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"Open Innovation in start-ups: the role of the Network Ability"

RELATORE:

CH.MA PROF.SSA SILVIA RITA SEDITA

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Firma dello studente

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To my family, for their care and support,
and my closest friends,
near and far.

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INTRODUCTION

In the past, companies used to develop innovative ideas within the organization because of the marginal role of the external environment and customers. Gradually, environment grew in complexity and in terms of knowledge; the shapes of industries and companies changed as well to match the recent outside changes. Chesbrough (2003) theorized all those phenomena that were modifying innovation process: firms that used to apply a closed approach while generating and managing innovations; nowadays, are using an open approach, in which external knowledge and internal knowledge merge, breaking their respective boundaries. Open Innovation (OI) is not only a theoretical paradigm; it is also a group of practices applied by many companies in different industries while managing business and innovation.

The thesis is divided in 4 chapters: starting from a comprehensive definition of OI, Business Model (BM) is introduced to explain the economic feasibility of OI practices; finally, introducing the network ability, it is tested the statistical validity of these theoretical concepts.

The first chapter introduces the OI paradigm dealing with inbound and outbound knowledge flows; then, the focus moves on spin-offs, divided in academic spin-offs and corporate spin-offs, depending on their origins. After an explanation of co-creation process and governance mechanisms, the chapter ends providing some concrete examples of small and large companies that systematically adopted OI designing their innovation process. Finally, there are some remarks on the main ideas introduced in the chapter.

The second chapter illustrates the concept of BM, which is a tool that can be used to translate OI theory in formalized practices for companies running innovation process. The business model canvas, created by Osterwalder & Pigneur (2010), is introduced to depict a first complete picture of the tool; then, the thesis deals with some challenges that are internal and external as well. In light of these challenges it is proposed a redesigned BM that offers an interesting alternative to start-ups belonging to ICT industries, which need a more dynamic and focalized framework than other companies with different size and operating in other industries. Finally, it is described the BM innovation: some principles that all together can portray a winning attitude aimed to guarantee a continuous improvement and update of the BM, overcoming inner and external challenges.

The third chapter deals with networking; in particular, it is divided in two sections: the first about collaborative strategies and the second about the Network Ability (NA). In the first section, the focal point is placed on collaborative strategies and networking relationships; after an explanation of the financial impact, it is stressed the importance of the incubators and their services provided. In the second section, it is introduced the NA; an ability of the founder, recognized in literature, that should help start-ups in setting and managing relationships with outside partners. It is finally introduced the absorptive capacity concept, which in this thesis is conceived as a complement of the NA and the control mechanisms that should be used in the long-term to ensure a good strength and duration of networking relationships.

The fourth chapter introduces the empirical analysis. After an overview of the innovative and economic context of the Italian ICT industry, the focus moves on the presentation of the methodologies used to collect data and the sampling procedure, which allows creating a sample of innovative ICT start-ups. Statistical analysis is then implemented through R, a statistical software used through its intuitive interface called RStudio. First, we estimated three regression models to demonstrate the hypotheses put forward in the previous chapters; all the results are commented under a managerial perspective. Second, we implemented a cluster analysis, which identified three start-ups archetypes. This grouping gives the opportunity to identify optimal strategies and guidelines that every innovative start-up should adopt when coping with innovation and networking management.

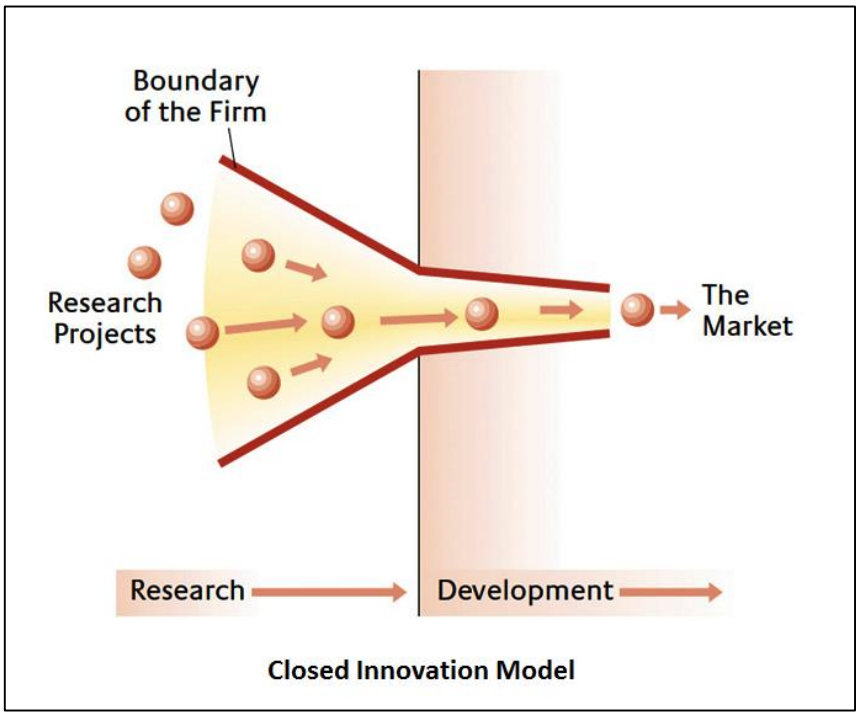
CHAPTER 1 – THE OPEN INNOVATION FRAMEWORK

1.1 From closed to Open Innovation

Henry Chesbrough (2003) has been the first to theorize the concept of Open Innovation (OI), which received large consensus in academia, given the huge number of citations. Consequently, his approach found also many fields of application, revealing its important economic value.

In order to understand the OI framework, it is necessary to introduce first the closed innovation model. After the World War II, Xerox and many companies adopted this paradigm: all stages of the innovation process were internalized within the boundaries of the firm and the only bridge with the external environment was for selling and commercializing innovative ideas, products or services (Chesbrough, 2003).

Figure 1 – Closed Innovation Model



Source: Chesbrough (2003)

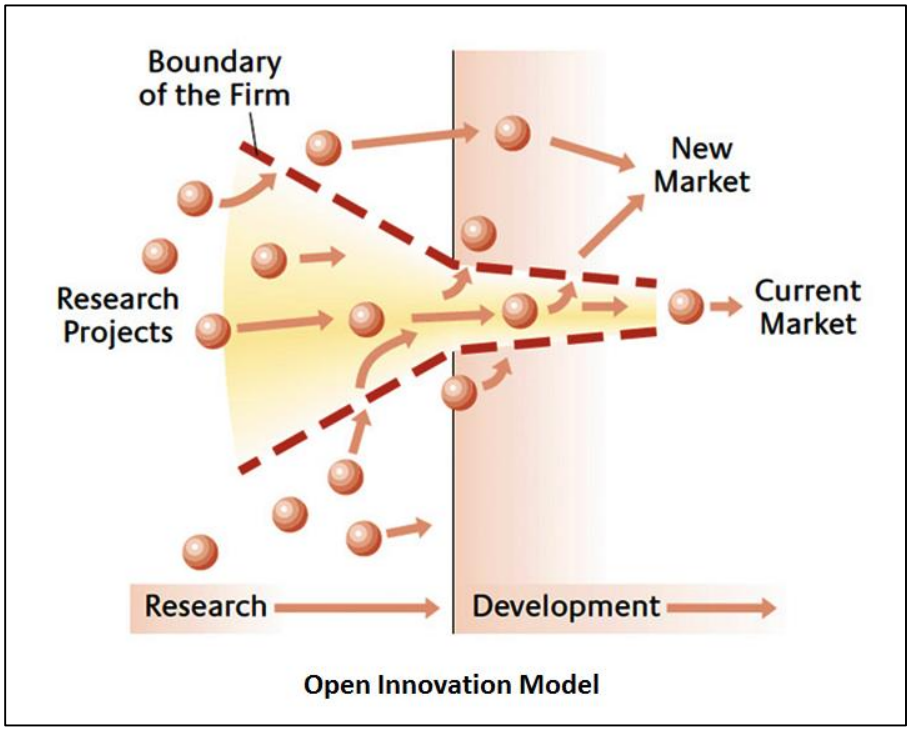
Companies used to run their business without collaborating with external actors in the market. The external environment was quite poor and not stimulating; moreover, there was a predominant fear

of knowledge spillovers. For these reasons, firms started an enlargement process that drove a vertical integration aimed to guarantee independency from suppliers and distributors (Chesbrough, 2003).

Later, some deep changes, like the mobility of the employees across companies and the increase in skills of the suppliers, showed how much this closed approach was outdated and not applicable anymore; OI era began (Chesbrough, 2003).

If the first definition of OI was introduced by Chesbrough (2003), Laursen and Salter (2006) deepened the model providing interesting empirical results; they affirm that: "*an 'open innovation' model is using a wide range of external factors and sources to help them achieve and sustain innovation*" (Laursen & Salter, 2006, p.131). Some years later, Chesbrough and Bogers (2014) gave the following definition: "*We define open innovation as a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model*" (Chesbrough , 2014, p.12). This is a more mature and complete definition of OI, in which knowledge influence and economic implications are connected.

Figure 2 – Open Innovation Model



Source: Chesbrough (2003)

The inbound and outbound features of innovative flows as the pecuniary and non-pecuniary mechanisms represent a crucial point. Dahlander & Gann (2010) affirm that these four components express the degrees of openness of the company, that is, how much is likely that innovations arise and turn into a business outside or inside the company.

Figure 3 – Openness and innovative flows

	Inbound innovation	Outbound innovation
Pecuniary	Acquiring	Selling
Non-pecuniary	Sourcing	Revealing

Source: Dahlander & Gann (2010)

The same authors provide brief definitions of these four dimensions (Figure 3):

- Revealing: companies that freely reveal internal ideas to the market without expecting a pecuniary reward back (indirect reward in the future);
- Selling: companies that sell their innovations or provide a license to other companies expecting in exchange a pecuniary reward;
- Sourcing: companies analyze their environment to spot innovative ideas that they can internalize without any cost;
- Acquiring: companies gather external ideas to undertake innovation internally in exchange of a pecuniary reward.

This new paradigm ignites several inner challenges regarding the management and the overall organization. In particular, top managers are accountable for collaborating with external actors and appropriating the value generated by inbound and outbound knowledge flows (West et al., 2014). In fact, according to van de Vrande et al. (2009), two preliminary factors are crucial:

- Technology exploitation: activities aimed to boost and use technological knowledge located outside the company;
- Technology exploration: activities aimed to internalize outside knowledge and benefit from outside technological flows.

Companies should also take care of governance system and incentive system: starting from an analysis of the main factors that influence the innovation, they should choose the proper system; for instance, Nokia, after the sign of a non-disclosure agreement, gave its production plan to external companies, hence adopting a selective reveal of knowledge. Moreover, managers should be adequately rewarded with the right incentives that do not necessary have economic implications; sometimes managers want to feel part of a community and be recognized as part of it (Wallin & Von Krogh, 2010).

Also the context is very important, OI practices are more incisive in specific situations. There is a dimension which is internal and external. The internal one comprises inner features of the company like the age, the revenues or even the size; the external one is focalized, mainly, on the industry and it expresses how internationalization or technology intensity generate positive results under an OI perspective (Huizingh, 2011).

OI is a concept that can be found across many industries. This is due to the deep changes of the environment and technologies that are not compatible with the traditional innovation model that was applied many years ago. Nevertheless, ICT industries are more affected by those kinds of phenomena: here the capability to innovate is not only an upgrading factor, but a basic factor that is crucial to cope with these markets.

Van de Vrande et al. (2009) argue that Small and Medium-sized Enterprises (SMEs) have a fundamental role in OI. In this context, entrepreneur and entrepreneurial values are necessary if the company wants to exploit and screen the outside technological knowledge; features like the Network Ability (NA) (explained later in the text) are the "fuse" needed to light the innovation "flame". Furthermore, these companies prefer to adopt routines that are not formalized and, at the same time, they do not invest many resources in innovation, preferring approaches that are effective and cheaper (van de Vrande et al., 2009). These companies rely on external networks established vertically with customers and suppliers, with university and other academic institutions or horizontally with other companies at the same level of the value chain; the extended size of the network offsets the limited size of the company and represents a potential source of resources (Lee et al., 2010).

Smaller companies could establish a collaborative agreement with larger companies to utilize infrastructure and resources that the former ones do not own; however, to ensure an effective

collaboration, both firms have to engage in a win-win relationship (both actors benefit from the relationship and leverage its advantages) (Parida & Örtqvist, 2015).
Small companies could provide their flexibility and the high level of specialization that acquired over time; in fact, large companies approaching to OI usually are less flexible and more resistant to dimensional and organizational changes (Lee et al., 2010).

Finally, according to Gassmann et al. (2010), it is interesting to draw an overview of the future trends that are affecting and changing the shapes of OI paradigm:

- The pervasiveness of the concept: OI concept is been concretely applied in many industries and, many times, in contexts far away from ICT; nowadays, it represents the only way a company can survive in a dynamic environment;
- Size: as showed before, small companies, like start-ups, have a crucial role in OI and show a greater suitability than larger companies;
- Innovation process: the new innovative process embraces a more interactive approach and a more collaborative thinking that involves customers, suppliers and also universities;
- Services vs Products: services will gradually reach more importance in matter of innovation, services will be able to enhance and sometimes replace the utility stemming from a product;
- To protect the innovation vs to trade the innovation: the closed innovation approach, that stimulated a protective attitude towards innovation, is been replaced by an open approach in which innovations could be sold to other companies, able to use these ideas to develop brand new innovative products or services.

In his book, Chesbrough (2003) stressed the importance of the spin-off companies pointing out that they promoted an efficient use and exploitation of those technologies which were lying “on the shelf” of larger companies like Xerox. In particular, thanks to their flexibility and size, they reached a high level of skills and specialization.

1.2 Spin-off companies

Spin-off companies played an important role during the interim period between closed innovation and OI eras. These companies encouraged a transmission of knowledge, especially tacit knowledge; in fact, if the codified knowledge can be also sold and spread without consistent problems, tacit knowledge is embedded within the employees and in the organizational culture (Salvador, 2011).

To give a comprehensive definition of this type of company, it is necessary a clear distinction between:

- Corporate spin-off: an autonomous company that is focused on a set of activities that a larger parent company performs (Els & Bart, 2006);
- Academic spin-off: an independent company that is been created by a member of university that still wants to keep a close relationship with the institute (Markman et al., 2008).

In many cases, technologies that have a wider scope work better for academic spin-offs rather than corporate spin-offs; in addition, higher degrees of novelty in technologies imply a lower growth in academic ones, while tacit knowledge enhances the opportunities of growth for corporate ones (Clarysse et al., 2011).

Harrison & Leitch (2010) noticed that academic spin-offs represent a bridge between universities and market side, this link allows a "market test" aimed to understand if a product or service fits preferences of the customers. Furthermore, this kind of spin-offs faces specific issues that regard their restricted size and the poor skills provided by university in raising financial funds; nevertheless, the most important problem regards the Technology Transfer Office (TTO). In fact, this office is fundamental to commercialize the academic ideas and gives a huge support to many companies at their early stages; but, in many cases, all the advantages generated are captured by external actors and not by the university itself.

Visintin & Pittino (2014) demonstrated how the team composition is another important factor in this topic: they showed how the heterogeneity of the team (in this case people belonging to

academic or non-academic context) can enhance the overall performance because of creative discussions and more reliable decisions. This positive effect is always mediated by other components like skill background and personal experiences.

National institutions have to create a favorable environment to a kind of company that undergoes many troubles and faces many barriers; this is even crucial in some national contexts.
In terms of policy is necessary to analyze the shapes and the features of the country and industries; sometimes it can be useful to establish policies aimed to boost the number of spin-off companies or to consolidate the position of certain companies in certain industries.
In this regard, a study has been conducted to find out how to design effective policies for spin-off companies; several moves have been identified: for instance, national institutions should spot those industries that show chances of entry and provide them facilities to lessen the competition or ensure legal protection (Gilsing et al., 2010).

Wennberg et al. (2011), in depicting a policy framework, expressed some problems that are peculiar for each type of spin-off (academic or corporate). Academic spin-offs confirm their lead position in knowledge generators, nevertheless they lack direct knowledge of markets and contacts, for this reason, they experience a worse performance (in terms of employee growth and sales growth) than corporate spin-offs. Finally, corporate spin-offs, despite the greater performance, they own a knowledge that is strictly commercial rather than theoretical.

The next step is to deal with the vertical innovation mechanisms (supplier or customer relationships) to enter a more concrete side of OI; furthermore, it is taken in consideration the possible governance framework that can be applied to fully generate and capture the value created through these mechanisms and OI practices in general.

1.3 Co-creation and governance system

Among all the definitions of co-creation provided in the literature, Roser et al. (2013) provided the simplest and most comprehensive one: co-creation is a creative process performed among stakeholders, in an interactive way, started by the firm at diverse phases of the value generation process. In this thesis, the focus is on the co-creation processes involving customers that are the most common ones; nevertheless, in some cases, the focus will move on suppliers as well.

Von Hippel (1986) introduced the term of the so-called "lead user": a user that is able to enjoy some benefits by finding a solution to certain needs and capable to lead some important trends that, in turn, will push other users to experience certain needs that lead user experienced first.

Gradually, companies stimulated a continuous engagement of the customer in innovative process by, for instance, providing samples of product or setting personal contacts. Franke & Piller (2003) stressed the importance of the "mass customization": in this case, information obtained by customers represent the main source to solve market needs, users are integrated in the value chain of the supplier. Furthermore, toolkits represent the best interaction system between company and user: it comprises a configuration software that leads the user throughout the process, a feedback system that allows the user to "learn by doing" and, finally, all the results are analyzed by the company to be translated in products or services.

Users become the co-creators of the products, able, not only to reduce the research costs and the risk of wrong innovations, but to enhance the likelihood that an innovation will be successful; it is discussed if this kind of involvement has a positive effect more in matter of incremental innovation than in matter of radical innovation (Parida & Örtqvist, 2015).

The practice of free revealing (introduced in the previous paragraphs) is very effective if it is done on user innovation networks (networks, regarding for instance developing or selling activities, that are spread across many users horizontally). Their main output is the user-generated content: content, available publicly, stemming from innovative and creative activities, performed in an amateur way (Schweisfurth et al., 2011).

User-generated content is another interesting tool: if it is a subsidiary tool in developing the right solutions, for online dictionaries like Wikipedia it is vital because all the content is generated entirely by users (Bughin, 2007). Bughin et al. (2008) introduced many examples of companies that created products by interacting with customers. LEGO collected suggestions sent by users to

create new product models, while Threadless outsourced t-shirt design process to its customers. Some companies opened the idea-generation process to customers, while other companies preferred to rely on customer for idea-selection process based on the leakage of designs pre-developed by the company; firms like Google or Facebook provided public software and complementary resources to support both idea-generation and idea-selection process (King & Lakhani, 2013).

A crucial condition in co-creation process is the free revealing (free leakage of knowledge to the public) that, against any classic economic theory, has some indirect advantages. According to von Hippel (2007), a free revealing process is able to enhance the overall reputation of the company. Moreover, the innovation cannot be kept secret for a very long time horizon and, however, is firm specific; finally, profits generated (increase in the customer base) and the increase in asset value offsets costs the company bore. It is also true that a fully free leakage of information can seriously damage the companies and dissipate the benefits; a right solution could be a selective reveal. In this case, companies apply a mix between free reveal of information to the market and protective tools; this allows an appropriation of all the benefits of the free revealing, reducing costs and finding a new application for a technology (Henkel, 2006).

After all these examples and applications of co-creation techniques in products, it is natural to think about the services as well; for their intangible features, they could seem harder to manage and to be placed in a context of OI.

Chesbrough (2011) affirms that it is a matter of "bringing the outside in" and "taking the inside out". Companies like LEGO shared programmable motors with their customers to push the generation of brand new designs ("bringing the outside in"), while other companies like Amazon leaked their expertise to other companies and, contemporarily, they offered the access to its own servers to become an infrastructure provider ("taking the inside out").

Innovation applied in services requires a close interaction with the customer; under a wider vision it embraces a so-called S-D logic. Vargo et al. (2008) argue that services require this kind of logic: a perspective in which companies and users are able to co-create value promoting frequent interactions through integrating resources and skills. There is no real value until a service offered outside is experienced by customers. In a context of value creation, two drivers can be identified: the value-in-use that represents the "nominal value" usually associated to the price paid for the

service and the value-in-exchange which is embedded in resources and competencies which, when exchanged, are able to activate the value. Summarizing, under an S-D logic the value is co-created by a reciprocal exchange of services between parties (Vargo & Lusch, 2004). Finally, Payne et al. (2008) in their paper introduced some direct implications stemming from this innovative logic: new technologies offer an interesting opportunity to build a more valuable relationship with the customer, boundaries of industry have become more blurred and there are new tools to reach the customer. Finally, the changes in customer tastes and lifestyles allow a more customized and personal relationship with the customer.

It is necessary to point out that a co-creation relationship implies a vertical collaboration with customers and suppliers as well. Cova & Salle (2008) provide an extensive vision of the S-D (Service Dominant) logic that comprises suppliers, customers and their respective networks: first, the co-creation process occurs between supplier and customers (with their networks); then it occurs between the supplier with the respective network and the customer with the respective network.
If the social dimension was often considered in old papers, nowadays it has a key role in explaining the new paradigm of innovation and it will be discussed throughout this thesis in the next chapters.

To ensure the whole capture of the innovative ideas generated or selected during the co-creation process, it is important to establish clear governance systems and procedures depending on the situation. In some cases, consumers that produce user-generated content claim that reasons for the engagement are altruism, fame or fun; factors that have a non-economic nature (Bughin et al., 2008).
When companies create communities aimed to co-creation activities, they have to establish clear procedures that balance the freedom of the participants and conflict solving; a good idea could be to put employees within the community, encouraging a better control and a better efficacy of the process (Bughin et al., 2008). Hadaya & Cassivi (2012) argue that two fundamental governance mechanisms can be found: formal ones relying on third-party enforcement, like for instance, legal

contracts and informal ones relying on trust that exists between parties, like for instance, goodwill trust (belief that the partner will behave with responsibility respecting the interests of the firm[1]). Customers should be put at the center of the organization and all the co-creation activities should be conducted with a direct interaction with them. An effective co-creation system should be based on two principles: the whole integration of the customer to create value and the matching of the activities related to co-creation process and new skills acquired (X. Zhang & Chen, 2008).

Roser et al. (2013) introduced a new dimension that deeply influences how a co-creation process is managed, the crowdsourcing. Crowdsourcing is defined as the activity to appoint an external community (or network) to perform a work that was first performed within the company (Whitla, 2009). In doing governance decisions, crowdsourcing implies a different approach (e.g. usually a market approach in the case of crowdsourcing); furthermore, the type of market served by the company has an impact, a B2B company will act differently from a B2C company (Roser et al., 2013).

Many studies, regarding governance systems, adopted the Resource-Based View (RBV) to describe the most appropriate governance mechanisms. "*RBV has been introduced and developed to describe how managing organizational resources strategically can generate sustainable competitive advantages for the firm*" (Jamali et al., 2015, p.137). Barney (1991), one of the first authors that coined this term, added that investments dedicated, for instance, to employee training or employee engagement systems can potentially provide high outcomes if aimed to those resources that are valuable, rare, inimitable and non-substitutable (VRIN). Internal challenges, regarding managers or resources, are important to drive an adjustment to cope with external challenges resulting from OI; top managers are responsible to promote the necessary solutions to overcome these challenges (West et al., 2014). In the case of start-ups, the RBV is a good starting point to build competitive advantage and to nurture the ability to apprehend external signals. These companies tend to compensate their restricted size by relying on external ties provided by larger networks they belong.

[1] Li, W. and Veysel, Y. (2013). Research on relationship between goodwill trust, competence trust and alliance performance. *Proceedings of 2013 6th International Conference on Information Management, Innovation Management and Industrial Engineering*, ICIII 2013. IEEE, 2, pp. 569–573.

1.4 Companies that adopted OI paradigm

OI has a consolidated literature and there are many concrete examples of companies that applied this concept in defining and running their business activities. To introduce these examples is necessary to fix and understand a concept that, even if it could seem theoretical and abstract, was born due to real needs expressed by the market; the final aim of this chapter is to give quick examples regarding how OI paradigm is been adopted by companies.

1.4.1 BlaBlaCar

Founded in France in 2006, BlaBlaCar is a two-sided platform that connects drivers available to give a ride and people that request a ride; the "touch point" between drivers and passengers is reached through the company website (www.blablacar.com).
Di Minin et al. (2016) provide an analysis regarding how this company experienced an unaware application of OI paradigm: this company noticed that there was the opportunity to create a new segment in the market; it created a smart website as bridge of these customers and, at the same time, as control system based on feedback system.
The application of the paradigm is clearer if the focus is moved on the factors that drove the success of this company: firstly, users can generate content and provide suggestions that are considered by the company; secondly, company acquired other start-ups to reach core skills, resources faster or scalability of the business faster than competitors (Di Minin et al., 2016).

1.4.2 STMicroelectronics

STMicroelectronics was born in 1998 and it operates in ICT industry in Switzerland. It owns the 3% of the semiconductors' market worldwide and it is one of the largest producer in this industry (www.st.com). In this case, the main innovation drivers are: the integration of the customer in innovation process; the capability to lead co-creation process; provision of information about the demand (the customers are business themselves so they have a specialized knowledge); application of Internet of Things (IoT) in production process, especially to develop advanced technologies like nano-technologies (Di Minin et al., 2016).

1.4.3 Procter & Gamble

Established in United States in 1837, P&G is one of the biggest companies worldwide; it operates in many markets through many brands and it currently generates approximately $16 billion of sales (www.pg.com). For all these features, this company does not seem the right target company which can be used as comparable company; especially in a thesis that is focused in analyzing OI under a start-up perspective. Nevertheless, it is useful to point out how this company is been able to exploit the OI paradigm and overcome huge barriers and organizational resistance. One of the main steps to innovation is been the "Connect and Develop" program: introduced to turn technologies, developed in the organization, into product; to reach this step it was decided within the company a collaboration with outside partners almost for 50% of business activities (Sakkab, 2002). The program promoted a strategy aimed to collaboration between employees themselves and between employees and people outside the company: to foster this collaboration, P&G introduced a website platform called "InnovationNet", aimed to external and internal worldwide data sharing among employees, to boost innovation and promote an international view. Then the American company introduced "CreateInnovate", a small group of 18 employees working with other 18 people outside the company: the idea was to create an interaction among people with diversified skills and diverse knowledge backgrounds; this could increase a more critic discussion and more prudent decisions (Dodgson et al., 2006).

All these initiatives point out that Procter and Gamble, supporting advanced technological improvements and virtual applications, tried to transmit OI practices to people within the company. In fact, with their knowledge base, their skills and their organizational procedures, they are the starting point of an effective innovative change strategy and they can determine a good or a bad implementation of the consequent technological and operational transformation.

1.4.4 The Italian companies

Lazzarotti & Manzini (2009) deployed explicitly the difference between closed innovator and open innovator: the first innovator type focuses their investment in internal R&D and in the development of technologies within the company because they think that openness cannot be properly managed to drive profitability. The second innovator type acknowledges the importance of R&D investment but it truly believes that it is not sufficient without exploiting the complementary role of OI practices.

Table 1 – Italian Innovators (%)

	Open Innovators	Closed Innovators	Specialized collaborators	Integrated collaborators
N. of companies (%)	43%	41%	9%	7%
Size (%)	25% big; 40% medium; 35% small	26% big; 21% medium; 53% small	0% big; 50% medium; 50% small	0% big; 67% medium; 33% small

Source: Lanzarotti and Manzini (2009)

In Table 1, that is reported on the same paper (2009), the authors interviewed 52 italian companies that, depending on the answers, are been collected in 4 categories: Open Innovators, Closed Innovators, Specialised Collaborators and Integrated collaborators (in this case the focus is only on the first two categories). An interesting result regards the size of the company within the two categories. There are more big companies, less medium companies and more small companies in Closed Innovators group; while there are less big companies, more medium companies and less small companies in Open Innovators group. These outcomes lead to some conclusions:

- Big companies are not likely to change their practices and move to the new paradigm maybe because of organizational constraints and sunk costs;
- Medium companies are very open and systematically apply these kinds of routines within production process;
- Small companies prefer closed innovation thinking maybe because of the poor resources that they own or the closed-minded vision of their respective entrepreneur(s).

1.5 Final remarks

At the beginning of the chapter, closed innovation and OI are compared and it seems that the first paradigm is been replaced by the second one that represents the only answer for the companies to effectively cope with the variability of the external environment. Regarding this, Trott & Hartmann (2009) introduced two important thoughts. First, the dichotomy between the two paradigms does not imply that the companies that want to innovate have to choose between these two paradigms without trying to apply alternative approaches; second, during the closed innovation era, companies like IBM or Xerox managed to survive and co-evolve with the respective markets without explicitly applying the OI practices. However, an awareness of the innovative practices applied and a formal application of OI allow exploiting, in a complete manner, all the advantages offered by the paradigm.

Further, the focus of the thesis has been placed on the definition of the OI paradigm, the benefits of its application and the implications; it is important to point out the problems faced by the companies, but also the inner problems of the OI itself. When sourcing external knowledge, companies need to verify the accuracy and validity of information gathered; furthermore, the collaboration with outside partners implies transaction costs that cannot be ignored (Keupp & Gassmann, 2009). Regarding internal challenges, Sieg et al. (2010), analyzing seven chemical companies established in Germany, found out that there are three main managerial challenges faced by the companies that apply OI. The first challenge is the resistance of scientists: scientists working for the firm in many cases are reluctant to adopt this approach because they do not want to leak sensitive information outside the company without a proper patent protection. The second is to select the problems that could be revealed to external partners and have back the solutions for those problems. Finally, the third challenge is to formulate in the right way the problems: companies, in communicating with outside collaborators, should strive to avoid a specific language in the formulation and strive to formulate the issue in terms of goals meant to be achieved and not in terms of solutions meant to be reached. Often, managers are new with this kind of way of thinking; they can lack the right knowledge base or for instance, they can lack an open-minded vision that, in turn, pushes the managers to seek profits through following a paradigm that seems contrary to the main economic principles (King & Lakhani, 2013). A research conducted to explore SAFER, an OI interface that involves 22 actors (like universities and companies), set three challenges that

are faced within the companies, the organizations and SAFER itself. For instance, it is difficult to comply with the decision system within the interface, to have the right balance between organizations that create new knowledge and organizations that expect to gather new knowledge; finally, it is hard to perform a proper selection of the optimal people that should belong to the interface (Ollila & Elmquist, 2011).

Moreover, the chapter focuses on the customers dealing with co-creation topic is not random: in a research conducted by Enkel & Gassmann (2007) on more than one hundred companies, 78% of the respondents declared that customers represent their main source of outside knowledge. Nowadays, customers are more active, more dynamic, they dedicate more resources in searching information; in many cases, they can create something that could harm the competitive advantage reached by a company (e.g. Open Source Software). It is also true that companies employ more resources in R&D than customers and have specialized skills acquired through direct experience; in high-tech industries, usually, companies have an high amount of R&D expenses, even if, nowadays, this amount is decreasing (Enkel & Gassmann, 2007).

Finally, the chapter shows some specificities of start-ups, which are the unit of analysis of the thesis; they usually rely on informal ties because of a minor resource involvement and the safety of the relationship. In an OI context, companies (not necessarily small, f.e. Procter & Gamble) are used to this kind of interaction (Chesbrough & Brunswicker, 2013; Enkel et al., 2011; Fichter, 2009): in this case, the relationships are based on trust and common expectations, instead of explicit formal rules (Brunswicker & Ehrenmann, 2013). This respects flexibility and speed that are core principles of the OI paradigm: firms struggling to apply OI practices have to show these attributes to match and overcome the features of the market that they serve, especially in specific contexts like the ICT one. The overall aim of this chapter has been the definition of OI concept, providing a clear and concrete application of the concept in real life business.

CHAPTER 2 – OPEN INNOVATION BUSINESS MODEL FOR ICT START-UPS

2.1 Business Model Canvas

After a complete explanation of the OI paradigm, it is relevant to talk about the Business Model (BM) concept. The application of a BM is the only tool that can ensure that the OI practices are concretely applied, coherently with the strategy and the objectives of the company. About this, Baden-Fuller & Haefliger (2013) argue that "*developing the right technology is a matter of a business model decision regarding openness and user engagement*" (p.419).
This concept is present in many articles regarding OI paradigm (Brunswicker & Ehrenmann, 2013; Casadesus-Masanell & Ricart, 2010; Chesbrough, 2011; Konsti-Laakso et al., 2012; West et al., 2014). While in the previous chapter it is been possible to find a stable and recurrent definition of OI, in the case of BM it is not so simple because of the novelty of the term. The term is widely used and, even if it is applied in many concrete cases, it does not have a full theoretical comprehension.

Osterwalder & Pigneur (2010) give the following definition of BM: "*a business model describes the rationale of how an organization creates, delivers, and captures value*" (p.14). This definition could be simple but comprises many features that are integrated in the overall model.

According to Timmers (1998), the BM is "*an architecture for the product, service and information flows, including a description of the various business actors and their roles; a description of the potential benefits for the various business actors; a description of the sources of revenue*" (p.3). This is a more comprehensive definition that includes additional factors that are not taken in consideration in the previous definition. For example, it is pointed out the architectural validity, the importance of each internal and external actor that collaborates with the company and it is specified that there are always economic implications that justify the necessity of cash flows to finance the business.

Wirtz et al. (2016) affirm that: "*In addition to the architecture of value creation, strategic as well as customer and market components are taken into consideration, in order to achieve the superordinate goal of generating, or rather, securing the competitive advantage*" (p.41).

Through this sentence, it is added the strategic validity of the BM; it is clear-cut how the BM requires a total change of the company with heavy organizational changes.

If this concept represents the leading definition through the thesis, to describe the main components of the BM, the business model canvas contained in the paper by Osterwalder & Pigneur (2010) will be introduced.

Company, in designing its BM, should start defining the right Customer Value Proposition (CVP): beginning from the identification of the group of customers to satisfy, company should spot the needs asked by its demand and provide the right offering that solves those needs (Porter, 1996).

The offering is created through the right mix of resources and skills: about this topic, Baden-Fuller & Haefliger (2013) claim the leading role of technology and users. In particular, there is an interactive relationship between technology and BM: a BM can deeply change the way a technology is sold in the market; at the same time, a technology can require a generation of a new BM or a modification of the existing one. Regarding the users, they have a crucial role, not only because they are addressees of the message contained in CVP, but also because they can influence the way the value is created and if it is created or not (Baden-Fuller & Haefliger, 2013). Disruption of recent technologies and demographic shifts are changing the skills required and the shapes of the BM: it is needed a process of "reskilling" to update the competencies of the workforce across the majority of the industries. This process implies a necessary change of the BM, especially in those industries in which technology has the strongest impact (World Economic Forum, 2016).

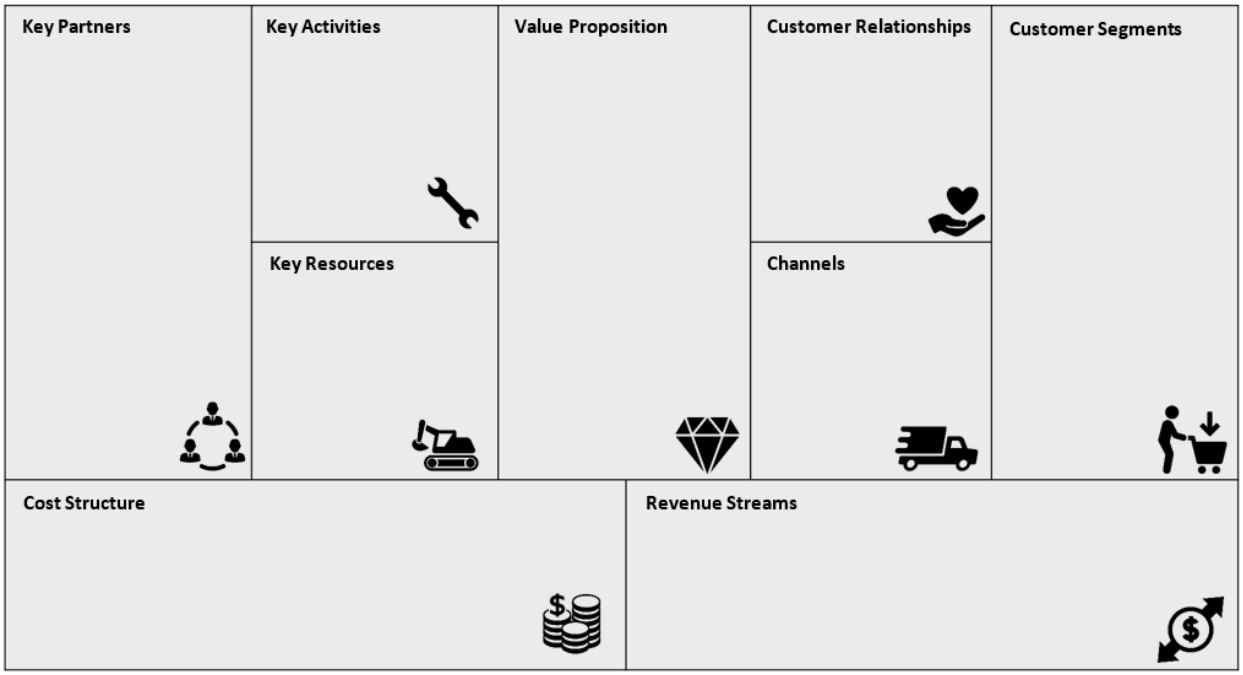
In the case of start-ups, entrepreneur has a very important role in providing his/her own skills and create the right background to foster human capital skills. After the studies at university, the young entrepreneur usually tries to develop general skills that are after embedded in a certain job profile; they should try to apply this general view in deciding for human capital strategy (Lazear, 2004).

Often, smaller companies have a lack of skills and, at the same times, poor resources to invest in gathering them. Papagiannidis & Li (2005) talk about the so-called skills brokerage: a reciprocal exchange of skills that occurs between the entrepreneurs and skills brokers. In the information-driven markets, skills are crucial to elaborate and exploit the data; if the skills brokerage is an interesting solution, it should be supported by an open view of the entrepreneur that could rely on relationships with other actors like venture capitalists (to raise capital especially in the earliest stages) or incubators to promote growth paths. Furthermore, skills brokerage can represent the

natural solution for start-ups, not only in case of ICT markets, but also when companies establish networks with other external actors.

To clarify the BM concept, the business model canvas is introduced. This framework, ideated by Osterwalder & Pigneur (2010), describes the BM as an architecture that comprises nine building blocks showed in the next figure and deployed in the next lines.

Figure 4 – The Business Model Canvas



Source: Osterwalder & Pigneur (2010)

The components[2] of the canvas are:

- Value proposition: as written before, company has to provide a certain solution to solve a certain need claimed by the customers served, this implies to introduce the right offering in terms of products or services;
- Customer segments: it is crucial to define specifically the customer or the group of customers that the company wants to reach;

[2] All the definitions are inspired by: Osterwalder, A., Pigneur, Y., (2010). *Business Model Generation – A Handbook for Visionaries, Game Changers and Challengers*. John Wiley and Sons, Inc., Hoboken, New Jersey.

- Channels: these are the “touch points” between the company and the customers, the only way to communicate and sell the offering;
- Customer relationships: there are many kinds of relationships that depend on the type of customer and the type of strategy undertaken by the firm;
- Revenue streams: these are the cash flows that are created by effectively delivering value proposition to customers;
- Key resources: every company needs some resources to create value proposition, deliver it and make the BM work;
- Key activities: like in the previous case, company needs to perform all the activities necessary to run the BM;
- Key partnerships: company can run the BM only through a network that includes all the partners;
- Cost structure: all the operations conducted to run the BM imply some expenses.

In doing a preliminary analysis of the right BM to adopt, company should take care of BM phase. It could represent a useless step and a consideration that does not cause significant changes in the market; nevertheless, it can be very important to achieve inner goals and pursue efficiency. Amit & Zott (2012), adopting an activity system perspective, introduce three elements that should be the cornerstone in designing the BM: the content (the activities that company have to carry out); the structure (the linkages among all these activities); the governance (system adopted to decide the people accountable for doing the activities). Dubosson-Torbay et al. (2002) talk about some dimensions that affect the design of BMs in ICT industry; if some of those overlap with the nine components introduced previously in the chapter, others regard something new. In particular, those are: the degrees of innovative process, for instance a company could do the same stuff but through innovative ways or introduce radical innovations; the bargaining power of the supplier or the buyer; finally, the transaction control, which can vary from self-organized to hierarchical control system.

The entire thesis adopts a general view of the company, except when the focus is moved on the ICT industry. Start-up enterprises face many constraints and barriers that other companies do not; as said before, one of them is the size itself. Sigmund et al. (2015) affirm that it is generally recognized a “liability of smallness”, a concept that it has been introduced many years ago. Essentially, smaller companies lack some resources and exchange ties that hinder an optimal

growth of the business; this feature causes an overall unattractiveness of the organization towards other companies. In addition, Abatecola et al. (2012) recognize a “liability of newness”, a concept firstly introduced by Arthur Stinchcombe in his works. In particular, companies, which are at the early stages of their life cycle, experience a higher failure rate than those companies that are in the latter stages of the life cycle.

2.2 Emerging challenges

Companies that belong to ICT industry face more challenges than companies belonging to low-tech industries; nowadays, technologies are more advanced and have more implications than the past. For instance, firms that provide cloud-computing services face many challenges regarding physical and virtual constraints of the actual technologies. Machine learning and virtualization are changing the boundaries of the industry and BMs, energy efficiency is a constant thought of the companies that use these powerful technologies. Finally, the increase in the data exchanged and uploaded requires an accurate analysis of the traffic on the platform and a good protection against malwares or other kinds of viruses (Zhang et al., 2010).

Individual features of the companies are important for the determination of their reaction to changes and emergent problems in the industry. Van Der Meer (2007) analyzed the main barriers faced by Dutch companies in approaching and implementing OI. In particular, he found out that many companies failed in innovative projects because of lack of resources but also lack of the right management vision; similar problems were found in SMEs that pointed out how the borrowing capacity and R&D capabilities are other crucial barriers to innovate.
Entrepreneur, for instance, can lack the right motivation or cognitive scheme to innovate or create a BM or the entire organizational structure itself can hide many problems, e.g. daily routines or poor innovation process (Björkdahl, 2013).

It is also important, in designing the BM, to control the gradual implementation of the BM in all its phases; in fact, these phases can hide other important challenges that should be controlled by the company. Frankenberger et al. (2013) introduced a comprehensive framework of the phases of the BM specifying all the arising challenges. They recognize four main phases (4Is):

- Initiation: company starts from the analysis of the external environment to understand how to define the boundaries of the BM; the main challenges are to identify the needs of the stakeholders and formalize the change drivers.
- Ideation: companies draft some ideas; here they have to be careful about thinking in an open-minded way, thinking under a BM perspective and trying to develop new tools aimed to BM creation.
- Integration: stage in which BM is built; in this case, core issues are to "put together" all the components of the BM and to manage relationships with partners.
- Implementation: the model is finally implemented; company should overcome all the inner resistance due to organizational routines or employees and should apply techniques, like trial-and-error, to reduce risks stemming from BM.

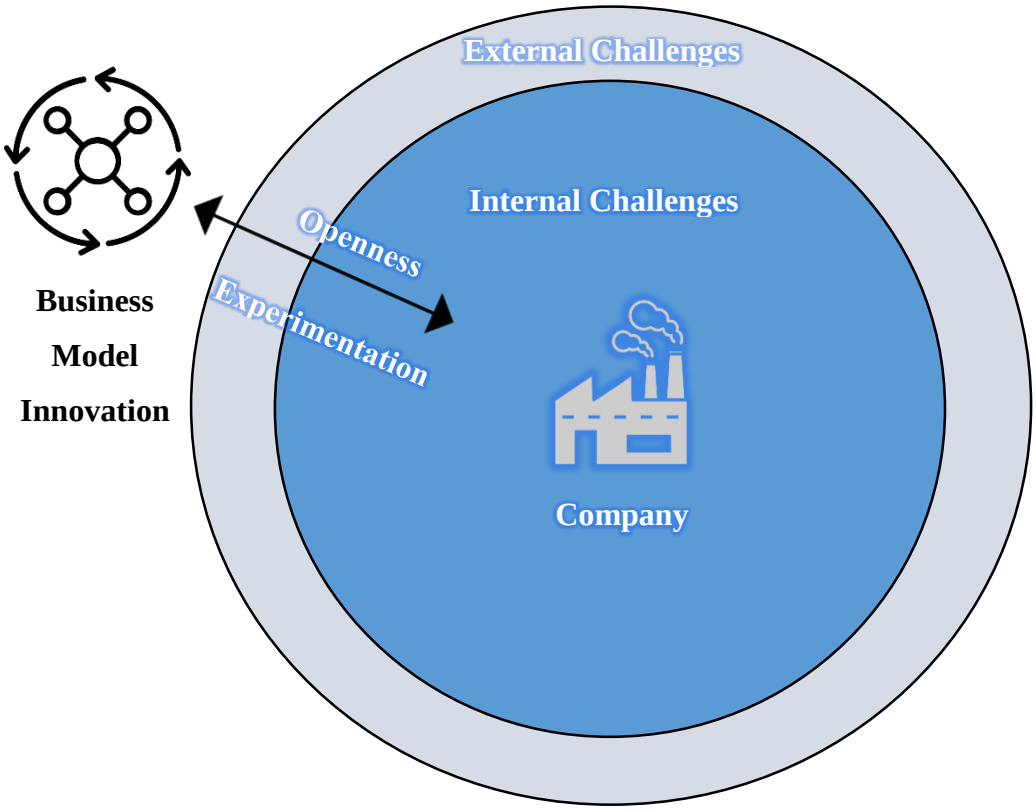
The right management of the network of partners is another important concern; it is not a coincidence that in these four steps these collaborators are always taken in consideration and this importance is coherent with the focus on the start-ups, adopted throughout the thesis. Networks comprise many kinds of collaborators like suppliers, customers or competitors that, at the same time, have different objectives; this diversity can cause some conflicts that, in turn, damage the solidity of the BM (Spieth et al., 2014).

Schneider & Spieth (2013) argue that the main barriers in BM are "confusion and obstruction". According to them, managers, through a proper knowledge management, are able to overcome these barriers; furthermore, they can show, under an operational perspective, the concrete advantages introduced by a renewal of the BM or a creation of a brand new BM. Other important managerial challenges regard the innovation management: companies should focus only on a restricted group of innovations that are promising, dismiss the project that do not bring any positive result and promote a coordination among the single team and the overall company strategy; finally it is needed a specific concern about the business scalability (Lindgardt et al., 2009). Business scalability is the ability to generate marginal profits that are higher than marginal costs; a company that wants to achieve this objective should understand how the BM could match a larger scale of customers (Björkdahl, 2013).

All these problems can be included in a unique possible answer: companies have to intervene on their existing model or on a new BM if they do not have one. Co-existence of the old BM and new BM can provoke problems that can be eliminated with an overall openness of the model and a

constant experimentation; these two solutions have several implications that affect the costs and the revenues as well (Chesbrough, 2007).

Figure 5 – The challenges of Business Model



Source: own elaboration

It is possible to delineate an overall summary of the challenges faced by the company: internal challenges, like organizational resistance or closed-minded vision of the entrepreneur, and external challenges, like the dynamic evolution of the environment and the relationship with the network (Figure 5). The only way to get out from those "challenge circles" is the Business Model Innovation (BMI) that will be explained later in a specific chapter; this process, in turn, can be achieved only adopting an open view of the BM and implementing experimentation to understand which is the right BM strategy to overcome the challenges. Nevertheless, BMI should be the final step of an innovative change that starts from redesigning the BM, taking in consideration start-ups and ICT context (a dynamic and unstable environment).

2.3 Redesigning the Business Model for start-ups in ICT industries

The BM framework, introduced by Osterwalder & Pigneur in their respective book (2010), can provide a simple and clear representation of all the main components of a company. Nevertheless, start-ups that operate in ICT industries have peculiar needs that are not completely compatible with that framework and they adopt a dynamic perspective that requires a dynamic vision of the BM as well. Next lines will introduce a renewed and integrated BM framework specifically designed and adapted for start-ups in ICT industries.

2.3.1 The activity system and Resource-Based View

Before introducing the first building block of the redesigned BM, it is crucial to mention a tool that, for its pervasiveness and richness, it is considered a constant background of start-ups companies, which operate in ICT markets; the internet platform.

It is well known that through internet it is possible to get access to many sources of information bearing a very low cost; furthermore, there is a high availability of free services and systems that potentially can deeply affect organizational procedures. Angehrn (1997) argues that internet provided additional space that overcame boundaries of traditional marketplace. In particular, this space affects several dimensions. Company information can be spread to many people through web channels and new information can be gathered by company itself; new communication channels allow to break geographical and physical constraints; products and services can be sold online nationally and internationally; finally, transactions and payment process can be completely managed with the minimum waste of resources.

If the previous considerations underline the richness (in terms of different functions) of internet, pervasiveness is important as well. Nowadays, World Wide Web “placed its roots” in many different contexts; hence it is not strange that business is been also affected. Even if literature about this topic is not well developed, there are BMs that are driven by internet features; the so-called internet-based models (Morris et al., 2005).

Usually, companies perform different activities that have a different impact on BMs and accomplishment of strategic objectives; it is useful to define a comprehensive approach that comprises all the activities and gives instructions about the proper activity management.

Zott & Amit (2010) introduced the concept of activity system: a system that defines the group of activities performed by the company (from procurement phase to distribution phase), keeping the focus on the value created by each activity. It is obvious that value created depends on partners that interact with the company while conducting activities. The same authors provided four "design themes" that should characterize every activity:

- Novelty: firms should select new activities, new ways to manage them and new ways to link them;
- Lock-in: activities should act like a magnet towards other partners to turn them into active part of BM, for instance lock-in can regard switching costs or network externalities;
- Complementarities: activities should show complementarities to guarantee that, if activities are performed jointly within the system, company is able to create more value than each activity per se;
- Efficiency: companies should design activities to pursue an overall efficiency aimed to minimize total costs.

Activities are often placed at the center of BM theories; according to Zott et al. (2011), they can be considered as the catalyst able to drive a unification of the different concepts of BM.
Activity system is the inner tool that allows to generate value that, later, is perceived externally by customers; companies, once they have set a clear strategic position in the market, should put additional effort in activity system (Seddon & Freeman, 2004).
Activities differ from resources because of their interdependence with internal capabilities and competencies of the employees; nevertheless, the key to create value is to combine the right activities with the right resources in an effective way (Shafer et al., 2005). In fact, resources and activities are not able to create value by themselves; value is generated by finding the best relationship between those two components.

Resource-Based View (RBV) definition is been already introduced in the previous chapter; the main objective of this paragraph is to understand how RBV can drive an effective design of BM.

It is demonstrated that this view is strictly linked with knowledge (crucial factor in ICT) and relations (crucial factor in start-ups); nevertheless, RBV is a prominent concept across many topics, including BM (Acedo et al., 2006).

Managers have a leading role in RBV; only their proactive behavior is able to activate resources within the company. In particular, they have to: consider functionalities of resources to decide the most profitable utilization, recombine resources to foster company expansion and, finally, manage activities because the latters can encourage a process of growth (Lockett et al., 2009). It is important to point out that activities are accountable to generate capacity and to create resources over time.

Furthermore, resources are deeply linked with capabilities, hence knowledge flows. In fact, under an OI perspective, companies need to develop dynamic capabilities, keep them within the organization to create and modify resources over time; this is crucial to encourage an equilibrium between internal and external environment (Lichtenthaler & Lichtenthaler, 2009). All these conditions are aimed to put RBV on the same level of OI; indeed, these concepts have a complementary nature and not a substitute one. Vanhaverbeke (2006) argues that RBV encourages a careful analysis of inner resources to understand if there are complementarities with resources owned by other companies; this is the starting point to create a network and to decide properly the optimal partners. Summarizing, resources are created through activities and knowledge management (capabilities); adopting RBV, companies are able to manage networking activities and, more generally, relationships with external environment.

2.3.2 Customerization – an integrated customer-centric view

The second building block of the redesigned BM regards the approach that an ICT start-up should follow in designing marketing strategy. In particular, value proposition, customer segments, customer relationships and channels are included in this view; nevertheless, if Osterwalder & Pigneur (2010) treated them as separate building block of the canvas, under customerization perspective, they are an active part of a unique building block. This decision reflects needs introduced by disruptive trends that occurred in ICT markets. Concepts like Customer Relationship Management (CRM) and Segmentation do not work in those environments and show their limits when facing international competition. If companies traditionally had to follow a careful process to became global, nowadays, there are start-ups that do not follow these conventional steps; the so-called “born globals” (Gabrielsson & Gabrielsson, 2004).

Recent evolutions in ICT industry affected the customer behavior in two main ways: groups of customers are more fragmented and, at the same time, some of those are empowered; in particular, they can actively refuse certain market offerings because they are looking for certain particular services, hence influencing value proposition offered by companies (Pires et al., 2006).
Customerization is a term stemming from the union of two words: mass customization and customized marketing. In particular, companies, which apply this concept, leave more control to the customer in transaction; but they try to influence end-users through framing the offering alternatives (Wind & Rangaswamy, 2001).

Companies, while choosing the right target of marketing strategy, should focus on those customers that are empowered and that are willing to pay more for the additional services they are searching; if this move seems simple, the consequent outcome is far from been predictable (Pires et al., 2006). Then, it is crucial to decide the proper channel able to deliver value proposition, coherently with the targeted customer or group of customers.

To choose the right channel is very important because certain channels imply different forms of customer support; for instance, companies that choose to serve customers through direct channels are able to provide a more qualitative support than companies that adopt indirect channels (Goffin, 1999). Once companies decided to adopt whether indirect or direct channels, they have to select the proper kinds of channels within these two categories; for instance, in ICT industries, it is very common to adopt internet as distribution platform (e-commerce) or as engagement and interaction platform (community). It is demonstrated that companies, which prefer virtual interactions to physical ones, are able to survive for a longer period than companies that do not (Kauffman & Wang, 2008). To select the right channel is a matter of value proposition; for instance, if company is pursuing high level of quality, it should secure its source of assets and try to establish a more intimate relationship with respective customers (Ballon & Van Heesvelde, 2011). Finally, innovative solutions that are introduced can deeply affect channel selection and management depending on degrees of novelty; in fact, radical innovations require dedicated channels able to keep and even boost the inner potential value of the innovation (Grilo & Jardim-Goncalves, 2010).

During and after purchases, social dimension has an enormous impact fostered by social networks and online communities; nowadays, people are connected everywhere thanks to mobile devices and high development of connectivity infrastructure. Shu (2011) argues that, before purchasing a good or a service, customers tend to talk with friends and other people belonging to their social circle; in the end, people will probably buy what other people recommended to purchase. These mechanisms seem reasonable: people that buy online face constant trust problems and low bargaining power; furthermore, customers are influenced by their social group and, for this reason, adopt a behavior that fit the collective one. Companies can start offering space on their website reserved to customers discussions, they could provide samples of new product they are commercializing; finally, company could search information that customer left on social networks, like habits, preferences and thoughts expressed about purchasing experience (Wei et al., 2011).

Companies should focus more resources and more effort in setting a more close relationships with those people that are more loyal to the brand than other customers. Nevertheless, brand loyalty is anchored in economic reasons and not in emotional engagement or irrational reasons, which often drive customer through transactional experience. About this topic, Schultz (2000) introduced the so-called brand advocates: some customers, driven by emotional motivations, can develop a high level of engagement towards the brand. These people become active supporters of the company depending on the membership to one of these two groups: people hired by the company and people that become advocates in a spontaneous way.

People, which had positive experiences with some products and felt connected to the values promoted by the brand, will spontaneously share positive thoughts about the brand through "word of mouth" mechanisms, occurring between them and their friends (Kemp et al., 2012). Because of recent developments of digital connections, "word of mouth" turned into "word of mouse"; physical interactions are been largely replaced by virtual interactions. Social media represent an effective and popular communication channel for everyone: people use this channel to communicate and follow their favorite artists because of a sense of belonging and a deep emotional engagement; it is usual that the same attitude occur towards brands (Turri et al., 2013). In particular, customers comply with a set of shared values and do not respect economic utility theories; even though, repeated repurchases is one of the advantages of brand advocacy.

It could be useful to introduce certain metrics that allow an evaluation of brand advocacy, especially in social media contexts. Regarding this topic, Wallace et al. (2014) noticed that "likes" on Facebook, number of fans and "word of mouse" can represent an interesting way to measure

emotional engagement. The “advocates” will like the brand and share their experience with other users belonging to the same community; furthermore, a brand that has a high number of fans on Facebook is likely to be considered a reliable and appreciated purchasing choice. The same authors provided some managerial advices that should be adopted by the company in this virtual context: companies should encourage conversations around the brand and cultivate relationships with engaged customers; ultimately, these last ones will convince other people belonging to the same network.

Brand advocacy is not only an online concept; those mechanisms work in online and offline contexts. The point is that companies should nurture brand trust and identification: customers that have a positive purchase experience will trust companies and will start to feel themselves as an active part of the brand; this identification will lead an interaction with other potential customer that will likely buy the product (Becerra & Badrinarayanan, 2013). People trust brand advocates because of two simple reasons: they know that advocates had a direct experience with purchased product and they do not have any reward for supporting the company; they do this because of a spontaneous engagement.

Finally, considerations about customers segments, channels and brand advocacy match perfectly customerization approach. Nowadays, customer should be placed at the center of every marketing strategy and BM: they are more powerful and can trigger a high level of influence because of rise of social media, advent of digital technologies; but, especially, because of the increased importance of social dimension in purchasing process.

2.3.3 The revenue model

In the end, company has to be sure that the BM applied generates the cash flow needed to reinvest in resources and activities. In this phase, it is important to decide which is the best way to obtain revenues; for instance, if it is better to place advertising or exploit inner quality of the product/service provided. In the ICT literature, there are four main revenue models, widely adopted by the most successful companies:

- Advertising: during the dot-com bubble, many companies, in exchange of money, allowed to other companies (advertisers) ad placements on the software provided by the former

company; this model showed some problems and contributed to the failure of many companies. This does not mean that advertising is not the right way, many companies exploit this source of revenue; the point is that companies should try to apply the model in a smart way. For instance, Google showed the concrete advantages stemming from advertising: this company provided services for free but placed ads on these ones; in this case, advertisers paid to appear in the top positions of search engine results (Marín de la Iglesia & Labra Gayo, 2009).

- Freemium: this is a very common strategy in mobile and PC software industries. ICT companies know that, usually, there are two distinct customer segments: the ones that want to enjoy a basic version of the software for free and people willing to pay a fee to obtain a software with extra functions. Essentially, companies, through flows obtained by people that adopt the premium version, are able to repay the missed revenues of the users that enjoy software for free (Marín de la Iglesia & Labra Gayo, 2009).

- Mass collaboration: in this case, companies provide services for free with the condition that these services will remain free in the future (Marín de la Iglesia & Labra Gayo, 2009); this principle matches the so-called "gift economy", an economy that works under free exchange of something valuable without immediate rewards (Cheal, 1988). Open-source movement is a tangible example that works with mass collaboration principle (Barbrook, 1998); Wikipedia is a great example as well. This dictionary works on mutual sharing of information between users that are providers and consumers at the same time. Despite free exchange of goods, mass collaboration represents a revenue model often based on donations: users are satisfied with services offered by Wikipedia, hence they will gladly make donations (www.wikipedia.org).

- "Razor-razor blade model": this revenue model is very common in manufacturing industries. Principle is simple: companies price razors less (fixed part) and price razor blades (variable part) more. Essentially, in these situations, it is always possible to identify: a good that can be reused many times after the purchase and a good that is consumed after the use (Teece, 2010).

2.3.4 Cost innovation

There are always expenses and costs that affect the BM and, at the same time, are necessary to run it. The majority of the companies put many efforts in minimizing expenses and in making cost structure more efficient; even though, they do not think that cost structure could represent part of the innovative process itself. If, usually, companies experience a notable increase in costs because of innovations; nowadays, especially start-ups, are trying to innovate limiting overall costs and investments.

Williamson (2010) pointed out that, recently, companies established in emerging countries are exploiting their cost advantages to offer a higher level of utility for a lower price. This phenomenon is called "cost innovation", an innovation that is focused on the cost structure of a BM.
Nowadays, Chinese small companies are contributing to a larger production scales through participating in global integrated network; through this structure, firms do not have to face a direct competition with multinational companies (Zeng & Williamson, 2007). Asian companies applied the principle of "modularization of manufacturing". Nowadays, suppliers of car manufacturing companies tend to produce all the components and group them into families (called in this case modules) that later will be assembled by car manufacturers; for instance, some fundamental modules are suspension, seats, engines or doors (Christensen, 2011). Through modularity, companies are able to ensure a good level of standardization and flexibility simultaneously; in fact, the customization and application of latest technologies is moved at the end of the value chain, while standardization is kept at earliest stages.

According to Williamson (2010), cost innovation disrupts three main economic principles:

- To produce sophisticated technologies, it is necessary to bear high costs: Chinese companies are developing niche technologies which are sold at a very competitive price; e.g. they are able to save costs relying on low-cost servers.

- Customers who want a high level of variety, have to pay a premium price: many companies are trying to develop products in different versions that are sold with a little variation in

prices; therefore, customers can afford a good variety of products without paying an excessive price.

- In the markets, it is possible to identify niche products, because offered to small customer segments, and mass products offered to wide customer segments: Asian companies, thanks to their lower costs, managed to sell niche products in mass markets at a convenient price; competitors could not react because of huge losses they would have borne and large sunk costs.

It is crucial to point out that cost innovation does not regard a geographical cost advantage that is difficult to be imitated by foreign companies; but it represents an innovative way to manage cost structure and pricing mechanisms.

To reply challenges introduced by cost innovation, companies could settle partnerships with other companies that adopted this cost structure; in this way, companies are able to acquire the open-minded vision embedded in this paradigm (Zeng & Williamson, 2007). Companies should try to provide more utility at lower price. They could focus on those core functions of the products and eliminate all those functions that are not really important or outsource product design activities to those companies that apply cost innovation. Finally, they should try to overcome the three challenges, introduced before, by maximizing value for money (the utility stemming from the product considering price paid during the transaction) (Williamson, 2010).

2.3.5 Towards a more collaborative approach

Osterwalder & Pigneur (2010), introducing the key partnership building block, dealt with reasons under the collaboration with outside partners. This paragraph is aimed to point out which are the most collaborative relationships and which are the core features that ensure a good control system and achievement of objectives in collaborations.

The ability to manage collaborations is very important because they allow to cope with external environment and manage in a proper way all the activities underlying the value chain; however, in the end, companies need to translate all the potential advantages of collaborations in concrete value

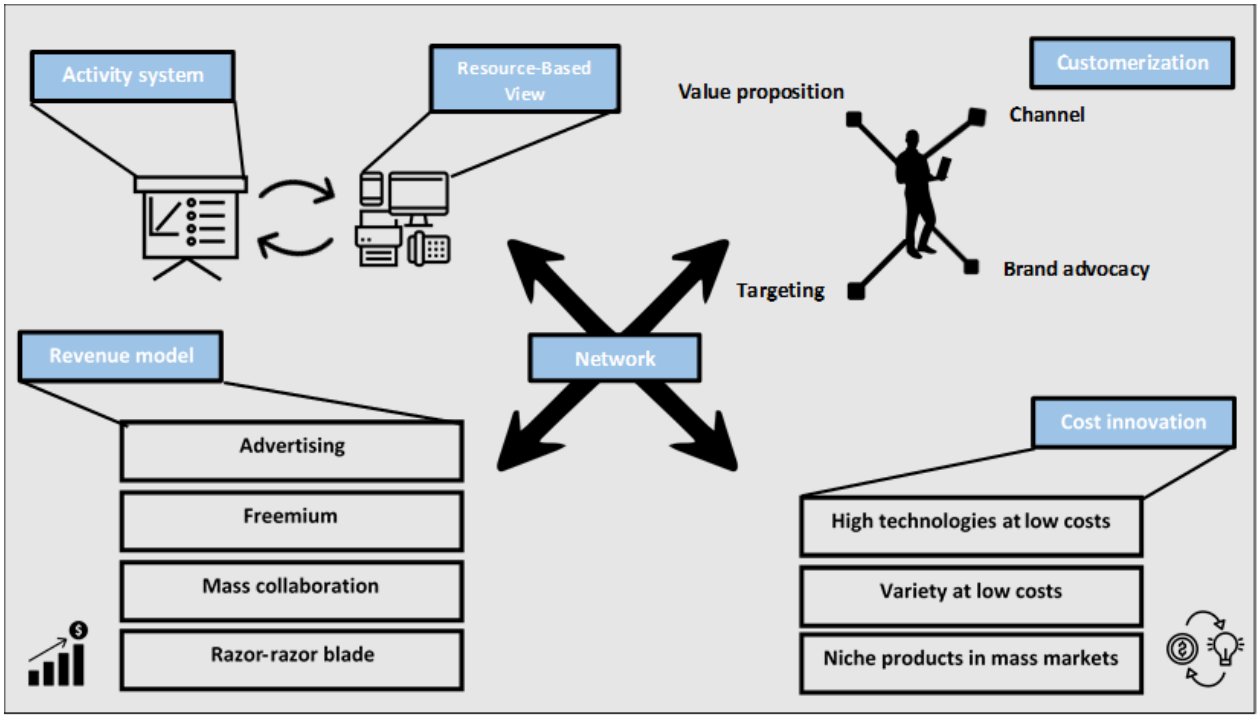
(Ng et al., 2013). Tuten & Urban (2001) affirm that there are three important features that should be always present in a partnership: attributes of partnership, features of the collaborations like commitment or trust issues; behavior in communication and quality; characteristics of information exchanged; dispute resolution methods, necessary to prevent eventual conflicts among partners. Ultimately, companies, which want to build successful relationships, have to ensure commitment, trust among partners and a transparent communication; furthermore, even though formal partnerships still prevail on informal partnerships, these last ones provide more flexibility and lower costs (Tuten & Urban, 2001).

Collaborative agreements with partners can vary depending on characteristics of value proposition; for instance, products are different from services, the latter ones are characterized by an intangible and perishable nature (Vargo & Lusch, 2004). In service context, partnership should be set selecting the right partners that seem more trustworthy: in fact, trust can turn a transactional relationship in a long-term collaboration (Kedia & Lahiri, 2007). Finally, an effective partnership design goes through a review of the entire BM; flexibility and focus on the objectives can ensure that companies, collaborating with partners, can generate and enhance value creation (Chaurey et al., 2012).

2.3.6 The redesigned framework

Figure 6 represents all the components of the redesigned BM for start-ups in ICT.

Figure 6 – The new Business Model



Source: own elaboration

First, companies decide the right target of the marketing strategy considering the empowerment of users in ICT context; then, they are ready to set the proper value proposition that will be delivered through the right channels. Finally, firms adopt all those necessary moves to turn customers into spontaneous advocates of the brand. The entire process occurs in integrated way under customerization perspective.

Secondly, company has to manage all the activities in BM, exploiting the right skills and capabilities; this is paramount to create and develop resources difficult to be imitated over time (Lockett et al., 2009). This guarantees an operational feasibility of what is been decided in marketing plan.

Thirdly, it is crucial to choose the right revenue model that will depend on customer needs and product/service features. The choice is not limited to the four models suggested in the thesis, even though, they are the most common in literature and in business practice.

Fourthly, all the activities and resources generate costs. Under OI perspective, these costs can be managed in certain ways aimed to exploit innovation and an enhanced value creation and delivery.

Finally, all these processes require a careful look to internal and external environment; companies are not self-sufficient and set relationship with outside actors that can belong to value chain (suppliers, distributors etc.) or not (universities). The entire value creation process, especially in ICT companies, passes through network management, which should be conducted opening the boundaries between company and environment; for this reason, networking will be the core argument of the next chapter.

2.4 The Business Model Innovation

BM cannot be decided once and left unchanged for a long time; it has a dynamic nature that explains why it is important to guarantee changes in and, sometimes, of BM.
To start an innovative process of the BM adopted brings out many challenges: external ones, regarding trust issues in network management or knowledge sharing flows and internal ones, regarding organizational resistance or persistence of methods and routines (Berglund & Sandström, 2013). In fact, internal factors like organizational inertia can really contribute to hinder a BM change; for this reason, companies have to decide if it is better a gradual or an immediate transition of the framework (Wirtz et al., 2016).

Entrepreneurs need to exploit their leadership skills to drive this evolution, even though, they should adopt a strict collaboration with management, which will be accountable for lead employees throughout the organization (Doz & Kosonen, 2010).

Furthermore, Doz & Kosonen (2010) argue that these skills are useful to foster the capabilities, which every company should own and develop:

- Strategic sensitivity: attention and consciousness of strategic evolutions;

- Leadership unity: speed and effectiveness of top managers in decisional processes;

- Resource fluidity: ability to promote a reconfiguration of skills and resource deployment.

In addition, BMs should pursue an "eternal" flexibility, in terms of market positioning and satisfaction of customer needs. Through redesigning activities and configuring resources, companies are able to align themselves to the external environment and, ultimately, to customers (Mason & Mouzas, 2012). As in the case of VRIN model, BM should be hard to be imitated. In his paper, Teece (2010) affirms that a BM is hard to be replicated if: the company has unique resources or activities that embody specific skills, there is a level of obscurity that hides mechanisms under BM implementation, introducing a BM can cannibalize sales or profits. Flexibility should be rooted in an internal dynamic consistency: in this way, companies are able to adapt themselves to external environment and, contemporarily, maintain coherence and stability in BM (Demil & Lecocq, 2010). In pursuing consistency, management has a crucial role: it should spot and analyze all those risks that could have a considerable impact on BM; in this way, it can anticipate challenges stemming from internal and external environment; finally, tactics and objectives can be implemented in an effective way (Demil & Lecocq, 2010).

Hacklin et al. (2018) argue that value migration in industry and across firms is an important factor that affects the way to effectively compete within market and sustain BM: usually, in high-tech industries, value is concentrated in those firms that perform better than others do. Once new companies, because of inner skills and resources or supported by technological changes, enter the industry and perform better than incumbent firms, provoke a migration of the value in the industry from worst performers to best performers. Furthermore, in industries characterized by high value migration, companies should adopt a proactive behavior and innovate their BM in the case of low value migration industries, companies should set another new BM to capture additional value (Hacklin et al., 2018).

Finally, BMI is set under a networking perspective; as said before, the only way to survive is to change BM depending on external and internal environment. It is not a case that many papers point out how networking is an important tool that has to be taken in consideration when designing and

innovating BM (Berglund & Sandström, 2013; Demil & Lecocq, 2010; Mason & Mouzas, 2012; Teece, 2010). Start-ups belonging to ICT industry tend to satisfy a demand that is not local, but global; this depends on the virtual nature of products and services provided which guarantee low costs and high speed. The companies that want to undertake an internationalization process are used to rely on external partners, in fact, they need resources and skills that cannot develop internally; many of them tend to adopt a co-opetitive approach (Kock et al., 2010). In addition, collaboration with other companies is optimal when start-ups have to manage a complex product development process that usually characterizes an internationalization path (Gnyawali & Park, 2009).

For all these reasons, this hypothesis is posited:

H1: *Start-ups that are changing their Business Model to enter foreign markets and establishing a global competitive position can experience a positive impact on financial performance if they set a collaboration with other companies.*

CHAPTER 3 - NETWORKING

3.1 A quick definition of the concept

Environment is a source of uncertainty and instability that should be managed carefully by companies; nevertheless, companies set relationships to cope with environment and merely to survive in their markets (Berglund & Sandström, 2013).
Nowadays, many companies are engaging in collaborative relationships aimed to pursue competitive advantage through the sharing of knowledge and resources as well (Romero & Molina, 2011).
Networking includes several mechanisms that influence the firm at many levels. In particular, Vanhaverbeke (2006) argues that, in an OI context, there are three distinct levels of impact by networks on company.

Firstly, an intra-organizational level analyzes the internal mechanisms within the company that create and transmit the knowledge. There is a clear distinction between tacit knowledge, the knowledge that is embedded in employees and cannot be easily codified; and the explicit knowledge, embedded in codified mechanisms like routines and that can be transmitted to other people (Lagerström & Andersson, 2003). In the same paper, there is a clear identification of the teams as the core actors accountable of the transmission of knowledge through proper methods; overcoming common challenges like cultural barriers or diverse backgrounds.

Secondly, there is a company level that has been stressed before in the previous chapter on the OI framework (Chesbrough, 2003).

Thirdly, there is an inter-organizational level. This is the broader level that analyzes the way the companies manage their relationships with external companies, often on a global scale. Companies can build informal or formal ties and wide or deep ties; the choices are based on the strategy and objectives (Vanhaverbeke, 2006).

Formal ties regard formalized forms of collaborations among partners willing to exchange skills and resources to reach a mutual advantage (Parker, 2008). Parker, in his paper (2008), argues that

there are some prerequisites in creating a formal business network, in particular: they work better in a prosperous environment full of innovative flows, they should be performed with a proper incentive system that penalizes free riders; finally, urban areas should fit better networks than rural areas. If all these features "put the spotlight" on the main positive indirect effects of the formal networks on the company growth; Schoonjans et al. (2013), taking in consideration a sample of SMEs included in PLATO (a program introduced by Flemish government to support SMEs), demonstrated that there is a direct effect between business network and firm growth. In particular, formal networks support the company for an acquisition of resources that can balance the inner size limits of the companies. Finally, it is crucial to transform all the collective benefits generated by the business networks in personal benefits of the company: companies that are actively focused in improving the collective interests of the formal network are aware that improvements in networks turn into improvement in the single companies belonging to the network (Munksgaard & Medlin, 2014).

In the case of informal ties, it is important to build a background, managed by trust and harmony, that ensures good communication and a proper distribution of power among partners; it is also true that these tools boost free knowledge flows within the network (Rampersad et al., 2010). Informal collaborations match perfectly the OI practices: informal ties foster the openness of company towards the various outside partners like universities, laboratories or companies (Brunswicker & Ehrenmann, 2013). The company is the main character of the so-called "co-opetition", the collaboration among companies that compete and, at the same time, cooperate (Mention, 2011). This phenomenon is very common in ICT industries: companies use this form of collaboration to build expensive infrastructures and get access to core resources; if "co-opetition" promotes many advantages, it is also true that it involves complex dynamics and many conflicts that partners need to manage in advance (Gnyawali & Park, 2011).

Deep ties are characterized by a repetitive nature of knowledge flows, while the wide ties are characterized by a heterogeneous nature of information. This explains why, depending on the objectives of the company, deep ties are more likely to drive incremental innovations; while wide ties are more likely to stimulate radical innovations (Vanhaverbeke, 2006).

Open source software industry is a good example of how networks (communities in this case) are able to build products satisfying the customers' needs. Open source software are software, which code is freely available worldwide (Henkel, 2006); in this context, users are crucial in developing new innovative ideas. Communities are characterized by the presence of diverse people born in different cultures and that acquired ICT skills in an amateur way; their final aim is to provide solutions to solve certain emerging needs without expecting necessarily something in exchange (Rajala et al., 2012). Rajala et al. (2012) discovered two important aspects that are shaped by the networks:

- Resources management: the capabilities emerging from the networks and the nature of these relationships, both external and internal, prompt a right reconfiguration of resources to achieve business strategy;
- Flexibility: if communication and trust are important also in this situation, networks promote a flexible structure of the business that matches needs of the external environment.

3.2 Collaborative strategies and impact on performance

The creation of the networks represents the last stage of a process that requires an open strategy of the company when it takes decisions regarding collaborative interactions. In setting the collaborations, there are three preliminary decisions: the breadth (the different nature of the partners belonging to the network, e.g.. University or customer); the depth (the intensity of the collaborations); the spatial distribution (the geographical distances among the partners) (Sedita & Apa, 2016). Before analyzing more in depth these three factors, it is worth to mention that it is crucial to decide in a proper way the right partners, guaranteeing that the connectivity among partners is kept or even improved over time (Wilson, 2012).

Breadth cannot be fully understood without a specific analysis of the kind of partners that can interact with the company; partners that have different strategic objectives and that can influence the company strategy in different ways.

University is one of the most preferred partners of the company. It has an important role in terms of knowledge transfer and competencies: companies interact with university because they want to

acquire certain specific academic ideas that can drive innovations and, contemporarily, enhance the skills of the company; furthermore, universities provide various services aimed to the commercialization of a product or to co-creation initiatives (Ivascu et al., 2016). Those interactions between university and company can seriously harm the "academic freedom": business objectives can drive the direction of academic research towards more empirical than theoretical research fields. Furthermore, projects undertaken by both parties should benefit companies and university as well; the only way to obtain this mutual advantage is embedded in a trade-off between how much joint projects are challenging and how much they affect business performance (Perkmann & Walsh, 2009). This is linked with the comparison among academic collaboration and commercialization. In the first case, it is important to focus on engagement and skills expressed on an individual level because it is demonstrated that, in this case, often individual expertise does not imply a collective expertise (university). In the second case, in dealing with commercialization, it is crucial to adopt a collective perspective because individual impact is not significant (Perkmann et al., 2013). The concept is simple: academic collaborations are supported more by individual features of the best researchers, while commercialization processes are more linked to organizational structure, so to collective mechanisms.

Ankrah et al. (2013) underlined the importance of creating a win-win relationship between companies and universities. This can be done only if there is an exploitation of complementary benefits that both actors provide: universities can provide their expertise and infrastructure to support innovative process; while companies can provide training to students and researchers and career opportunities to newly graduated students. Knowledge transmission works if there is a cognitive closeness that allows to both partners to obtain and use the knowledge in their respective business (Heikkilä & Heikkilä, 2013). For this reason, knowledge transfers work better in informal relationships: in this case, the higher frequency of interactions, the transmission of tacit knowledge and high level of trust are able to leverage and support a successful collaboration (Liew et al., 2013). Finally, university gives an important contribution in boosting the complementary strengths of companies and other universities; in meeting specific business needs in specialized fields; in sustaining a balanced national economic growth. Nevertheless, in the literature, some authors think that universities are not able to respond immediately to needs expressed by the companies; lack of specific business capabilities, bureaucratic costs and financial limits contribute to harm the benefits of an academic collaboration (Wilson, 2012). Incubators are able to offer services that offset these

limits expressed by universities, like financial support, business support and networking services. For this reason, these companies will be introduced and explained deeply in the next paragraph.

Surely, collaborative strategies with customers are the best choice that many companies adopt when dealing with OI (Enkel & Gassmann, 2007); it is not a case that this kind of strategy is reported in many OI articles (Henkel, 2006; King & Lakhani, 2013; Parida & Örtqvist, 2015; Enkel & Gassmann, 2007).
Nowadays, companies are replacing their firm-centric view with a customer-centric view; in particular, usually, companies interact with customers to design and develop new product. In particular, co-creation practices are often applied with individual customers and, for this reason, it is necessary to adopt a dynamic and flexible approach depending on the interaction between company and customer. The need of a more customized experience matches exactly the so-called "mass customization" (high scale production aimed to minimize cost and, at the same time, to satisfy a unique group of customers) (Prahalad & Ramaswamy, 2004).
Yi & Gong (2013) identify four stages that characterize customer behavior throughout co-creation process:

- Information seeking: initially, customers try to gather information aimed to understand better the products or services offered by the company and to have a better performance in co-creation process;
- Information sharing: this stage ensures that customers are able to communicate their needs to the employees of the company;
- Responsible behavior: customer should recognize their duties and their accountabilities towards the company;
- Personal interaction: it is necessary to establish an interaction between customers and employees to exploit completely value stemming from co-creation.

If customers play an important role in guaranteeing a good effectiveness of collaborative strategies, companies should take care of those conditions that influence outcomes of the strategies. About this topic, Kristensson et al. (2008) express some important thoughts. Firstly, there is an identification of the various roles embodied by the customers in this experience and the context in which the customer is immersed. Secondly, companies should give some specific tools that support

the customers in co-creation, setting also a proper incentive system that does not necessarily regard financial rewards (as stressed before, many times, customers collaborate because they are interested in finding specific solutions in specific fields). Thirdly, companies, in constructing the collaborative strategies, should replicate a daily context and should not underestimate the limited expertise of the customer; in fact, it is demonstrated that customers that already have specific knowledge in specific fields are less likely to drive disruptive innovation. Fourthly, companies should prefer a heterogeneous group of customers to stimulate proactive discussions and reliable decisions.

Even if a strategy focused on customer satisfaction is usual and is been applied in many markets, co-design activities between customers and firms are been applied only recently. This trend depends on the difficulty in choosing the proper governance systems that ensures control and value generation, furthermore consumer is been conceived always as receiver at the end of the innovative process. In the end, everyone recognized academic validity of co-creation practices but few companies applied this strategy in the market (Sanders & Stappers, 2008).

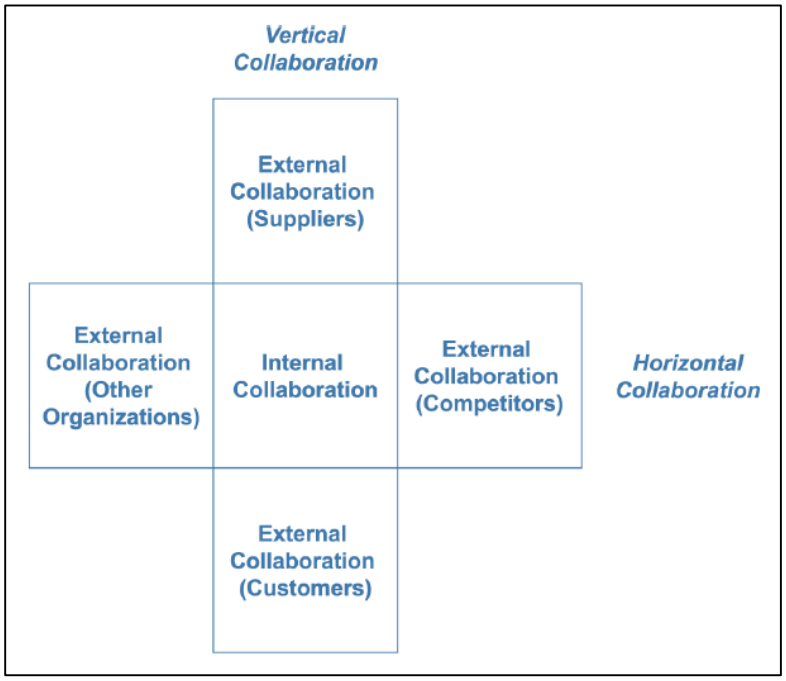
Roberts et al. (2014) argue that customers willing to collaborate with customers can be pushed by intrinsic or extrinsic outcomes: in the first case, consumers want to collaborate for egoistic or other personal reasons; for instance, because they are disappointed about some products or they have unsatisfied needs. In the second case, customers are driven by an external outcomes (often economically desirable); for instance, because they expect to receive a monetary reward or a career opportunity within the company. In the same paper, it is introduced a kind of outcome that lies in-between the extrinsic and intrinsic dimension. Here, customers that rely on these outcomes want to collaborate because they expect back a social recognition as an active part of the community; in particular, if there is an external reward regarding the membership to a group, there is an increase in personal satisfaction and self-esteem.

Even if the most common forms of collaboration involve universities or customers, companies operating in dynamic industries usually rely on other forms of collaboration; for instance, they cooperate with consultants, suppliers or competitors, like in the case of co-opetition phenomenon (Figure 7 summarizes all the main possible interactions among companies and partners). According to Barratt (2004), companies should not ignore the internal collaboration but, instead, place it at the same level of the external collaboration. Furthermore, he argues that companies should select accurately the partners and, with them, build a closer relationship; nevertheless, throughout the

paper, it is underlined that choices about the nature of partners and intensity of relationship are susceptible to industry and company features.

In ICT industries, companies adopt an OI approach in a natural way due to the competitive drivers and knowledge intensity in the sector; this does not deny that company should be careful in sharing knowledge with outside partners; on the contrary, openness in collaborations has a wider scope that comprehends also these safeguards. In fact, an open approach: can boost the effectiveness of internal R&D expenses (Drechsler & Natter, 2012); has a direct positive effect on firm performance (Eisingerich et al., 2010); especially in service industries, can deeply affect innovation processes at many steps (Love et al., 2011).

Figure 7 – Main collaborative strategies



Source: Barratt (2004)

Summarizing all the considerations taken before, the following hypotheses are posited:

H2: *Under an Open Innovation perspective, companies will adopt the openness principle in forming collaborations; that is, a company that adopts one type of collaboration will be more likely to adopt other types of collaboration.*

H3a: *Collaborations have a direct positive impact on the financial performance of companies.*

H3b: *Collaborations with customers and suppliers will show a greater impact than other types of collaborations on the firm performance.*

3.3 Role of incubators and networking services

Surely, collaborative strategies play an important role in reaching strategic objectives and financial growth; furthermore, in the case of start-ups, these services are crucial to mitigate the "liability of smallness". In fact, these firms, through collaborative strategies, are able to exploit big networks that, in turn, are able to offset the limited internal size, encouraging a reciprocal exchange of skills and resources.
Nevertheless, start-ups face also a "liability of newness", for this reason, these "newborn" companies need to interact with other actors that are specialized in providing business services at earlier stages of company life cycle; the business incubators (Sedita & Apa, 2016).

According to Bergek & Norrman (2008), a business incubator can be conceived as a supportive background addressed to start-ups and other companies at earlier stages; in particular, they usually provide the following services:

- Additional office spaces rented to companies for business meetings;
- A group of services aimed to reduce the overall costs and finance companies;
- Professional support, training and coaching activities;
- External and/or internal networking activities.

Basically, incubators are able to provide "hard" and "soft" services: the first category regards all those facilities and resources that are provided to aid companies; while the second category regards all those technical or organizational activities provided to encourage sharing and creation of knowledge flows (Zhigao et al., 2006). In ICT industries, knowledge is the main good that is exchanged among different actors. Information and Communications Technologies (ICT) facilitate knowledge sharing eliminating many constraints like time, speed and location; if it is true that these

technologies have wider scope, they need to exploit internet infrastructure to be effective (Hendriks, 1999).

Business incubators topic is been always discussed by institutions in deciding economic policies; like universities, incubators have an important public role in boosting the entire national economy. It is not a coincidence that the majority of the incubators are no-profit businesses (Tavoletti, 2013). For instance, business incubators (especially public ones) contribute to employment, alleviation of poverty, technology creation and transfer (Masutha & Rogerson, 2015). Incubator does not represent a substitute to entrepreneurial activity. It is a propeller able to foster entrepreneurial activity and encourage an overall economic growth, through provision of services and facilities (Lesáková, 2012).

For this reason, another two hypotheses are proposed:

H4a: *Entering a business incubator experience has a positive effect on the firm financial performance.*

H4b: *The effect of the incubation experience on the firm financial performance is mediated by the entrepreneurial capabilities of the founder.*

In literature, there are many different deployments of incubator archetypes depending on the criteria of segmentation adopted by authors. Barbero et al. (2012) identified four main incubator archetypes: basic research incubator (aimed to development and commercialization of technologies through Intellectual Property), university business incubator (supported by university and company funds), economic development incubator (public organizations focused on wide economic objectives) and private incubators (private and corporate objectives). Taking in consideration a Spanish sample of incubators, they found out that: private and basic research incubators meet standard goals of the archetype they belong; university business incubators quite meet these goals; while economic development incubators do not meet these criteria at all.

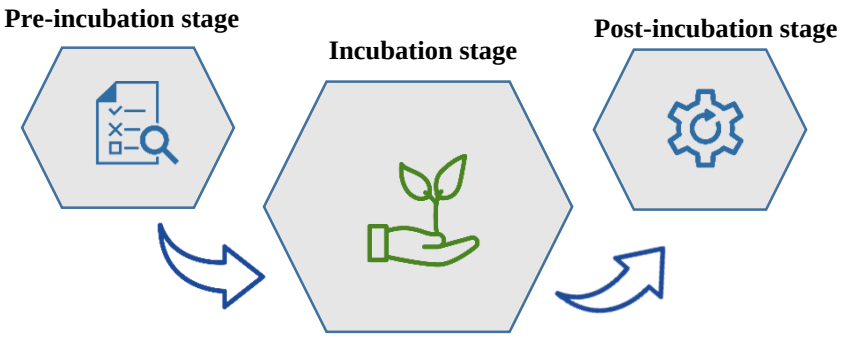
High-tech markets have some peculiarities compared, for instance, to low-tech markets: in fact, the first ones are characterized by a more fragmented competitive structure; dynamic and disruptive evolution of technologies; high level of globalization. In these markets, companies compete on a physical level (formed by resources exchanged) and on a virtual level (formed by information

exchanged) (Rayport & Sviokla, 1995). In setting strategic objectives, company should consider that the only way to compete effectively on both level is to focus on value creation; this implies a creation and maintenance of innovative networks that leverage existing complementarities between physical resources and intangible assets (Laubacher et al., 1998). Furthermore, companies, in managing innovative collaborations, should nurture their absorptive capacity, which depends on frequent interactions with partners, past experience and, finally, by incubator itself (Sedita et al., 2019). In fact, company, collaborating with incubators, could overcome the lack of personal and relational skills that, in turn, encourage an effective and fruitful interaction between company and partner.

An important tool, which can rescue ICT start-ups and provide core services to reach these goals, is the virtual incubator: an internet-based incubator that, through provision of networking services and web resources, helps companies across the value creation path (Nowak & Grantham, 2000). These for-profit incubators have a stable online presence that allows exploiting all the services and networking activities; as the name suggests, they lack of a stable physical location and operate worldwide through web channels (Von Zedtwitz & Grimaldi, 2006).

It seems that virtual incubators are able to capture some advantages that are missed by other types of incubator like university business incubators; in turn, the latters are able to capture advantages missed by the former ones. Carayannis & Von Zedtwitz (2005), in their paper, argue that there is a tool able to overcome respective limits and boost advantages of real and virtual incubators; the so-called GloCal, Real & Virtual Incubator Network (G-RVIN), where GloCal are global and local networking infrastructures. G-RVINs can be defined as "*…knowledge and innovation infra-structure and infra-technology which would link entrepreneurs and micro-entrepreneurs with local, regional, and global networks of customers, suppliers and complementors and thus help not only bridge, but also leverage, the diverse divides*…" (Carayannis & Von Zedtwitz, 2005, p.109). In the same paper, it is underlined how these networks are able to connect segments, communicating only through physical channels and exploiting web-based connectivity devices; at the same time, these unique network ties encourage and leverage classic geographical proximity.

Figure 8 – The three stages of incubation



Source: own elaboration

Finally, it is important to point out that incubation does not represent the only stage involved in the entire incubation process; incubators should take care of all those useful activities performed before (pre-incubation) and after (post-incubation) the actual provision of services to clients (Figure 8).
During pre-incubation stage, incubators can provide facilities, test the entrepreneurial abilities of the company or support the company in drawing up the business plan (Lalkaka, 2003; Sonne, 2012); furthermore, they can provide tools that can be used by founder to test their skills and competencies (Grimaldi & Grandi, 2005).
During post-incubation stage, incubators need to nurture the relationship with customers and guarantee a mutual assistance (Lalkaka, 2003); they need to check that companies reached their predetermined objectives and a quite stable financial independence (Al-mubaraki & Busler, 2013).
In performing all those preliminary and consequent activities, incubators need a constant and tangible support by government and related policies (Adegbite, 2001).

Networking activities are one of the most important services that a business incubator provides to a start-up; it is useful to discover which are those elements that show the difference between a good or a bad incubator performance. Cooper et al. (2012), in their paper, analyzed an awarded university business incubator to find out which are the main performance drivers that justify a good networking interaction with start-ups. They identified four influential factors:

- Formal or informal interaction: it is important to decrease the formal distance between companies and incubators; the first starting point is to create an informal and trustworthy collaboration.

- Social assistance: start-ups want to be considered as part of a community, because this relationship can simplify resource sharing and assistance.

- Impact of firm stage: stage of the company is able to reshape the frequency, the strength and the kind of collaborative relationship.

- Geographical closeness: even if interaction with partners is aided by telecommunication and technologies (see virtual incubator), a physically close interaction encourages a better communication with start-ups; in addition, it ensures trust between parties and tacit knowledge sharing.

3.4 The Network Ability

It is widely recognized a particular ability, within the company, aimed to manage and set networking relationships with other external actors; if this ability is been often associated to network management concept, nowadays, there is a vast literature about the Network Ability (NA) (Ritter et al., 2004). The latter, even if it incorporates elements contained in network management, comprises other individual and organizational elements. The NA can be defined as "*an individual-level skill, defined as the ability to develop friendships and build strong, beneficial alliances and coalitions*" (Sigmund et al., 2015, p.266). This capability represents the main prerequisite to generate successful innovations; in fact, inclusion of outside partners encourages a fruitful generation of innovative ideas, an effective implementation and commercialization of the product (Konsti-Laakso et al., 2012). Start-ups, due to their young age, face the so-called liability of newness (already defined previously) that hinders a perfect integration within the network; NA can offset this weakness and encourage an entry in bigger and more attractive networks, in fact, these networks can provide those core resources that companies cannot obtain by themselves (Semrau & Sigmund, 2012). Hence, NA contributes to offset liability of newness and liability of smallness as well.

Carnabuci & Operti (2013) argue that knowledge flows and organizational implications are two components that can affect output stemming from NA. In particular, often, companies, recombining technologies in certain ways, are able to come up with new innovations depending on knowledge background; companies that have similar background will be likely to generate innovations through recombining existing technologies, while the ones that have a different background will be likely to promote a recombination of new technologies. The point is the following: companies with similar backgrounds will explore ideas belonging to the same research field in which they are specialized; while companies with diverse ones will explore disruptive ideas that belong to new research fields. Regarding organizational implications, start-ups could prefer using informal structures because of less restrictions and complexities that can arise from a formal structure; nevertheless, informal structure can exhibit control issues regarding, for instance, rules systems and procedures (Carnabuci & Operti, 2013). In SMEs, entrepreneurs represent a bridge between internal and external knowledge flows. In this regard, Corno et al. (2014) introduced the figure of the "Knowledge Intensive Entrepreneur", an entrepreneur of a SME that is focalized in exploring, innovating or decoding external knowledge. Furthermore, this entrepreneur occupies a significant position in rendering innovation economically, because of his/her dynamic attitude and leadership skills. Moreover, Shu et al. (2017), in their paper, stressed the importance of the entrepreneur's Network Ability; through his/her competencies the founder can set interpersonal relationships based on trust which, in turn, can encourage reciprocal exchange of tacit knowledge. The same authors affirm that four dimensions describe NA effectively:

- Network orientation: this factor argues with the social openness and trust that entrepreneurs employ in these kinds of collaboration;

- Network building: this factor regards the effort put by entrepreneur in extending networking relationship, finding new information about partners;

- Network maintenance: entrepreneurs have to nurture and support the relationship adopting a long-term perspective;

- Network coordination: to manage all the relationships that he/she built, entrepreneur has to adopt an integrated approach that secures an optimal level of coordination.

Shu et al. (2017) demonstrated that the NA, through the impact of these four components, affects positively the chance to find unexplored opportunities in the market; effect that is mediated by power distance (the extent to which a boss can establish the attitude of his/her subordinate[3]). In addition, Sigmund et al. (2015) demonstrated that NA has a direct positive effect in increasing financial performance of the company; this impact is explained by the capability to set bigger networks that involve powerful collaborative relationships.

Thus, this hypothesis is proposed:

H5: *Network Ability has a positive impact on the financial performance of the company. The impact will be measured looking at all the components of network ability: network orientation, network building, network maintenance and network coordination.*

3.4.1 The complementary role of absorptive capacity

Someone may argue that NA is very close to the so-called absorptive capacity; even though, if the two concepts are compared, important differences emerge.

Cohen & Levinthal (1990) introduced this term in their paper, when dealing with learning and innovative mechanisms. In particular, they defined absorptive capacity as the "*ability to recognize the value of new information, assimilate it, and apply it to commercial ends*" (p.128). This capacity reflects on individual and organizational level as well; in addition, it depends on the previous knowledge background, in fact, knowledge, once stored in memory, will allow to interpret and capture the outside information (Cohen & Levinthal, 1990). Absorptive capacity is strictly related to R&D investments: companies that invest a significant amount in R&D are able to build knowledge background needed to spot outside knowledge and capture the value stemming from it (Cohen & Levinthal, 1989).

The importance of knowledge flows represents a similarity with NA, where, even if there is a networking context, outside knowledge has to be internalized and reused (Carnabuci & Operti, 2013). Furthermore, whether companies use absorptive capacity or NA, they are focused in managing relationships with external environment to generate high value from knowledge flows;

[3] Hofstede, G. (1984). *Culture's consequences: International differences in work-related values*, (Vol. 5). Sage.

nevertheless, in the knowledge itself there is the limit of absorptive capacity. In fact, absorptive capacity is strictly dependent on the knowledge field in which is been built; thus, companies that explore novel knowledge fields will not be able to export their knowledge background, hence their absorptive capacity (Cohen & Levinthal, 1990). Under OI, absorptive capacity can overcome its own and OI limits; moreover, absorptive capacity can encourage a better network engagement (Huang & Rice, 2009). In the same paper, Huang & Rice (2009) affirm that SMEs which have a high level of absorptive capacity can experience more benefits in terms of innovation, when acquiring a technology externally; this does not mean that absorptive capacity does not imply costs. In fact, absorptive capacity is cumulative and "path-dependent" (Cohen & Levinthal, 1989); investments in this kind of capacity will harm the performance in the short term and will eventually improve the performance in the future, once the knowledge background is been built (Huang & Rice, 2009). Absorptive capacity can be considered as a trigger that can improve the overall performance; but companies that apply OI principles, even if they do not develop absorptive capacity, can successfully manage inbound knowledge flows (Spithoven et al., 2010).
Lichtenthaler & Lichtenthaler (2009) affirm that absorptive capacity, even though it is an important prerequisite of a good knowledge management, is necessary but not sufficient to manage knowledge flows. In particular, this capacity takes care of all those knowledge mechanisms that go from outside to inside: companies that invest in absorptive capacity want to gather external information that after will be collected in the knowledge background of the company, which, in turn, will be used to gather further knowledge.

3.4.2 Deepening the collaboration and choosing proper governance mechanisms

The previous paragraphs were focused on the preliminary stages in which NA arises; in particular, how companies interpret and internalize outside knowledge, but also how companies choose network partners and extract value generated by the interaction. Now it is important to deal with the latter stages of NA like network maintenance and network coordination; during these phases, it is important to deepen the relationship and understand which are the right ways to set influence mechanisms over partners (Prenkert & Følgesvold, 2014). Reinforcement of network ties encourages more emotional and economic support, in addition, partners will be likely to bear all risks associated to collaboration in pursuing mutual objectives; finally, in many cases, companies that deepen their collaborative relationship turn informal collaborations into deeper collaboration

forms like strategic alliance or business partnerships (Barnir & Smith, 2002). Companies that frequently interact within each other can get those core resources needed to implement the strategy; furthermore, network strength and frequency represent a solution to those difficulties that start-ups have to bear in entering a new market, especially if they are assessing an internationalization strategy (Chen & Chen, 1998). Companies, once established a consolidated relationship, will gladly set face-to-face interactions with their partners; ultimately, this contact method will stimulate a reciprocal sharing of tacit knowledge (Chen & Chen, 1998). Start-ups that operate in ICT industries tend to prefer a dynamic structure that matches the short life cycle of the product sold or service provided; through personal meetings and negotiation processes, these companies are able to guarantee trust and a deep interaction as well (Grefen et al., 2009). In addition, Grefen et al. (2009) argue that start-ups, in managing their respective networks, prefer to set a collaborative interaction that puts all the network partners at the same level of power. Network strength itself could represent a governance system: companies that develop their collaborative relationships are able to decrease all the collaboration risks and reinforce the collaboration itself (Barnir & Smith, 2002). Nevertheless, it is important to determine how the power should be distributed across the partners belonging to the network; ultimately, if it is better to adopt an autocratic or a collaborative approach.

In the first case firms use authority as governance mechanism, while, in the second case, they use trust as governance mechanism. Authority is the ability to influence the behavior of another person to reach specific objectives, while trust is based on the assumption that other partners will not adopt an opportunistic behavior, which can harm the company (Snehota & Håkansson, 1995).

Traditionally, within organization it is been always recognized a power pattern aimed to distribute power among those who instruct a command and those who has to comply with a formalized system of rules; autocratic system is been applied, mainly, within medium or big companies, in which a complex bureaucratic structure was needed to run the business (Hamilton & Biggart, 1988). Nevertheless, in countries like South Korea, within business networks, which comprise mainly SMEs; there is a centralized governance system that prioritizes the authority of the national government (Hamilton & Biggart, 1988). In networking, authority can prevent potential opportunistic behavior that cannot be strictly managed through more collaborative approaches. Teegen & Doh (2002) introduced the authority balance, a reciprocal approach that justifies the control over some networking activities by some partners compensated by control over other

activities by other partners; this could represent a good alternative to a pure autocratic approach that encourages a medium-high asymmetry of power.

Companies that show a high level of trust, on the contrary, assume that the other partners will perform all strategic actions trying to give benefits to the company or, at least, avoiding those actions that can harm company performance (Snehota & Håkansson, 1995). Trust is strictly linked with depth of collaborative relationships and frequency of interactions with partners; in fact, a deepening of the network relationship builds trust over time (Teegen & Doh, 2002). Snehota & Håkansson (1995) demonstrated that start-up companies, in setting network relationships to cope with external environment, are willing to establish a mixed governance system that includes trust and authority as well; furthermore, this system is aimed to guarantee high degrees of control in case of significant interdependence among partners.
It would be interesting to check how this mixed approach (combining trust and authority) would affect the collaborative strategies adopted by the start-ups companies; thus, this hypothesis is posited:

H6: *In conducting network management, companies that adopt autocratic governance system and a trust governance system (measured by network strength and frequency) jointly, will experience higher degrees of collaborations with their partners.*

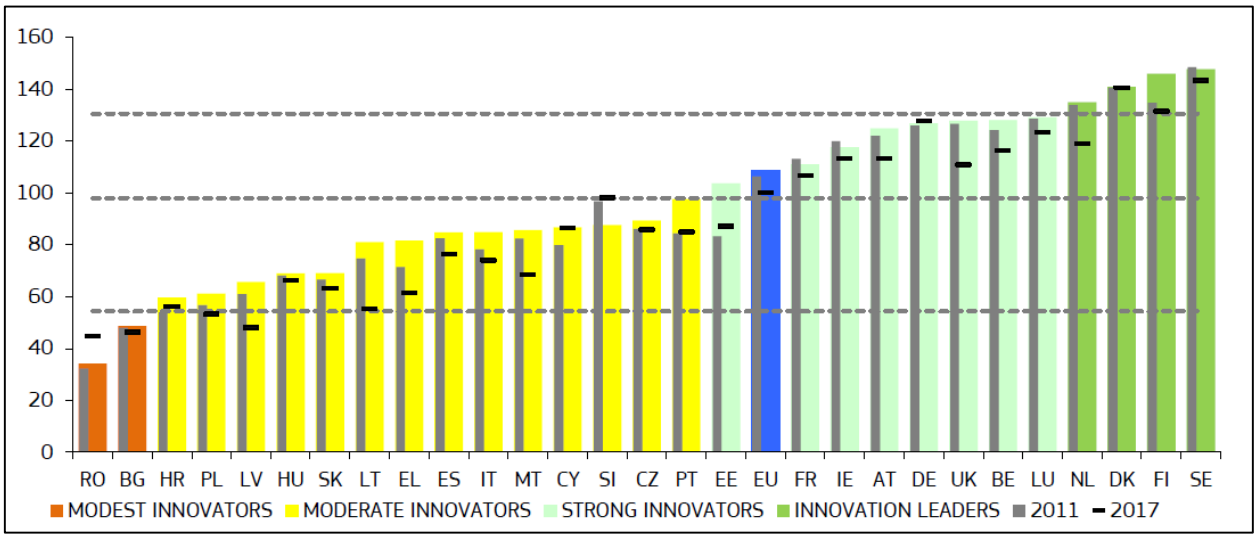
In the end, NA and its governance mechanisms can affect cultural background of the company and, at the same time, they are affected by it; national institutions can determine the efficacy of the results stemming from network relationships (Chen & Chen, 1998). Finally, start-ups that undertake internationalization strategies should always perform an in-depth cultural analysis of countries they are trying to enter. In the next chapter, results and discussions will show how Italian situation is affected by institutional and cultural background, these are actually the factors which explain why sometimes results comply with literature, while, in other cases, they do not.

CHAPTER 4 – THE CASE OF ITALIAN INNOVATIVE ICT START-UPS

4.1 Overview of the Italian ICT industry

To measure the innovation performance of countries, Hollanders et al. (2019) introduced the "European Innovation Scoreboard", an indicator, expressed in percent, that comprises four core innovative dimensions: framework conditions (human resources or research infrastructure), investments (company investments or access to funding), innovation activities (company analysis or intellectual property) and impacts (employment or revenues). Depending on the score level, it is possible to distinguish four big innovator groups (Figure 9): "innovation leaders" (with a score over 120%), "strong innovators" (with a score between 90% and 120%), "moderate innovators" (with a score between 50% and 90%) and "modest innovators" (with a score under 50%). To give a global view of the variation of score among countries, also non-EU companies are introduced in the table below with their respective score (Hollanders et al., 2019).

Figure 9 – Innovation performance of EU and non-EU countries

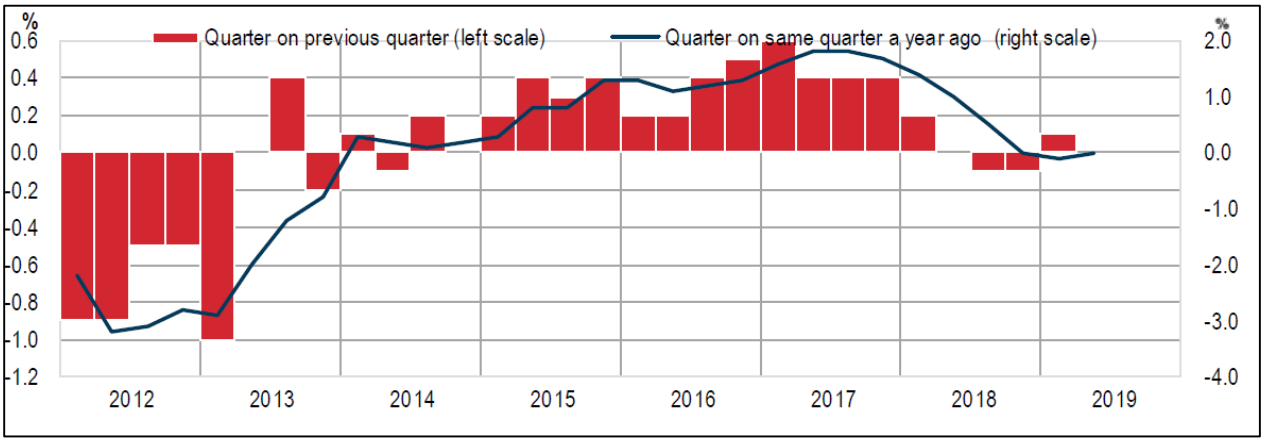


Source: Hollander et al. (2019)

Italy (IT) belongs to the category of "moderate innovators", compared to the one in 2011, its performance improved reaching a value equal to 85% in 2018; SMEs internal innovations regarding products or processes, encouraged this trend overcoming its weaknesses, like financial support or human resources management (Hollanders et al., 2019).

Italy comprises a spread industrial system supported mainly by SMEs, which represents the 95% of all Italian companies; they are specialized in producing high quality solutions applying advance design and engineering techniques; nevertheless, nowadays, Italy is still coping with those negative effects arising from the global recession (Corno et al., 2014). These effects reflect on Gross Domestic Product (GDP).

Figure 10 – Quarterly GDP growth in Italy



Source: ISTAT (2019)

In this case, GDP is calculated as "*sum of the values added by all activities producing goods and services, plus taxes less subsidies on products*" (ISTAT, 2019, p.4). If, from the second quarter until the fourth quarter of 2018, the GDP growth rate has been usually negative, also in the fourth quarter itself (-0,1%); in the first quarter of 2019, the rate reached a slightly positive value (+0,1) which decreased to 0 in the second quarter (ISTAT, 2019). According to Hassan & Ottaviano (2013), Italy is facing a stagnant period in many industrial sectors, especially in ICT industries; ICT investments are addressed to those sectors that showed a low total factor productivity. Furthermore, Italy did not fit the recent changes needed to cope with digital technologies evolution (Hassan & Ottaviano, 2013); for instance, in business service sectors, ICT trend encouraged a growth path within the industry, but, after the end of 80s, this growth suddenly stopped (Saltari et al., 2013). Saltari et al. (2013) argue that this sudden stop is due to production and managerial lacks: at the beginning, this industry exploited the benefits stemming from introduction of digital technologies; after, since organizational restructuring and rearrangement of managerial activities

did not occur, this positive trend suddenly reached an end. In particular, Hassan and Ottaviano (2013) argue that:

- Incentive system within companies is not based on performance;
- Employees are rewarded without a clear correlation between efforts and results;
- People that underperform are not fired;
- Managers do not concentrate on talented people because of a wrong management of organizational priorities.

Someone may argue that another limit of Italian economy is the company size itself: larger companies own more resources aimed to production activities, furthermore, they can absorb and implement external technologies in an easier way (Bugamelli et al., 2018). This could not be an exhaustive explanation for the Italian situation: the country does not own an adequate digital infrastructure and this lack puts start-ups in an uncomfortable position already at the beginning of their life cycle. Moreover, as discussed before, start-ups are not supported by an effective educational system; professional bodies, for instance incubators, do not provide core skills and capabilities; finally, the majority of the start-ups do not receive adequate external financial support which is replaced by self-financing (Corno et al., 2014).

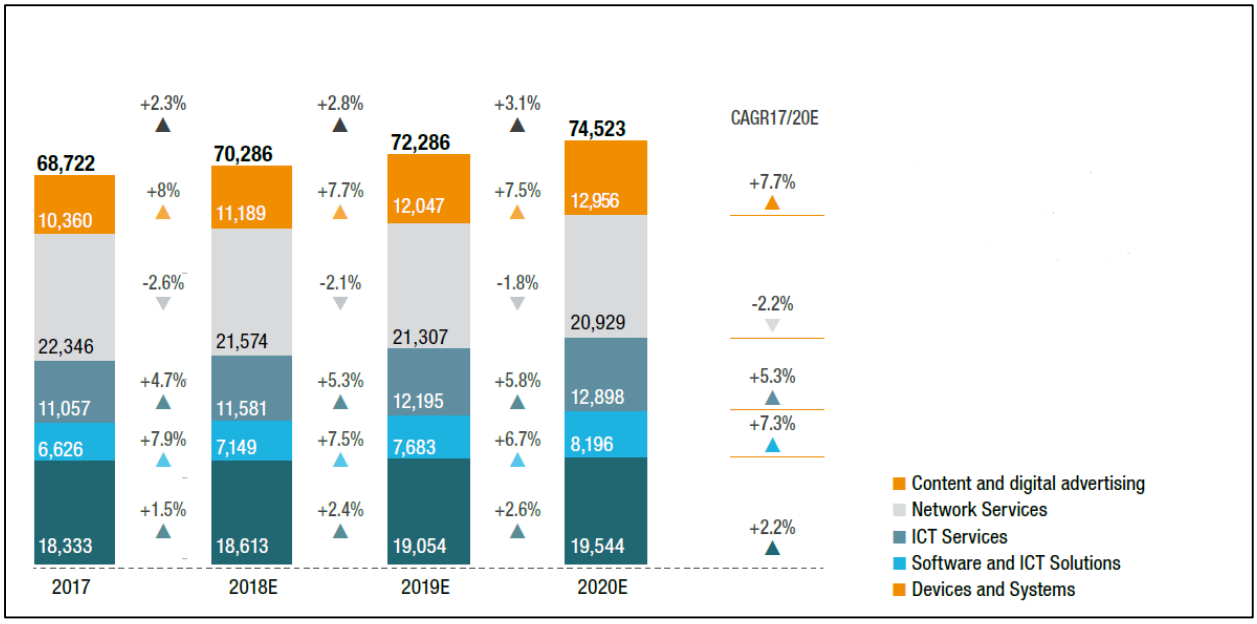
During 2017, CAGR in Italian digital market grew by 2.3% (Figure 11), outclassing the growth rate of the previous year (+2%), in particular, ICT services showed an upward trend as well; cloud computing, through an increase in efficiency and effectiveness in management of resources, supported the overall growth of this industry (Anitec - Assinform, 2018).

For what concerns ICT employment, Lasagni (2011) affirms that the link between capital investments and human skills is not so clear in this industry, in particular, small companies showed a great economic performance with low fixed costs; instead of R&D or capital investments they exploited the ability to provide customized solutions to customers.

Finally, it is discussed how, unlike the other industries, employment in ICT industry is not affected by regional differences. This does not mean that there are no regions that perform better than others

(Lasagni, 2011). Lombardia and Lazio are the regions that show highest market share in the ICT market (40.9%), a reason, which could explain this rate, is the surrounding technological infrastructures: users and service companies provide a wide range of solutions and, at the same time, create a supportive background for technological investments. The residual 59.1 % is distributed equally among Piemonte, Veneto, Emilia-Romagna and Toscana (Anitec - Assinform, 2018).

Figure 11 – The Italian digital market



Source: Anitec – Assinform (2018)

4.2 Data collection and sampling

The overall aim of the research, conducted in this thesis, is to analyze the impact of the Network Ability (NA) on the performance of innovative start-ups operating in the ICT industry in Italy; for the sake of this, two questionnaires have been sent to a sample of ICT innovative start-ups located in Italy. The first questionnaire comprises 24 items divided in 3 sections. The first one includes personal information about company that could have time or economic nature (e.g. company name, activity, year of incorporation, number of founders, number of employees, financial information about sales and BEP). The second one comprises types of collaboration with outside actors (e.g. with universities, suppliers or other start-ups), adoption of innovative technologies (e.g. 4.0 technologies) and sources of financing (e.g. personal funds or public funds). Finally, the third one

regards strategic directions (e.g. towards product development or increase of turnover) and operational (e.g. regarding BM), market (e.g. market entry decisions) or entrepreneurial (e.g. environmental sustainability strategies) decisions. The second questionnaire comprises 12 items, developed in 2 sections. The first section includes personal data about founders: e.g. past experiences of the founder, academic qualification or skills level. The second section regards the Network Ability (NA) (measured by the 4 components by Shu et al. (2017)), network frequency (of interaction), network strength and network governance mechanisms. Starting from a group of 2914 companies, which represents Italian innovative start-ups included in Italian register and born between 2012 and 2017, 1397 have been contacted and, finally, 219 interviews have been conducted. A service provider company contacted these start-ups using a Computer-Assisted Telephone Interview (CATI) to collect the results, which later in the thesis will be analyzed through a statistical software called R (used through R Studio interface, an intuitive Integrated Development Environment (IDE) designed for R). As said before, the sample includes 219 start-ups, grouped according to ATECO (ISTAT, 2007) sector they belong (Table 2). Screening this sample, it is been recognized a new subsample of 179 companies; including those companies that perform "information service activities and other IT services" (30) and those that perform "software production, IT consulting and related activities" (149). Due to some missing values, regarding mainly networking, employees and turnover information; the sample is been further screened reducing the number of start-ups to 145.

Table 2 – ATECO sectors classification of sample

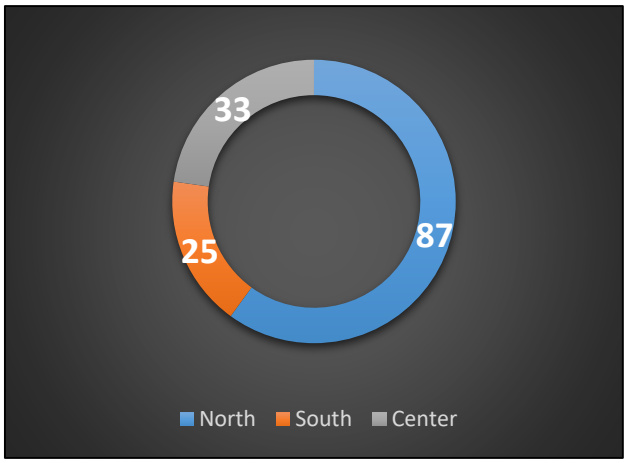
ATECO - Economic activity	N. of start-ups
Advertising and market research	1
Architectural and engineering activities; testing and technical analysis	1
Creative, artistic, and entertainment activities	3
Film production, video and television programs, music and sound recordings	4
Information service activities and other IT services	30
Other manufacturing industries	1
Other professional, scientific, and technical activities	11
Printing and reproduction of recorded media	3
Publishing activities	16
Software production, IT consulting, and related activities	149
Total	**219**

Source: ISTAT (2007)

4.3 The sample

The sample comprises 145 companies located all over the country. As confirmed in the paper about technological districts by Miceli (2010), northern side has a leading position in terms of firm concentration and technological specialization; in fact, the majority of innovative start-ups of the sample belong to the northern area, while only more than 20 belong to the southern area (Figure 12).

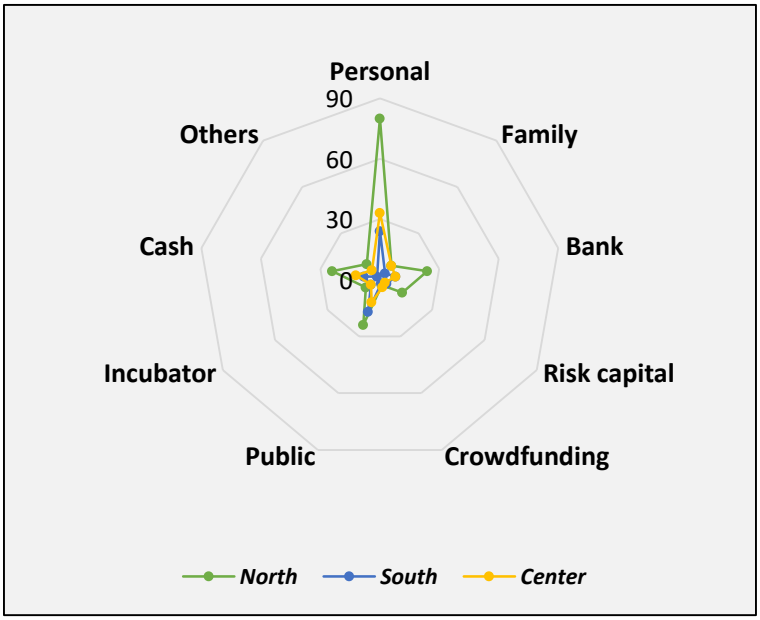
Figure 12 – Regional distribution



Source: own elaboration

For what concerns the access to finance, as showed in Figure 13, start-ups, depending on their geographical locations, are compared considering the kind of source of financing adopted.

Figure 13 – Overview of sources of financing



Source: own elaboration

Generally, all the start-ups prefer to get access to personal funds; this result is coherent with literature about access to finance in ICT start-ups (Corno et al., 2014). Observing Figure 13, all the values seem larger in the north: this confirms the classic north-south divide; on the other hand, the majority of the companies of the sample are located in northern area. Crowdfunding and incubator funding services are generally not adopted;

possible explanations could be obtained by analyzing literature. In the first case, crowdfunding campaigns conducted in Italy showed a lower performance than other countries like Germany (Rossi & Vismara, 2018); in the second case, incubators, science parks and crowdfunding represent a recent phenomenon in Italy (Corsi & Berardino, 2014), furthermore innovative start-ups tend to exploit more other incubator services like networking (Cooper et al., 2012). Finally, center and southern area do not show significant differences, except for public funding, which is slightly more common in the southern area, and for personal funding, which is stronger in the central area.

In the next table (Table 3), start-ups are screened by type and, for each type, some personal and strategic information are reported; the majority of the companies are independent (127), while the remaining ones are spin-off companies (18). If number of BM changes is stable among groups (slightly higher for academic spin-offs), other variables show different results.

Academic spin-offs show the lowest average turnover and the highest age; all these start-ups adopt a strategy aimed to increase turnover and only the 63% of this group is focused on product development; finally, they are more likely to innovate their BM to develop new collaborations than other kinds of start-ups.

Corporate spin-offs show the greatest average turnover and the younger age; they show an opposite strategic orientation compared to the previous group and less than 50% of these start-ups changed their BM to pursue a collaborative approach.

Independent companies have a higher turnover than the first group, but lower than corporate spin-offs, the age is in the middle of the three groups; finally, strategic orientation is focused more on product development than turnover, while the BM is rarely changed to match collaborative strategies.

Table 3 – A financial and strategic summary

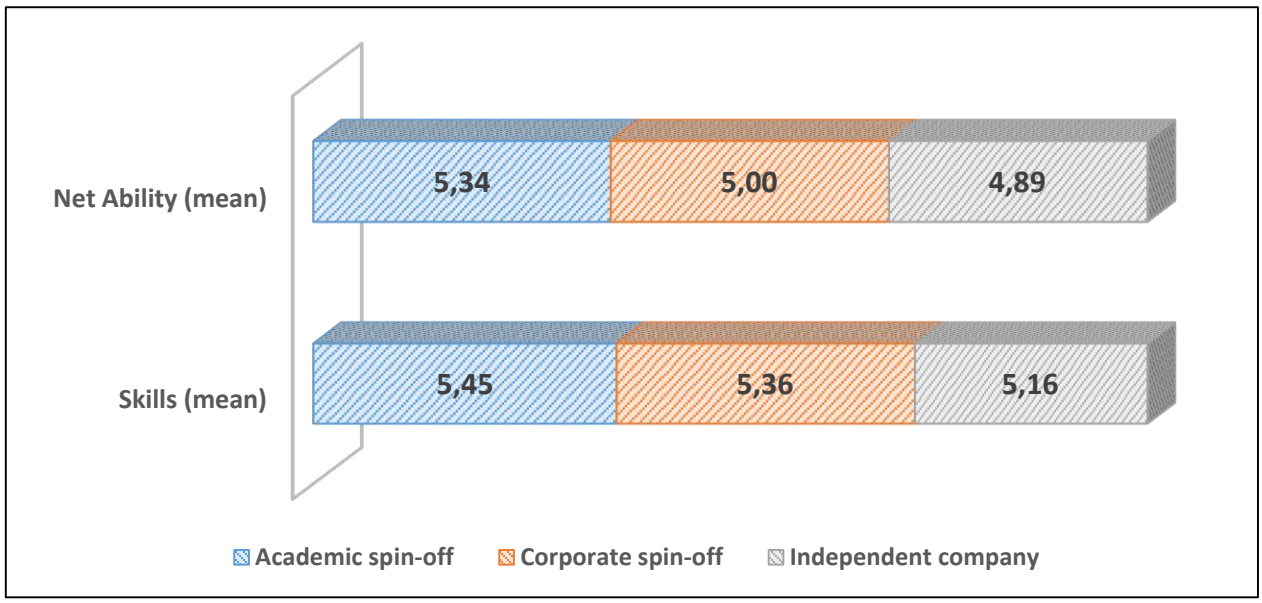
all values are expressed in mean	Turnover	Age	Stra_turn	Stra_prod_dev	N. BM change	BM_change_coll
Academic spin-off (8)	87500	3.50	1.00	0.63	1.625	0.50
Corporate spin-off (10)	394100	2.90	0.70	1.00	1.400	0.40
Independent company (127)	185545	3.45	0.80	0.91	1.291	0.31

Source: own elaboration

Finally, in Figure 14, it is considered networking and personal skills of the companies, divided in the 3 previous groups. In particular, "Network Ability" is equal to the mean of the four components (expressed on a Likert scale) introduced in the paper by Shu et al. (2017) (network orientation,

network building, network maintenance and network coordination). “Skills” represents the mean among 5 indicators (expressed on a Likert scale) that represent the specific competencies of the founder in 5 fields: ICT, management, market, technology and relations.

Figure 14 – Network Ability of start-ups



Source: own elaboration

Academic spin-offs have the highest degrees of competencies and the highest ability of set and nurture networking relationships; this confirms their importance in managing and generating knowledge, even though they have the lowest turnover (Table 3). Nevertheless, they experience some troubles in capturing the value generated from innovation process (Harrison & Leitch, 2010). Corporate spin-offs, even if they show a lower level of NA and Skills, they are able to reach a better financial performance (Table 3); the main reason under this lack is the nature of the knowledge that, in this case, is more commercial rather than theoretical (Wennberg et al., 2011).

4.4 The regression analysis

The hypotheses introduced before regard Business Model (BM), Network Ability (NA) and networking in general with many managerial and economic implications. To test the validity of those assumptions, we estimated 10 regression models.

4.4.1 Dependent variable(s)

Many articles regarding OI practices point out how these kinds of strategies affect positively financial performance (Chesbrough, 2003); these positive effects can be found applying collaborative strategies (Timmers, 1998; Eisingerich et al., 2010); setting networking relationship through exploitation of the NA (Sigmund et al., 2015); collaborating actively with incubators (Sedita & Apa, 2016). For all these reasons, the first dependent variable is turnover, in its logarithmic form due to scale issues, (**Ln_turn**); which is included in two regression tables.

It is interesting to understand how the degrees of collaborations are affected by networking management and control mechanisms (Snehota & Håkansson, 1995; Teegen & Doh, 2002). This allows a closer look to those mechanisms, regarding degrees of openness or governance issues; which often have implications that do not necessarily have economic or financial implications (Dahlander & Gann, 2010). For all these motives, the second dependent variable is the likelihood of collaboration with universities for market reasons, expressed on a Likert scale, (**Coll_uni_market**); in particular, this kind of collaboration represents a good benchmark of collaborative strategies in general thanks to the implications on networking features, skills and incubation services (Table 4).

4.4.2 Independent variables

Within the thesis, after an overview of OI theory and practices, focus moved first on BM creation and innovation; later focus moved on networking relationships and mechanisms. For these reasons, the following independent variables, grouped in 5 categories for sake of clarity, are added in the framework.

Business Model Innovation (BMI) and collaborations. To manage properly BM creation or change, company has to set the right relationships with other actors belonging to value chain; the entire production process and all the business activities rely on an active and complex network (Konsti-Laakso et al., 2012). In the regression model, we will try to demonstrate if a company that is starting a BM change aimed to an internationalization strategy will have a positive effect on performance through a collaboration with other companies (Gnyawali & Park, 2009; Kock et al., 2010). Start-

ups are used to enter global markets and sometimes it is the only way they can survive; furthermore, it is demonstrated that network building and collaborations boost efficacy of this global strategy (Cannone & Ughetto, 2014). Hence, 3 variables are added in the framework. **Bm_change_inter**, a dummy variable that is equal to 1 if the start-up undertook a BM change to enter a foreign market; **Coll_same_market**, the likelihood of collaborations with other start-ups for market knowledge exchange (variable expressed on a Likert scale); **Coll_same_market*Bm_change_inter**, an interaction variable among the 2 previous variables just introduced.

The role of collaborations. Collaborative strategies play an important role within the thesis: they could affect the financial performance (Eisingerich et al., 2010) and enhance the likelihood to adopt an approach which embraces openness (Dahlander & Gann, 2010). The focus is on collaboration breadth, i.e. which are the partners of the collaboration; in fact, the reasons under which a company collaborated with partners are not taken in consideration (all collaborations are carried on for market reasons). 5 variables are introduced. **Coll_same_market**, already introduced; **Coll_sup_market**, likelihood of collaboration with suppliers for market reasons (variable expressed on a Likert scale); **Coll_uni_market**[4], likelihood of collaboration with universities for market reasons (expressed on a Likert scale); **Coll_cli_market**, likelihood of collaboration with customers for market reasons (variable expressed on a Likert scale); **Coll_consul_market**, likelihood of collaboration with private consultants for market reasons (expressed on a Likert scale).

Network Ability. To measure the NA, the 4 variables stemming from the paper by Shu et al. (2017) are included in the regression: network orientation (**Net_orient**), network building (**Net_build**), network maintenance (**Net_maint**), network coordination (**Net_coord**). **Net_ability** is a variable that is the mean of these 4 components. All these variables are expressed on a Likert scale. Finally, it will be analyzed the interaction between network building and collaboration with customers for market reasons (**Coll_cli_market*Net_build**).

Impact of incubator on networking. To measure how incubation process affects the ability of the founder to set networking relationships (Lesáková, 2012) and impact of incubator on financial

[4] This variable is set as independent when, in the regression, Ln_turn is the dependent variable; while it is the dependent variable in the last regression table.

performance (Sedita et al., 2019); 2 variables are introduced. **Incubator**, a dummy variable that is equal to 1 if start-ups set a relationship with private or public incubator or 0 if it is not; **Incubator*Net_ability**, interaction term between the former variable and Network Ability (NA).

Autocratic vs trust-based relationships. Once companies established right partners and relationships, they should establish the right control mechanisms to manage network on a long-term horizon; ultimately, if it is better to adopt an autocratic or collaborative control mechanism (Hamilton & Biggart, 1988; Teegen & Doh, 2002). For this purpose, 3 variables are added in the regression framework. **Net_stren**, average strength of relationships with other founders, employees and external partners (expressed on a Likert scale); **Net_freq**, average frequency of interactions with other founders, employees and external partners (expressed on a Likert scale); **Net_gov**, a dummy variable which is equal to 1 if founders exercise their power on subordinates and to 0 if it is not.
In the Table 4, there is the correlation matrix, which includes all the 26 variables with means and standard deviations.

4.4.3 Control variables

Variables selection process provided as outcome 10 variables, included in all the regression tables that can be grouped, for a clearer understanding, in 3 categories.

Time, size and location. For what concerns dimensional factors, it is widely recognized a liability of smallness that deeply affects start-ups (Sigmund et al., 2015); hence numbers of founders (**N_found**) and number of employees (**Ln_empl**), the latter in its logarithmic form due to scale issues, are included in the regressions. For what concerns time factors, it is recognized a liability of newness that causes an early failure of the majority of start-ups; this is likely to affect the performance of those companies (Abatecola et al., 2012). Hence, the age of the company at 2018 (**Age**) and the stage of company in start-up life cycle (**Stage**) are included in the regressions. Finally, to measure the geographic impact, it is included a dummy variable that is equal to 1 if start-up is located in the north or 0 if it is not (**North**).

Personal skills and competencies. Personal skills or competencies that are owned by start-ups could be really relevant, due to their size and the importance of the founder in performance (Corno et al., 2014). Hence, it is introduced a variable (**Skills**), expressed on a Likert scale, that measures the average skill level of the founder on 5 fields: ICT, management, market, technology and relations. Moreover, it is added a dummy variable that is equal to 1 if the majority of the founders within the start-up are graduated, while to 0 if it is not (**Graduate**).

Strategy and Funding. Strategic implications can affect the performance and collaborative relationships (Osterwalder & Pigneur, 2010); furthermore, the fact that start-ups use certain sources of financing instead of others has a different impact on dependent variables (Corno et al., 2014). For all these considerations, 3 variables are included. **Stra_turn**, a dummy variable that is equal to 1 if start-ups adopt a strategy aimed to experience a fast growth in revenues. **Stra_prodev**, a dummy variable, which is equal to 1 if companies adopt a strategy aimed to product development. **Fund_personal**, a dummy variable that has a value equal to 1 if start-ups use personal funds to finance their business.

4.4.4 Results and implications

In Table 5, 6 and 7, it is possible to check results of regression models; beyond p-values for each coefficient, every regression model has some indexes to check the validity and accuracy of the model. In particular, Root Mean Squared Error (RMSE) is a good predictor of accuracy of the model (Hyndman & Koehler, 2006); Variance Inflation Factor is a proper index to check if there is an excessive multi-collinearity among variables (O'Brien, 2007); R squared and Adjusted R squared are a good measure of the overall fit of the regression model (Cameron & Windmeijer, 1997).

Table 4 – Correlation matrix

		Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	Age	3.41	1.04	1.00																									
2	N_found	2.87	1.24	-0.13	1.00																								
3	Stage	2.88	0.57	0.22**	0.02	1.00																							
4	Ln_turn	11.51	1.17	0.12	-0.06	0.15†	1.00																						
5	Coll_sup_market	3.27	2.14	-0.01	-0.09	-0.02	0.13	1.00																					
6	Coll_cli_market	4.86	1.96	-0.07	0.00	0.00	0.04	0.24**	1.00																				
7	Coll_same_market	3.67	2.06	-0.06	0.12	0.05	0.08	0.22**	0.17*	1.00																			
8	Coll_consul_marke	3.56	1.91	-0.11	0.07	-0.13	-0.04	0.06	0.17*	0.02	1.00																		
9	Coll_uni_market	3.17	2.20	-0.05	-0.05	-0.06	0.02	0.17*	0.31***	0.23**	0.24**	1.00																	
10	Incubator	0.37	0.49	0.02	0.12	0.01	-0.10	0.13	-0.07	0.06	0.09	0.24**	1.00																
11	Fund_personal	0.94	0.23	0.16†	-0.05	0.00	-0.02	0.06	0.00	-0.10	0.15†	-0.12	-0.13	1.00															
12	Stra_turn	0.80	0.40	0.05	-0.03	0.08	-0.04	0.04	0.19*	-0.02	0.06	-0.06	-0.08	0.11	1.00														
13	Stra_prodev	0.90	0.31	0.03	0.07	-0.15†	0.15†	0.03	0.10	0.14†	0.16†	-0.04	0.03	0.02	0.06	1.00													
14	Bm_change_inter	0.19	0.40	0.02	-0.03	0.04	0.03	0.03	0.17*	0.03	0.18†	0.11	0.06	-0.03	-0.06	0.11	1.00												
15	North	0.60	0.49	-0.01	-0.04	0.05	0.13	-0.10	-0.23**	-0.08	-0.19*	-0.08	-0.01	-0.14	0.05	-0.09	-0.06	1.00											
16	Graduate	0.80	0.40	-0.08	0.11	-0.01	-0.15†	0.03	0.06	-0.11	0.01	0.16*	0.14	0.03	-0.03	-0.06	0.03	-0.16†	1.00										
17	Skills	5.19	0.88	-0.02	-0.06	-0.02	0.11	0.13	0.12	0.04	0.24**	0.17*	-0.05	0.12	-0.02	0.10	0.14†	0.04	-0.17*	1.00									
18	Net_orient	4.54	0.90	-0.24**	0.16†	-0.27**	-0.05	0.19*	0.04	0.10	0.06	0.05	-0.04	0.11	-0.08	0.03	-0.14†	-0.05	0.02	0.17*	1.00								
19	Net_build	4.36	1.05	-0.22**	0.09	0.02	-0.19*	0.04	0.18*	0.14†	0.10	0.14†	0.09	0.14†	0.12	0.05	-0.07	-0.12	0.12	0.27**	0.31***	1.00							
20	Net_maint	5.30	1.01	-0.21**	0.06	0.23**	0.01	0.18*	0.09	0.04	0.13	0.07	0.01	-0.08	0.12	0.01	-0.01	-0.01	-0.05	0.21*	0.22**	0.40***	1.00						
21	Net_coord	5.48	0.91	-0.10	0.19*	0.15†	-0.07	0.06*	0.13	0.10	0.23**	0.13	0.02	0.06	0.15†	-0.05	0.01	-0.01	0.03	0.23**	0.09	0.43***	0.55***	1.00					
22	Net_ability	4.92	0.69	-0.27**	0.17*	0.06	-0.11	0.16	0.16†	0.13	0.18*	0.14†	0.03	0.08	0.11	0.02	-0.07	-0.07	0.04	0.31***	0.56***	0.77***	0.77***	0.72***	1.00				
23	Net_freq	5.30	1.31	-0.07	0.10	-0.04	0.13	0.12	0.14†	0.05	0.11	0.12	0.03	-0.11	0.01	0.11	0.07	-0.07	-0.08	0.17*	-0.04	0.10	0.06	0.14	0.09	1.00			
24	Net_stren	4.65	1.24	0.01	0.01	0.02	0.06	0.04	0.14	0.05	0.16†	0.18*	0.00	-0.02	-0.13	0.10	0.14†	-0.08	0.01	0.25**	-0.04	0.22**	0.11	0.20*	0.18*	0.60***	1.00		
25	Net_gov	0.64	0.48	-0.08	-0.08	0.07	-0.13	-0.12	0.00	-0.02	-0.03	-0.08	-0.02	0.07	0.06	-0.11	0.07	0.09	0.06	0.10	0.01	0.15†	-0.10	-0.12	-0.02	-0.10	-0.03	1.00	
26	Ln_empl	1.47	0.61	0.06	0.32***	0.14†	0.50***	-0.02	0.00	0.06	-0.08	0.04	0.12	-0.14	-0.09	0.03	0.04	0.12	-0.06	-0.04	-0.11	-0.06	0.01	0.07	-0.03	0.26**	0.13	-0.03	1.00

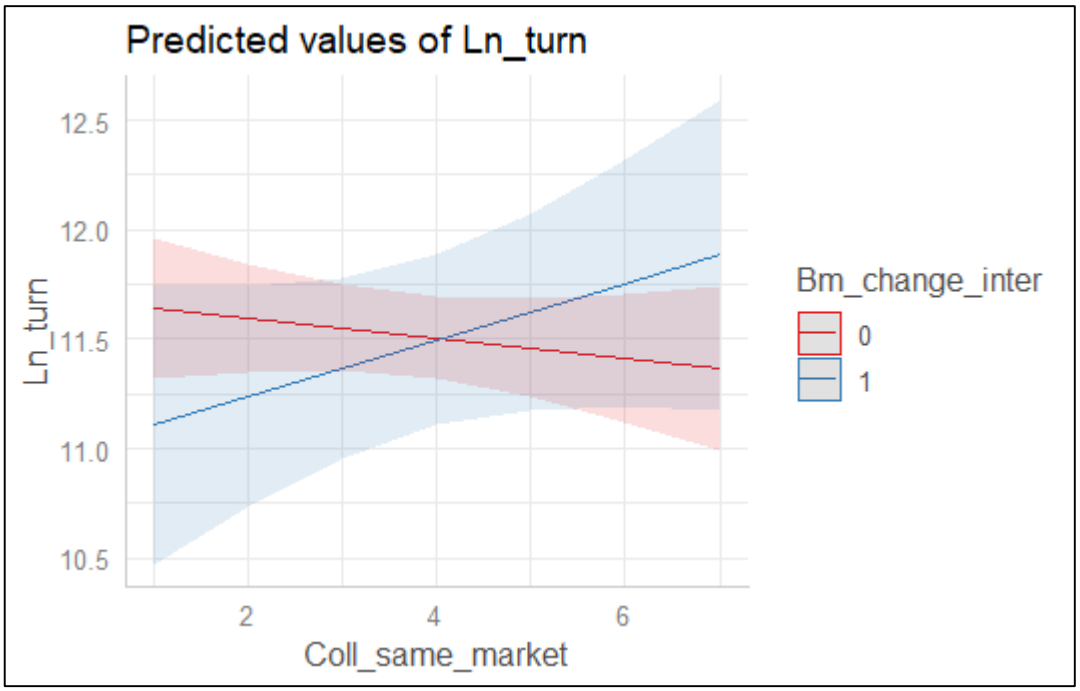
Source: own elaboration

Analyzing the Table 5, the Model 1 includes only the control variables: N_found has a negative impact on turnover, probably because of conflicts that can arise among founders, while conducting business; as predictable, an additional employee can increase turnover, because of the additional output unit produced. It is interesting to notice that, if Stra_prodev has a significant positive effect on financial performance, Stra_turn does not have any significant effect; this suggests that company should interpret turnover as a consequence of the strategy, instead of an aim.

The Model 2 tests Hypotheses 3a and 3b, in particular, if collaboration shows a positive impact on financial performance; this impact should be stronger in case of collaboration with customers and suppliers. Surprisingly, collaborations do not affect financial performance by themselves; hence, Hypotheses 3a and 3b are both rejected. Probably, these variables should interact with other components to show a financial impact (Sedita et al., 2019).

The Model 3 tests Hypothesis 1: start-ups that change their BM, to start an internationalization strategy, experience a positive effect on financial performance if they set collaborations with other start-ups. If BM change by itself shows a significant negative effect on turnover, the interaction between the latter variable and collaboration with other start-ups have a significant positive impact; hence, Hypothesis 1 is supported.

Figure 15 – Interaction plot of Coll_same_market*Bm_change_inter

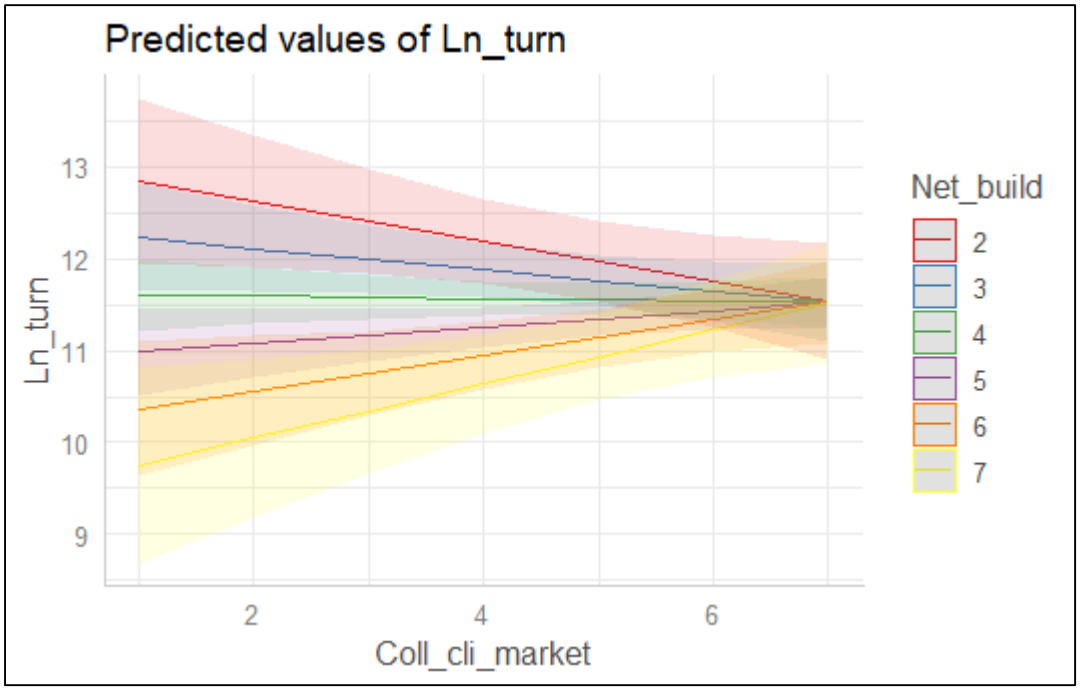


Source: own elaboration

Observing Figure 15, it is clear that a start-up which is changing its BM to enter a global market should take in consideration a collaboration with other start-ups.

The Model 4, following the directions of the paper by Sedita et al. (2019), tests an alternative solution to Hypotheses 3a and 3b. In particular, collaboration with customers is fruitful and affects performance of the company if it is matched by a nurture of network building; that is a sort of propeller of collaborative strategies (Lesáková, 2012).

Figure 16 – Interaction plot of Coll_cli_market*Net_build



Source: own elaboration

Low levels of network building can hinder exploitation of advantages stemming from collaborative strategies with customers; on the contrary, higher levels of network building can affect positively turnover, when collaboration with customer is deepened over time (Figure 16).

Table 5 – Results from the first regression on turnover

	Ln_turn			
	Model 1	Model 2	Model 3	Model 4
Constant	**8.725*** **	**8.575*** **	**8.760*** **	**11.204*** **
	(0.894)	(0.974)	(1.032)	(1.393)
Control variables				
Age	**0.031**	**0.037**	**0.056**	**-0.018**
	(0.091)	(0.100)	(0.096)	(0.098)
Stage	**0.186**	**0.180**	**0.162**	**0.184**
	(0.192)	(0.198)	(0.201)	(0.193)
N_found	**-0.213****	**-0.205****	**-0.206****	**-0.206****
	(0.074)	(0.076)	(0.076)	(0.069)
Ln_empl	**1.043*** **	**1.034*** **	**1.034*** **	**1.006*** **
	(0.160)	(0.168)	(0.167)	(0.167)
Graduate	**-0.173**	**-0.170**	**-0.210**	**-0.157**
	(0.208)	(0.224)	(0.232)	(0.215)
North	**0.129**	**0.168**	**0.158**	**0.125**
	(0.176)	(0.185)	(0.187)	(0.190)
Skills	**0.115**	**0.099**	**0.095**	**0.176**
	(0.108)	(0.120)	(0.120)	(0.119)
Fund_personal	**0.175**	**0.163**	**0.110**	**0.399**
	(0.472)	(0.497)	(0.495)	(0.421)
Stra_prodev	**0.624***	**0.598***	**0.579***	**0.657***
	(0.256)	(0.271)	(0.264)	(0.270)
Stra_turn	**-0.056**	**-0.085**	**-0.096**	**-0.003**
	(0.196)	(0.205)	(0.203)	(0.202)
Independent variables				
Coll_same_market		**0.012**	**-0.026**	**0.015**
		(0.051)	(0.063)	(0.048)
Coll_sup_market		**0.060**	**0.074**	**0.056**
		(0.049)	(0.051)	(0.047)
Coll_uni_market		**-0.013**	**-0.022**	**-0.003**
		(0.041)	(0.040)	(0.039)
Coll_cli_market		**0.014**	**0.021**	**-0.424***
		(0.057)	(0.057)	(0.202)
Coll_consul_market		**-0.004**	**0.011**	**-0.033**
		(0.050)	(0.047)	(0.046)
Interaction variables				
Bm_change_inter			**-0.737†**	
			(0.410)	
Coll_same_market*Bm_change_inter			**0.173†**	
			(0.090)	
Net_build				**-0.721****
				(0.255)
Net_build*Coll_cli_market				**0.103***
				(0.048)
RMSE	**0.940**	**0.930**	**0.919**	**0.887**
Average VIF	**1.106**	**1.198**	**1.659**	**4.678°**
R^2	**0.352**	**0.366**	**0.381**	**0.423**
Adjusted R^2	**0.304**	**0.292**	**0.298**	**0.346**

Robust standard errors in parentheses
°VIF tends to increase when an interaction term is included in the model

*Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '†' 0.1 ' ' 1*

Source: own elaboration

The table 6 represents results stemming from the second regression conducted on Ln_turn. The model 1 is the same model of the previous regression table, including only control variables; hence, results are identical.

Model 2 tests Hypothesis 5: if network orientation, building, maintenance and coordination have a positive financial impact within the company. If network orientation, network maintenance and network coordination do not have a significant impact on turnover level; network building is the only variable that affects financial performance, even though, this effect seems to be negative. Hence, Hypothesis 5 is rejected. These results rebut what is been demonstrated in the paper by Sigmund et al. (2015); nevertheless, Shu et al. (2017) demonstrated a positive impact of the 4 network components on "opportunity discovery" and not on financial performance. Probably, the benefits of the NA translate in financial benefits only in the long-term; in the short-term, efforts and costs employed to build networks prevail on the benefits stemming from them.

Model 3 tests Hypothesis 4a and Hypothesis 4b: if relationship with an incubator affects positively financial performance by itself and if this interaction has an effect mediated by entrepreneurial ability (Network Ability) of start-ups. Incubator variable has a strong and significant positive effect on turnover, thus confirming all the benefits expressed in academic literature (Masutha & Rogerson, 2015; Sedita et al., 2019). Thus, Hypothesis 4a is supported. Interaction between incubation process and entrepreneurial capability (Network Ability) has a significant impact on financial performance; hence, Hypothesis 4b is supported as well. Nevertheless, if NA is confirmed as a propeller of financial performance (Lesáková, 2012), the effect appears to be negative. Probably, in Italy, incubation services are not developed and well added in a proper policy framework (Corsi & Berardino, 2014); it is also true that start-ups are not completely ready to exploit completely offerings provided by incubators (Cooper et al., 2012). A possible conclusion can be deducted from Figure 17: start-ups with a low level of Network Ability (NA) (e.g. 3), when they enter an Incubator, reach a higher financial performance (Ln_turn is between 12 and 13) than start-ups with similar level of Network Ability (NA) that do not enter an Incubator (Ln_turn is between 11 and 12). Nevertheless, at higher levels of Network Ability (NA) (e.g. 6) trend reverses; hence, start-ups within an incubator experience a worse performance (Ln_turn is between 10 and 11) than those which do not enter an incubator (Ln_turn is between 11 and 12). Incubator can be considered as an important partner when start-ups are building their NA; nevertheless, these advantages are not exploited by start-ups with higher levels of this capability. In fact, Incubator are useful to those companies at their earliest stages of life (Bergek & Norrman, 2008).

Table 6 – Results from the second regression on turnover

	Ln_turn		
	Model 1	Model 2	Model 3
Constant	**8.725*** **	**8.534*** **	**7.850*** **
	(0.894)	(1.081)	(1.139)
Control variables			
Age	**0.031**	**0.004**	**0.011**
	(0.091)	(0.094)	(0.094)
Stage	**0.186**	**0.257**	**0.187**
	(0.192)	(0.210)	(0.183)
N_found	**-0.213** **	**-0.209** **	**-0.176***
	(0.074)	(0.076)	(0.074)
Ln_empl	**1.043*** **	**1.062*** **	**1.048*** **
	(0.160)	(0.161)	(0.154)
Graduate	**-0.173**	**-0.075**	**-0.112**
	(0.208)	(0.214)	(0.212)
North	**0.129**	**0.083**	**0.181**
	(0.176)	(0.182)	(0.175)
Skills	**0.115**	**0.178**	**0.190†**
	(0.108)	(0.112)	(0.098)
Fund_personal	**0.175**	**0.262**	**0.202**
	(0.472)	(0.456)	(0.446)
Stra_prodev	**0.624***	**0.631** **	**0.589***
	(0.256)	(0.232)	(0.022)
Stra_turn	**-0.056**	**0.056**	**-0.051**
	(0.196)	(0.196)	(0.194)
Independent variables			
Net_orient		**0.141**	
		(0.098)	
Net_build		**-0.232***	
		(0.095)	
Net_maint		**0.064**	
		(0.101)	
Net_coord		**-0.088**	
		(0.133)	
Interaction variables			
Net_ability			**0.098**
			(0.162)
Incubator			**3.033***
			(1.220)
Net_ability*Incubator			**-0.677** **
			(0.246)
RMSE	**0.940**	**0.908**	**0.896**
Average VIF	**1.106**	**1.309**	**9.521°**
R^2	**0.352**	**0.395**	**0.411**
Adjusted R^2	**0.304**	**0.329**	**0.353**

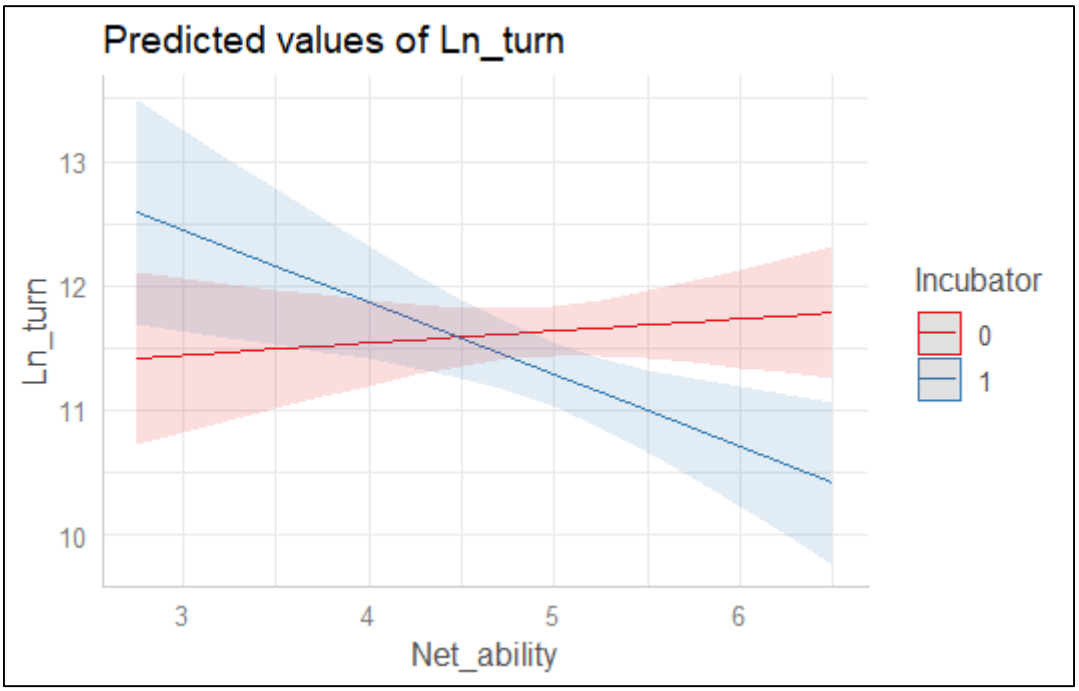
Robust standard errors in parentheses

°VIF tends to increase when an interaction term is included in the model

*Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '†' 0.1 ' ' 1*

Source: own elaboration

Figure 17 – Interaction plot of Net_ability*Incubator



Source: own elaboration

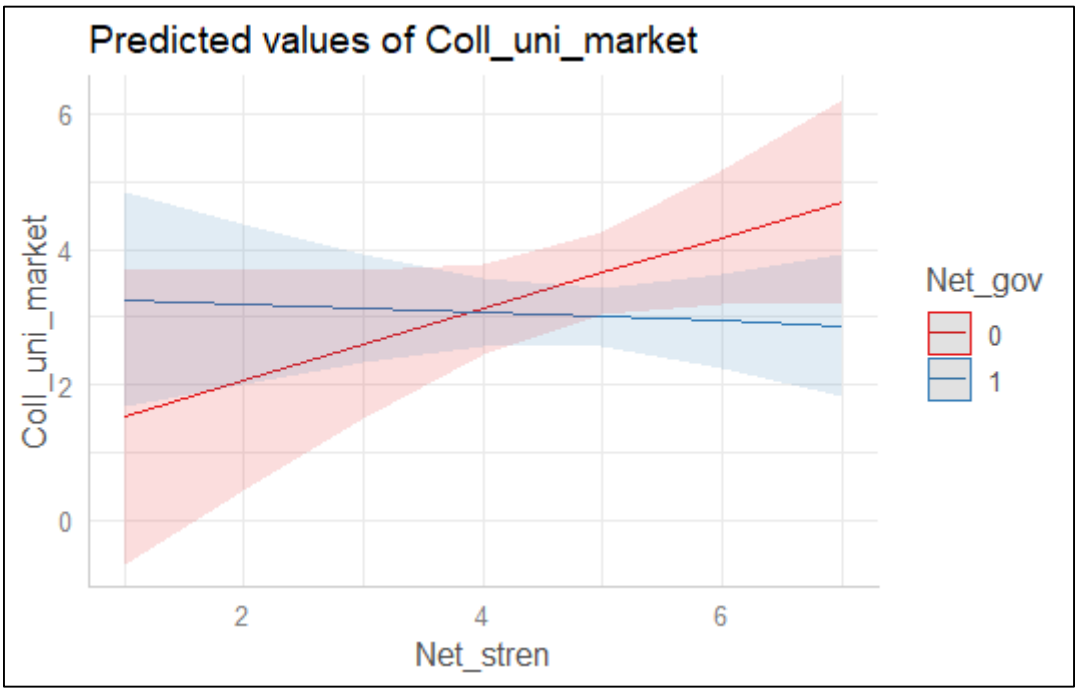
For what concerns Table 7, Model 1 includes only control variables which are the same used in the previous regression tables; even though, in this case results are different. In fact, founders that are graduated are more likely to collaborate with universities (Graduate); these founders were student in the past, hence they know which are the main services offered by university to support start-ups. Furthermore, skilled founders are more likely to collaborate with universities (Skills); they see this institution as a knowledge generator that can increase skills and competencies (Wennberg et al., 2011).

Model 2 tests Hypothesis 2, under which a company will adopt an open approach in managing its collaborations. Collaboration with clients, start-ups and private consultants show a positive effect on likelihood of collaboration with universities; start-ups will collaborate with different actors to offset limits and exploit complementarities among actors. For instance, collaboration with start-ups or customers could offset limits, in terms of commercialization and market skills, showed by universities (Wilson, 2012). Hence, Hypothesis 2 is supported.

Model 3 tests Hypothesis 6: start-ups that adopt trust-based and, at the same time, autocratic approach are able to enhance degrees of collaboration with their partners. Network frequency and network governance (autocratic governance system) do not affect dependent variable by

themselves; while network strength and interaction variable between the latter variable and network governance show a significant impact on dependent variable. In particular, network strength by itself has a significant positive effect on collaboration with universities; companies that deepen their relationships will likely build a strong relationship and share the risk with their partners, improving efficacy of collaboration itself (Barnir & Smith, 2002). The interaction variable has a negative impact on the dependent variable: start-ups that adopt an autocratic approach, while deepening their networking relationship, they will not improve degrees of collaboration with universities; on the contrary, start-ups that do not adopt an autocratic approach are able to increase degrees of collaboration, while relationships becomes stronger over time (Figure 18).

Figure 18 – Interaction plot of Net_stren*Net_gov



Source: own elaboration

It is demonstrated in many papers that, under an OI perspective, informal ties, often, work better than formal ones (Brunswicker & Ehrenmann, 2013; Liew et al., 2013; Rampersad et al., 2010); finally, trust-based relationships guarantee more free knowledge flows, less costs and transmission of tacit knowledge than more formalized relationships.

Table 7 – Results from regression on collaboration with universities

	Coll_uni_market		
	Model 1	Model 2	Model 3
Constant	**2.134**	**0.292**	**-0.038**
	(1.853)	(1.830)	(2.562)
Control variables			
Age	**-0.001**	**0.118**	**0.089**
	(0.184)	(0.183)	(0.181)
Stage	**-0.242**	**-0.256**	**-0.274**
	(0.321)	(0.321)	(0.326)
N_found	**-0.159**	**-0.203**	**-0.189**
	(0.173)	(0.169)	(0.181)
Ln_empl	**0.308**	**0.271**	**0.226**
	(0.323)	(0.310)	(0.345)
Graduate	**1.113***	**1.171****	**1.177****
	(0.483)	(0.422)	(0.436)
North	**-0.419**	**0.117**	**0.069**
	(0.386)	(0.361)	(0.373)
Skills	**0.564****	**0.329†**	**0.290**
	(0.209)	(0.182)	(0.187)
Fund_personal	**-1.498**	**-1.411**	**-1.366**
	(1.030)	(0.973)	(0.982)
Stra_prodev	**-0.415**	**-0.890**	**-1.048**
	(0.750)	(0.616)	(0.672)
Stra_turn	**-0.057**	**-0.398**	**-0.257**
	(0.506)	(0.475)	(0.458)
Independent variables			
Coll_cli_market		**0.257****	**0.246****
		(0.091)	(0.092)
Coll_same_market		**0.225***	**0.250****
		(0.089)	(0.095)
Coll_sup_market		**0.044**	**0.034**
		(0.086)	(0.089)
Coll_consul_market		**0.255***	**0.238†**
		(0.118)	(0.129)
Interaction variables			
Net_freq			**-0.260**
			(0.369)
Net_stren			**0.529†**
			(0.270)
Net_gov			**0.340**
			(2.334)
Net_freq*Net_gov			**0.371**
			(0.434)
Net_stren*Net_gov			**-0.591†**
			(0.356)
RMSE	**2.063**	**1.870**	**1.833**
Average VIF	**1.106**	**1.158**	**5.880°**
R^2	**0.111**	**0.270**	**0.298**
Adjusted R^2	**0.044**	**0.191**	**0.191**

Robust standard errors in parentheses
°VIF tends to increase when an interaction term is included in the model

*Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '†' 0.1 ' ' 1*

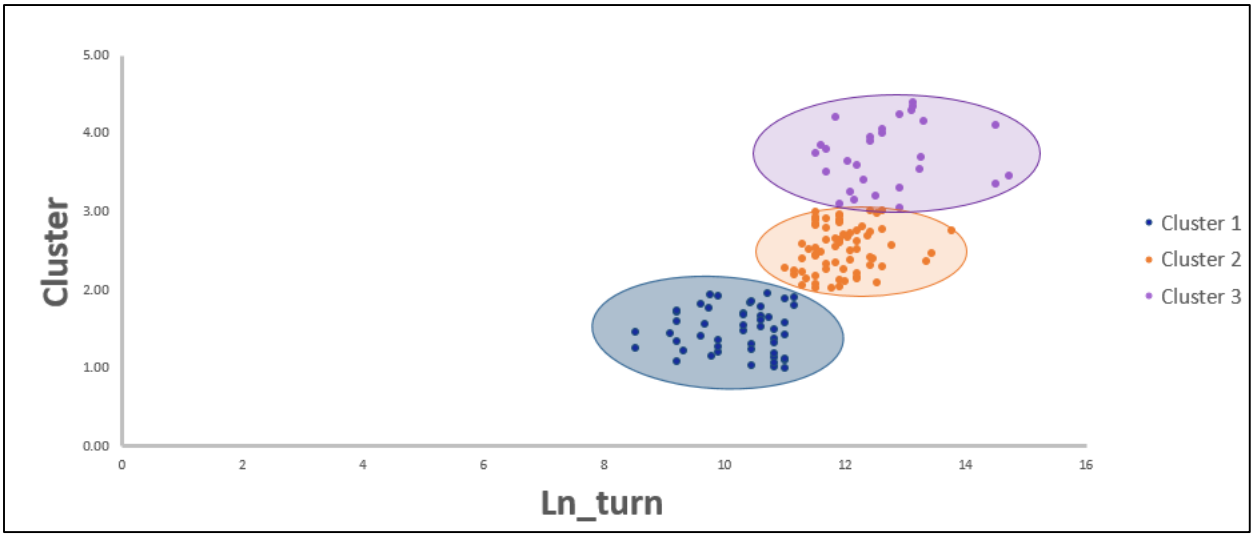
Source: own elaboration

4.5 Cluster analysis: identifying three types of innovative start-ups

The last step of the overall statistical analysis, introduced in the thesis, involves a hierarchical clustering analysis. The dendrogram stemming from this cluster analysis suggested 3 as optimal number to cut the cluster tree; cluster analysis is been performed considering 5 variables: Ln_turn, Incubator, Stra_turn, Stra_prodev and Net_ability.

The clustering algorithm that is been chosen is an alternative version of the classic Ward method: this method is aimed to minimizing the overall within-cluster variance; as the classic method, this variant shares the same aim but there is a difference. After that distances are computed, these are squared before being included as input of the clustering analysis (Murtagh & Legendre, 2014).

Figure 19 – Identification of clusters



Source: own elaboration

Figure 19 depicts all three clusters identified after the analysis; it can be noticed that Cluster 1 has the lowest level, Cluster 2 is in the middle, while Cluster 3 has the highest turnover level. Considering all the average values of the variables used in clustering approach, it is possible to depict a profile of three start-up archetypes: the Friendly Newcomers, the Potential Winners and the Far-sighted Star (Table 8).

Table 8 – The three start-up archetypes

			
	Friendly Newcomer	**Potential Winner**	**Far-sighted Star**
N. of start-ups	49	68	28
Ln_turn (mean)	10.220	11.958	12.688
Incubator (%)	38.78%	35.29%	39.29%
Stra_turn (%)	87.76%	79.41%	67.86%
Stra_prodev (%)	83.67%	89.71%	100.00%
Net_ability (mean)	5.015	5.191	4.098

Source: own elaboration

The Friendly Newcomer. 49 start-ups belong to this archetype, the key features of these start-ups are the lowest average turnover level and a consistently high level of average NA; they are defined by this name because they will likely exploit and set collaborative relationships with other partners (Friendly) and, at the same time, they did not experience a turnover growth (Newcomers).

The Potential Winner. 68 start-ups belong to this group, if these companies show all the prerequisites needed to be a top-performer (e.g. highest level of average NA and almost 90% of start-ups with a strategic orientation towards product development); they are overtaken by the third cluster, in terms of average turnover. They represent a sort of question mark: they own a potential that is not "unlocked" to reach a better financial performance.

The Far-sighted Star. Only 28 start-ups belong to this cluster, these start-ups show the best level of average turnover and the lowest level of average NA; 100% of the start-ups belonging to this group adopts a strategy aimed to product development and only 68% of these start-ups is focused on turnover increase. They are far-sighted because of their prevailing strategic orientation that

considers turnover as a consequence and not a direct strategic purpose; furthermore, they are star because of their astonishing financial performance.

It is clear that a strategic orientation towards product development is a winning and wise strategy (highest percent level in Far-sighted Stars, while lowest percent level in Friendly Newcomers); while strategy aimed to an increase in turnover is a weak and incomplete strategy (lowest percent level in Far-sighted Stars, while highest percent level in Friendly Newcomers). Finally, the overall low percentage of start-ups that entered an incubator could be a signal of the weak development of these kinds of services within Italian context (Corsi & Berardino, 2014).

CONCLUSIONS

The entire work gave important contributions to the OI literature and the business literature in general; these contributions can be found throughout all the chapters.

First, if the OI topic is been stressed and explained in a detailed way throughout all the chapters, many examples of open innovators (like BlaBlaCar or P&G) contributed to assess the operational feasibility and the empirical validity of the OI. The differences among these companies show how OI paradigm it is applied in many different firms, unless the diverse size or business strategy. Many authors recognized the importance of the OI; the point is that only some of them provided examples of a concrete application of the concept.

Secondly, the redesigned BM represents an innovative tool: even though this tool is anchored to the existing literature, it is able to introduce a brand new perspective with new theoretical implications. The contributions regard the way well-known theories are put together within this framework. Resource-Based View (RBV) and activity system perspective make us understand how companies have to understand which are the core resources that justify their competitive advantages and, in addition, which are their main activities and how they should linked among each other to generate synergies. Customerization perspective gives to the customer a leading role in deciding the success of certain start-ups: the empowerment of them represents an interesting opportunity for innovative start-ups, only if this process is managed through setting the right value proposition delivered through the right channels to stimulate a long-term brand advocacy. The latter is very important in ICT industry: social media are deeply affected by the advocates, people that talk positively about a brand in a spontaneous way.

All these mechanisms have to be translated into revenues: to choose certain revenue models, instead of others, can leverage or "destroy" the potential profitability stemming from the tools previously introduced. For instance, start-ups that develop and sell apps should seriously consider the freemium revenue model: in this way, they are able to meet two different segments of customers; the ones that want to exploit the app for free and the ones that want to exploit more advanced functions in exchange of a certain fee.

Cost management is not only a matter of operational efficiency, but also a matter of innovation: the question is how to provide more utility with a lower cost. Chinese companies that exploited

cost innovation taught a valuable lesson to western companies; this strategy does not depend only on geographical advantages, companies located outside Asian countries can apply this strategy. Finally, all those building blocks are embedded in a networking perspective in which all the partners embody an important role in the overall value creation process.

Finally, the Network Ability (NA) is a new concept that does not have a consolidated literature; this thesis gave more theoretical and empirical recognition to this innovative concept, showing all the potential benefits stemming from it and the financial implications, the latter often neglected in business papers. For instance, in the paper by Shu et al. (2017), it is demonstrated how NA has an important role in discovering hidden opportunities in the market; nevertheless, nothing is affirmed about the financial performance. Moreover, the addition of the personal skills of the founder in the regression framework ensures a consideration of the individual attitude in entrepreneurship.

Furthermore, there are contributions that regard managerial implications and suggestions addressed to start-ups and their founders.

First, a good explanation of the BM guarantees that founders, in designing business strategy, take in consideration the importance of this tool and the consequences that it has in shaping the firm performance. In addition, the thesis deals with Business Model Innovation (BMI): companies have to change their BM over time to cope with the external environment; this can work only if it is adopted a flexible approach and it is nurtured the relationships with the other partners belonging to the company network. In fact, BMI allows to overcome all those internal challenges, like organizational inertia and internal employee resistance, and external challenges belonging to the external environment.

Secondly, we stress the importance of governance mechanisms in co-creation process; many authors stressed the concept itself and provided some examples, but few of them dealt with governance systems. In the thesis, it is introduced the concept of free leakage of information that should be switched with the selective reveal: an excessive free leakage of information can harm a full exploitation of the benefits stemming from the leakage itself; provision of tool kits and the presence of internal employees can ensure a proper management and control of the entire co-creation process.

Thirdly, after an analysis of the effects of networking on financial performance and a description of the role of incubators in this context, we dealt with the governance systems that should be adopted to manage relationships in the long-term. In particular, the classic difference between an autocratic approach and a trust-based approach is discussed and overcome: both approaches can co-exist and offset their respective limits. Informal relationships can encourage more trust between parties and hopefully drive to more stable and strong ties; autocratic relationship can encourage a diverse distribution of power among parties and a more stable governance system with formalized rules.

Fourthly, all the statistical analyses conducted in this work encouraged a clear vision of the NA: through results stemming from regression framework and cluster analysis, start-ups are able to understand how NA works and which are the main drivers of profitability and success in matter of innovation. Ultimately, choosing the proper mix between NA and these drivers represents the key to build a winning business strategy. In fact, NA is conceived as a propeller that, even though by itself does not show positive effects on financial performance, can provide several advantages when combined with other factors. For instance, in our regression framework, an interaction of NA with incubation process showed a significant effect on financial performance; the same effect cannot be found in NA by itself.

If this thesis gave some contributions on several levels to recent literature about OI and NA, there some limitations and aspects that are not been stressed here; these latter features can represent the starting point of further research by other authors.

First, the importance of knowledge was stressed within all the chapters; nevertheless, in regression models and in clustering analysis it has been treated only marginally. Future research could focus on knowledge flows to consider other mechanisms that affect business relationships and innovative performance, e.g. absorptive capacity. For instance, other authors can check if absorptive capacity has an impact on NA and on financial performance; a statistical regression, including these factors, can be conducted to test empirically these phenomena. To measure this capacity authors could use R&D investment ratio and indicators about knowledge flows.

Secondly, the research conducted in this thesis maintained a strict focus on Italy, affected by cultural phenomena and demographic features; future research agenda could include the analysis of other national contexts to check if all the variables behave in a different way. In fact, many countries are deeply affected by cultural factors: this justifies why two countries could experience opposite outcomes when certain policies are decided, even though these policies are almost identical. It is also true that within the paper we considered cultural factors only marginally: institutional features and policies depend on several aspects that go beyond the topic of the thesis and the nature of our collected and sampled data.

Thirdly, only Business Model Innovation (BMI) has been analyzed in regression models; other authors could focus on how BM per se affects financial performance and the effectiveness of collaborations. In addition, the contribution of the redesigned BM in existing literature is only theoretical and its empirical validity is not been demonstrated; future research agenda can involve a statistical analysis to test the concrete efficacy of the framework.
Moreover, the focus was on start-ups that changed their BM to enter international markets; additional studies should be conducted on other reasons that can drive BMI, like for instance collaborative relationships or financial growth.

Fourthly, it has been investigated the role of start-ups in ICT industries, it should be interesting to check if these principles work also in low-tech industries and within large companies. In fact, Network Ability is crucial for start-ups, especially at their earliest stages, but this does not mean that this ability can be easily replicated in a larger context and in industries in which innovation has not a leading role to generate competitive advantage. In low-tech industry, OI could have only a marginal effect and the disadvantages stemming from the introduction of these practices can prevail on the advantages. Furthermore, we expect that the importance of the personal skills owned by the founder decreases in larger companies: in this case, managers are accountable for conducting the business, while entrepreneurs are more focused on financial care. In addition, the type of company could represent an interesting discriminating factor: for instance, in our sample there are some spin-offs, even though they represent a low portion of the entire group of start-ups; this is also the reason why this little subgroup is not considered separately in the regression framework.

Furthermore, in performing clustering analysis, only few variables were used to apply grouping methods; it could be interesting to take in consideration other variables that, in turn, can provide new clusters and new implications.

Finally, it is useful to express some considerations about our main character of this thesis, the start-ups. Characterized by liability of smallness and liability of newness, they cope with many challenges that show up at their earliest stages already; here, the founder has a crucial role as catalyst of knowledge and in business decision process. For these reasons, recognizing their importance in the new paradigm of OI and in ICT industry, it is important to point out how to choose other types of company can substantially change the final results stemming from the thesis. For instance, as said before, larger companies show a different impact for certain choices and have to face some constraints and problems that are not necessarily faced by start-ups. It is not only a matter of size, in fact also the age and the type of company has a significant weight on the final results we reached in this work. Ultimately, we have to remember that we deal with innovative start-ups that serve the ICT market; other industries will likely imply another outcome.

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