center: a model for new venture creation. *IEEE Transactions on Engineering Management*, *35*(4), 221–231. https://doi.org/10.1109/17.7444

Huizingh, E. K. R. E. (2011). Open innovation: State of the art and future perspectives. *Technovation*, *31*(1), 2–9. https://doi.org/10.1016/j.technovation.2010.10.002

Jaffe, A. B., Trajtenberg, M., & Fogarty, M. S. (2000). Knowledge Spillovers and Patent Citations: Evidence from a Survey of Inventors. *American Economic Review*, *90*(2), 215–218. https://doi.org/10.1257/aer.90.2.215

Karlsson, C., Flensburg, P., & Horte, S.-A. (2004). *Knowledge spillovers and knowledge management* (Edward Elgar Publishing, Ed.).

Katz, R., & Allen, T. J. (1982). Investigating the Not Invented Here (NIH) syndrome: A look at the performance, tenure, and communication patterns of 50 R & D Project Groups. *R&D Management*, *12*(1), 7–20. https://doi.org/10.1111/j.1467-9310.1982.tb00478.x

Kirschbaum, R. (2005). Open Innovation In Practice. *Research-Technology Management*, *48*(4), 24–28. https://doi.org/10.1080/08956308.2005.11657321

Kuratko, D., & LaFollette, W. (1987). Small business incubators for local economic development. *Economic Development Review*, *5*(2), 49–55.

Lampel, J., Jha, P. P., & Bhalla, A. (2012). Test-Driving the Future: How Design Competitions Are Changing Innovation. *Academy of Management Perspectives*, *26*(2), 71–85. https://doi.org/10.5465/amp.2010.0068

Laursen, K., & Salter, A. (2006). Open for innovation: the role of openness in explaining innovation performance among U.K. manufacturing firms. *Strategic Management Journal*, *27*(2), 131–150. https://doi.org/10.1002/smj.507

Lee, S. M., Hwang, T., & Choi, D. (2012). Open innovation in the public sector of leading countries. *Management Decision*, *50*(1), 147–162. https://doi.org/10.1108/00251741211194921

Lewin, K. (1947). Frontiers in Group Dynamics. *Human Relations*, *1*(2), 143–153. https://doi.org/10.1177/001872674700100201

Lichtenthaler, U. (2005). External commercialization of knowledge: Review and research agenda. *International Journal of Management Reviews*, *7*(4), 231–255. https://doi.org/10.1111/j.1468-2370.2005.00115.x

Macchi, M., Rizzo, U., & Ramaciotti, L. (2014). From services dealers to innovation brokers: How open innovation paradigm affects incubator activities. Evidence from Italy. *Journal of Intellectual Capital*, *15*(4), 554–575. https://doi.org/10.1108/JIC-06-2014-0078

March, J. G. (1991). Exploration and Exploitation in Organizational Learning. *Organization Science*, *2*(1), 71–87. https://doi.org/10.1287/orsc.2.1.71

Meige, A. (2009, October 25). *Golden Age of Closed Innovation*.

Mergel, I. (2015). Opening Government. *Social Science Computer Review*, *33*(5), 599–612. https://doi.org/10.1177/0894439314560851

Mian, S. A. (1994). US university-sponsored technology incubators: an overview of management, policies and performance. *Technovation*, *14*(8), 515–528. https://doi.org/10.1016/0166-4972(94)90151-1

Mian, S. A. (1996). Assessing value-added contributions of university technology business incubators to tenant firms. *Research Policy*, *25*(3), 325–335. https://doi.org/10.1016/0048-7333(95)00828-4

Miles, M., & Huberman, M. (1994). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks.

Moleiro Martins, J., Abreu, A., & M.F. Calado, J. (2020). Business Incubator and Economic Development. In *Intellectual Property Rights - Patent*. IntechOpen. https://doi.org/10.5772/intechopen.88562

Mortara, L., Napp, J. J., Slacik, I., & Minshall, T. (2009). *How to Implement Open Innovation: lessons from studying large multinational companies*. http://www-g.eng.cam.ac.uk/CIKC/

Munsch, K. (2009). Open model innovation. *Research Technology Management*, *52*(3), 48–52.

Paternoster, N., Giardino, C., Unterkalmsteiner, M., Gorschek, T., & Abrahamsson, P. (2014). Software development in startup companies: A systematic mapping study. *Information and Software Technology*, *56*(10), 1200–1218. https://doi.org/10.1016/j.infsof.2014.04.014

Pedersen, K. (2020). What can open innovation be used for and how does it create value? *Government Information Quarterly*, *37*(2). https://doi.org/10.1016/j.giq.2020.101459

Provan, K. G., & Kenis, P. (2007). Modes of Network Governance: Structure, Management, and Effectiveness. *Journal of Public Administration Research and Theory*, *18*(2), 229–252. https://doi.org/10.1093/jopart/mum015

Rice, M. P. (2002). Co-production of business assistance in business incubators An exploratory study. *Journal of Business Venturing*, *17*, 163–187.

Sanipedia. (2022). *Sanipedia - About Us*. Https://Www.Sanipedia.Com/About/.

Schwartz, M., & Hornych, C. (2010). Cooperation patterns of incubator firms and the impact of incubator specialization: Empirical evidence from Germany. *Technovation*, *30*(9–10), 485–495. https://doi.org/10.1016/j.technovation.2010.05.001

Sedita, S. R., Apa, R., Bassetti, T., & Grandinetti, R. (2019). Incubation matters: Measuring the effect of business incubators on the innovation performance of start-ups. *R and D Management*, *49*(4), 439–454. https://doi.org/10.1111/radm.12321

Stake, R. (1995). *The art of case study research* (Thousand Oaks, Ed.). Sage.

Stuart, T., & Podolny, J. (1999). Positional causes and correlates of strategic alliances in the semiconductor industry. *Research in the Sociology of Organization*, *16*, 161–182.

Suciu, M.-C., Piciorus, L., & Imbrisca, C. (2012). Intellectual Capital, trust, cultural traits and reputation in the Romanian education system. *Electronic Journal of Knowledge Management*, *10*(3), 208–278.

Teece, D. J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy*, *15*(6), 285–305. https://doi.org/10.1016/0048-7333(86)90027-2

Tesch, R. (1990). *Qualitative research analysis types and software*. Falmer Press.

Ubi Global. (2022). *Ranking*. Https://Ubi-Global.Com/Rankings/.

Yin, R. (2009). *Case study research: Design and methods* (SEGE, Ed.).