The Cooperation between Universities and Companies – A case study from Portuguese Universities

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Acknowledgements

Life is a complex journey. There are challenges, obstacles, opportunities, and people. Some of the people that cross this path leave, but others stay, remain, and support.

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Abstract

The present research aims to study the Cooperation between Companies and Universities in Portugal, focusing on understanding its importance and the use of methods that can develop or change it.

In this sense, 41 interviews were conducted to Companies and 9 interviews to Institutional Entities, which the analysis of their content made it possible to identify the dimensions that need to be study. This analysis was complemented with arguments used by the participants to justify and exemplify some reasons given regarding each dimension identified. Subsequently, it was made an analysis of the results of the interviews, which has enabled to identify the factors that are influencing the Cooperation between Universities and Companies. Hence, gathering all the factors, it was possible to conclude that there are eight determinant factors, positive or negative, of the relationship between both entities.

Finally, after showing the importance of the Cooperation for each entity and for the society and revealing what factors are influencing it, some of the entities participating in the study have made a suggestion for improving the Cooperation.

Keywords: Cooperation; Companies; Universities; Knowledge; Innovation
Resumo

A presente investigação tem como objetivo estudar a Cooperação entre as Empresas e as Universidades em Portugal, focando-se na compreensão da sua importância e nos métodos que podem ser usados para a melhorar ou mudar.

Neste sentido, foram feitas 41 entrevistas a Empresas e 9 entrevistas a Entidades Institucionais, onde a análise dos seus conteúdos tornou possível a identificação das dimensões que precisavam de ser estudadas. Esta análise foi complementada com argumentos usados pelos participantes para justificar e exemplificar algumas das razões dadas relativamente a cada dimensão reconhecida. Posteriormente, foi feita uma análise aos resultados das entrevistas o que possibilitou a identificação dos fatores que estão a influenciar a Cooperação entre as Universidades e Empresas. Assim, juntando todos os fatores, foi possível chegar à conclusão que existem oito fatores, positivos ou negativos, determinantes na relação entre as duas entidades.

Por fim, depois de mostrar a importância da Cooperação para cada entidade e para a sociedade e revelar quais os fatores que a estão a influenciar, algumas das entidades participantes do estudo deram uma sugestão para melhorar a Cooperação.

**Palavras-chave:** Cooperação; Empresas; Universidades; Conhecimento; Inovação
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1. Introduction

The study and analysis presented in this thesis will look further investigate the Cooperation between Universities and Companies in Portugal. The main objective is to understand the main advantages and difficulties that, at this moment, exist in the country. The investigation will be done through deep and semi-structured interviews performed with different types of companies in Portugal, with distinct dimensions, sectors, and localizations and, also done to different Portuguese Universities and Technology Transfer Offices.

Atalay, Anafarta, and Sarvan (2013) stated in their study that the relationship between Universities and Companies is one of the main procedures to provide innovation and economic development to a society. By innovating, a competitive advantage is created and so the link that these two entities establish is important for the growth of a nation. Portugal is not strange to this Cooperation, and although some efforts are being already done to increase it, some aspects still need to be improved and others need to be changed. Knowledge is the base for evolution and development, and this can be reached by investing in Science, Technology, Innovation, and nowadays, in Artificial Intelligence. A country that wants to pursue this path to become more competitive than others, needs to have Companies with a mindset to innovate and to grow. University is the main source of knowledge (Breznitz, 2014), having the most required and specialized students and teachers with different skills ready to help Companies to develop themselves and to innovate. On the other hand, times are changing, and Universities need to adapt because students of today have a different academic and professional mindset from their counterparts of years ago, and also Companies of today search for specific skills and knowledge different from the ones taught years ago.

This Cooperation between these two entities is not just crucial for the development of the two entities, but also for the economic growth of Portugal. The graphic presented below, from EUROSTAT shows that the average amount of investment in R&D in the EU countries is higher than the values observed in Portugal.
According to a study made by Forum showed that Portugal is in the position 14 out of 27 in terms of Competitiveness of EU countries, demonstrating that Portugal needs to improve its Innovation, Enterprise environment, Education and training, and its Labor market and employment.

Portugal is a country that has all the assets and resources to improve and to grow, but for that to happen, it needs to have stronger and more numerous collaborations between Universities and Companies.

Lastly, as usual in this type of investigation, the study is divided into five parts. First, it is presented the literature review, which explores the required concepts to understand the topic that is being studied. After that, it is discussed the objective of this investigation, where it
will be displayed the research question. Then, the methodology used to study this topic will be explained with the help of some literature. It will be made an analysis of the participants of the interviews and, also of their content to identify and qualify various types of collaborations between the two entities that can exist. It will be as well explained and categorized the different arguments that each participant made. Finally, the conclusions of the study will be presented at the end.

This investigation aims, mainly, to get to know, in deep, the relationship between Universities and Companies in Portugal, to understand the advantages and types of it, the main challenges, but more importantly, to understand the reason why is not working or why it is not incremented.
2. Literature Review

This present chapter will present some theoretical thoughts that will support the research question. Thus, it starts by defining five key concepts and the relationship that exists between them: Knowledge, Science, Technology, Innovation, and Artificial Intelligence. The meaning of these concepts and the connections that they create among them is a crucial part of understanding the importance of the Cooperation between Companies and Universities. After explaining them, it will be shown a view of the influence of these concepts in society, by demonstrating that through them Companies can grow and develop and consequently society does too. In this sense, to put in practice the connection that exists between them in a Company business, there is a need to obtain knowledge and innovation, that most of it come from the Universities. So, it was found that one of the knowledge sources is born in Universities.

After the explanation of the key concepts and their influence on the development of the society and then showing where knowledge is being created, it is presented how the transfer of knowledge from Universities to Companies can happen and therefore the benefits that can bring with it. At the same time, it is also studied how Companies can transfer knowledge to Universities and the influence and positive consequences that have on Academia. Alongside with these thoughts, it is exposed to different types of collaboration that these two entities can have, giving a special reference to R&D projects, showing their importance for the two parties.

Finally, it ends by showing also some constrains of the Cooperation that Companies and Universities can have. The aim of this chapter is to demonstrate the importance that this relationship has on Companies and Universities growth and also on the society development, by giving some examples of types of Cooperation that can have, but at the same time warning about the constrains that sometimes can happen.

2.1. Some key concepts

Knowledge is defined by Hansen, Mork, and Welo (2017, p. 3) as a “justified true belief”, where its formation depends on each person’s thoughts and visions of the world. Hitting at the term, knowledge is a combination of information that was acquired from the process of learning during some casual activity (Oseledchik, Inozemtsev, Ivleva, & Ivlev, 2016), that, in
turn, has a direct impact in human lives, guiding them in every decision and experience (Yi & Choi, 2011).

Furthermore, scientific knowledge is one of the types of the concept mentioned above that has as the main purpose to develop the society and, also, to help it to comprehend what is surrounding it (Yi & Choi, 2011). However, it is not constant and it can change, as regardless the inclusion of theories and the so-called facts, it is not an absolute truth (Lederman, 2013). As described by Lederman (2013) science is linked to knowledge and appears from the most simple form, as it “lives on open questions – surprises” (Becker, 2010, p. 135). Thus, Science is also linked to technology, as the first one is the base of knowledge and the second one is the repercussion of that knowledge to the physical demonstrations, this means that even though technology is conducted by science, it can be said that the inverse can also happen (Becker, 2010). Hence, technology appears in another form of knowledge, a more practical one that, throughout the past years, has conducted to the progress and development of the economy and the world (Vernardakis, 2016). This same idea is also defended by Becker (2010, p. 136), that describes technology as “one of the most important drivers in today’s economy”. This means that today businesses are completely influenced by the evolution of technology (Andriole, 2005), because this business transformation that requires the right time, the right costs and the right technology has become something that everyone wants (Andriole, Cox, & Khin, 2017). So, as science and technology are two interconnected concepts, it is possible to analyse that not only technology has effects on the industry, but also science (Vernardakis, 2016).

In fact, for Becker (2010, p. 138) “Science and technology are highly interacting, and thus, leading to innovation”, which means that knowledge is also the rout of innovation (Chesbrough, Vanhaverbeke, & West, 2006). As a result, Becker (2010) describes this concept in two approaches: that innovation can be the development of something new and innovative or it can be picking something that already exists and improve it. This same idea is also defended by Kahn (2018) that noted that innovation can be seen not only in results or methods, but it can be observed in people’s way of thinking. It can be identified various types of innovation, like incremental innovation and disruptive innovation (Norman & Verganti, 2014). The first one regards the developments that can be done in a solution, like slight changes in a pre-existing idea, and the second one refers to innovations that are created from the roots, for instance something that was never done before and so the biggest difference.
between these two types of innovation lives in whether the innovation is just a modification of something that was already created or whether the innovation is completely something new (Norman & Verganti, 2014). Therefore, one of the most important and innovative technologies created is the artificial intelligence, that not only has direct repercussions on products or processes but has a specific contribution on the form that people observe, recognize and solve different types of problems (Brynjolfsson & McAfee, 2017). Notwithstanding artificial intelligence is not a very clear concept, it can be defined as a group of methods that have the main goal of being similar to some human actions, through the use of machines (Calo, 2017). Nowadays, the progress of artificial intelligence is known as machine learning (Calo, 2017), which is, for now, a set of competencies that a machine possesses to develop some task and increasing its efficiency without the human’s presence (Brynjolfsson & McAfee, 2017). On the whole, a more direct definition of artificial intelligence was given by Dobrev (2012, p. 2), which stated that it “will be such a program which in an arbitrary world will cope not worse than a human”.

2.2. The impact in the Society

The process of learning science can be through two methods: learning and hearing from a teacher or developing the human thinking that is used through scientific activities or processes (Sumirat, 2017). The second form means that, when facing something that raises a doubt, the student should pursue an answer or resolution, and this method improves the human’s scientific thinking skill (Thitima & Sumalee, 2012). In this turn, education is pursuing the objective of developing this skill to help modern society to grow (Das, 2014) because it will increase the awareness of the capability of finding the right directions and the right success (Vernardakis, 2016). So, Vernardakis (2016, p. 29) resume that in one sentence “rapidly evolving technological fields are based on powerful applied sciences which are, in turn, based on powerful basic sciences”.

Additionally, technology, as it was said before, is seen as the outcome of knowledge combinations (Becker, 2010). Andriole et al. (2017, p. 5) stated that technology is now recognised as a “digital weapon”, as Companies have in mind that while having it, that competitors will grow, and consequently so will their business. Thus, Companies are increasingly introducing technologies in their businesses without previous analysis of what it takes to adopt it, even if they do not know what consequences it might bring. As a result,
embracing this digital transformation has become a challenge for enterprises as searching and discovering new technologies turn out of being a need for them. In this sense, the rise of technologies in Companies starts when they try to develop an idea that came out from a costumer’s need (Bergeron & Blander, 2002), which means that because of the organisational Company’s system, technology needs to promptly expand (Becker, 2010). Therefore, Andriole (2008, p. 65) argues that technology is moving forward in two paths: as a “commodity” or as a “strategic driver of competitive advantage”.

Furthermore, nowadays, the competitive advantage of products is observed for their level of innovation and not anymore for their price (Vernardakis, 2016), which means that it became a driver for Companies and, as a result, it has changed their culture (Wang & Wang, 2012). So, more innovative firms, achieve more success and profit, as they respond to costumers’ needs in a more efficient and swift manner, bringing and using new technologies to their work environment (Wang & Wang, 2012). This same idea is also defended by Andriole (2014, p. 31) that stated that innovation is now a crucial capability for any organization, “essential to survival” and because of that Companies manage their business to achieve emerging technologies that they consider that will be beneficial for them and the ones that they want to implement. Consequently, to gain competitive advantage, innovation has to be implemented as fast as possible to increase the efficiency of Companies’ tasks to be one step forward of their competitors (Wang & Wang, 2012), which turns this concept as a strategic movement (Becker, 2010) that tries to answer the society’s needs and the competition challenges (Tödtling, Asheim, & Boschma, 2013).

Moreover, regarding artificial intelligence, a study made by Davenport and Ronanki (2018) has demonstrated that this technology can benefit Companies’ business by supporting in automatization, in data analytics and in the relationship between their workers and clients, which will change the way of working. Despite this argument, it is witnessed a wave of criticism and negativism towards this subject as it is seen as a highly superior technology regarding human intelligence. On one side, this trait can represent a threat to society (Calo, 2017), on another, Acemoglu and Restrepo (2018) exposed that throughout the past, the automatization of processes on work had positive repercussions on labour, more exactly, the demand and the wage has increased. This happens because of three aspects: the first one is regarding the productivity as although it decreases the cost of doing some automated tasks, the ones that are not automated will need workers to do it; the second one is due to the
excess of capital in production that automation raises and, thus, it will require a demand on labour force; and the last one, as automation replaces tasks that were already replaced by capital, it raises an additional shift and so the demand of labour increases. This means that artificial intelligence will not replace completely a specific job or function, but will help to execute it quicker and more efficiently, for instance two parts of the function will be done by the machine (Brynjolfsson & McAfee, 2017). Hence, it will allow that more tasks can be done by machines and, consequently, will increase its performance and efficiency (Acemoglu & Restrepo, 2018). Companies need to implement this technology and above all, they must want it to have, because as Brynjolfsson and McAfee (2017, p. 20) revealed: “Over the next decade, AI won’t replace managers, but managers who use AI will replace those who don’t”.

2.3. The transfer of Knowledge from Universities to Companies

Knowledge is seen as a driver of competitiveness on Companies’ business (Hadad, 2017), as it is a skill that allows firms to understand all kind of movements, experiences and its changes of work’s ecosystem (Vernardakis, 2016). Thus, firms not only find and use knowledge, as also they create it to develop themselves to a more innovative business (Bereiter & Scardamalia, 2014), and this knowledge can have different routes and be absorbed by many activities, like searching and sourcing, which only depends on the Companies’ skills (Tödtling et al., 2013). Hitting at the term, Hadad (2017) describes today’s economy as a “Knowledge Economy (KE)”, that represents a new concept of Companies that guide their business through reliable knowledge and require for it developing competencies. In this type of economy, knowledge is used as the source of its growth and competitiveness, boosting innovation, that, consequently, turn into its driver. Therefore, human capital became the main concern, as only with educated and developed workers it is possible to progress, which in this economy they are characterized as “highly-skilled workers”. Human capital and technology are both the result of stored knowledge, and this know-how refers to the abilities of a person, that can be trained and developed and can be kept in the firm (Vernardakis, 2016). This has become an important issue as knowledge is a capacity that is always changing throughout time, specially nowadays, and because of that Companies need to keep themselves updated by learning and creating new knowledge (Hansen et al., 2017). This procedure is reached through different types of organizations that share their knowledge (Breznitz, 2014), which makes Companies consider that picking up knowledge from outside of them will restore the one that they already have and this will lead to innovation (Díaz-
Díaz & de Saá Pérez, 2014). A method that allows this transfer of knowledge is the creation of alliances between the Company and other institutions, like the University, to not just acquire it, but also to assimilate it and produce a new one (Díaz-Díaz & de Saá Pérez, 2014).

Subsequently, Breznitz (2014) showed, based on some studies, that knowledge is seen as a crucial factor for economic progress and that is promoted by its transfer through organizations. One of the reasons that this happens is because it is an easy and quick way to pick up knowledge outside of the Company without having to waste resources of creating it internally (Chesbrough et al., 2006). In this sense, one of the types of collaboration to transferring knowledge and technology is between Companies and Universities that allow the interface of the educational system with the industrial one (Ankrah & Al-Tabbaa, 2015), which will help industry and economy to grow (Breznitz, 2014). This collaboration is the most common knowledge base (Tödtling et al., 2013) that requires a trade between the two interfaces of tangible and intangible knowledge to not just transfer it, but also to create it (Ankrah & Al-Tabbaa, 2015). Thus, this collaboration involves all the professionals from both sides that together, and always protecting their knowledge, will work to reach production and innovation (Hadad, 2017). At this term, although one of the main objective of the Companies is the quest for profit, there are several reasons why they want this collaboration with the University, because it is a form for them of getting knowledge of the technological and scientific advancements and of getting the help of skilled students to find solutions and to develop their business (Hewitt-Dundas, 2011). Besides that, Companies also pursue Universities because of the possibility to commercialize technologies and also because of the opportunity to participate in research collaborations with different Universities and firms (Ankrah & Al-Tabbaa, 2015). As a result, Hansen et al. (2017) stated that this relationship lets Companies use it as a means to not just get new knowledge but also to increase their performance.

The Cooperation between Companies and Universities is mainly due to the transfer of knowledge between them that leads to an increase in innovation (Ankrah & Al-Tabbaa, 2015), which means that besides a country’s innovation is partly due to some “players” actions, like Universities or Companies, is also due to the relationships that they stand between them that will conduct to economy’s growth (Atalay et al., 2013). To reach it, there is a need to have an interaction between all the departments and areas of both organizations (Vernardakis, 2016), which, in turn, makes University research a crucial practice to incentive
innovation in Companies (Becker, 2010). This effect is highly affected by the government that plays a role to support this collaboration, because of the rise of international competitiveness and, also, because of the fact that technology is always moving forward (Ankrah & Al-Tabbaa, 2015). As a result of these changes, Companies, when facing a problem or an obstacle in their innovation, tend to search for Universities’ help as they are described “as a source of information” (Hewitt-Dundas, 2011, p. 104). Hence, Companies benefit from this collaboration with Universities not just because it is a way of getting additional knowledge, but also to get access to skilled people, to training their present and future workers, to have the possibility of using the University facilities and equipment, to have public funding and incentives for their research projects, and finally to have the University's help for the R&D projects by sharing the risks and the costs (Guimón, 2013).

Also, in the study of Breznitz (2014) is demonstrated that creating this alliances with Universities, Companies benefit from different ways, because the Academy starts to be treated as a source of knowledge and, therefore, as a mean to reach innovation. This happens because, students are seen as persons with a creative mind that look for Companies’ problems and see them as an opportunity to create new knowledge (Becker, 2010), to transfer it to the business world and to share that knowledge with the society (Breznitz, 2014). Consequently, Companies seek students with the required skills for the business in Universities (Tödtling & Grillitsch, 2015), that trained them with enough knowledge to innovate and to help the business’ of any firm (Tödtling et al., 2013). Thus, students and Companies’ workers will innovate during their research (Presse & Terzidis, 2018) and, an example of this transfer of knowledge is the advancement of the artificial intelligence in Companies that requires to look for the work of leading Universities’ scientists (Calo, 2017). Working with the academic world lead to a discovery of new findings that gives the opportunity to business to boost and sustain their innovation (Goel, Göktepe-Hultén, & Grimpe, 2016) and so to have repercussions in the economic development (Hewitt-Dundas, 2011).

Moreover, this collaboration also happens because Companies need to recruit and, frequently, they search for candidates in Universities as they see this entity as a strong source of knowledge (Tödtling & Grillitsch, 2015). Kunttu (2017) exposes that students have the required skills for Companies because of the knowledge that they acquire in research projects, their mind full of new ideas, and their experience as a customer.

Hence, Etzkowitz in the study of Breznitz (2014, p. 22) describes the importance of the
University in the transfer of knowledge between this two parties as followed: “As knowledge becomes an increasingly important part of innovation, the University as a knowledge producing and disseminating institution plays a larger role in industrial innovation”.

2.4. The transfer of Knowledge from Companies to Universities

One of the main sources of knowledge creation comes from Universities, which their main objective is to instruct society (Perkmann et al., 2013). However, in the study of Bellucci and Pennacchio (2015), it is shown that most important source of knowledge comes from Universities that have courses more adjusted to industry and have a superior quality of their researches. Thus, the acquisition of knowledge by students increase their skills and provides them a strong knowledge base to further develop and obtain a more advanced one (Bereiter & Scardamalia, 2014), which University promotes by teaching and researching (Breznitz, 2014) and then transfer all the knowledge gave it by the research for itself or by the trained students that were taught by them (Chesbrough et al., 2006). As a result of this, the University gave it for itself three missions: teach, research, and support the society through knowledge and technology creation and transfer (Bellucci & Pennacchio, 2015), which means that this third mission is related to a better understanding of the Companies’ needs to sustain the economic growth (Guimón, 2013). University has an essential role of being a source of fresh knowledge, that promotes the development of innovation, and consequently of new technologies (Presse & Terzidis, 2018), which is affected by the relationships that it has with others such as research institutes and other Universities (Breznitz, 2014). Academic knowledge has become a key role to reach innovative technology and economic development (Becker, 2010) and also in some countries have put them as leaders in the world (Breznitz, 2014). In this sense, as Universities innovate and transfer it to businesses, this allows them to measure their quality and their performance by “technology commercialization”, that can be reached by creating patents or licenses or by raising spin-out firms (Breznitz, 2014). This formation of knowledge and consequently technology is due to the quality of Universities students that have fresh and innovative minds, which are trained to ingress industry, and when they learn from the same institution, the knowledge flow is easier and quicker (Breznitz, 2014). Hitting at this, the skills of a student or a University professional will directly influence the academic engagement, which means that, people who have more research publications, social capital, and government grants will be more productive and will work better with the industry (Perkmann et al., 2013). On the whole, Hadad (2017) demonstrates that the main
The objective of Universities is to teach and form people, giving them the required skills to incorporate the society where they are living.

Companies are seeking more for Universities because of the talent and knowledge that they have, which can be obtained by scientific publications, but what is preferable for Companies is to have their collaboration in research (Hewitt-Dundas, 2011). Universities benefit from the collaboration with Companies to enhance the teaching methods, to have access to funding, to promote the reputation and, also, to be able to have direct contact with empirical data from the Companies (Guimón, 2013). Bellucci and Pennacchio (2015) found in their study that Universities are more reached as a resource of knowledge when have an entrepreneurial orientation with entrepreneurial activities and courses, which should be motivated by governments. Competition and technology are always changing and because of that governments have to intervene by stimulating this collaboration between Companies and Universities by giving support in the research field as they consider that this will lead to a flow of knowledge (Ankrah & Al-Tabbaa, 2015). Hence, there is a need to pick up the academic knowledge, absorb it and apply it to the industrial environment (Presse & Terzidis, 2018) and so, several traditional Universities are developing to a more entrepreneurial one, more connected to the industry to facilitate the transfer of knowledge (Bellucci & Pennacchio, 2015). Moreover, Universities want to keep a connection with Companies because of the prestige that they get as it shows that they are an institution linked to the market and that contributes to economic development (Ankrah & Al-Tabbaa, 2015). This new type and form of Universities more linked to the Industry gives the possibility of creating spin-out firms, of giving the service of consultants to Industry, of having more educated graduates that will better fulfil the market needs, of licensing new technologies, and, finally, promoting network and interaction between them that will positively affect the innovation and economic growth of a society (Bramwell, Hepburn, & Wolfe, 2012). Thus, moving to a more entrepreneurial education, Universities have found a need to connect with industry to explore their knowledge (Hewitt-Dundas, 2011), through different mechanisms, such as internships, probability of employment, researches with funding and if they come up with an innovation, they will get a licence and this link between these two organizations is the base of the third mission of an University, which is, to promote the development of the society (Breznitz, 2014). Also, the collaboration with the industry through commercialization of their researches and get licences of patents is a way of Universities to get funding and to get away from the dependence of public sources (Ankrah & Al-Tabbaa,
In fact, for them, the success of this Cooperation is measured by the funding they receive to research, by the practicability of their achievements and by the discovery of new themes for research (Lee, 2017), and so their motivation is or to get industry financial support or to get access to resources that they cannot get by themselves (Goel et al., 2016). Furthermore, academics are also motivated to have a direct link with the industry, because having a good academic background and, at the same time, working together with a firm, will get them a greater acknowledgement and so, other companies will be attracted to employ them (Breznitz, 2014). Franco and Haase (2015) also showed that this is one of the main reasons why academics want this collaboration with industry as they know that having their research published or participating in conferences will develop their qualifications and productivity and, therefore their performance. Also, in the study of Franco and Haase (2015) the importance of getting financial support for research and getting reputation is an idea reinforced as an influence of universities to collaborate with companies and it was found too that academic with more qualifications and higher performance are the ones that want more this collaboration, more exactly in their research projects.

The areas that the academic world benefits more with the link with industry is technology and innovation (Becker, 2010), as academics are more into to investigate and to achieve technological developments (Soetanto & van Geenhuizen, 2015). Consequently, Bellucci and Pennacchio (2015) found in their study that the applicability of academic knowledge in companies is more efficient when universities have an entrepreneurial orientation and also a higher research quality. In this sense, according to Presse and Terzidis (2018), this industrial orientation may result in more innovative ideas and in the search for new opportunities.

2.5. Types of Collaboration – R&D

A study made by Vernardakis (2016) showed that the level of productivity is positively correlated with the need for R&D, which means that as the investment in R&D increases, the productivity goes on the same level too. Hence, R&D appears, when the performance of the company needs to be expanded (Chesbrough et al., 2006), as this specific activity allows that employer's skills, such as creativity and ambition, get a voice in the economy (Bergeron & Blander, 2002), which made firms start investing in it in order to create and develop new knowledge (Díaz-Díaz & de Saá Pérez, 2014). Nonetheless, times are changing, and so in companies too, where this area is not anymore done only by them but in cooperation with
other organizations, like Universities (Becker, 2010). Businesses want to innovate and to do that, it is need to have access to new and fresh knowledge, external from the form, which can be found in Universities (Bellucci & Pennacchio, 2015).

This Cooperation between these two entities has positive consequences on R&D as by working together the duplication of it is prevented, there are more private investment and scientific and technological competencies are being together exploit (Guimón, 2013). University research has big effects in the development of a new product of a Company (Hewitt-Dundas, 2011), by decreasing costs or even by having better and open access to research made by the top academics (Becker, 2010), which, consequently, has positive impacts on its reputation for stakeholders (Ankrah & Al-Tabbaa, 2015). This collaboration with the Academia is also highly influenced by financial grants that can come up with the research that combining with the costs reduction and with innovative products will carry out to acquisition of competitive advantage, and, because of that Companies seek for the best students to employ (Ankrah & Al-Tabbaa, 2015). In fact, having, inside of the Company, researchers directly from the University gives the opportunity to have access to academic knowledge and knowledgeable students that will work to solve Companies’ issues (Chesbrough et al., 2006), like in the biotech area, R&D is considered to be the main responsible to develop improvements in processes and products (Tödtling & Grillitsch, 2015).

The collaboration between Companies and Universities in the R&D field is based on a flow of knowledge between them (Bellucci & Pennacchio, 2015), that if it is not well used it will affect negatively the innovation process of the firm (Chesbrough et al., 2006). University researchers have different incentives to collaborate with firms than other institutions, as they are mainly interested on gaining reputation and on contributing to science development, and this can be seen in the fact that they publicly publish their findings, instead of protecting them (Chesbrough et al., 2006). Hence, Becker (2010) showed that University research can be divided into two methods: by area of research or by commercialization process. The first one is split into three that correspond to life sciences, science disciplines, which is included engineer or IT and all the other areas, such as arts or humanities. Regarding commercialization research, it is based on knowledge and it can be by diffusing, producing, or creating some kind of relationships or engagement and this can be done by different processes, such as “consulting, contract research, licensing or spin-off companies”.
2.6. Other Types of Collaboration

Universities are the entity responsible for creating new knowledge, that is crucial for innovation (Presse & Terzidis, 2018) and the collaboration with the Industry can develop people's skills, increase the knowledge base and its adoption and promote the entrepreneurship through the creation of spin-offs (Guimón, 2013). Thus, academic knowledge combined with innovative ideas can lead to the creation of spin-offs that will positively affect the economy (Becker, 2010). Hitting at the term, spin-offs are viewed as independent Companies that create products or services based on the academic knowledge, which University supports by offering its knowledge, resources, and funding (Soetanto & van Geenhuizen, 2015). A more direct definition was given by Presse and Terzidis (2018, p. 213) that defines a spin-off as a “high-tech venture” of an academic-based on preceding researches. Moreover, in their study they found out that to a Company be considered as a spin-off needs to accomplish some settings: needs to have, at minimum, one academic researcher with a Company share; this University researcher needs to have been on its University for at minimum three years; the business needs to be oriented to seek profit; and, the products, services or technologies developed need to be from the same area as the researcher has studied. However, this type of Company confronts a bigger threat because of the level of technology that evolves and, also because it requires financial capital or funding to pursue its activity (Soetanto & van Geenhuizen, 2015).

There are some Universities offices, called technology-transfer offices, that contribute for the rise of the spin-off Companies, by estimating the value of their inventions, patenting them, licensing the technology developed and supporting its creation (Breznitz, 2014), which means, on the whole, that these offices are established to assure the commercialization of academic researches but in the form of a spin-off firm (Presse & Terzidis, 2018). Notwithstanding the benefits that this type of firm can bring, the support that they got, sometimes, is not enough, and also as they have few market and entrepreneurial experiences, that can become a barrier to its success (Soetanto & van Geenhuizen, 2015).

Furthermore, the existence of this collaboration has effects on students, which accomplish entrepreneurial experience on the Companies, and get access to academic knowledge and resources on the University due to an immediate link between the two entities (Al-Tabbaa & Ankrah, 2016). Hence, Universities are adopting an entrepreneurial orientation to stimulate the knowledge transfer between entities (Lee, 2017), which can be done by
distinct activities to encourage trust and engagement of both parties (Al-Tabbaa & Ankrah, 2016). In this sense, Al-Tabbaa and Ankrah (2016) suggest the use of intermediaries to facilitate this process and, consequently, to promote the success of the collaboration by creating activities such as conferences, workshops, or seminars. These collaborative activities have led to knowledge exchange and, evidently, to a transfer of research projects from University to Companies (Presse & Terzidis, 2018). Thus, in the study of Ankrah and Al-Tabbaa (2015) can be found that the collaboration of these two entities can be classified as research support, that evolves trust fund, cooperative research, which are agreements between the two parties, knowledge transfer, it is a cooperative education, and technology transfer, that requires the commercialization of activities throughout the research.

Therefore, there are several approaches that this relationship can be taken, such as joint ventures, alliances, or R&D projects (Chesbrough et al., 2006), that can change through the distinct level that both sides are into the relationship (Ankrah & Al-Tabbaa, 2015). Joint education is viewed as the invitation of academics with employers of the Company to be present in some lectures or in a course as a form of giving access for both to knowledge and of promoting their communication (Kunttu, 2017). As a result, Kunttu (2017) demonstrated in its study that educational cooperation between Universities and Companies can take four forms: project groups for undergraduate students that retracts a topic of a research project given by a Company, that after can apply the results in its business, and is controlled by both entities; thesis projects, that can be done in a master or a PhD, and if it is initiated as a research project, then is also co-supervised by a professor and a Company manager, and has also a value for the industry; tailored degree courses, which are organized by Universities and includes all the specific competencies and skills that a specific Company required and, in exchange, the Company ensures employment opportunities for the students; and the last one, jointly organized courses, which are created by both parties and aim to teach themes that are related to some University-Company project.

Furthermore, it is important to notice that the person from the Company is usually the one who controls the innovation projects in collaboration with the University, even so, the academic person is the one who represents the University and contributes with its new and fresh knowledge (Hansen et al., 2017). This same idea is also defended by Goel et al. (2016) that showed that in most of the collaborative activities, Companies take in charge and University researchers do not have so much control of it.
2.7. Constrain of the University-Company Collaboration

Notwithstanding all the benefits from the Cooperation between Universities and Companies, some opinions state separation of them, pointing out that academics do not have the required industrial knowledge to decide if a project can be or not commercialize (Breznitz, 2014).

Universities are perceived by industries as more theoretical than practical, which is a problem since a Company is focused on practical issues, and this creates a gap between them (Al-Tabbaa & Ankrah, 2016), for instance spin-out Companies are searching for candidates that have skills and capacities different from the ones that Universities teach (Breznitz, 2014). Additionally, Companies are focused on short-term results to get their investment back and to put the results right away on their business, as their only interest is to create new patents and products, instead of having publications, which for University is a motivation (Guimón, 2013).

Moreover, having a more entrepreneurial orientation can lead Universities to get far from their objective of teaching “open science”, like an open approach of knowledge, and Companies cannot have a release of information about their inventions or products in order to keep their competitive advantage regarding its competitors, which means that each organization has its owns values and rules and that can create a divergence among them (Al-Tabbaa & Ankrah, 2016).

Another issue that comes up in this Cooperation is the intellectual property rights because in this relationship knowledge and technology are produced to get a place on the market and so, in the middle, it can happen to have contestations, putting them far away from their initial objectives (Al-Tabbaa & Ankrah, 2016). Thus, the commercialization of technology is highly affected by intellectual property rights, legislation and by the quality of the collaboration between the two entities (Breznitz, 2014) and the knowledge that should be transferred is also affected by its nature and by the skills developed by Companies to identify new and external knowledge (Chesbrough et al., 2006).

Bellucci and Pennacchio (2015) discover in their study that this collaboration does not always work because the academic knowledge is not well utilized by Companies, as after all as bigger is the Company, less the knowledge that comes from Universities matters and also
because, regarding Universities, they have no access to Company facilities and funding. Additionally, Goel et al. (2016) note that University researchers are responsible to produce new knowledge and to find resolutions for Companies, whereas the responsibility of the business is to consume that knowledge that was created, and, so, the authors defend that University players should manage these collaborations and not the opposite. Also, the authors have indicated the problem of the difference of timings, which means that academic researchers work and think for the long term and Companies for the short term. Simultaneously, the academic education is a forgotten topic in this collaboration (Kunttu, 2017), as, for example, the reviewed studies are not used on the teaching and learning activities for students (Ankrah & Al-Tabbaa, 2015).

Furthermore, Franco and Haase (2015) have demonstrated that this Cooperation is not a mean to progress in career, because of the Company interaction on teaching and researching methods and also they present bureaucracy, legal framework and lack of support and responsibility by the managers of the projects as the main barriers to the success of this Cooperation.

On the other hand, Becker (2010) argue that legislation, policies, lack of capital and intellectual property rights are some of the constrains from the University side, whereas for Company side the lack of understanding academic researches, the cultural and gender differences between them, the discussions about funding, the conflicts of interest, the lack of academic resources and the insufficient University time are pointed as the main constraints for Companies to participate in this collaboration.

On the whole, OECD in the study of Presse and Terzidis (2018, p. 229) describes that “higher education is facing unprecedented challenges in the definition of its purpose, role, organization and scope in society and the economy” and this is due to new demands of the world regarding the technological changes, the knowledge economy and the inconstant economic environment.
3. Research Question

The relationship between the Portuguese Universities with Companies

The innovative capacity of a society depends on the competencies of each Company or University, but, more importantly, on the ties that exist between them (Atalay et al., 2013). Besides the consequences on innovation and development of the Companies, the ties have strong repercussions on the economy growth of the country (Bramwell et al., 2012). Hence, the Cooperation of Universities with Companies is something that requires work and development, as it brings benefits for all the parties. However, although Portugal has all the resources to have a solid base for this Cooperation, it continues to have some problems to expand and improve it.

This study aims to deeply understand the relationship between the Portuguese Universities with Companies with different dimensions and sectors by doing several interviews on the two entities.

3.1. Definition of the research question

Research Question:
- What are the factors that are influencing the Cooperation between Portuguese Universities and Companies?
4. Methodology

4.1. Type of the Study

The study presented is based on qualitative research that aims to explore deeply the point of view of the study’s participants, their insights, and their actions about the issue that is being analysed (Malhotra & Birks, 2007). Thus, this study has made use of primary data, which means that it was collected directly by the researcher with the purpose to use it on this investigation (Malhotra & Birks, 2007).

In this sense, as the main objective is to discover how the participants behave in some specific situations related to the topic of the research, their opinions, and additional information about the issue, in-depth interviews were the method chose to support this study (Aires, 2011). It was used an interview script (Annexe 1) that is composed of open and semi-structured questions, organized with principal questions, and with others related to them (Jamshed, 2014). This script structure allows that the interview becomes more a conversation between the researcher and the participant which the result is not to get facts, but to interpret the participant’s answers (Malhotra & Birks, 2007). Therefore, the interview starts with initial questions and its flow is determined by the participant’s answers, and so the order of the questions vary from each participant (Malhotra & Birks, 2007), which creates a room to add some other questions depending on the conversation’s flow (Aires, 2011).

Before the realization of the interviews, each participant profile was studied. The basic data of each Company and Institutional Entity was collected before, with the purpose of the researcher has a more solid base of information of the Company that was going to be interviewed. Moreover, the name of the participants of this study is anonymous and so, they are identified by a specific segmentation. The duration of the interviews was around 30 and 60 minutes, being done by video or phone call. All the interviews were recorded and then transcribed.

4.2. Selection of the Participants

The Companies selected for this study only have one criterion that is to have offices or headquarters in Portugal. Regarding the Institutional Entities, the criterion used was only to be a Portuguese University or a Portuguese Technology Transfer Office.
Hence, concerning the selection of the Companies, 485 were contacted. Inside of this prospecting number, there are two categories: engagement and closure. The engagement is related to the Companies that have replied to the contact made and the closure respects to the interviews that were concretized. Looking for the table below, it is possible to verify that, in the final, 41 Companies were interviewed, which corresponds to 8% of the total Companies contacted by email, *Linkedin* or phone call.

![Figure 3 - Analysis of the relation between the prospecting Companies’ contacts made and their engagement and closure](image)

On the other hand, regarding the selection of the Institutional Entities, 24 were contacted. Then, 10 of them have replied to the contact made, creating some engagement. Finally, 38% of the Institutional Entities contacted, which corresponds to 9 institutions, have done the interview. Also, all the Institutional Entities were contacted by email.

![Figure 4 - Analysis of the relation between the prospecting Institutional Entities’ contacts made and their engagement and closure](image)
4.3. Characterization of the Participants

The Companies that have participated in this study were segmented into four groups regarding their size: Micro (MIC), Small (SMA), Medium (MED), and Big (BIG). This segmentation was based on data collected in Eur-Lex, which table is presented in Annexe 2. In this sense, it is possible to observe in the table below that 17 Companies constitutes the group with the dimension of Big (BIG), 14 Companies belong to the Medium dimension group (MED), and the dimension group of Small (SMA) and Micro (MIC) Companies is composed by 5 Companies each of them. Also, in the table is possible to verify the sector and creation date of each Company. Besides the Companies’ information, it is displayed the gender and age average of each interview’ participant. Therefore, it can be concluded that 25 of the participants are male and 16 are female and that besides the age range 25-35 being the most common, the average age of the participants is 40 years old.

<table>
<thead>
<tr>
<th>Company Reference</th>
<th>Dimension</th>
<th>Number of workers</th>
<th>Sector</th>
<th>Creation Date</th>
<th>Participant’s age</th>
<th>Participant’s Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIG1</td>
<td>Big</td>
<td>1700</td>
<td>Banking</td>
<td>1846</td>
<td>46-55</td>
<td>Male</td>
</tr>
<tr>
<td>BIG2</td>
<td>Big</td>
<td>700</td>
<td>Pharmaceutical</td>
<td>2001</td>
<td>36-45</td>
<td>Male</td>
</tr>
<tr>
<td>BIG3</td>
<td>Big</td>
<td>400</td>
<td>Chemicals</td>
<td>1898</td>
<td>36-45</td>
<td>Male</td>
</tr>
<tr>
<td>BIG4</td>
<td>Big</td>
<td>1400</td>
<td>Retail</td>
<td>1993</td>
<td>25-35</td>
<td>Female</td>
</tr>
<tr>
<td>BIG5</td>
<td>Big</td>
<td>2400</td>
<td>Electrical Manufacturing</td>
<td>1948</td>
<td>36-45</td>
<td>Male</td>
</tr>
<tr>
<td>BIG6</td>
<td>Big</td>
<td>1002 to 5000</td>
<td>Construction</td>
<td>1950</td>
<td>46-55</td>
<td>Female</td>
</tr>
<tr>
<td>BIG7</td>
<td>Big</td>
<td>501 to 1000</td>
<td>Food Production</td>
<td>1987</td>
<td>46-55</td>
<td>Female</td>
</tr>
<tr>
<td>BIG8</td>
<td>Big</td>
<td>800</td>
<td>Retail</td>
<td>1792</td>
<td>46-55</td>
<td>Female</td>
</tr>
<tr>
<td>BIG9</td>
<td>Big</td>
<td>201 to 500</td>
<td>HR Consulting</td>
<td>1991</td>
<td>25-35</td>
<td>Male</td>
</tr>
<tr>
<td>BIG10</td>
<td>Big</td>
<td>501 to 1000</td>
<td>IT Services</td>
<td>2016</td>
<td>25-35</td>
<td>Male</td>
</tr>
<tr>
<td>BIG11</td>
<td>Big</td>
<td>&gt; 800</td>
<td>IT Services</td>
<td>1993</td>
<td>36-45</td>
<td>Female</td>
</tr>
<tr>
<td>BIG12</td>
<td>Big</td>
<td>1001 to 5000</td>
<td>IT Services</td>
<td>1989</td>
<td>36-45</td>
<td>Female</td>
</tr>
<tr>
<td>BIG13</td>
<td>Big</td>
<td>3000</td>
<td>Paper &amp; Forest Products</td>
<td>2016</td>
<td>56-65</td>
<td>Female</td>
</tr>
<tr>
<td>BIG14</td>
<td>Big</td>
<td>1190</td>
<td>Retail</td>
<td>1945</td>
<td>46-55</td>
<td>Female</td>
</tr>
<tr>
<td>BIG15</td>
<td>Big</td>
<td>&gt;12000</td>
<td>Telecommunications</td>
<td>1980</td>
<td>56-65</td>
<td>Male</td>
</tr>
<tr>
<td>BIG16</td>
<td>Big</td>
<td>&gt;790</td>
<td>Renewables &amp; Environment</td>
<td>2005</td>
<td>36-45</td>
<td>Male</td>
</tr>
<tr>
<td>BIG17</td>
<td>Big</td>
<td>45000</td>
<td>Financial Services</td>
<td>1828</td>
<td>36-45</td>
<td>Male</td>
</tr>
<tr>
<td>MED1</td>
<td>Medium</td>
<td>&gt; 160</td>
<td>IT Services</td>
<td>2005</td>
<td>46-55</td>
<td>Male</td>
</tr>
<tr>
<td>MED2</td>
<td>Medium</td>
<td>207</td>
<td>Telecommunications</td>
<td>2003</td>
<td>36-45</td>
<td>Female</td>
</tr>
<tr>
<td>MED3</td>
<td>Medium</td>
<td>51 to 200</td>
<td>IT Services</td>
<td>2000</td>
<td>25-35</td>
<td>Female</td>
</tr>
<tr>
<td>MED4</td>
<td>Medium</td>
<td>201 to 300</td>
<td>IT Services Consulting</td>
<td>2007</td>
<td>36-45</td>
<td>Female</td>
</tr>
<tr>
<td>MED5</td>
<td>Medium</td>
<td>202 to 500</td>
<td>IT Services</td>
<td>2014</td>
<td>25-35</td>
<td>Female</td>
</tr>
<tr>
<td>MED6</td>
<td>Medium</td>
<td>51 to 200</td>
<td>IT Services</td>
<td>2004</td>
<td>25-35</td>
<td>Male</td>
</tr>
<tr>
<td>MED7</td>
<td>Medium</td>
<td>140</td>
<td>IT Services</td>
<td>2005</td>
<td>46-55</td>
<td>Male</td>
</tr>
<tr>
<td>MED8</td>
<td>Medium</td>
<td>&gt; 100</td>
<td>Software Engineering</td>
<td>1988</td>
<td>25-35</td>
<td>Female</td>
</tr>
<tr>
<td>MED9</td>
<td>Medium</td>
<td>52 to 200</td>
<td>Computer Software</td>
<td>1986</td>
<td>46-55</td>
<td>Male</td>
</tr>
<tr>
<td>MED10</td>
<td>Medium</td>
<td>51 to 200</td>
<td>Software Engineering</td>
<td>1988</td>
<td>36-45</td>
<td>Male</td>
</tr>
<tr>
<td>MED11</td>
<td>Medium</td>
<td>120</td>
<td>Textiles</td>
<td>1998</td>
<td>25-35</td>
<td>Male</td>
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<tr>
<td>MED12</td>
<td>Medium</td>
<td>75</td>
<td>IT Services</td>
<td>2007</td>
<td>25-35</td>
<td>Female</td>
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<tr>
<td>MED13</td>
<td>Medium</td>
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<td>Communications Engineering</td>
<td>2000</td>
<td>46-55</td>
<td>Male</td>
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<tr>
<td>MED14</td>
<td>Medium</td>
<td>250</td>
<td>IT Services</td>
<td>2003</td>
<td>25-35</td>
<td>Female</td>
</tr>
</tbody>
</table>
The Institutional Entities that have participated in this study were segmented into two groups: Universities (UNIV) and Technology Transfer offices (TTO). Thus, 4 entities constitute the Technology Transfer Offices group and the Universities’ group is represented by 5 entities. Also, besides the type of institution, each entity has associated its localization. Regarding the information of the participant’s interviewed it can be concluded that, concerning the gender, 5 of them are Female and 4 are Male. Looking for the age of the participants the most common age range is 46-55 and the average age is 44 years old.

<table>
<thead>
<tr>
<th>Entity Reference</th>
<th>Type</th>
<th>Localization</th>
<th>Participant's age</th>
<th>Participant's Gender</th>
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<tbody>
<tr>
<td>TTO1</td>
<td>TTO</td>
<td>Famalicão</td>
<td>46-55</td>
<td>Male</td>
</tr>
<tr>
<td>TTO2</td>
<td>TTO</td>
<td>Porto</td>
<td>56-65</td>
<td>Male</td>
</tr>
<tr>
<td>TTO3</td>
<td>TTO</td>
<td>Castelo Branco</td>
<td>25-35</td>
<td>Female</td>
</tr>
<tr>
<td>TTO4</td>
<td>TTO</td>
<td>Lisboa</td>
<td>25-35</td>
<td>Female</td>
</tr>
<tr>
<td>UNIV1</td>
<td>University</td>
<td>Porto</td>
<td>46-55</td>
<td>Female</td>
</tr>
<tr>
<td>UNIV2</td>
<td>University</td>
<td>Lisboa</td>
<td>36-45</td>
<td>Female</td>
</tr>
<tr>
<td>UNIV3</td>
<td>University</td>
<td>Lisboa</td>
<td>46-55</td>
<td>Female</td>
</tr>
<tr>
<td>UNIV4</td>
<td>University</td>
<td>Porto</td>
<td>56-65</td>
<td>Male</td>
</tr>
<tr>
<td>UNIV5</td>
<td>University</td>
<td>Porto</td>
<td>36-45</td>
<td>Male</td>
</tr>
</tbody>
</table>

Table 1 - Segmentation of the Companies interviewed

Furthermore, it is important to highlight some characteristics of Portugal’s Higher Education System. In Annex 3, there is a table that reveals that in 2020, there are 108 University institutions and 4811 courses in total (DGES) and, in Annex 4, there is a graphic that demonstrates the ascending evolution of the number of students that attend the University, which, in 2020, are 385,247 students (PORDATA). Regarding the investigation field, in PORDATA is possible to realize that the number of PhD recognized by Portuguese Universities done in foreign countries until 1980 was higher than the ones made in Portugal, but, in 2015, the paradigm has changed and 2500 out of 3000 PhD were being done in

<table>
<thead>
<tr>
<th>Entity Reference</th>
<th>Type</th>
<th>Localization</th>
<th>Participant's age</th>
<th>Participant's Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMA1</td>
<td>Small</td>
<td>11 to 50</td>
<td>Computer Software</td>
<td>2006</td>
</tr>
<tr>
<td>SMA2</td>
<td>Small</td>
<td>11 to 50</td>
<td>IT Services</td>
<td>2019</td>
</tr>
<tr>
<td>SMA3</td>
<td>Small</td>
<td>11 to 50</td>
<td>Computer Software</td>
<td>2006</td>
</tr>
<tr>
<td>SMA4</td>
<td>Small</td>
<td>20 to 49</td>
<td>Surface Engineering</td>
<td>1986</td>
</tr>
<tr>
<td>SMA5</td>
<td>Small</td>
<td>11 to 50</td>
<td>IT Services</td>
<td>2012</td>
</tr>
<tr>
<td>MIC1</td>
<td>Micro</td>
<td>1 to 10</td>
<td>IT Services</td>
<td>2013</td>
</tr>
<tr>
<td>MIC2</td>
<td>Micro</td>
<td>1 to 10</td>
<td>Industrial Engineering</td>
<td>2018</td>
</tr>
<tr>
<td>MIC3</td>
<td>Micro</td>
<td>1 to 10</td>
<td>Computer Software</td>
<td>2016</td>
</tr>
<tr>
<td>MIC4</td>
<td>Micro</td>
<td>2 to 10</td>
<td>Nanotechnology</td>
<td>2010</td>
</tr>
<tr>
<td>MIC5</td>
<td>Micro</td>
<td>4 to 10</td>
<td>Architect</td>
<td>2016</td>
</tr>
</tbody>
</table>

Table 2 - Segmentation of the Institutional Entities interviewed
Portugal (Annex 5). Additionally, in the Annex 6, a graphic is shown to expose that there are more R&D investigators in Universities than in Companies, but since 2005, the Companies are presenting growth in this indicator (PORDATA) and, in the Annex 7, it can be seen that since 1995 the number of scientific publications is increasing, and, in 2018 it was near to 25000 publications (PORDATA).
5. Data Analysis and Results

5.1. Content Analysis

This present chapter will focus on analysing the content of the interviews and their results. According to Kuckartz (2019), the process of analysing the content requires 6 steps. The first step is to organize the data, and after that comes the creation of categories that are associated with the interview questions. Then, those categories need to be coded and each of them will have some text fragments of the interviews which will allow to create sub-categories. The fifth and sixth step is to analyse that categories and results and report them.

The analysis of the interviews made for this study has complied with a set of stages that can be visualized in the following figure. In this sense, after a meticulous reading, the second step was the separation between Companies and Institutional Entities. Subsequently, the interviews were divided into main dimensions and, at the same time, this analysis was complemented by arguments used by Companies and by Institutional Entities regarding their opinion on the main dimensions identified before. After the content analysis, it was made the result analysis according to the segmentation of each group of participants, which made it possible the identification of the relevant factors that influence the Cooperation between Universities and Companies. In the finishing step, it was made a comparison of the results regarding the factors discovered between the Companies and the Institutional Entities.

Following this, it will be presented a set of tables of the content analysis by the type of participant (Companies or Institutional Entity). Each of the tables represents a main dimension that was identified in the interviews made and it will be complemented with the

![Figure 5 - Process of content and results analysis](image-url)
arguments used by the participants. Furthermore, it will be shown what factors for each theme were mentioned more and pointed out as an influence of the Cooperation, which will be divided by the type of participant and by their segmentation. This analysis of the results will be complemented by a comparison between the Companies’ factors mentioned and the ones mentioned by the Institutional Entities.

5.1.1. Content Analysis – Companies

Advantages of the Cooperation between Universities and Companies for Companies

The first main dimension identified in the interviews that is going to be analysed is the advantages of the Cooperation between Universities and Companies from the point of view of the Companies. Hence, all the Companies’ interviews were read and analysed with the objective to gather all the advantages pointed out by them through all the questions made. Consequently, all the advantages were split into six variables: Knowledge (F1); Skilled human resources (F2); Profitability (F3); Innovation (F4); Brand awareness (F5); and R&D (F6). In the table below, it is possible to verify the definition of each variable and, right after that, the different examples of the advantages considered by the Companies split by its corresponding variable. The first advantage identified was “Knowledge” (F1), which means that one of the benefits of this Cooperation for Companies is the access to knowledge, as Universities are seen as one of the main sources of knowledge:

MED11: “The Portuguese Universities have high quality, as they create very important knowledge, and for Companies that are looking to differentiate themselves in the market, the capitalization of that knowledge is very important.”

BIG15: “When a person does not have an answer to a question, it should go to the University to look for that answer, because it is there where the knowledge is.”

Moreover, the next advantage recognized was “Skilled human resources” (F2) that is related to having access to people, in this case, students, with the skills that Companies are looking for their business:

BIG14: “Portugal is one of the countries where education is better.”
The variable “Profitability” (F3) was also accepted as a benefit taken from the Cooperation, as Companies argued that working together with the University in the different projects and events, causes an increase in the Company’s performance regarding costs and productivity, due to the access to different competencies, resources and their help to do some projects. “Innovation” (F4) was a recognized advantage as well, demonstrating that when Companies work together with the Universities, helps them to innovate their business through having access to resources, new methods, and knowledge:

MIC1: “There are Companies that were born from academic projects and then have transformed their business, and this is the best case of transfer of knowledge.”

MED10: “Either the incremental Innovation either the disruptive Innovation, we have done both of them, and we only could do it through tests done with academic knowledge”

The last two advantages mentioned on the table are “Brand awareness” (F5) and “R&D” (F6). The first one (F5) shows that cooperating with the Universities provides benefits in terms of expanding and promoting the Company’s brand. The second one (F6) refers to the benefit of having help in the R&D Companies’ projects, as Universities besides having the required resources, they also dedicate themselves to research:

MIC3: “It is almost a mandatory situation to have a University as a partner in R&D projects, and honestly, I think that we have the best institutions in Europe working in these situations”

<table>
<thead>
<tr>
<th>Fi</th>
<th>Fi Variable</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Knowledge</td>
<td>Access to concepts, theories or competencies that enables the development and update of processes and methods</td>
<td>Access to Science; Access to know-how; Access to experience; Exchange of knowledge; To be updated of what is being developed; Possibility to understand the teaching methods</td>
</tr>
<tr>
<td>F2</td>
<td>Skilled human resources</td>
<td>Access to trained human capital that has the required competencies and skills for a specific role</td>
<td>Access to talent; Recruitment; Need for professionals in IT; To absorb the best students since the first year at the University</td>
</tr>
<tr>
<td>F3</td>
<td>Profitability</td>
<td>Processes or activities that help to develop an entity and also to expand its profit</td>
<td>Fewer costs; Productivity increase; Competitiveness increase; Value production; Work in projects that company does not have time to do; Development of competencies; The growth of the Company</td>
</tr>
<tr>
<td>F4</td>
<td>Innovation</td>
<td>Access to methods and competencies that help to create value and differentiation into a product, service or process that may or may not already exist</td>
<td>Creativity; To find different solutions; To take risks; Acceleration of the process of developing a solution; Access to different perspectives; Development of technologies; New ideas; Development of products</td>
</tr>
<tr>
<td>F5</td>
<td>Brand awareness</td>
<td>Actions that allow the promotion of an entity’s name and activity</td>
<td>Networking; Reputation</td>
</tr>
<tr>
<td>F6</td>
<td>R&amp;D</td>
<td>Research activities of an entity that can be improved by having access to certain competencies and methods that are easier to reach using partnerships between two or more entities</td>
<td>Dedication; Access to resources; Access to fundamental research; Close contact with the professors; Possibility to join theoretical with practical competencies; Possibility to test an idea and see if it works in the market context</td>
</tr>
</tbody>
</table>

Table 3 - Content Analysis of the advantages of the Cooperation for Companies by Companies
Advantages of the Cooperation between Universities and Companies for Universities

The dimension presented is very similar to the previous one, but instead being the advantages of the Cooperation for Companies, is regarding the advantages for Universities from the point of view of the Companies. Therefore, only the variable “Innovation” (F4) was not identified by the Companies as an advantage for Universities of the Cooperation, and, in this sense, “Knowledge” (F1), “Skilled human resources” (F2), “Profitability” (F3), “Brand awareness” (F5) and “R&D” (F6) were pointed as advantages. Hence, the access to knowledge (F1) for Universities comes with the necessity for them to be updated of the corporate world, having access to a different knowledge from the one that they have:

BIG16: “The role of the Universities is to give to students the necessary competencies to be able to acquire knowledge and to keep continuously acquiring new knowledge”

Regarding the access to skilled human resources (F2), for Universities, it is an advantage as Companies are looking for trained human capital, and as Universities have it, they are motivating their students to find a job. Then, the variable “Profitability” (F3) is an advantage for Universities, as it promotes the financing of their activity by providing some of their services to Companies. Moreover, “Brand awareness” (F5) is also a Universities’ advantage mentioned by the Companies, which has considered that by working together with Companies, Universities take also some benefits regarding their reputation. Finally, “R&D” (F6) is the last variable believed as an advantage for the Universities and it is related to the fact that by cooperating with Companies, Universities have access to some assets that by their own they could not achieve. For instance, instead of studying cases that could not be real, they have access to actual Companies’ cases, that have some applicability:

MIC1: “The Companies should be open to Innovation, especially in the competitive world that we are today living, but it is also needed that the Universities understand the necessity to guide what is doing to the real world.”
Difficulties of the Cooperation between Universities and Companies

After the advantages of the Cooperation between Universities and Companies, the difficulties of this relationship are another dimension that was taken from the interviews made to Companies. To collect information for this dimension, four questions were considered: the investment regarding their participation in University projects; the main difficulties or challenges; the management of the curricular internships; and the adaptability of the students’ knowledge degree. The same process of the advantages dimension was applied to the difficulties, that was split into six variables that correspond to the main difficulties of the Cooperation recognized by Companies: From theory to practice (F7); Different working methods (F8); Bureaucracy (F9); Communication (F10); University’s projects (F11); and Lack of culture (F12). The first difficulty identified was “From theory to practice” (F7), which means that Companies attribute Universities as too theoretical and that what they teach to students has low applicability in the real-world context:

MIC4: “Nowadays, the courses are too theoretical and when the students arrive in the real-world, they are missing experience in practical components.”

BIG17: “There is a generalized opinion that the University courses are too theoretical, very focused on the theoretical part than in a more practical one, and this is a generalized opinion of all the interviews that we do and it is transversal to all the Universities.”

Another pointed difficulty was “Different working methods” (F8). This variable respects mainly to the fact that University and Companies cannot find a working middle term, because University works for long-term and its main objective is to research and publish, mainly due to University professors being motivated by the number of publications that they made. On

<table>
<thead>
<tr>
<th>Fi</th>
<th>Variable</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Knowledge</td>
<td>Access to concepts, theories or competencies that enables the development and update of processes and methods</td>
<td>Exchange of knowledge; Exchange of experiences; To be updated of the corporate world; Moments of learning and developing at the professional and personal level</td>
</tr>
<tr>
<td>F2</td>
<td>Skilled human resources</td>
<td>Access to trained human capital that has the required competencies and skills for a specific role</td>
<td>Stimulate the students to enter in the market</td>
</tr>
<tr>
<td>F3</td>
<td>Profitability</td>
<td>Processes or activities that help to develop an entity and also to expand its profit</td>
<td>Form to finance the University activity; To turn the intern adaptation to the market easier</td>
</tr>
<tr>
<td>F4</td>
<td>Brand awareness</td>
<td>Actions that allow the promotion of an entity’s name and activity</td>
<td>Having a bank with a national reference working with them; More interest for students to study at the University</td>
</tr>
<tr>
<td>F5</td>
<td>R&amp;D</td>
<td>Research activities of an entity that can be improved by having access to certain competencies and methods that are easier to reach using partnerships between two or more entities</td>
<td>Access to resources; Access to real and practical cases to study and investigate; To give a theme to guide some academic degree; Value production in Ph.D. thesis and scientific articles</td>
</tr>
</tbody>
</table>

Table 4 - Content Analysis of the advantages of the Cooperation for Universities by Companies

29
the other side, Companies work for the short-term, as they research with the objective to commercialize it, and so they are not interested in the fundamental research, but the more practical context of it:

BIG7: “Companies need to understand that R&D projects cannot be done in short term and that sometimes cannot work, and Universities need to understand that R&D projects are not just nice to know, but need to have some practical purpose.”

BIG15: “The quantitative evaluation of professors was necessary for Portugal in the ‘70s or ‘80s, because we did not have a PhD in Portugal. However, people are created and so there should be a change to a qualitative evaluation.”

“Bureaucracy” (F9) was another difficulty variable that Companies indicated, demonstrating that University has too much bureaucracy in its processes and that some of that could easily be removed:

SMA4: “The University is stuck in a huge bureaucracy web, which does not facilitate the things. Everything is too bureaucratic and that is something that I hate.”

BIG3: “The bureaucracy that exists in University is, without any doubt their Achilles’ heel.”

Nevertheless, this is not a generalized opinion, and there is at least one Company that does not consider bureaucracy a barrier to this Cooperation:

BIG17: “The processes in University are still a little bureaucratic, but it is understandable, and, in my opinion, it is not a barrier for this cooperation, because Companies are prepared for that.”

Furthermore, the problems with “Communication” (F10) are another variable found in the Companies’ interview, that concern to the fact that the contact between Universities and Companies is not very continuous and flexible, and neither the entities sometimes respect the requirements and conditions of each other:

MED11: “When the Universities integrate people that have already worked in the industry and when the industry integrates people that have already worked in University research, then it will result in a better symbiosis, as it exists a better comprehension of the obstacles and objectives of both sides.”

BIG5: “The best form to transfer knowledge is by bringing people from University to the Company to work.”
“University’s Projects” (F11) variable is a difficulty that is related to the problems of some projects and events made by Universities, like job fairs and internships, that are valued by the Companies, but still have some problems that sometimes work as an impediment to be realized. The last variable is “Lack of culture” (F12), which is linked to a problem of both entities because some Companies and some Universities do not have an appropriate culture to expand and develop this Cooperation, and so they resist it. However, in the examples below there are some divergent opinions regarding the Universities’ culture. The first example is the opinion regarding the University’s professors availability to do this Cooperation:

MIC1: Not all of the University’s professors are available to do this partnership and that is something that needs to be incremented because we are paying to the University in the research projects and that is their source of funding and so the professors should be more pre-disposed to do this.”

MED10: “Decades ago, we felt difficulties in the dialogue with the University’s professors, that today we do not feel anymore. Today, University’s professors have realized that their attractiveness increases when there is a big approximation with the Companies and also have already realized that a big share of the University funding comes from research projects done with the Companies’ collaboration”

The second example addresses the opinion if the Universities give or not value to this Cooperation:

SMA3: “This Cooperation is more crucial for our growth than for Universities. I wish that Universities have the same interest as us in this Cooperation”

MIC3: “I think that this is a B2B relationship. I think that we benefit with it and that Universities also benefit and have an interest in it.”
Means of achieving Innovation

The “Means of achieving Innovation” was another dimension considered for this study that was possible to take from the Companies’ interviews. The importance of this dimension is related to the fact that, as it was studied by Tan (2004), Innovation has directly impacts on Companies growth and on Society development, in terms of GDP and productivity. To collect the variables, only one question was considered, the one that directly concludes the various methods to achieve a competitive level of Innovation. In this sense, this dimension was considered to analyse its importance and the mechanisms to reach it. Hence, by questioning directly the means to achieve Innovation, it was split into five variables: “Knowledge” (F1); “R&D” (F6); “Soft-skills” (F13); “University” (F14); and “Company Resources” (F15). The first two variables identified were already mentioned in the dimension of the advantages, but it is equally important to highlight that the access to knowledge (F1) and development of the R&D (F6) was referred too as two important means to reach Innovation. Additionally, “Soft-skills” (F13) was pointed out also as a variable of this dimension, because Companies argued that to have Innovation, there must have a range of specific soft-skills that will help to concretize it. The next variable found in this dimension in the interviews was “University” (F14) that is regarding all the assets that this entity can
provide to Companies, like having partnerships with it, its training, its qualifications, and its talent:

MED1: “The University can be the first local that makes the country grow, mature, and win a certain leadership in the world.”

The last variable identified was “Company resources” (F15) that is regarding all the Company assets that can help to reach innovation, like Company’s training, culture, or strategy:

SMA4: “If we do not keep differentiation in the knowledge and efficiency, we enter in the depreciation of what we are selling. Without Innovation, there is not continuous improvement.”

BIG3: “We as a Company that wants to be competitive and wants to differentiate from our competitors, we have to look obviously to Innovation and embracing it in our daily routine.”

<table>
<thead>
<tr>
<th>Fi</th>
<th>Fi Variable</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Knowledge</td>
<td>Access to concepts, theories or competencies that enables the development and update of processes and methods</td>
<td>Different perspectives; Have time to think; Work</td>
</tr>
<tr>
<td>F6</td>
<td>R&amp;D</td>
<td>Research activities of an entity that can be improved by having access to certain competencies and methods that are easier to reach using partnerships between two or more entities</td>
<td>Research</td>
</tr>
<tr>
<td>F13</td>
<td>Soft-skills</td>
<td>Group of personal competencies that are perceived as drivers of Innovation</td>
<td>Autonomy; Cooperation; Curiosity; Determination; Initiative; Motivation; Opportunity; Patience; Pragamism; Resilience</td>
</tr>
<tr>
<td>F14</td>
<td>University</td>
<td>Access to a cooperation with the University and human capital trained by it</td>
<td>Different academic background; Employing qualified professionals; Partnership with the University; Young people that had experience in national and international Universities</td>
</tr>
<tr>
<td>F15</td>
<td>Company Resources</td>
<td>Group of values, resources, strategies, and activities that a Company can obtain to increase its performance</td>
<td>Company Culture; Financial Resources; Human capital; Market interface; Market research; Organizational interface; Strategy; Technological interface; Work-life balance; Training</td>
</tr>
</tbody>
</table>

Table 6 - Content Analysis of the means of achieving Innovation by Companies

Means to invest in Artificial Intelligence

The last dimension found in the Companies’ interviews was Means to invest in Artificial Intelligence. Artificial Intelligence is a concept that is growing and gaining some importance, which Companies need to start looking for it and try to implement it in their business, as it is a form of competitive advantage (Reim, Åström, & Eriksson, 2020). Consequently, in the interviews made to Companies, there were some questions related to this issue with the
objective to understand if the Companies are aware of its relevance and in what form it is possible to invest in it. Consequently, five variables were identified in this dimension: “Knowledge” (F1); “Innovation” (F4); “R&D” (F6); “University” (F14); and “Company Resources” (F15). The variables F1, F6, F14, and F15 were also mentioned in the dimension “Means of achieving Innovation” since Companies found the same methods to invest in artificial intelligence as they found in innovation. However, there was one variable that although was already recognized in the “Advantages of the Cooperation” dimension, was not identified in “Means of achieving Innovation”, but it was mentioned in the presented dimension that is “Innovation” (F4). This variable is seen as a form to reach Artificial Intelligence as Companies explained that by investing in Innovation, it is investing in Artificial Intelligence, as innovation is a means of it:

BIG11: “The investment in Artificial Intelligence is very related to the organizations being available to bet in this type of Innovation and technology.”

<table>
<thead>
<tr>
<th>Fi</th>
<th>Fi Variable</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Knowledge</td>
<td>Access to concepts, theories or competencies that enables the development and update of processes and methods</td>
<td>Identification the problem that needs to be solved</td>
</tr>
<tr>
<td>F4</td>
<td>Innovation</td>
<td>To have access to methods and competencies that help to create value and differentiation into a product, service or process that may or may not already exist</td>
<td>Development of products</td>
</tr>
<tr>
<td>F6</td>
<td>R&amp;D</td>
<td>Research activities of an entity that can be improved by having access to certain competencies and methods that are easier to reach using partnerships between two or more entities</td>
<td>R&amp;D projects; Private R&amp;D department</td>
</tr>
<tr>
<td>F14</td>
<td>University</td>
<td>Access to a cooperation with the University and human capital trained by it</td>
<td>Employing qualified professionals; Partnership with the University</td>
</tr>
<tr>
<td>F15</td>
<td>Company Resources</td>
<td>Group of values, resources, strategies, and activities that a Company can obtain to increase its performance</td>
<td>Financial Resources; Training; Equipment; Investment in every IT area; Technology</td>
</tr>
</tbody>
</table>

Table 7 - Content Analysis of the means to invest in Artificial Intelligence by Companies

5.1.2. Content Analysis – Institutional Entities

Advantages of the Cooperation between Universities and Companies for Companies

After a careful and attentive reading of the Institutional Entities’ interviews, it was possible to conclude that they presented the same dimensions as the Companies’ interviews and, consequently, each dimension has gathered the same variables as the ones mentioned in
the Companies’ interviews. In this sense, the similar advantages and difficulties of the Cooperation and means of achieving Innovation were identified in the Institutional Entities’ interviews. The only dimension that was not possible to recognize was “Means to invest in Artificial Intelligence” as it respects more the Companies’ business.

Furthermore, the advantages found, through all the questions made in the interviews, are described in the below variables, which are the same as the variables identified in the Companies’ interviews: “Knowledge” (F1); “Skilled human resources” (F2); “Profitability” (F3); Brand awareness (F5); and R&D (F6). The only variable that was not identified in the Institutional Entities’ was Innovation, which means that this type of entity does not consider it as an advantage of this Cooperation for Companies. Like in the Companies’ interviews, by cooperating with the Universities, Companies have access to knowledge (F1) and that was considered an advantage by Institutional Entities:

UNIV3: “A Company that does not adopt technology and knowledge does not survive.”

UNIV4: “The University is the place that prepares the best professionals that the Companies can use, where the talent is generated. It is the source where the best young people are, it is the source of knowledge.”

Another advantage for Companies considered by Institutional Entities was the access to skilled human resources (F2), in which the entities have presented the same justifications as the Companies. Additionally, “Profitability” (F3) was mentioned by this type of entities, that was justified like Companies did, that working together with the Universities would have direct effects on the productivity of the Companies’ business:

UNIV4: “The sustainable competitiveness of Companies depends on their Innovation capacity, and the Innovation comes from different things, but most of it comes from knowledge.”

The last two advantages referred by these entities were “Brand awareness” (F5) and “R&D” (F6). “Brand awareness” (F5) was found, like Companies, as a form to promote the Companies’ brand, as the Cooperation allows them to have access to network with different types of entities. Lastly, the possibility to improve their R&D (F6) was another advantage found in the Institutional Entities’ interviews and it was considered a benefit for Companies because R&D is one of the University’s roles and so when Companies cooperate with them, they are working with an institution where one of their missions is to research:
“The main mission is to transfer knowledge to the industry, to convert the knowledge into economic and social value, to be able to pick in more scientific things and transform it into products or processes or technologies that Companies can use.”

**Advantages of the Cooperation between Universities and Companies for Universities**

Regarding the advantages for Universities of the Cooperation between Universities and Companies, the variables identified in the Institutional Entities’ interviews were the same as the ones identified in the Companies’ interviews too. As a result, the first variable identified is “Knowledge” (F1) since the Institutional Entities also have the opinion that Universities benefit from Companies with access to a more practical context. Furthermore, the next variable was “Skilled human resources” (F2) that respects to the fact that Universities by training their students and having them with enough and required knowledge, will have a bigger opportunity to place them in the labour market:

UNIV3: “The first advantage for us, and it is in our mission, is related to causing an impact in the society, which means through the insertion of graduates, masters, PhD in the Companies which they can cause some difference with the knowledge that they take from the UNIV3.”

“Profitability” (F3) was another advantage mentioned by the entities interviewed, which presented the same justification as Companies did, which was that by working together with Companies, the Universities can finance their activity by providing some of their services:

---

**Table 8 - Content Analysis of the advantages of the Cooperation for Companies by Institutional Entities**

<table>
<thead>
<tr>
<th>Fi</th>
<th>Variable</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Knowledge</td>
<td>Access to concepts, theories or competencies that enables the development and update of processes and methods</td>
<td>Access to Science; Access to know-how; Access to experience; Exchange of knowledge; To be updated of what is being developed; Possibility to understand the teaching methods</td>
</tr>
<tr>
<td>F2</td>
<td>Skilled human resources</td>
<td>Access to trained human capital that has the required competencies and skills for a specific role</td>
<td>Access to talent; Recruitment; Need for professionals in IT; To absorb the best students since the first year at the University</td>
</tr>
<tr>
<td>F3</td>
<td>Profitability</td>
<td>Processes or activities that help to develop an entity and also to expand its profit</td>
<td>Fewer costs; Productivity increase; Competitiveness increase; Value production; Work in projects that company does not have time to do; Development of competencies; The growth of the Company</td>
</tr>
<tr>
<td>F4</td>
<td>Innovation</td>
<td>Access to methods and competencies that help to create value and differentiation into a product, service or process that may or may not already exist</td>
<td>Creativity; To find different solutions; To take risks; Acceleration of the process of developing a solution; Access to different perspectives; Development of technologies; New ideas; Development of products</td>
</tr>
<tr>
<td>F5</td>
<td>Brand awareness</td>
<td>Actions that allow the promotion of an entity's name and activity</td>
<td>Networking; Reputation</td>
</tr>
<tr>
<td>F6</td>
<td>R&amp;D</td>
<td>Research activities of an entity that can be improved by having access to certain competencies and methods that are easier to reach using partnerships between two or more entities</td>
<td>Dedication; Access to resources; Access to fundamental research; Close contact with the professors; Possibility to join theoretical with practical competencies; Possibility to test an idea and see if it works in the market context</td>
</tr>
</tbody>
</table>
UNIV4: “There are a lot of advantages to University. The first one is a financial advantage, which means that it is a form to finance the University activity. The University has various methods to have funding. On one side, they have the tuition fees, for the other side they have transfers that come directly from the Government, and then, there is a very important parcel that is related to the funding of the R&D projects and the services that they can provide to Companies.”

Additionally, “Innovation” (F4) was also referred too as an advantage for Universities because it helps to develop technologies and to create spin-offs. Also, Institutional Entities have pointed out “Brand awareness” (F5) as a benefit for Universities, because having a partnership with Companies helps in the reputation of the Universities, as most of the students want to be incorporated in the labour market and so, they look for Universities that have more relations with Companies. The last variable mentioned was “R&D” (F6), since Institutional Entities’ argued that Universities by having the support of the corporate world, they can achieve more easily and better R&D results that have indeed some applicability:

UNIV2: “Working together with Companies give a big contribution because the academics can understand what are the problems that are indeed interesting to be resolved, as scientifically we can have a research question that is interesting for us, but that may not make any sense for the Companies.”

<table>
<thead>
<tr>
<th>Fi</th>
<th>Fi Variable</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Knowledge</td>
<td>Access to concepts, theories or competencies that enables the development and update of processes and methods</td>
<td>Exchange of knowledge; Development of knowledge; New forms of thinking; To have more direct contact with the real world; To have a more practical education</td>
</tr>
<tr>
<td>F2</td>
<td>Skilled human resources</td>
<td>Access to trained human capital that has the required competencies and skills for a specific role</td>
<td>Stimulate the students to enter in the market</td>
</tr>
<tr>
<td>F3</td>
<td>Profitability</td>
<td>Processes or activities that help to develop an entity and also to expand its profit</td>
<td>Form to finance the University activity; Putting the students in the market with a job; To get the students close to the companies</td>
</tr>
<tr>
<td>F4</td>
<td>Innovation</td>
<td>To have access to methods and competencies that help to create value and differentiation into a product, service or process that may or may not already exist</td>
<td>Development of technologies; New ideas; Development of products; Creation of spin-offs</td>
</tr>
<tr>
<td>F5</td>
<td>Brand awareness</td>
<td>Actions that allow the promotion of an entity’s name and activity</td>
<td>More interest for students to study at the University; Better ranking</td>
</tr>
<tr>
<td>F6</td>
<td>R&amp;D</td>
<td>Research activities of an entity that can be improved by having access to certain competencies and methods that are easier to reach using partnerships between two or more entities</td>
<td>Access to real and practical cases to study and investigate; Opportunity to put in practice their projects</td>
</tr>
</tbody>
</table>

Table 9 - Content Analysis of the advantages of the Cooperation for Universities by Institutional Entities
Difficulties of the Cooperation between Universities and Companies

The difficulties of the Cooperation between Universities and Companies are a dimension that presents almost all the variables identified in the Companies’ interviews. In this sense the difficulties mentioned by the Institutional Entities that were also stated by the Companies were: “From theory to practice” (F7); “Different working methods” (F8); “Bureaucracy” (F9); “Communication” (F10); and “Lack of culture” (F12). The difficulty “University projects” (F11) was not pointed by the Institutional Entities, because all of them have shown that these projects were working well and were not a barrier to the Cooperation. Thereby, “From theory to practice” (F7) was a barrier mentioned by the Institutional Entities, which the only reason that they referred was that the research of the University is very fundamental. Another difficulty pointed was “Different working methods” (F8), which the Institutional Entities’ arguments were very similar to the ones given by the Companies, that is regarding the difference that exists between them concerning the objectives, expectations, timings, methods of working, which cannot achieve a middle term. The form that the University’s professors are motivated is also referred, demonstrating that they are very linked to the fundamental research and to publish it:

TTO2: “The University is most of its professors and PhD that only make theoretical and laboratory research, and the research for Companies goes beyond this.”

UNIV3: “Universities have higher and optimist expectations regarding the valorisation of a knowledge or a technology.”

Moreover, “Bureaucracy” (F9) is mentioned and is related more to the Intellectual Property Rights, which means that when Universities and Companies are cooperating in a specific R&D project that can develop a new product or idea, in the end, sometimes, both of them want to keep the rights of it and this can be a barrier when it is not decided since the beginning. Besides this, the excessive bureaucracy is also pointed to the Portugal national system that creates barriers to create Interface institutes, that in the Institutional Entities’ optic are a form to promote the Cooperation between Universities and Companies:

TTO2: “One of the reasons for the gap between University and Companies relationship is the limitation of our system that does not allow to create skilled structures that are directed to this Cooperation inside the University.”
Regarding the “Communication” (F10) variable, the Institutional Entities argued that the contact is not very fluid with PME’s Companies:

UNIV3: “When we are working for small and medium Companies, most of these Companies does not have an R&D department and, so they do not have a lot of trained human capital with advanced qualifications. This turns the dialogue very complex.”

UNIV5: “Our economic network is mostly constituted by small and medium Companies that have their objectives well defined and that most of the times do not have the necessary resources to lead with other people, besides their suppliers and clients, and to invest in projects with big uncertainty and not an immediate return. So, they do not have the required conditions and do not give the priority to work in those projects, and this brings difficulties to our work.”

The last variable mentioned in the table below is “Lack of culture” (F12), like in Companies’ interviews, Institutional Entities identified that in some Universities and Companies is missing the motivation and values to perform this Cooperation. However, some of the opinions are divergent:

UNIV5: “The Companies have not yet identified the opportunity and advantages that they can have when working in collaboration with the Universities.”

TTO3: “Most of the time, Companies know that if they want to be one step ahead of their competitors, they need to have the collaboration of Universities in R&D projects.”
Means of achieving Innovation

In the Institutional Entities’ interviews, as it was said before, it was possible to identify the dimension of “Means of achieving Innovation”. Also, the variables found were the same as the ones found in the Companies’ interviews: “Knowledge” (F1); “R&D” (F6); “Soft-skills” (F13); “University” (F14); and “Company resources” (F15). In this sense, the variable “Knowledge” (F1) comes in the form of being updated on what already exists and be able to identify the problem. “R&D” (F6) variable refers to the constitution of start-ups:

TTO2: “It is important to have a cluster of start-ups because it creates a dynamic around the University, showing that it does not only teach and investigates.”

“Soft-skills” (F13) is a variable that Institutional Entities presented the same arguments as Companies, which refers to the competencies of the human capital. Furthermore, having a partnership with the University (F14) is also pointed and the opinions are the same as the Companies, which is working and having trained human capital by University is a form to reach Innovation:

<table>
<thead>
<tr>
<th>Fi</th>
<th>Fi Variable</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>F7</td>
<td>From theory to practice</td>
<td>The contrast between the University teaching method (theoretical) and the Companies’ requirements for University (practical)</td>
<td>University Research is too fundamental</td>
</tr>
<tr>
<td>F8</td>
<td>Different working methods</td>
<td>The opposition between the form of working between Universities and Companies regarding objectives, strategies, and decisions</td>
<td>Different objectives; Different timings; Expectative management; Companies do not understand the real value of the technologies developed by the Universities; Most of the Universities do not have the process of technology transfer to the Companies professionalized</td>
</tr>
<tr>
<td>F9</td>
<td>Bureaucracy</td>
<td>Amount of paperwork or legislation that need to be filled and fulfilled regarding some activity</td>
<td>Intellectual property rights; Exploration Rights; Limitation of Portugal’s Educational System</td>
</tr>
<tr>
<td>F10</td>
<td>Communication</td>
<td>Weak continuous contact between the entities that sometimes can lead to their distance or omission of some relevant aspects</td>
<td>PMEs obstacles</td>
</tr>
<tr>
<td>F12</td>
<td>Lack of culture</td>
<td>University and Companies’ culture that is not motivated and addressed to perform a partnership between them</td>
<td>Lack of time by Companies to invest in this relationship; Some professors show some resistance to do these partnerships; Lack of time by Universities to invest in this relationship</td>
</tr>
</tbody>
</table>

*Table 10 - Content Analysis of the difficulties of the Cooperation by Institutional Entities*
UNIV5: “A necessary condition is to collaborate with UNIV5. At this moment, we are aware that most of the solutions require knowledge. So, solutions with added value, differentiators, need to have sophisticated knowledge and technology and, UNIV5 can give a contribution to that because it is in that area that we move.”

Finally, the last-mentioned variable was “Company resources” (F15), which Institutional Entities also referred as all the assets that a Company can have that can contribute to reach Innovation:

UNIV2: “Open to new and that tolerates the error and that allows the conflict of ideas”

<table>
<thead>
<tr>
<th>Fi</th>
<th>Fi Variable</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Knowledge</td>
<td>Access to concepts, theories or competencies that enables the development and update of processes and methods</td>
<td>Identification the problem that needs to be solved; Knowing what already exists</td>
</tr>
<tr>
<td>F6</td>
<td>R&amp;D</td>
<td>Research activities of an entity that can be improved by having access to certain competencies and methods that are easier to reach using partnerships between two or more entities</td>
<td>Clusters of startups</td>
</tr>
<tr>
<td>F13</td>
<td>Soft-skills</td>
<td>Group of personal competencies that are perceived as drivers of Innovation</td>
<td>Resilience; Entrepreneurial spirit; Luck; Creativity</td>
</tr>
<tr>
<td>F14</td>
<td>University</td>
<td>Access to a cooperation with the University and human capital trained by it</td>
<td>Employing qualified professionals; Partnership with the University; Change the career status of a professor</td>
</tr>
<tr>
<td>F15</td>
<td>Company Resources</td>
<td>Group of values, resources, strategies, and activities that a Company can obtain to increase its performance</td>
<td>Company Culture; Market research; Equipment; Capital of risk</td>
</tr>
</tbody>
</table>

Table 11 - Content Analysis of the means of achieving Innovation by Institutional Entities

5.2. Results

5.2.1. Results Analysis

After the detailed analysis made of the interviews’ answers of the participants, it was conducted an analysis of the results of them to understand the relevance of each dimension’s variable in each participant segmentation. This result analysis will enable identify which factors influence, positively or negatively, the Cooperation between Universities and Companies, by distinguishing which are the most mentioned variables by Companies and Institutional Entities, according to each segment.

The first dimension that is going to be analysed in the interviews is the advantages of the Cooperation for Companies. In the table below, it is possible to verify how many
Companies and Institutional Entities for each of their segment mentioned each variable, which means, each advantage. Hence, the advantages that were more stated by Companies were Innovation, Brand awareness, and Knowledge, where all the Micro Companies pointed Innovation, for Small Companies was Brand awareness, for Medium Companies was Innovation (12 out of 14 Medium Companies), and for Big Companies, Knowledge was the most cited advantage (14 out of 17 Big Companies). It is important to notice that the variable “Profitability” was the least mentioned by Companies. Regarding the Institutional Entities’ answers, Knowledge was also the most mentioned advantage, which 4 out of 5 Universities pointed out as an advantage, and, like Companies’ point of view, “Profitability” was the advantage that was least stated.

The next dimension that is going to be studied is the advantages of the Cooperation between Universities and Companies for Universities. The same process was done, and in the following table, it is possible to observe what advantages for Universities were most considered by each group of participants. Thus, concerning the Companies’ interviews, this variable had few answers as 22 of the 41 Companies interviewed did not present any advantage for the Universities. Nonetheless, gathering the advantages given by the rest of the Companies, it is possible to conclude that the possibility to improve R&D was the benefit for Universities most stated by Companies. On the other side, gathering all the advantages given by Institutional Entities, it can be concluded that Innovation was the advantage most mentioned by them. However, looking more detailed for the data, TTO entities pointed more R&D as an advantage and all Universities interviewed considered Knowledge and Innovation an advantage.

Table 12 - Comparison of the results of the Institutional entities with those of the Companies of the dimension “Advantages of the Cooperation for the Companies”
The third dimension that is going to be explored is the difficulties of the Cooperation. Looking into the Companies' answers, there are three most mentioned difficulties: From theory to practice; Different working methods; and Communication. The difficulty “Bureaucracy” was only referred by three Companies. Also, like Companies, for Institutional Entities, the difficulty “Different working methods” was the most enumerated, with 6 out of 9 institutions with this opinion.

<table>
<thead>
<tr>
<th>Difficulties</th>
<th>Micro</th>
<th>Small</th>
<th>Medium</th>
<th>Big</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory vs. Practice</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Different working methods</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Bureaucracy</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Communication</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>University’s projects</td>
<td>1</td>
<td>-</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Lack of culture</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Difficulties</th>
<th>TTO</th>
<th>University</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory vs. Practice</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Different working methods</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Bureaucracy</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Communication</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Lack of culture</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

The following dimension is Means of achieving Innovation. In the Companies’ interviews the variables most referred were “Company Resources” and “Knowledge” and the less one was “R&D”. In fact, 13 out of 17 Big Companies have considered “Company Resources” as a form to reach Innovation. Furthermore, Institutional Entities have agreed with Companies in this dimension, as “Company Resources” was also the most mentioned variable, 6 out of 9 Institutional entities, and “R&D” was the less one.

<table>
<thead>
<tr>
<th>Means of achieving Innovation</th>
<th>Micro</th>
<th>Small</th>
<th>Medium</th>
<th>Big</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Soft-skills</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>University</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Company Resources</td>
<td>2</td>
<td>3</td>
<td>8</td>
<td>13</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Means of achieving Innovation</th>
<th>TTO</th>
<th>University</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Soft-skills</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>University</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Company Resources</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 13 - Comparison of the results of the Institutional entities with those of the Companies of the dimension “Advantages of the Cooperation for the Universities”

Table 14 - Comparison of the results of the Institutional entities with those of the Companies of the dimension “Difficulties of the Cooperation”

Table 15 - Comparison of the results of the Institutional entities with those of the Companies of the dimension “Means of achieving Innovation”
The last dimension that is going to be analysed is the Means to invest in Artificial Intelligence. In the table below, it is possible to verify that the variable “Company Resources” is, like in the dimension before, the most stated one by the Companies. Moreover, “University” is also a very considered form to invest in Artificial Intelligence. It is important to notice that 4 out of 5 Small Companies considered in this dimension the variable “University”.

<table>
<thead>
<tr>
<th>Means to invest on Artificial Intelligence</th>
<th>Company Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Micro</td>
</tr>
<tr>
<td>Knowledge</td>
<td>1</td>
</tr>
<tr>
<td>Innovation</td>
<td>1</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>1</td>
</tr>
<tr>
<td>University</td>
<td>-</td>
</tr>
<tr>
<td>Company Resources</td>
<td>3</td>
</tr>
<tr>
<td>Did not answer</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 16 - Comparison of the results of the Institutional entities with those of the Companies of the dimension "Means to invest in Artificial Intelligence"

5.2.2. Factors that most influence the Cooperation between Universities and Companies

Once the content and results of the interviews are analysed, it is possible to identify which factors, according to the 50 participants of the study, are influencing more the Cooperation between Universities and Companies. Regarding the positive factors, Companies have defended that this Cooperation is important due to five factors: Knowledge; Innovation; Brand awareness; R&D; and Artificial Intelligence. In this sense, Companies argued that cooperating with Universities enables access to more fresh, new, and updated knowledge and it is a form to have access to resources and methods that help to innovate. Moreover, this relationship allows the promotion of the Company’s brand and activity and also to improve the R&D projects of the Company, by having the help of the University researchers and resources. The last factor identified was Artificial Intelligence. In most of the Companies’ interviews, the participants agreed that Artificial Intelligence would be the future or part of it of the entrepreneurial world, that would be present in the Company’s business.

MED11: “I think that Artificial Intelligence will be the future of the entrepreneurial world and, without any doubts, that in the next years will be present in everything that we do and Companies which do not adapt, will fall behind.”
BIG10: “Yes, it will be the future and it is something that we need to accept and adapt. We cannot lose the boat, because it is something that it is in at advanced level and Companies that do not bet on it, will suffer the consequences and will lose competitiveness.”

Also, at the same time, most of them considered that having a partnership with the University was a form to invest in Artificial Intelligence. This lead to a conclusion, according to the Companies interviewed, that if Artificial Intelligence is becoming important to the Company’s business and if “University” was considered a form to invest in it, then Artificial Intelligence is an influencing factor of this relationship. In this sense, it is possible to verify that four of the factors mentioned are related to each other, since by having access to knowledge, the R&D of a Company improves by receiving new concepts and new technologies. This will impact Innovation, that depends on the research and knowledge acquired, and, finally, by having knowledge, investing in R&D and incrementing Innovation, the concept of Artificial Intelligence, considered by Reim et al. (2020) a disruptive innovation, can be better implemented in a Company’s business.

![Figure 6 - Relation between factors identified by Companies](image)

Regarding the Institutional Entities’ positive factors, curiously, they pointed out the same three ones: Knowledge; Innovation; and R&D. Hence, both participant entities (Companies and Institutional Entities) agreed on the same factors that positively influence the Cooperation between Universities and Companies. In addition, it can be noted that the variable Knowledge is the origin of the consequent factors that were considered an influence of the Cooperation. Hadad (2017) has demonstrated that the use of knowledge is a form to reach competitiveness and growth in a Company’s business, that also helps to boost the Innovation. Hitting at the term, it was a concept very stated in most of the interviews, showing that, the general opinion is that Companies look at Universities as a source of knowledge, in the form of concepts, theories, technologies, or human resources, which can be applied in their businesses. Theses opinions are in line with the study of Ankrah and Al-Tabbaa (2015) which stated that the base of the Cooperation between Universities and Companies lies on the transfer of knowledge, which is a factor that promotes the boost of
Innovation. Thus, in the Institutional Entities’ interviews, all the participants considered academic and scientific knowledge as one of the main drivers of Innovation.

TTO2: “The challenges of our time require a degree of academic knowledge and Portugal only can win competitiveness and have more technology when investing in know-how, in academic knowledge.”

UNIV3: “The academic and scientific knowledge are the main drivers of Innovation, not just because of the knowledge itself, but also because of the human capital that have absorbed that knowledge. It is, without any doubts, fundamental.”

On the other side, Universities look at Companies, as a form to have access to more applicability of their knowledge and, consequently to improve their R&D by having access to Companies’ resources and their real cases to investigate. Gathering these aspects, Universities can also develop new technologies or products and create spin-off Companies, which an example of that was seven of the Companies interviewed for this study that started as University spin-offs:

MIC1: “The Company has born from the activity of a University professor, from an academic project that then was transferred for the entrepreneurial market.”

SMA1: “We were a research group inside of the University that started research the core business of the Company, and the Cooperation with the University was essential for the creation of the Company.”

Concerning the factors that negatively influence the Cooperation between Universities and Companies, the Companies interviewed have considered three factors: From theory to practice; Different Working methods; and Communication. Thus, Companies argued that University teaching methods should be updated and become less theoretical and more adapted to the necessities of the labour market. Additionally, one of the big barriers of the Cooperation is the difference that exists between both entities regarding objectives, timings, and expectations. Universities work for the long-term and have the objective to publish their findings whereas Companies need the results for the short-term and are not interested in publishing but in commercialize the idea, and sometimes this generates a barrier because the interests are not the same. Moreover, another factor that negatively influences this relationship and that is inherent to the others is Communication. In fact, every problem that each entity referred to is, in its nature, a problem of Communication, because it is not fluid and continuous throughout the time that the Cooperation exists. By having weak contact,
not trying to understand the other side, and not giving the required time to focus on the issue, the relationship between Universities and Companies cannot develop and become better.

On the other side, the factor that most influences the Cooperation between Universities and Companies by Institutional Entities is the same as one of the Companies: Different Working methods. Hence, it can be concluded that this is a negative factor considered by both entities that constitute a barrier to this Cooperation. However, if both have an open and understandable communication since the beginning of the relationship, the probability of this barrier appear would be minor. Therefore, some participants have suggested to soften this gap, by having inside the Companies an agent with an University work experience, a PhD, and Universities have someone with an entrepreneurial background to facilitate the dialogue:

UNIV4: “The big challenge is to put two institutions with different mindsets, different objectives in dialogue. And for that happens, it is needed that inside the Companies people that came from the academic world and it is needed inside the University people that came from a Company.”

BIG7: “The relationship of our Company with Universities is getting better since we have dedicated a group of people who serve as interpreters between the University and the Company. I think that is the solution: it needs to have a single point of contact that understands the needs of the other entity.”
6. Conclusions

The study presented comes to contribute to the understanding the Cooperation between Universities and Companies in Portugal, based on the perspectives of Companies and Portuguese Institutional Entities. Through the analysis of the interviews made to Companies and Institutional Entities, it was possible to identify which factors are influencing, positively or negatively, the execution of this Cooperation.

This investigation has allowed understanding the point of view of both sides of the Cooperation, which helped to find its benefits and barriers. Hence, the access to knowledge (I) is one of the main advantages considered by both entities, which is considered the source for the other factors mentioned: R&D (II); Innovation (III); and Artificial Intelligence (IV). Those four factors are seen as benefits and drivers of the Cooperation, as Companies know that by implementing Innovation and Artificial Intelligence, they can increase their competitiveness and so, they look at the Universities as a source where they can reach their desired results. On the other side, Universities benefit also by becoming nearer to the entrepreneurial world, which means having the possibility to put in practice their researches and innovations. Also, Brand awareness (V) was considered by Companies a positive factor of this relationship, which has positive effects on their business, as develops the promotion of the brand. The main negative factor mentioned by the participants was the fact of Universities and Companies have different working methods (VI) which makes it difficult to find a middle term to work and communicate. Additionally, Companies also pointed as a barrier the excessive theory in University teaching methods (VII) that complicates the adaptation of it to the labour market, claimed by them as “practical”. Moreover, they also have referred Communication (VIII) as a reason why the gap in the Cooperation exists, because in their opinion both entities do not make an effort to have a more continuous and fluided contact throughout the time that the Cooperation exists.

The literature review presented is in line with the statements of the participant’s entities and with the influencing factors found. Therefore, it has agreed with the importance of the Cooperation for the performance of the Company and the economic development of the country. In this sense, it is expected that both Universities and Companies start to be more open to each other since the first moment to facilitate the communication and the understanding of the objectives, expectations, and methods of working of each. An idea to facilitate this process, besides the change or facilitation of Portugal legislation regarding the
creation of interface institutes, was to have to work in each entity a person from the other side. Thus, Universities would have someone from the Companies working with them, and Companies would have someone from the University working with them, and this process would facilitate the dialogue between the entities, as both would start talking in the same “language” and this would help to improve the Cooperation.

6.1. Theoretical Contributions

This research has allowed to identify which factors, based on the interviews made to Companies and Portuguese Institutional Entities, are influencing the Cooperation between Companies and Universities. Some of these factors were positive, which means that were considered advantages of having this relationship, and others were negative, as they were believed as a barrier for the realization of the partnership. Besides this, it is important to highlight that the conclusions of the research regarding the importance of the Cooperation and the factors that influence it are in line with the literature review, showing that although the study was based on Portuguese Universities, the opinions are not so divergent from the rest.

6.2. Practical Contributions

The realization of this research has allowed to understand the point of view of the Companies and Institutional Entities interviewed. Both entities can look to the opinions of the opposite entity and try to comprehend their side and some of their attitudes relative to some issues. Additionally, they can realize which area or mindset should be changed or improved in order to develop the Cooperation. Hence, this study stands out the importance of the existence and expansion of the Cooperation between Universities and Companies, showing that the benefits are not just for them but also for society. Both entities should try to have a more open communication to create a beneficial relationship for all the intervenient sides, not giving space for one of them to be not allowing space for one of the entities to be harmed or unwilling to repeat the Cooperation.
6.3. **Limitations of the study and future research**

This study is based on in-depth interviews made to two different entities: Companies and Institutional Entities. In this sense, one of the main limitations was the availability of the entities, as when they answered the request to participate in the study, it was difficult for them to find the required and enough time to participate in the interview. Besides, this year is being marked by a pandemic caused by COVID-19, which during some weeks has obligated Companies and Universities to close, which made it impossible to reach them during that time. Also, even when the entities have started working, the realization of the interviews needed to be made by video or phone call, which sometimes was a factor that has blocked some of their opinions and statements. Besides, the entities took some time to answer the requests to participate in the research, which made the gathering of data more time-consuming.

The number of Institutional Entities interviewed was low compared to the number of Companies interviewed, which has decreased their representation in the study and has biased some of the answers.

In future researches, the number of Companies and Institutional entities should be higher, especially the Institutional Entities, to increase the relevance of the study and the research field. Moreover, it can be interesting to interview Institutional Entities from different countries, as the comparison of the form of acting in the Cooperation between them could be helpful to find solutions or ideas to implement in Portugal. Also, as the main dimensions were already identified, the next interviews can only focus on them, avoiding making questions that are not relevant to the study and that can break the flow of the conversation. Finally, whenever it is possible, the interviews should be on-site to extract more information because it will enable to have more interaction, answers flexibility, and more empathy from both sides.
References


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Annexes

Annex 1 – Interview Scripts

Interview Script for Companies

1. What type of relationship the Company has with Universities?
   1.1. What is the biggest advantage of having this relationship?
   1.2. Do you consider this cooperation crucial for the growth of both parties?
   1.3. Do you have any success case with this relationship?
   1.4. Do you consider a good investment the participation in University projects, like talks and job fairs?
   1.5. What are the main difficulties or challenges in this relationship?

2. Does the Company accept curricular internships? How is it managed?
   2.1. Do the interns receive any kind of training when they start working in the Company?
   2.2. Do you consider that the university students have the require knowledge to work in the Company?
   2.3. Do you consider the Exchange Programs an asset in the students’ competencies?
   2.4. In what way the students influence the mindset of the most experienced workers in the Company?

3. Does the Company participate in R&D projects with the University?
   3.1. What is the advantage of having the University as a partner in these projects?
   3.2. Does the Company have students doing thesis or R&D projects inside the Company? What is the advantage?

4. What is Innovation?
   4.1. What is necessary to reach Innovation?
   4.2. Do you consider fundamental the continuous investment in Innovation? What Company’s area benefits more with this investment?

5. What is Artificial Intelligence?
5.1. How can you invest in Artificial Intelligence?
5.2. Do you consider Artificial Intelligence the future of the entrepreneurial world?

**Interview Script for Institutional Entities**

1. What type of relationship the Institutional Entity has with Companies/Universities?
   1.1. What is the biggest advantage of having this relationship?
   1.2. What University’s area has more competitive advantage?
   1.3. Do you consider this cooperation crucial for the growth of both parties?
   1.4. Does the Institutional Entity have any success case with this relationship?
   1.5. Do you consider a good investment the participation of Companies in University projects, like talks and job fairs?
   1.6. What are the main difficulties or challenges in this relationship?

2. Do you consider necessary that curricular interns have a training when they start working in a Company?
   2.1. Do you consider that the university students have the require knowledge to work in the Company?
   2.2. Do you consider the Exchange Programs an asset in the students’ competencies?

3. What is the advantage of having Companies participating in your R&D projects?
   3.1. What is the advantage for Companies having the University as a partner in these projects?

4. What is Innovation?
   4.1. What is necessary to reach Innovation?
   4.2. Do you consider that academic and scientific knowledge are the main pushers of Innovation?

5. What is Artificial Intelligence?
   5.1. Do you consider Artificial Intelligence the future of the entrepreneurial world?
Annex 2 – Categorization of the EU Companies

<table>
<thead>
<tr>
<th>Company Dimension</th>
<th>Number of workers</th>
<th>Business Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro</td>
<td>Less than 10</td>
<td>Less than 2 million</td>
</tr>
<tr>
<td>Small</td>
<td>Between 10 and 49</td>
<td>Less than 10 million</td>
</tr>
<tr>
<td>Medium</td>
<td>Between 50 and 250</td>
<td>Less than 50 million</td>
</tr>
<tr>
<td>Big</td>
<td>More than 250</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 17 - Categorization of the EU Companies adapted from Eur-Lex

Annex 3 - Higher Education Institutions in Portugal in 2020

<table>
<thead>
<tr>
<th>Number of Institutions</th>
<th>Number of Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>34</td>
</tr>
<tr>
<td>Private</td>
<td>71</td>
</tr>
<tr>
<td>Total</td>
<td>108</td>
</tr>
</tbody>
</table>

Table 18 - Number of Institutions and courses in Higher Education in Portugal in 2020 adapted from DGES

Annex 4 – Evolution of the number of students attending Higher Education in Portugal from 1978 to 2019

Figure 7 - Evolution of the number of students attending Higher Education in Portugal adapted from PORDATA
Annex 5 - Number of PhD done in Portugal or in a Foreign country recognized by Portuguese Universities from 1970 to 2015

![Figure 8 - Number of PhD done in Portugal or in a Foreign country recognized by Portuguese Universities adapted from PORDATA](image)

Annex 6 - Number of R&D investigators in Companies and in Universities in Portugal from 1982 to 2019

![Figure 9 - Number of R&D investigators in Companies and in Universities in Portugal adapted from PORDATA](image)
Annex 7 – Number of Scientific publications in Portugal from 1981 to 2018

Figure 10 - Number of Scientific publications in Portugal adapted from PORDATA