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Foreign Subsidiaries and Innovation: Evidence from Portugal

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Foreign Subsidiaries and Innovation: Evidence from Portugal

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Resumo

A literatura em investimento direto estrangeiro em Portugal ainda não prestou atenção suficiente á importância da inovação local que estas subsidiárias estão a realizar. Para estudar este fenómeno, uma lista de subsidiárias estrangeiras localizadas em Portugal foi cruzada com informação sobre programas de financiamento públicos que suportam investigação e desenvolvimento (I&D). Um total combinado de 132 empresas (total de 262 projectos, 929.4 milhões de € de despesas elegíveis e 377.8 milhões de € em incentivos) tinham projectos aprovados. Um estudo de caso foi realizado de forma a podermos perceber de que forma uma subsidiária (Bosch Car Multimedia) iniciou processos de criação e transferência de conhecimento com parceiros locais (Universidade do Minho), assim como perceber quais os impactos económicos que esta interacção teve na economia do País. A capacidade de absorção, o stock de conhecimento de cada parceiro assim como o seu historial de interacção contribuiu para a formação da parceria. O túnel de inovação da subsidiária associado aos inputs do parceiro local foram factores decisivos na identificação, análise e validação das ideias do projecto. Recursos humanos com a visão ideal, um modelo de governação adequado, a proximidade geográfica que permitiu comunicação frequente, e políticas fiscais foram factores chaves no sucesso deste projecto de inovação indústria-universidade. A economia Portuguesa é beneficiada, a taxa de exportações aumentou, o talento das universidades é retido localmente, os níveis de empregabilidade aumentam e a inovação criada permite dar uma imagem positiva do País como uma localização ideal para actividades de I&D.

Palavras-chave: Multinacionais; Subsidiárias Estrangeiras; País de acolhimento; Inovação; Criação e transferência de conhecimento local; Impacto Económico.

Abstract

The literature review of foreign direct investment (FDI) in Portugal has not yet paid much attention to the importance of the innovation being created locally by foreign subsidiaries. To study this phenomenon, a list of foreign subsidiaries located in Portugal was cross-matched with public programs that support R&D activities. A combined total of 132 subsidiaries (total of 262 projects, with 929.4 million € of elegible expenses and 377.8 million € of incentives) had projects approved. A case-study was performed to understand how one subsidiary (Bosch Car Multimedia) has engaged in knowledge creation and transfer processes with local partners (University of Minho), as well as understanding the impact of this relationship on the Portuguese economy. The absorptive capacity, the knowledge stock of each partner and their history of interactions contributed to the establishment of the partnership. The innovation funnel of the company, together with inputs from the local partner, were decisive factors in the identification, analysis and validation of the project ideas. Having human resources with the ideal mind-set, an adequate governance model, along with the geographical proximity, that enabled frequent and broad-band communication, and local fiscal policies were key factors towards the success of an industry-university innovation project. The Portuguese economy benefited, exports have increased, fresh talent from universities is retained locally, local levels of employment rose and innovation was created leading to a positive image of the country as a prime R&D location.

Keywords: Multinationals; Foreign subsidiaries; Host countries; Innovation; Local knowledge creation and transfer; Economic impact.

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Bosch Car Multimedia Braga	BrgP
European Foundation for Quality Management	EFQM
Foreign Direct investment	FDI
Gross value added	GVA
Headquarters	HQ
Human-Machine Interface	HMI
National Statistics Institute	INE
Internet-of-things	IoT
Multinational Corporations	MNCs
Micro and Small and Medium enterprises	SMEs
National Innovation Agency	ANI
New product developments	NPD
Portugal Global - Trade & Investment Agency	AICEP
Project Management Officers	PMOs
Research and development	R&D
Resource-based view	RBV
Research questions	RQ
Statistics division of education and science	DGEEC
Total Productive Maintenance	TPM
University of Minho	UMinho
United Nations Conference on Trade and Development	UNCTAD

Chapter 1
Introduction

According to statistics Portugal (INE), there were 6.239 foreign subsidiaries in Portugal in 2015 (down from 6.338 in 2014). From these subsidiaries, 75% have their headquarters in European countries (mainly Spain, France and Germany) and less than a third (28.3% in 2014, 25.7% in 2015) exported products/services (Instituto Nacional de Estatística, 2016).

Innovation, flexibility and continued growth of operations have become imperatives in business strategy. New products, new processes and new markets are drivers for growth and development of businesses, regardless of activity sector, geographical region or firm size. Thus, knowledge has become one of the most important assets for organizations.

Multinational Corporations (MNCs) include one or more subsidiaries located in different countries. These foreign subsidiaries open the possibility of exchange and access to new knowledge and information, which seems to be essential in highly competitive environments. Internationalization strategies can be directed towards the pursuit of knowledge and innovation beyond what is available in the firm's home country (Maehler, Marques Curado, Ávila Pedrozo, & Pedro Pires, 2011). Different motivations lead MNCs to internationalize research and development (R&D): need to adapt products and processes to host-country markets, need to tap into knowledge centers abroad to source new technologies, recruit the best skills, monitor the activities of competitors and a quest for cost reduction are all reported in the literature.

The host countries of foreign subsidiaries may benefit from the transfer of knowledge from abroad and from the knowledge created by foreign subsidiaries located in the country: creation of high-skilled jobs; increase in the innovation output; market opening for domestic suppliers; increased competition and also knowledge and technology spillovers (Maehler et al., 2011).

The creation of knowledge is a driver of economic growth. Nevertheless, one single country is unable to produce all the knowledge required to remain competitive and to grow in a sustainable manner. Therefore, international networks of innovation are promoted to this end, involving both the home and host countries of MNCs. Inward and outward of foreign direct investment (FDI) in the internationalization of research and development (R&D) activities are two ways of creating opportunities for countries to access technologies, build value-added products and services and foster a "culture of innovation through spillovers to local firms and institutions" (UNCTAD, 2005). In Portugal, FDI accounted for more than 20% of gross fixed capital formation, both in 2014 and 2015, higher than the pre-crises level of 1,5% (2005-2007). The FDI stock as a percentage of gross domestic product is above 50% (UNCTAD, 2016).

FDI in R&D may help countries upgrading their innovation systems, industrially and technologically. This directly increases the technological capabilities of firms. A key determinant factor that allows firms to increase their technological capabilities is their absorptive capacity. In addition, it is reported in the literature that R&D linked to production, with interactions from MNCs with host country's local firms and R&D institutions (universities, research centers), leads to a greater likelihood of positive economic benefits for the host economy (UNCTAD, 2005). Joining together production capabilities with innovative R&D allows companies to create products and services that have higher impact and bring more value-added in the long-run. In addition, a

dynamic manufacturing sector is considered to be a prerequisite for an innovative and fast-growing economy. The manufacturing sector is a major source of technological progress since these firms are more likely to undertake R&D activities (Helper, Krueger, & Wial, 2012; Stöllinger et al., 2013; UNIDO, 2002). In Portugal, FDI in manufacturing account for less than 10% of total FDI stock (average 2008-2010). Foreign affiliates account for 15% of affiliates, 33% of employment and 29% of sales of affiliates of foreign MNCs in the host economy in 2009.

Firms can be considered as the key players for innovation. This innovation is complex and requires interaction with competitors, suppliers, clients but also with public institutions (connected with knowledge creation and innovation). The government should promote and foster frequent interactions and partnerships between these players. This network of relationships towards innovation is typically referred as the "national innovation system"(UNCTAD, 2005).

1.1 Motivation and Thesis outline

Research on of foreign direct investment in Portugal has not yet paid much attention to the importance of the innovation being created locally by foreign subsidiaries. Innovation processes include both the leveraging local pools of knowledge (tacit and explicit) as well as interaction with multiple stakeholders that enhance the creation of knowledge. At the same time, very few is known regarding the local implications of these innovation processes. How can the local environment benefit from the presence of foreign subsidiaries and from their interactions with local players? How can Portugal leverage the innovation generated locally by foreign subsidiaries? Little attention is being payed to the outcomes of these knowledge creation processes and how is knowledge diffused

within the subsidiaries' external and internal networks. This topic can be considered a hot topic since there is relatively few information regarding who are the foreign subsidiaries in Portugal that are actually creating and leveraging local knowledge. Simultaneously, given the current economic situation in Portugal, this topic is of extreme interest since investment is key to economic growth. Attracting more multinationals to invest in Portugal, more specifically in R&D projects, is a public policy goal.

Therefore, in this thesis, we aim at identifying the foreign subsidiaries in Portugal, how they create knowledge and how is knowledge transferred. At the same time, we want to understand how the subsidiaries interact in their internal and external networks, how they interact with the local environment and the outcomes of knowledge creation for the Portuguese economy.

The first task conducted is the identification of foreign subsidiaries located in Portugal that are creating and/or transferring knowledge. A case study is then selected aiming at answering the following research questions:

- How do foreign subsidiaries located in Portugal create and transfer knowledge?
- What are the factors that influence foreign subsidiaries knowledge creation and transfer processes?
- What are the outcomes of these processes for the Portuguese economy?

A single case study is analysed which allows us to understand in depth complex processes within a foreign subsidiary in the manufacturing industry. This approach has limitations since on its own it does not allow us to make generalizations and build theories from the studied processes. However, the case study may constitute a starting point for further research. The main reason to conduct a single case-study is the lack of information in the literature of similar studies conducted in Portugal, as well as the relative small time-frame available

to conduct this research. Therefore, this thesis aims at making a contribution to the literature on knowledge creation and transfer by subsidiaries of multinational companies and their effect on host countries.

The thesis will have the following structure: in chapter two, the relevant literature will be reviewed. A conceptual framework is presented at the end of this chapter, which will be the basis of the case study. The subsidiaries in Portugal that are creating and transferring knowledge are reported in chapter three, addressing the first task towards the case study selection. Based on this list of subsidiaries, we selected one case study. Chapter four starts with the description of the selected case study: Bosch Car Multimedia in Braga, one of the five Portuguese subsidiaries of Bosch group. It also addresses one key strategic project developed by Bosch Car Multimedia with a local partner: the HMIExcel project with University of Minho. The theoretical model developed is applied towards understanding the relationship of both partners, under the HMIExcel, towards knowledge creation and transfer. In chapter five the work developed is discussed. The answers to the research questions, the main limitations of this thesis and future research suggestions are presented in the conclusions (chapter six).

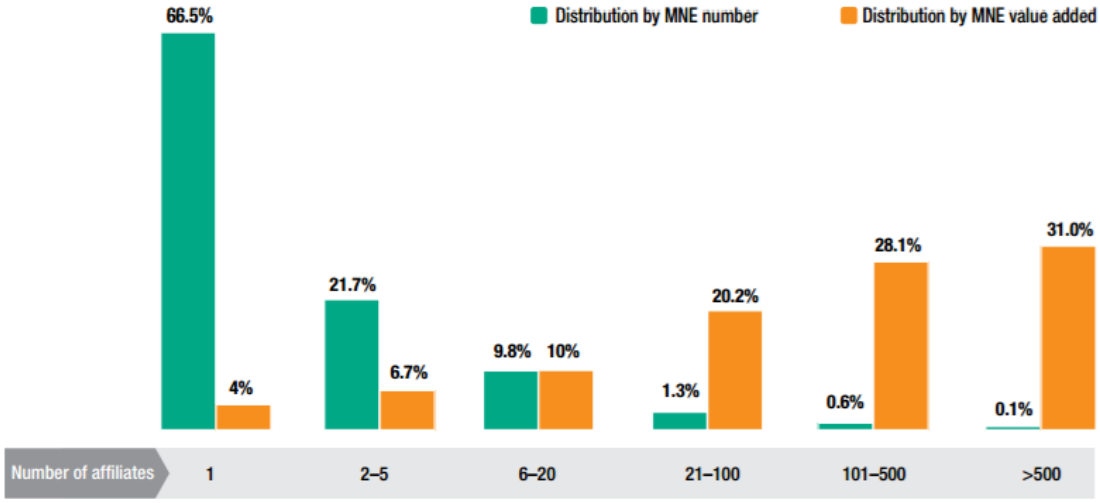
Chapter 2
State-of-art review

In this chapter, the state-of-art regarding MNC foreign subsidiary development is presented. It will focus on how subsidiaries create and transfer knowledge. The literature regarding MNC multiple embeddedness and the importance of local contexts for subsidiaries is also reviewed. Multiple examples from case-studies that answer similar research questions are analysed next. Based on this literature review, a conceptual framework that will work as the basis for this thesis is presented in the last section of this chapter.

2.1 MNCs subsidiaries development

"A foreign subsidiary is an incorporated or unincorporated enterprise in which an investor, who is resident in another economy, owns a stake that represents a lasting interest in the management of that enterprise (an equity stake of 10 per cent for an incorporated enterprise or its equivalent for an unincorporated enterprise)" (UNCTAD). Subsidiaries are operational units controlled by a parent company (defined as an enterprise that controls assets of other entities in countries other than its home country, usually by owning a certain equity capital stake), the headquarters (HQs). Foreign subsidiaries are necessarily based in a different country than the one where the HQs are located (home country). MNCs can control many subsidiaries in multiple countries (host countries). The United Nations Conference on Trade and Development (UNCTAD) reports in the latest World Investment Report (2016) the distribution of MNCs by size class of number of affiliates. This information is shown in Figure 1. It can be perceived that there is a very large group of MNC with few

subsidiaries directly and fully owned by the parent company. Simultaneously, there is a very small group of MNCs with a large number of foreign subsidiaries.



Source: ©UNCTAD analysis based on Orbis data (November 2015); adapted and updated from Altomonte and Rungi (2013).
Note: Based on a sample of 320,000 MNEs with at least one affiliate abroad: total affiliates are 1,116,000, of which 774,000 foreign. Estimates for value added are based on 220,000 affiliates and unconsolidated financial accounts. The perimeter of 320,000 MNEs is a globally representative universe resulting from a massive extraction of firm-level information from Orbis (based on an initial sample of 22 million firms reporting ownership information) after several computational and cleaning steps. The identification of the MNE corporate boundaries, and the computational effort of mapping a total of nearly 40 million ownership links, uses the algorithmic approach developed in Rungi et al. (2016).

Figure 1 UNCTAD Distribution of MNCs by size class (per cent %). UNCTAD World Investment Report 2016, Pages 134-135

Foreign subsidiaries may be constituted via different processes: greenfield or acquisition; fully-owned by the parent company or via a joint venture process with other companies or individuals (J. Birkinshaw, Hood, & Jonsson, 1998). Between the subsidiaries and the headquarters, multiple interactions occur at different levels: at a resource level (both in terms of capital, technology and human resources), products and services and in terms of information and knowledge. Subsidiaries may contribute to the resource base of global operations by leveraging local research and development (Yang, Mudambi, & Meyer, 2008).

MNCs typically use their subsidiaries abroad mainly with the purpose of locally adapting products to address customer needs. The integration-responsiveness framework enables the identification of 4 types of strategies and organizational structure (Ghoshal, 1987).

The subsidiaries play different roles in these 4 strategies and organizational types:

- Multinational / multi-domestic decentralized corporation with strong local influence (typically financial flows from HQ);
- Global centralized corporation with subsidiaries typically acting as mere sales pipelines;
- International corporation where there is exchange and knowledge leverage between HQ and the subsidiaries;
- And finally, a transnational model that combines the previous three approaches.

The multi-domestic, global and international types are homogeneous since they play a specific role: the multi-domestic are replications of the subsidiary parent company characterized by financial flows, being self-sufficient and decentralized; the international role looks at making local adjustments to the products/services created in the HQ; and the global role acts as distributions channels for the parent company. Conversely, the transnational role, typically organized as a differentiated network, is where the subsidiaries are specialized and play different roles, enabling value creation for the network. This type of multinational explains the need to understand the different roles that subsidiaries can play and their development within the internal and external network (Ghoshal & Bartlett, 1990).

Recently, subsidiaries have gained higher importance as it was acknowledged they were able to create knowledge and contribute to the competitive advantage of the parent company and of the host country. Subsidiaries could have different roles within the MNCs. At the same time, it enhances the importance of the local context for the competitiveness of MNCs (J. Birkinshaw & Hood, 1998)(Schmid, Dzedek, & Lehrer, 2014).

Subsidiary development is an important phenomenon since the host country economy may benefit from the contributions of these companies in the development of the economy. The foreign direct investment (FDI) that occurs may lead to technological spillovers and may help in the creation of linkages between the subsidiaries and their parent companies, together with local counterparts, therefore tapping into local clusters in multiple ways (Pedersen, 2006).

2.1.1 Subsidiary roles

Birkinshaw and Hood (1998b) were pioneers in the topic of "subsidiary development". Their theory included HQ-subsidiary relationships, the subsidiary roles and subsidiary development. Initially their theory assumed a hierarchical nature where the MNCs would have full control over the subsidiary and therefore their development process would always be dependent of the HQ's approval (J. Birkinshaw et al., 1998).

Birkinshaw and Hood (1998b) made several key contributions to the literature in this field of research. Their line of work divided subsidiaries initiative into two main categories: external initiatives (identification of opportunities outside the home country, with local interaction in the host country) and internal initiatives, where the network of the MNC was responsible for the emergence of new interaction between multiple subsidiary managers. Within each category, secondary classifications were proposed by (J. Birkinshaw et al., 1998; Schmid et al., 2014).

Depending on the type of subsidiary, their role within the MNC network may differ. Therefore, subsidiaries evolve with role changes. The role of the subsidiary and its long term evolution is inherently related to its specialised resource development, as reported in the study of Birkinshaw & Hood, 1997. This assumption is directly related with the network model of the MNC proposed by

Ghoshal & Bartlett (1990) which addresses the level of autonomy that the subsidiaries may have in relation to the headquarters. The network model also introduced key assumptions such as that subsidiaries profile is dependent on their network relationships with external and internal members of the MNC's network (including customers and suppliers).

Different authors have contributed to the characterization of subsidiary roles depending on different dimensions (i.e. product and market scopes, knowledge, resources, capabilities). Figure 2 presents an overview of subsidiary role typologies per author (Cavanagh & Freeman, 2012).

Source	Dimensions	Subsidiary types
White and Poynter (1984)	Product scope Market scope	Miniature Replica (Adopter) Miniature Replica (Innovator) Product Specialist Strategic Independent
Bartlett and Ghoshal (1986)	Capabilities Strategic importance	Black Holes Local Implementers Contributors Strategic Leaders
Jarillo and Martinez (1990)	Integration Responsiveness	Receptive Autonomous Active
Gupta and Govindarajan (1991)	Knowledge outflows Knowledge inflows	Local Innovator Implementers Global Innovator Integrated Player
Birkinshaw and Morrison (1995)	Derived from literature	Local Implementer Specialised Contributor World Mandate
Taggart (1997)	Autonomy Decision-making	Partner Collaborator Militant Vassal
Randoy and Li (1998)	Resource inflows Resource outflows	Resource User Resource Independent Resource Provider Networker

Figure 2 Subsidiaries roles typologies (Cavanagh & Freeman, 2012)

Similar to the line of thought of Bartlett and Ghoshal, the resource-based view (RBV) theory assumes that resource development could occur at the subsidiary level, despite the traditional view that this development would only occur at the headquarters. This theory is based on the fact that, given resources with certain characteristics (i.e. valuable, rare, in-imitable and non-substitutable), they can be the source of competitive advantages and therefore the subsidiary could evolve from this foundation. Authors such as (Andersson & Forsgren, 1996) seek to find

other relationships between these theories (network model and the resource-based view). They concluded that the subsidiaries' network relationships were indeed key resources that could be used to further develop the subsidiaries role within the MNC.

These multiple theories led to the creation of subsidiary roles frameworks based on the works of the previous mentioned authors. Three main types of subsidiary roles were defined by J. M. Birkinshaw & Morrison (1995): *local implementer, specialized contributor* and *world mandate* (Cavanagh & Freeman, 2012). The local implementers were focused on local market adaptation, whereas the specialized contributors were independent units within the MNE with specific functions. Finally the world mandate subsidiaries focused both on maximization of local response as well as being globally integrated, with operation and strategic autonomy.

A different classification was later proposed by Cavanagh and Freeman (2012) in their review paper, where four types classes of subsidiaries contributory roles have been defined (Raziq, Perry, & Battisti, 2014).

The classification is presented in Figure 3.

Contributory role	Reason for selection and application within this study
Implementer (Gupta & Govindarajan, 1991)	Originally described a subsidiary characterised by high knowledge inflows and low knowledge outflows. This implies that this type of subsidiary relies on parent company resources, rather than developing its own, and is thus used in this study to describe subsidiaries that exhibit no or very little resource development. Such subsidiaries may be viewed as 'competence-exploiting' (Cantwell & Mudambi, 2005).
Local Innovator (Gupta & Govindarajan, 1991)	Like the Implementer, this type of subsidiary features low knowledge outflows, which indicates a low level of resource development. However, such subsidiaries also exhibit low levels of knowledge inflows, which signifies that this type of subsidiary does not rely on parent company resources and thus must have developed some resources. Therefore, this role is applied in this study to describe subsidiaries that have typically undertaken relatively minor levels (as opposed to none) of resource development. These subsidiaries have gone beyond simply ' competence-exploiting' and are now beginning to assume 'competence-creating' mandates (Cantwell & Mudambi, 2005).
Specialised Contributor (Birkinshaw & Morrison, 1995)	Originally employed to describe a subsidiary that has developed considerable expertise in specific functions or activities, and performs a narrow set of value activities. As such, it is translated in the context of this study to represent a subsidiary with specialised resources in a narrowly defined set of value activities, such as the assembly of a particular vehicle model.
Centre of Excellence (Andersson & Forsgren, 2000; Frost et al., 2002; Holm & Pedersen, 2000; Roth & Morrison, 1992)	Originally used to describe a subsidiary with expertise in a major activity upon which the rest of the organisation may draw upon. In the context of this study it is more precise, describing a subsidiary with specialised resources in a broad set of value activities or functions, such as the entire development, production and exporting of a complete division of vehicles.

Figure 3 Four main types of subsidiaries contributory roles proposed by (Cavanagh & Freeman, 2012)

Subsidiaries have gained an emergent interest since recent research has sought to identify subsidiaries as key sources of research and development (innovation), and also as contributors towards the MNC's strategy implementation.

2.2 Subsidiaries Knowledge and Innovation

Subsidiaries innovation activities have been studied by multiple authors, including Cantwell & Mudambi, 2005. They discussed the innovation process that occurs at the subsidiary level. Two contrasting roles, competence-creating and competence-exploiting were discussed. These two contrasting roles are directly related to the knowledge creation and leverage process that can occur at the subsidiary level.

On the one hand, competence-creating indicates that knowledge is being created within the MNC network by the subsidiary. These types of subsidiaries are typically engaged in research-related production, as well as in strategic asset-seeking investment and are therefore typically labelled as contributors or centre-of-excellence subsidiaries.

On the other hand, subsidiaries that use knowledge previously developed by the headquarters are competence-exploiting, being typically less strategic, engaging in assembly-type production activities and therefore have less strategic value for the MNC (can be labelled as implementers or to some extent local innovators) (Lim, Hemmert, & Kim, 2016).

MNCs knowledge base is the foundation of the company to be competitive and innovative in multiple contexts. An example of internal knowledge development that resulted in technological breakthroughs, as well as massive market share domination, is Apple. Even though very little information is known about Apple's internal sources of knowledge flows, it can be perceived that knowledge and innovation are key (Heracleous & Papachroni, 2012).

Knowledge is a very broad concept. It includes factual and non-factual information such as know-how that typically is held by individuals and companies. Research and development activities are fundamental to understanding the importance that foreign subsidiaries have for the MNC headquarters. In the following sections, the types of knowledge and knowledge transfer mechanisms are reviewed.

2.2.1. Types of knowledge

Two important knowledge concepts can be distinguished: explicit and tacit knowledge. Explicit knowledge is typically knowledge that can be understood, written, codified, read, interpreted and can be explained without information loss while transferring it.

On the other hand, tacit knowledge is a type of knowledge that cannot be easily transmitted and learned by the same means as explicit knowledge; tacit knowledge is complex, key to organizations and harder to create, transfer and learn. Transfer of tacit knowledge requires experience through learning by doing.

Managing knowledge becomes critical for organizations. Knowledge needs to be developed, leveraged and transferred across MNCs internal network and therefore is of critical importance.

A knowledge creation framework (SECI model) was proposed by Nonaka and Konno (1998), based on a previous work by Nonaka and Takeuchi (1995). Their model is based on four key processes: socialization, externalization, combination and internalization that are analysed in two different dimensions: the level of analysis (i.e. the individual and the organization) and the type of knowledge (i.e. explicit and tacit).

Socialization is described as the capturing and dissemination of tacit knowledge. The authors emphasize the importance of physically proximity between individuals to promote interaction since that tacit knowledge is shared

between individuals. When this knowledge is shared, it is exposed to the understanding of the other individual, to his cognitive perception and interpretations of this know-how. This tacit knowledge needs to be written down (a combination of skills and know-how together with explicit information - externalization) so that it moves from the individual level to the organization level (from the tacit to the explicit), leading to the creation of databases, rules , products, services, business models or even intellectual property - combination. These interactions result, at the organizational level, in the creation of organizational routines (internalization). A schematic representation of these processes is presented in Figure 4 (Johnson, Weiss, & Veng Søberg, 2011).

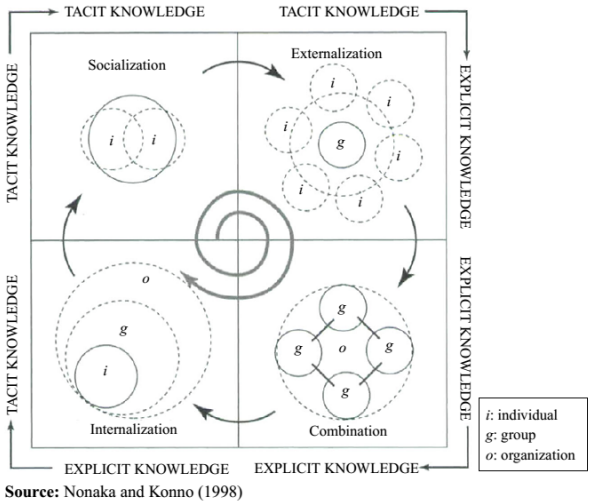


Figure 4 SECI Model (Nonaka & Takeuchi, 1995).

The SECI model is extremely useful in understanding how knowledge can be created and leveraged in order to increase MNC competitiveness. This model reflects that knowledge creation is a continuous process that requires both transfer, combination and conversion of tacit and explicit knowledge. To achieve this, users must practice, interact and learn.

2.2.2. Knowledge transfer flows

Knowledge transfer is the flow of information that occurs regularly in between two parts: between the HQ and the subsidiary ; between subsidiaries or even between a subsidiary and an external company in the host country (Johnson et al., 2011). These knowledge flows between the subsidiary's internal and external network have distinctive strategic roles, being critical for the subsidiaries to develop and leverage local specific advantages. To the same extent, subsidiary-to-parent knowledge transfer is different since typical is a vertical relationship.

Miao et al (2016) reports that the level of knowledge stock that each subsidiary has locally is a prerequisite for the knowledge transfer inside the MNC. Knowledge stock can be defined as the amount of knowledge elements that a firm has accumulated over time. This knowledge is embedded in organizational routines, technologies, employees, and other types of resources(Dierickx & Cool, 1989; Grant, 1996; Wu & Shanley, 2009). Nevertheless, this knowledge stock is typically specific to the local context, often tacit and sticky and is therefore difficult to transfer it in the internal network. Therefore, MNC management needs to have effective knowledge transfer mechanisms to ease communication between two members of the internal network. Therefore, two major factors influence knowledge transfer flows: (1) the stock of knowledge and (2) the performance and effectiveness of these transfer mechanisms. The same authors developed the theoretical framework presented in Figure 5 (Miao, Choe, & Song, 2011).

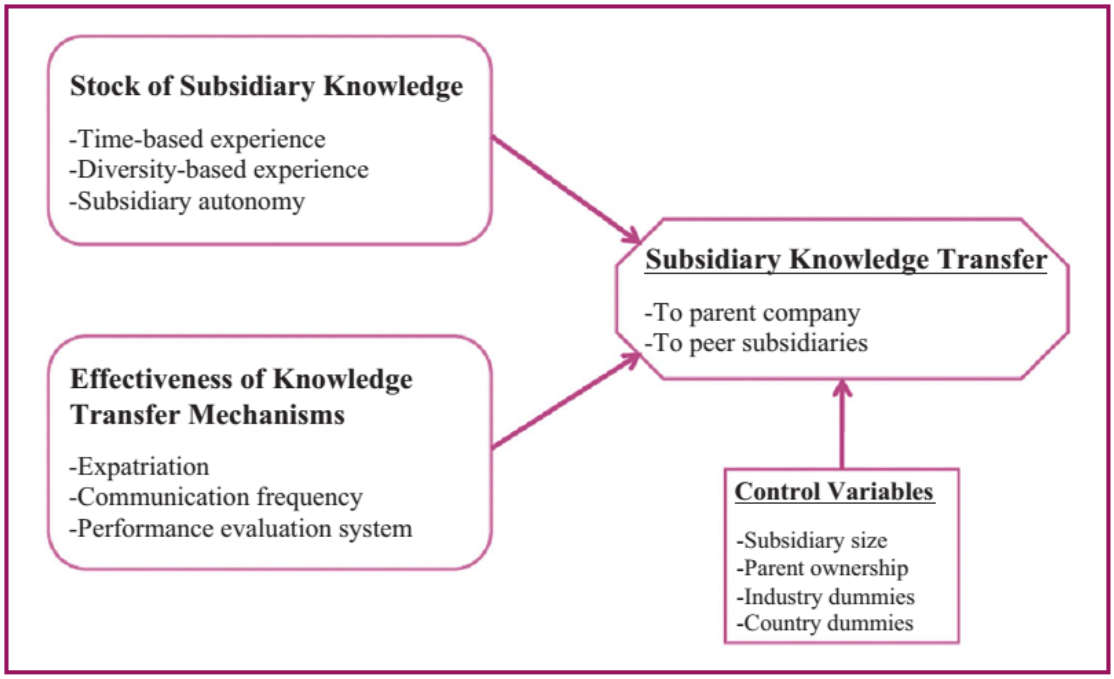


Figure 5 Subsidiary Knowledge Transfer Framework(Miao et al., 2011)

The authors evaluated whether factors such as host country experience (time and experience) and subsidiary autonomy would positively impact the subsidiary knowledge. Prior studies have reported that organizational factors contribute to the building of the knowledge stock of competence-creating subsidiaries. Subsidiaries that engage in more diverse experiences are more likely to accumulate knowledge in different areas, and therefore can be of value-added to their internal network. Subsidiary autonomy is also important since it is reported that centralized control by the headquarters typically leads to a more "pipeline"/implementer type of subsidiary (subsidiaries do not have knowledge seeking competences and do not engage in innovation practices). The opposite was also previously reported: subsidiaries with high a level of autonomy are indeed able to innovate and contribute to the MNC performance(Miao et al., 2011).

In terms of knowledge transfer mechanisms, typically there are some practices that can be implemented such as: (1) expatriation, (2) communication and finally

(3) a performance evaluation system. As reported earlier, most of the knowledge that is created at a subsidiary level is tacit and therefore the best way to transfer this knowledge is by expatriating managers and allowing the multiple subsidiaries to engage in peer-to-peer communication (by promoting formal and informal communication networks). Factors like language, culture and structural organizational factors (i.e. absorptive capacity of subsidiaries and parent company) are key when transferring inter-unit knowledge inside a MNC. Therefore, the managers are key facilitators of knowledge transfer. Managers play a key role in this process since their level of communication with the remaining partners will have a decisive role in the success the innovation being transferred among the network. The communication frequency is key to promote coordination and is a powerful mean of enhancing organizational information-processing capabilities (Miao et al., 2011). Finally, at the MNC level, the existence of a performance appraisal system that rewards transfer is extremely important for the long-term of the company since it promotes communication and provides incentives for managers to seek local innovation, to act locally and at the same time to think globally.

The authors conducted a survey over 404 firms, with a 50.3% response rate. In the end, they draw conclusions from 81 cases in analysing knowledge transfer to the parent company and 71 to peer subsidiaries (Miao et al., 2011).

Two factors explain different outcomes: knowledge transfer to the parent company is higher when the diversity of the knowledge stock is higher and the knowledge transfer to peer subsidiaries typically occurs based on the host country experience. Diversified knowledge stock is known to be more tacit and valuable and therefore it is with no surprise that it is typically transferred to the headquarters mostly due to the higher absorptive capacity of the HQ. In terms of subsidiary autonomy, the conclusions were similar: subsidiaries have much more incentives to transfer knowledge to the headquarters and therefore they

would rather do it than transferring it to the peer subsidiaries (based once again on the absorptive capacity argument). By transferring to the HQs, subsidiaries gain recognition from the parent company and over time may be given higher levels of autonomy.

In terms of the effectiveness of knowledge transfer, top management expatriation facilitates it because of the interpersonal networks that result from expatriation. An interesting conclusion is the fact that frequency of communication enhances the knowledge transfer to peer-subsidiaries but the same is not true with the parent company. This can be explained by the more informal kind of communications that tend to exist between peer-subsidiaries. Ultimately, as expected, an appraisal system emphasising knowledge sharing both between subsidiary and parent company and subsidiary and peer subsidiary enhances the quantity and quality of knowledge transfer, with positive effects for both.

The authors finally conclude that the most efficient knowledge transfer occurs at the subsidiary-parent level (not at the peer-to-peer level). This may be explained by better communication channels and enhanced absorptive capacity of the parent company (Miao et al., 2011).

Knowledge transfer mechanisms have been studied by multiple authors (Asmussen, Foss, & Pedersen, 2013; Lee, Tang, & Guo, 2014; Tsai & Yamin, 2010). All of them report the importance of these mechanisms and stress critical factors like the costs knowledge flows have for all partners. Miao et al. were able to bring together the contributions of these multiple works and that was the main reason why this section was essentially based on their work.

2.3 MNCs Multiple Embeddedness and Environments (Local contexts)

MNCs and their respective subsidiaries work within a complex competitive arena. This arena (or environment) is composed of several players, from the customers to the suppliers and also the competitors. Therefore, the strategy that is embraced at each decision centre (i.e. parent and multiple subsidiaries) is highly dependent of this internal/local competitive environment. This environment represents a set of threats and at the same time opportunities for the subsidiary, which will influence and shape the subsidiary management decisions towards company growth (J. Birkinshaw, Hood, & Young, 2005).

Multiple frameworks have been presented in order to study the competitive landscape, including Porter's five forces theory and his diamond of national competitiveness model, Freeman's stakeholder's theory and also Christopher Freeman's national innovation system approach, or even the triple helix framework proposed by Etzkowitz (Etzkowitz & Leydesdorff, 2000; C. Freeman, 1995; R. E. Freeman, 1994; Porter, 1979; Porter & Van der Linde, 1995).

Michael Porter has massively contributed to this field of research with his multiple works. The five forces model allows us to analyse the attractiveness of an industry locally by focusing on the behaviour of the players in the industry (suppliers, customers and rivals), but also by analysing the bargaining power of the adjacent industries, the entrance potential threat of new players and of substitute products. His theory provided valuable insights in terms of drivers of competitiveness, which are critical for each subsidiary to remain competitive.

Based on Porter's ground work, Birkinshaw et al. (2004) developed a theoretical framework that aims at transferring the Porter's competitive strategy theory and apply it to the subsidiaries. The authors started by splitting the competitive arena of each subsidiary into two different segments: internal and external (J. Birkinshaw et al., 2005). Both internal and external subsidiary environment consisted in three actors; local customers, suppliers and

competitors in the external context and internal customers, internal suppliers and internal competitors in the internal. The authors then stress that even though these two different arenas can be separated at a conceptual level, they necessarily operate together in multiple competitive environments. This requires the most from the subsidiaries since the subsidiary needs to be able to compete on both markets. This arena requires a higher level of entrepreneurial mind-set from the subsidiary management (J. Birkinshaw et al., 2005).

Meyer, Mudambi and Narula (2011) supports the idea that the local context varies in two dimensions: on an institutional and on a resource framework basis. The authors define local contexts as being critical in international business research since MNC management requires skills in creating homogeneity and at the same time managing differences. At the MNC level, the parent companies should organize their networks in order to be efficient in exploiting the differences, similarities and value-added activities that each subsidiary presents. At the subsidiary level, it is important to balance the internal embeddedness (together with parent and peer-subsidiaries) with the external embeddedness in the host country. The framework developed by the authors is presented in Figure 6 (Meyer, Mudambi, & Narula, 2011).

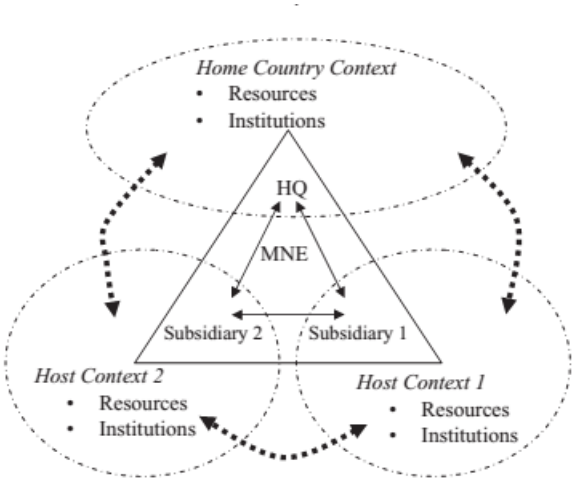


Figure 6 Mudambi framework (Meyer et al., 2011)

The authors present three different views on how MNCs interact with each local context. At a first level, a firm is shaped by its home context, meaning that subsidiaries build from the environment where they are located and its resources are the basis for their international growth. Secondly, each MNC is embedded in the local context of each country due to the presence of its subsidiary. This means that there are at least two different kind of institutional pressures on the subsidiary: one from the local context and another from the parent company. This second view is very much related with the integration-responsiveness framework. Finally, a third view is that the interaction level that occur between the HQ and the subsidiaries is highly dependent of how related the host countries are; concepts such as psychic distance or the CAGE framework correspond to this third view. In a nutshell, the authors aimed at identifying different subsidiary roles based on different levels of specialized resources and on the relationships between internal and external institutions. Besides, they show that the interaction inside MNCs with the various local contexts depends on how these contexts relate to each other.

Each different context has a different importance for the MNC since each location has different abilities, different features and different resources that can create value to the MNC. It is critical for MNC to be able to leverage tangible and intangible resources across multiple contexts. Being inside different countries allows the MNC to be present, to tap and be aware of resources, of capabilities and have the ability of integrating and leveraging from multiple contexts. In the short and long-run this is important for value creation and to build competitive advantage. Being geographically dispersed also implies that MNCs might have knowledge-intensive activities going on in multiple locations, which is also very important since, once again, they are able to learn and improve from different contexts and from different clusters. Therefore, flexibility is also a key competence that should be shared among the MNC network (Meyer et al., 2011).

The notion of cluster[1] is also important when addressing local contexts. Each country may have different industry clusters. Clusters have specific characteristics and vary among them, typically in terms of resources and competences. Literature reports that older clusters have more sophisticated knowledge and resource pools, while emergent clusters are less advanced. Porter's diamond model showed that the presence of clusters of firms in single locations would drive the competition levels of the entire cluster. Being present inside a cluster allows subsidiaries to be more focused, without having to deal with all value-added activities since these activities may be managed by the MNC (J. Birkinshaw et al., 1998).

Even though the historical importance and the fact that the studies reported previously had and still have today tremendous impact in the international business literature, both approaches (Meyer and Birkinshaw) focus on different research questions than the ones intended to be studied in this thesis. The works reported thus far focused either on the importance of the external and internal environment for the autonomy and performance of the subsidiary or on the identification of the subsidiary roles based on different levels of specialized resources. Literature in international business has not paid much attention to the linkages between foreign subsidiaries and local firms/local organizations, with a focus on the host country.

Giroud & Scott-Kennel (2009) proposes a framework to analyse linkages between foreign subsidiaries and local firms. The framework is presented in Figure 7 (Axele Giroud & Scott-Kennel, 2009).

[1] Clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standards agencies, trade associations) in a particular field that compete but also cooperate (Porter, 2000).

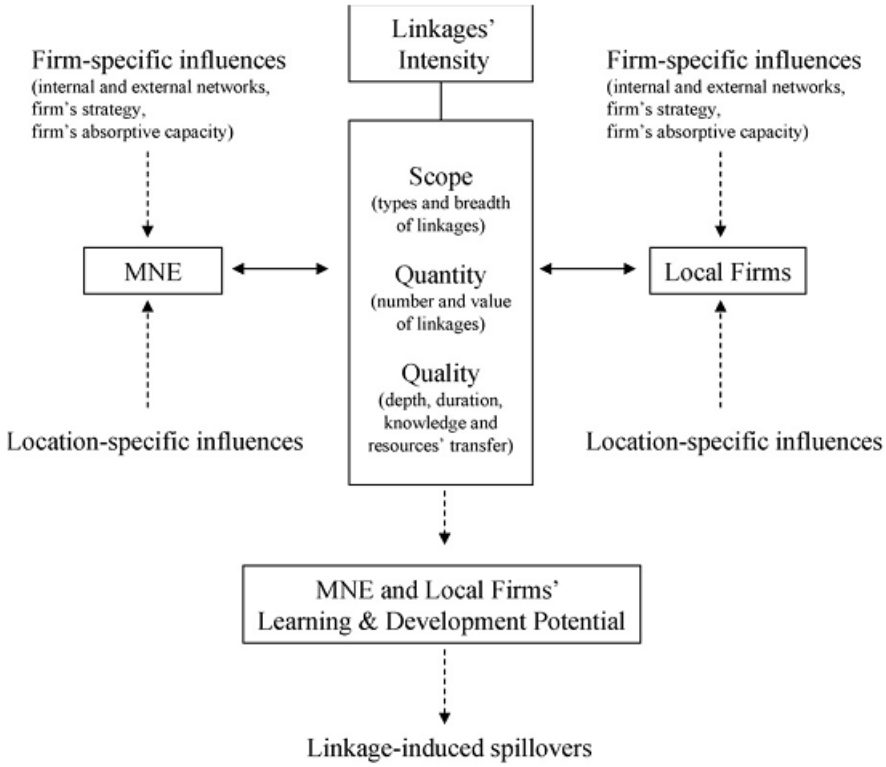


Figure 7 Giroud framework for Host Country subsidiary analysis (Axele Giroud & Scott-Kennel, 2009)

Linkages intensity is defined by three different kinds of attributes: the scope, the quality, and the quantity. Each attribute has different dimensions. Scope has two features: type and breadth; type refers to the type of connections created between both (subsidiary and local firm) companies (i.e. supply chain, decision of in-house or external production); breadth refers to whether the linkages are local or extended and embedded in corporate (international) networks. The linkage quality includes interactions between firms without a financial purpose (social interactions), as well as the knowledge and resources transfer that occurs and the duration of the relationship. Finally, quantity is the number of inter-firm relationships created locally, together with the added value of such linkages for both firms. At another level, the framework also includes two different concepts referred in the original work as determinants: firm-specific and location-specific influences. Both concepts have influence over the formation and extent of the

possible linkages between the local firm in the host country and the foreign subsidiary. The framework can be applied to the analysis of multiple linkages of a subsidiary, with different attributes (i.e. level of resources available, size of subsidiary, existing networks or even strategy). The three linkages formed by the MNC enable capturing the intensity of the linkages, which helps us to understand how the linkage offers potential for development by the firm within the host country. The authors then claim that this linkage intensity (i.e. engagement in business relationships) with local firms results in enhanced spillovers in the host country/economy (Axele Giroud & Scott-Kennel, 2009). One criticism of this framework is the fact that it does not take into account the foundation of the subsidiary and the local-firm (i.e. knowledge stock). The knowledge stock provides insight of the products/services and overall experience of both firms and allows both partners to identify key competences, experience and the value-added of each firm.

2.4 Related Works

Given the importance of the topic of this thesis, together with the economic situation of Portugal in the past few years, it could be expected that the literature would have thoroughly investigated the presented topic. Nevertheless, there is a lack of studies trying to answer similar research questions. Therefore, in this section, a review of the few studies regarding foreign direct investment in Portugal will be presented. Regarding Portugal, not many studies were published and therefore an overview of the research regarding both innovation conducted in Portugal and the Portuguese internal and external economies is presented. Case-studies focusing foreign subsidiaries that aimed at answering similar research questions to the ones in this thesis were also analysed.

Cano-Kollman, Mudambi and Tavares-Lehman (2013) published a paper on the innovation networks in peripheral economies, with regard to Portugal. The empirical context presents Portugal as a peripheral economy. The authors argue that Portuguese-located subsidiaries are specialized, export-oriented and characterized by reduced autonomy. In terms of local context, the communication and the linkages are also modest, but with expectation of increasing over time. A patent dataset was created and was the basis of the hypothesis and statistical analysis conducted. The conclusions suggest that subsidiaries located in Portugal interact more internationally than locally. In addition, there seems to be a difference in the role of subsidiaries depending on the location of the parent-company. Most of the conclusion are in line with previous conclusions made by Tavares-Lehmann (2007) (Kollmann, Mudambi, & Tavares-Lehmann, 2013).

Regarding Portugal, plenty of authors have already contributed. Silva & Simões (2012) presented a study analysing Portuguese firm's internationalization process, identifying motives (market share, recognition in domestic market and resource seeking) and barriers (lack of information, incentives, bureaucracy) to internationalize, as well as the main organizations that were supporting this foreign investment (AICEP, IAPMEI). Silva (2015) later presented a study by analysing FDI in Portugal during the financial crisis and bailout, verifying that the FDI in the period 2008-2013 shrank significantly. Very recently, Álvaro Silva (2016) presented an extensive review on the evolution of inward and outward FDI for a period of over one century (1900-2010). The author relates multiple economical periods and landmarks of Portuguese history. In terms of FDI and subsidiaries, the author thoroughly presented the quantification of FDI that occurred during the specified period. Then, based on multiple examples of companies, induced different entry strategies for foreign companies (joint-ventures with local firms from specific industries, FDI without alliances) for

different industries (technology, consumer goods, tourism) in Portugal (Á. F. da Silva, 2016).

Regarding case-studies addressing similar research questions, there are some works focusing on foreign subsidiaries at different levels: José Moleiro Martins (2012) aimed at studying the analytical dimensions of knowledge transfer from parent companies located in Portugal to subsidiaries located in Mozambique (Martins, 2012). The author verified that the knowledge transfer should be performed together with inputs from the recipients, who are aware of the local context, enabling the correct adaptation of the knowledge. Eckert & Rossmeissl (2007) present a study where they classify German MNC subsidiaries in Central Europe by analysing the subsidiary external environment of 99 german subsidiaries located in Czech Republic, Hungary and Poland. Their main conclusion was that subsidiary development was not affected by the mode of ownership. In addition they verified that the number of value chain activities conducted by firms that used acquisitions as a mode of entry is higher than the number of value chain activities of greenfields. Johnson et al. (2011) presented a framework based on knowledge creation to understand barriers in the creation and transfer of innovation-related knowledge in foreign subsidiaries from Scandinavian MNCs located in China and India. They identify socialization skills as the main impediment to innovation-related knowledge.

Regarding the interactions and development of foreign subsidiaries in the host country, Sandvik (2010) presented the history of a canadian nickel (Falconbridge) subsidiary in Norway. The study is relevant since at the time when facts occurred (early 20's) most of the literature on this topic was yet to be published. Nevertheless, most of the actions that occurred at the subsidiary were consistent with what is now referred as subsidiary autonomy, resource seeking or even vertical integration. The subsidiary plant in Kristiansand (Norway) managed to create know-how, critical knowledge that then lead the parent company to

acknowledge that they were highly dependent on the plant knowledge and production capacity. The subsidiary also interacted with local partners and improved the local economy (Sandvik, 2010).

Raziq et al. (2014) aimed at first identifying the subsidiaries based in New Zealand and then understanding their potentially in engaging in international roles, by analysing their autonomy and resources. The authors conducted a survey for a period of 6 months being able to identify 952 foreign subsidiaries in New Zealand. They targeted CEO, Country Managers, COO and also CFO's of each company. Based on their research, they were able to identify and draw several conclusions on different aspects such as international engagement profiles, willingness of countries to invest in New Zealand and industry sectors preferences of investment (Raziq et al., 2014).

Finally, in the work of Lim et al. (2016), authors report an extent case study analysis of a Korean sales subsidiary that evolved from being a sales subsidiary to being one of the most innovative subsidiary inside the MNC network. The authors followed the positivist single case study framework. Authors studied the role of the subsidiary during the period 2000-2012, the knowledge flows and concluded that through technical specialization, this subsidiary gained importance for the MNC, evolving from a unidirectional technical flow in 2000 to a bi-directional flows in 2012. The company was located in the mobile phone industry and in order to increase the subsidiary importance in the MNC, they initiated projects with local partners so that they could gain efficiency in some of the components required for their businesses (Lim et al., 2016).

2.5 Conceptual framework design

Based on the literature review performed, and focusing on the research questions aimed to be answered, a model to study foreign subsidiaries located in Portugal is proposed, based on the integration of two frameworks (Giroud & Scott-Kennel, 2009; Miao et al., 2011) previously presented.

Giroud & Scott-Kennel (2009) claims that strong-linkages between foreign subsidiaries and local firms will result in linkage-induced spillovers. Foreign subsidiaries can engage in different linkages not only with local firms, but also with local organizations such as universities or research centres. Giroud & Scott-Kennel framework refers to this non-profit organizations as location-specific determinants. Recently, Cano-Kollman et al. (2016) defended that current global value chains have a higher tendency to include multiple organizations, belonging or not to the company internal network. Therefore, it is reasonable to assume that local universities/research institutes may have a relevant role as suppliers or even partners of the subsidiary. The conceptual framework that we present aims at extending the concept of "local firms" to "local organizations" (i.e. local firms and non-industrial organizations – research centres, universities, centres of competence).

Currently firms are becoming more specialized. This leads to a greater connection to their parent companies, as well as with their local networks. We are particularly interested in the outcomes of this processes/interactions between foreign subsidiaries and local organizations.

The proposed model is presented in Figure 8.

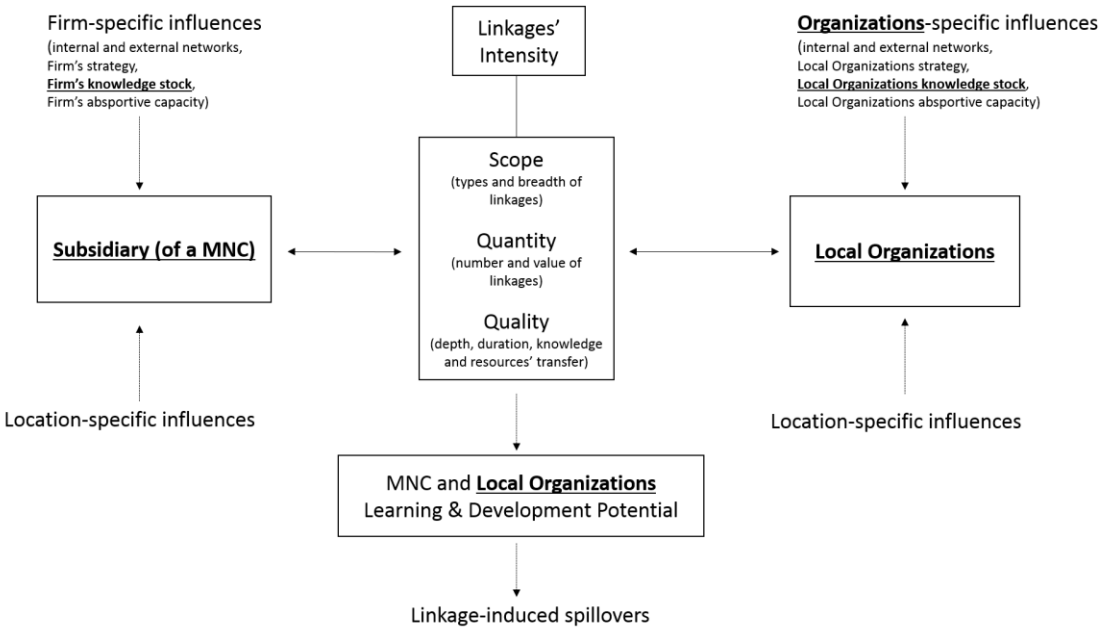


Figure 8 Proposed Model (adapted from Giroud & Scott-Kennel, 2009*). The differences between the original model and the proposed model are highlighted.*

Based on Giroud & Scott-Kennel (2009) framework, the interplay between the foreign subsidiary and local organizations will be analysed in the same dimensions proposed by the authors explained. Nevertheless, by joining the efforts of Miao et al. (2011) (framework for subsidiary knowledge transfer), another firm-specific feature (i.e. internal knowledge stock) will also be addressed. This stock of knowledge has extreme importance since it is something intrinsic to each organization and it is critical for this partnership/linkage success.

Then, we will concentrate on the outcomes of the linkages' that sustain this cooperation. Focus will be placed on how the subsidiary engages in knowledge creation and transfer in the local environment, as well as on the factors that influence (positively or negatively) this knowledge creation. The original framework focuses primarily on the foreign subsidiary and the three linkages that affect the learning and development potential of domestic and foreign firms in host countries. Our approach rather focuses the impact of external relationships/linkages rather than the foreign subsidiary and its internal linkages. It is reported in the literature that knowledge spillovers resulting from

vertical supply chain linkages leads to the economic development of host countries (Jindra, Giroud, & Scott-Kennel, 2009). The occurrence of knowledge spillovers is connected with specific characteristics of the host country environment – location specific influences (Hallin & Lind, 2012). Besides, linkage-related studies allows the illustration of how firm's characteristics lead to different impacts on the host country economy (Axèle Giroud, 2012).

Insight into the three research questions previously defined will be provided by applying the framework onto the analysis of an innovation project realized by a foreign subsidiary located in Portugal with a local organization. Chapter 3 explains the research method towards the identification of the foreign subsidiaries located in Portugal, as well as the subsidiaries conducting R&D activities.

Chapter 3
Research method

In this chapter the research method used to answer the research questions is explained. Section 3.1 explains the identification process of the foreign subsidiaries conducting R&D in Portugal. In section 3.2, the decision to select a single case study is explained. Sections 3.3 and 3.4 address data collection and data analysis techniques.

3.1 Foreign-Subsidiaries in Portugal

According to Statistics Portugal, in 2015, there were 6.239 foreign affiliates in Portugal, corresponding to 1.7% of the total number of non-financial companies, 25.3% of turnover, 24.8% of total gross value added (GVA) and 15.1% of people employed in the non-financial business sector. This corresponds to an average employment of 65 people per foreign subsidiary, with an average annual salary of 18.500€ per employee. There were 1.601 foreign affiliates with exporting profile, corresponding to 25.7% of the number of affiliates and 36.2% of GVA in 2015.

More than 75% of foreign affiliates were controlled by companies headquartered in EU member-states, with the emphasis on Spain, France and Germany. These countries occupied the top 3 positions in terms of number of affiliates, GVA and persons employed.

Foreign affiliates performed better than domestic companies in terms of the main economic indicators [2] (apparent labour productivity, return on sales, return

[2] Apparent labour productivity = GVA / Persons employed
Return on equity = Net profit / Equity * 100
Return on sales = Net profit / Turnover * 100
Investment rate = Gross fixed capital formation / GVA * 100
R&D expenditure (% of GVA) = Total investment in R&D / GVA * 100

on equity). However, the investment rate (= Gross fixed capital formation / GVA * 100) of foreign affiliates is lower than in the domestic companies but has been increasing at faster rates. As regards R&D Expenditure in percentage of GVA, the value was lower: 0.5% for foreign affiliates and 1% for the domestic companies.

In 2015, there were 784 foreign affiliates [3] in manufacturing. Considering the period 2010-2015, Germany led in Manufacturing and Energy (sections B to E of NACE-Rev.3), both in terms of GVA and employment. It was followed by Spain and France as regards GVA and by Spain and the US in terms of employment (Figure 9).

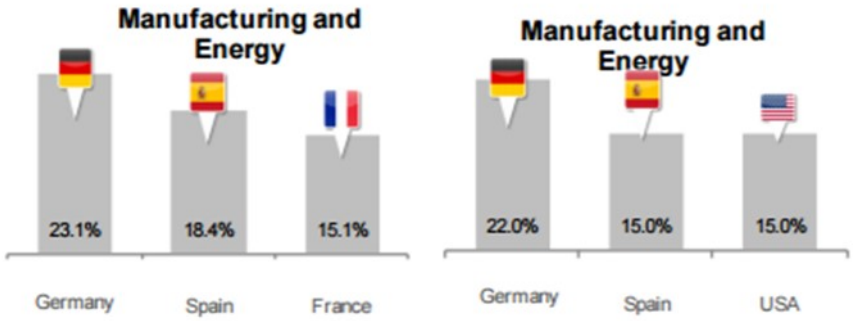


Figure 9 Capital control origin countries in manufacturing and energy by weight in GVA (left) and by weight in number of persons employed (right) - 2010-2015 (Source: (Portal do Instituto Nacional de Estatística, 2016) *- Statistics Portugal, Integrated Business Accounts System - IBAS)*

Statistics Portugal does not publish information regarding the investment rate and R&D expenditure of manufacturing affiliates.

To perform the nominal identification of the foreign subsidiaries located in Portugal, Statistics Portugal was contacted regarding the access to the information that was critical for this thesis. INE replied stating that the required

[3] A foreign affiliate in Portugal is defined as an enterprise, based in Portugal, controlled by a non-resident institutional unit. By control it's understood the power to determine the general policy of a company, choosing, when necessary, their board of administration.

In this study, companies were considered to be exporting companies when observing the following criteria:

-Companies where at least 50% of the turnover originates from the export of goods or;

-Companies where at least 10% of the turnover originates from the export of goods and the total value of exports is above EUR 150.000.

information was only available for registered researchers. To have access to the information, a bureaucratic formal approach was required. We decided not to proceed with the formal request to INE given the time frame available to conduct this thesis.

To perform this subsidiary identification, we focused our search in the sectors that are generally reported to have research and developments costs (Gunasekaran, 1999), which might indicate that they might be creating knowledge: the manufacturing industry.

Sabi database was used to start this process[4].

In Sabi, the search strategy used included:

1. Company located in Portugal → 596.815 companies
2. Foreign shareholder: ultimate owner located in another country → 9.294 companies
3. Industry sector: CAE Rev. 3 (codes 10 to 32 = manufacturing industry) → 1.068 companies.
4. Subsidiary status: active → 928 companies

This search allowed us to identify 928 foreign subsidiaries. This list of subsidiaries is presented in Appendix I.

Given the objective of studying the knowledge creation and transfer processes, we searched for public programs that support R&D, namely Portugal 2020 and COMPETE. Table 1 presents a summary of the cross-matching between Sabi and the approved projects from Portugal 2020 and COMPETE. The list of companies can be found in Appendix II and III.

[4] Besides Sabi, other agencies (INE, PCT, AICEP) were also contacted in order to cross-match the information retrieved from Sabi database. AICEP replied stating that INE was the institute that could provide precise information regarding the objective.

Incentive Program	No of Foreign subsidiaries with Projects Approved	No of Projects Approved	Total Eligible Expenses Attributed to the Operation (million €)	Total Fund Approved (million €)
QREN - COMPETE (Industry sector)	78	173	676,1	252,6
Portugal 2020	54	89	253,3	125,2

Table 1 Summary regarding the number of foreign affiliates in Portugal that had projects approved by both incentive programs (COMPETE, 2017b; Portugal 2020, 2017).

We found that a combined total of 132 subsidiaries (total of 262 projects, with 929.4 million € of eligible expenses and 377.8 million € of incentives) had projects approved (8 subsidiaries are using both programmes: Acco Brands, AIS Automotive, Aspock, Blocotelha, Bosch Car Multimedia and Bosch Security Systems, Heliflex, Pentaplast and PREH Portugal).

3.2 Descriptive Embedded Single case study

The case-study selected was the Bosch Car Multimedia (BrgP) in Braga. Bosch is considered the top European innovator in the powered vehicle industry in 2015, with 3057 inventions (Thomson Reuters, 2016). In addition, Bosch ranks #98 in the Forbes most innovative growth companies in 2016 (Forbes, 2016). We chose the purposeful - opportunistic case sampling method proposed by Patton (1990) to leverage the opportunity and availability of Bosch Car Multimedia to participate in the study.

The method adopted is the descriptive embedded single case study. The case study was the research method more appropriate to addressing the proposed research questions since we aim is to understand in depth the processes of knowledge creation and transfer involving foreign subsidiaries and local partners in Portugal, along with the factors that influence these processes. The embedded single case study can be used to describe real life phenomenon, in a contemporaneous context (Eisenhardt, 1989).

The theoretical framework behind this research is provided in the last section of chapter 2. The presented framework is aimed at trying to answer the three research questions. Firstly, given the objective of understanding how foreign subsidiaries create and transfer knowledge, the focus will be put into studying in-depth the strategy and the knowledge stock of the main actor, the foreign subsidiary. Hence, the second step of the process will be understanding what factors influence the subsidiary decisions into engaging in linkages with local partners. From the framework, we expect that this linkage will have a positive impact for both partners (i.e. foreign subsidiary and local organization) but will also have an impact for the local economy that goes beyond the local firm/organization.

The main unit of analysis is one relationship of the foreign subsidiary located in Portugal with a local partner. Secondary units of analysis such as the foreign subsidiary and local organizations were also analysed in order to understand the relationship. The analysis was performed over one relationship that is central to one specific key project. This approach has both advantages and disadvantages since it allows for an in-depth learning of the processes involved but it does not allow for generalizations and direct comparisons between similar projects/different relationships of the subsidiary. Time constraints are the main reason for this choice.

3.3 Data collection

Yin (2009) reports that are six common sources of evidence (i.e direct observations, interviews, archival records, documents, participant observation and physical artefacts) that can and should be used to sustain good case studies.

Archival records and secondary sources of information (e.g. official records from Bosch, provided by the company, annual reports, press releases and news published in the press) were used to prepare the interviews. All the information

gathered, together with the theoretical model developed, influenced the interviews guidelines prepared. The list of information (i.e database) collected to develop the case study is available in the Annex I of this document.

The data collected to build this case-study included one visit to Bosch Car Multimedia production unit, together with two interviews with key stakeholders (Table 4).

In order to understand how BrgP is creating knowledge with local partners, we interviewed Prof. José Oliveira, who has a management degree and master in Finance by the University of Minho. In Bosch, he was in charge of the TPM (Total Productive Maintenance) from 2004 to 2008, and for the BPS (Lean in Bosch), from 2009 to 2010. From 2011 to 2012, responsible for the change management process, process assessment, suggestions program, EFQM Model and partnerships with universities. Currently he is responsible for the Innovation Projects and EFQM Model at Bosch Braga.

This interview aimed at identifying one key project and the partners involved, as well as to complete the characterization of the subsidiary. The guidelines developed for this interview can be found in Appendix IV. The interview has four main parts: part I focus on Bosch Multinational; part II regards Bosch in Portugal and Bosch Car Multimedia; part III aims at identifying innovation projects developed by Bosch Car Multimedia in cooperation with local partners; part IV focus on how knowledge was created and transferred between the partners identified in part III.

Prof. Dr. José Oliveira identified the "HMIExcel - critical R&D in the framework of the development and production cycle of advanced multimedia solutions for automobile" as the key project that would allow us to understand how knowledge is being created and transferred locally by Bosch Car Multimedia. The key partner for this project was the University of Minho (UMinho). During the course of the interview, one of the key aspects was the

identification of a contact from UMinho with whom the information retrieved by Prof. Dr. José Oliveira could be cross-matched. A second interview with Prof. Dr. Eduardo Bacelar Pinto was conducted and the guidelines for this interview are available in Appendix V.

The interviews were not tapped but notes were taken [5]. Both stakeholders provided enough time to write down the key information.

The stakeholders interviewed were familiar with the knowledge creation and diffusion of the subsidiary. The interviews conducted at Bosch allowed us to understand the foreign subsidiary strategy towards creating knowledge locally and what they are looking for when establishing local partnerships. Besides, the reason behind interviewing and analysing documents from multiple parties is to avoid possible biases and omission of events. In addition, this triangulation of information provides reliability to the possible conclusions being drawn (Yin, 2009).

The list of interviews conducted[6] is presented in Table 2.

Name	Organization	Type of Interview	Duration
Prof. Dr. José Oliveira	Bosch Braga - TEF Innovation Projects and EFQM Model	Presential - Bosch HQ	1h
Prof. Dr. Eduardo Bacelar Pinto	UMinho - CCG	Presential - Porto	1h30
Eng. Miguel Barbosa	ANI - Administrator	e-mail	-

Table 2 List of interviews conducted. n.r. = no reply. The interview to Eng. Miguel Barbosa can be found in Appendix VI.

[5] Audio of the interviews was not recorded since it could jeopardise access to key critical information.
[6] Besides Bosch Car Multimedia and UMinho, to understand the economic impact of the project and also the role of the remaining partners, interview requests via e-mail were also sent to AICEP, COMPETE and also to the Dean of UMinho.

3.4 Data analysis

Regarding data analysis, a combination of techniques were used. The defined research questions require a more qualitative approach rather than a quantitative explanation and so prioritization was given to the interpretation of the qualitative information.

Langley (1999) presents seven different strategies on how to theorize from data: narrative, quantification, alternate templates, grounded theory, visual mapping, temporal bracketing and synthetic strategy. The strategies that were followed are the narrative and the visual mapping given that they can be applied to single case-studies. Schematics of how the innovation and knowledge creation processes are being conducted by the foreign subsidiary are presented. The narrative strategy will fit the temporal variables, whereas the visual mapping strategy will deal with the relationship variables. These approaches offers accuracy, simplicity and generality in the analysis. (Langley 1999).

Chapter 4
Bosch Multinational and Bosch Car Multimedia

In this chapter the Bosch Group is presented. Section 4.1 offers a short overview of the parent company located in Germany. The foreign subsidiaries of the MNC located in Portugal are presented in Section 4.2. Section 4.3 focus on Bosch Car Multimedia S.A. This section will include an extended overview of the subsidiary development since its establishment in Portugal in 1911**.** Key moments, subsidiary organization and structure, suppliers, customers, competitors, the products and services produced, the innovation and the financial analysis of the company are presented. Section 4.4 describes in detail one key research and development project (HMIExcel) developed by Bosch Car Multimedia in cooperation with University of Minho.

4.1 MNC Bosch

Bosch GmbH was founded in Stuttgart in 1886 by Robert Bosch with the opening of a Precision Mechanics and Electrical Engineering Workshop. Today, the Bosch group is an IoT (internet-of-things), a leading global supplier of technology and services in multiple industries (mobility solutions, industrial technology, consumer goods, energy and building technology). The company is owned by Robert Bosch Stiftung GmbH, which is a charitable foundation, that helds a 92% capital. Nevertheless, the majority of voting rights and therefore the decision-making power is detained by Robert Bosch Industrieltreuhand KG, an industrial trust. The remaining equity is shared by the Bosch family and Robert Bosch GmbH (Bosch Portugal, 2017c). Figure 10 presents the group ownership structure.

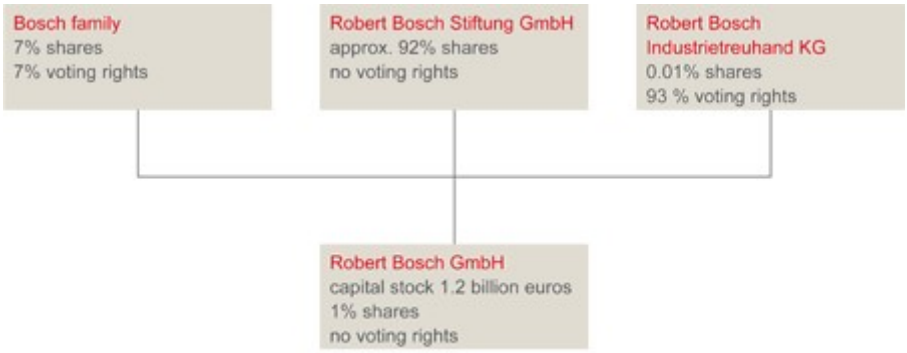


Figure 10 Bosch group ownership structure (Bosch group, 2013).

Bosch has multiple key philosophies: resembling to the spirit of the founder, Robert Bosch, the company looks at securing its future by ensuring strong and meaningful developments alongside preserving its financial independence. Bosch inventions aim at developing exciting products that have meaningful impact on people's quality of life. Three strategic focal points are reported: focusing on customers' needs to create innovative products (i.e. wireless charging systems that are cost and time-saving), being able to shape the change (i.e. introduction of automated driving) and also the need to strive for excellence. Bosch claims to work fast, be agile, accurate, to have efficient processes, lean structures, high productivity and these all together increase the value of the company (Bosch in figures | Bosch group, 2017).

Bosch is a leading IoT company that creates technology that is "Invented for Life". This is the message behind the company logo and can be seen in Figure 11.

BOSCH
Invented for life

Figure 11 Bosch Company Branding (Annual Key data Bosch, 2016).

The company generated sales of 73.1 billion euros in 2016 and 70.6 billion in 2015, a 44% increase in revenues when compared with 2014 (49 billion euros). Bosch group operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. The mobility solutions sector is the one leading the revenues with a 59% share (41.7 billion euros in 2015). European region stands for 53% share of total sales. North America has been the region where the sales of the company have increased 25% from 2014 to 2015 results (18% share). On the other hand, South America market is decreasing and only stands for a 2% share in total sales in 2015. Bosch employs about 390.000 associates worldwide. Currently the company has 450 subsidiaries in 60 countries. Together with sales and service partners, Bosch covers nearly every country in the world. Figure 13 presents an overview on its key financial numbers.

As an IoT company, research and development plays a major role in the company. The strategic view of the company aims at creating innovations that allow a connected-life; each product or service created aims at providing better life conditions. In 2016 the company reports to have spent 6.6 billion euros worldwide in R&D which represents 9% of total sales (Table 3 and Figure 12).

	2012	2013	2014	2015	2016
Sales revenue	44.703	46.068	48.951	70.607	73.100
Share outside Germany as percent	77	77	78	80	-
Number of associates (as of 12/31 of the year)	272.830	281.381	290.183	374.778	390.000
Located in Germany	108.460	107.285	105.429	131.994	134.000 **(34.3%)**
Located outside Germany	164.370	174.096	184.754	242.784	256.000 **(65.7%)**
Capital expenditure	2.714	2.539	2.585	4.058	-
Research and development cost[1]	4.442	4.543	4.959	6.378	6.600
Profit after tax	2.304	1.251	2.637	3.537	-

Table 3 MNC Bosch financial numbers. Values presented in million euros (Bosch in figures | Bosch group, 2017).

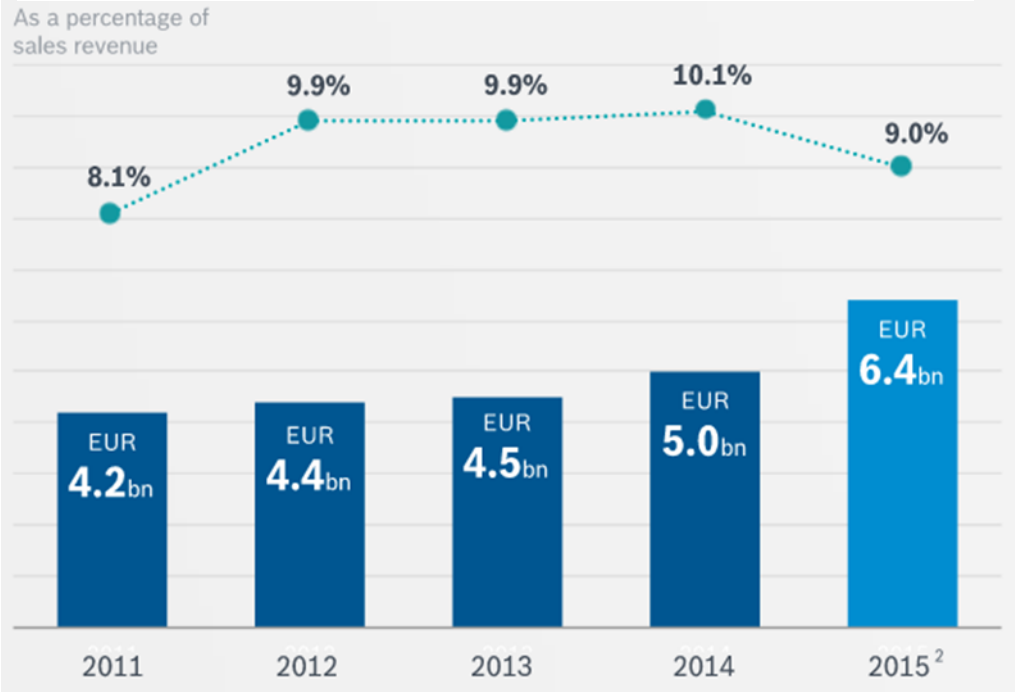


Figure 12 Research and Development Investment numbers by Bosch worldwide (Annual Key data Bosch, 2016).

Bosch group has international corporate research and technology units spread in multiple locations (e.g in Germany, India, North America, Russia, Asia and Israel). These units have between 1400-1700 associates developing and testing innovations for Bosch. The research is conducted mainly in four areas: energy storage and conversion; information technology and sensors; materials and

production technology; development methods and processes. The company reports currently employing 59.000 associates at 120 locations (15.1% of the total number of workers) conducting research and development activities (Bosch Group Business Sectors, 2017).

Each R&D location has a different importance for Bosch. For example, in India, researchers focus on technologies in the field of Internet of Things and Services (IoTS) and Computer Vision whereas in the United States the company aims at exploring current trends in research and engage in cooperative partnerships with universities. Finally in Asia, besides exploring new technology trends in the local market, employees in Singapore, Shanghai and Tokyo are establishing links with the Asian academic world (Bosch Locations, 2017).

Most of the developments and innovations conducted at Bosch are registered as patents worldwide. Bosch innovates and protects its development through this mechanism. At the same time, Bosch acknowledges that not every idea leads to a patent application. Several non-resulting patent ideas are publicly displayed in the Stuttgart office. The European Patent Office annually releases the number of European patents applications per company. In 2016 Robert Bosch was once again the European company with more registered patents. Table 4 shows the research and development costs together with the number of patents registered since 2012. Note that in 2012, one Bosch patent would cost 3,05M€ whereas in 2016 the cost of each patent is 4,97M€ (an increase of 61.3% in five years).

	2012	2013	2014	2015	2016
Research and development cost*	4442	4543	4959	6378	6600
Number of Patents of Robert Bosch	1456	1574	1438	1493	1327
Ratio Costs/Patents	3,05	2,89	3,45	4,27	4,97

Table 4 Bosch R&D analysis. Values in million euros (European Patent Office, 2017).

4.2 Bosch in Portugal

Bosch is in Portugal since 1911, starting with commercial activities only. In 1960 the first trading company was registered with headquarters in Lisbon. In 2014, Bosch group generated in Portugal 811 million euros in sales, with 90% of its production being exported worldwide to over 60 countries. Bosch was one of the top 10 exporters in Portugal, exporting an equivalent to 0.4% of the country Gross domestic product (GDP) in 2014. In Portugal, the Bosch Group operates in several sectors such as the automotive mobility technology, industrial technology (automation and packaging technology), construction technology (power tools) and household products (thermotechnology, household appliances, security systems) (Portugal, 2017).

Bosch in Portugal is represented by: Bosch Termotechnology, in Aveiro; Bosch Car Multimedia Portugal, in Braga; Bosch Security Systems, in Ovar; two delegations in Lisbon: a sales office and a home appliances company in Lisbon (Table 5 and Figure 13).

PT subsidiaries	Date of Creation	Activities	Divisions	Functional Areas	No of employees **
Braga – Car Multimedia	1990	Research and development; Production	Car Multimedia	Manufacture of Mobility Solutions; Ater Sales Services and Education; Research and Development	2084
Ovar – Security Systems	1940 **	Production	Security Systems	Production	348
Aveiro – Thermotechnology	1977	Research and development; Production	Thermotechnology	Manufacture Thermotechnology; Research and Development *	930
Lisboa – Bosch Portugal SGPS and Bosch S.A.	1960	Marketing and Technical Assistance	Automotive Aftermarket; Power Tools	After Sales Services and Education; Sales, Marketing and Services	36

*Table 5 Bosch in Portugal. * Information still not displayed in the oficial website. ** Information obtained through Sabi for 31.12.2015.*

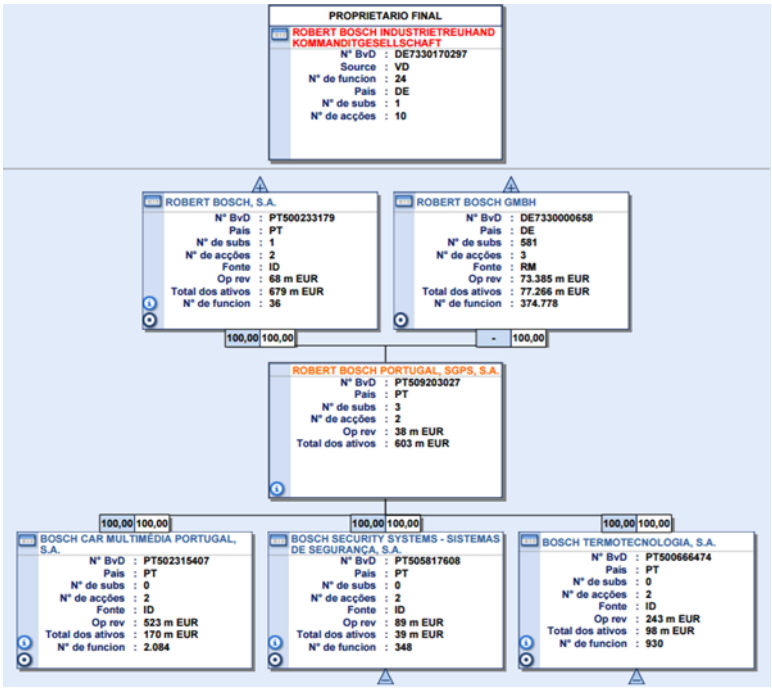


Figure 13 Bosch Portugal subsidiary structure. Source: SABI.

Bosch Thermotechnology and Bosch Security systems produce and manufacture a wide range of products, namely water heaters and security and communication systems. Most of this production is exported to international markets. Bosch Thermotechnology is the European market leader since 1992 and the third world manufacturer in water heaters. The subsidiary has been evolving through time, being currently the global centre of competence for the Bosch

group in hot water solutions. Since 1995 it has been producing gas-burning appliances and since 2007 solar panels. Bosch Thermotechnology in Aveiro was the first subsidiary of the MNC in Portugal to conduct research and development activities. Aveiro inaugurated a second R&D unit in 2016, representing an investment of 25 million € until 2020. The statistics division of education and science (DGEEC in Portuguese) compiled a report of the companies with high research and developments costs in 2015. In this report, Bosch has two research and development units identified (Braga and Aveiro), with a total of 12.265.363 € spent in R&D, 184 employees (DGEEC, 2015). In the company website it is reported that in 2015 the Bosch group invested 35 million € in Portugal (invested in Braga and Aveiro subsidiaries).

Regarding the performance per business sector in Portugal in 2015, total sales amount to 933 million €. The mobility sector represents more than 55% of the total sales, a percentage that is likely to increase with the Braga unit grows in the near future; the energy and building technology in Aveiro contributes with nearly 35%; the remaining 10% represent the sales of Bosch Security systems in Ovar (Bosch Portugal, 2017b).

4.3 Bosch Car Multimedia S.A.

4.3.1 Background and key moments

Bosch Car Multimedia S.A. (BrgP), located in Braga, is the main plant of the Bosch's Car Multimedia division worldwide and it's the largest in Portugal (Figures 14 and 15).

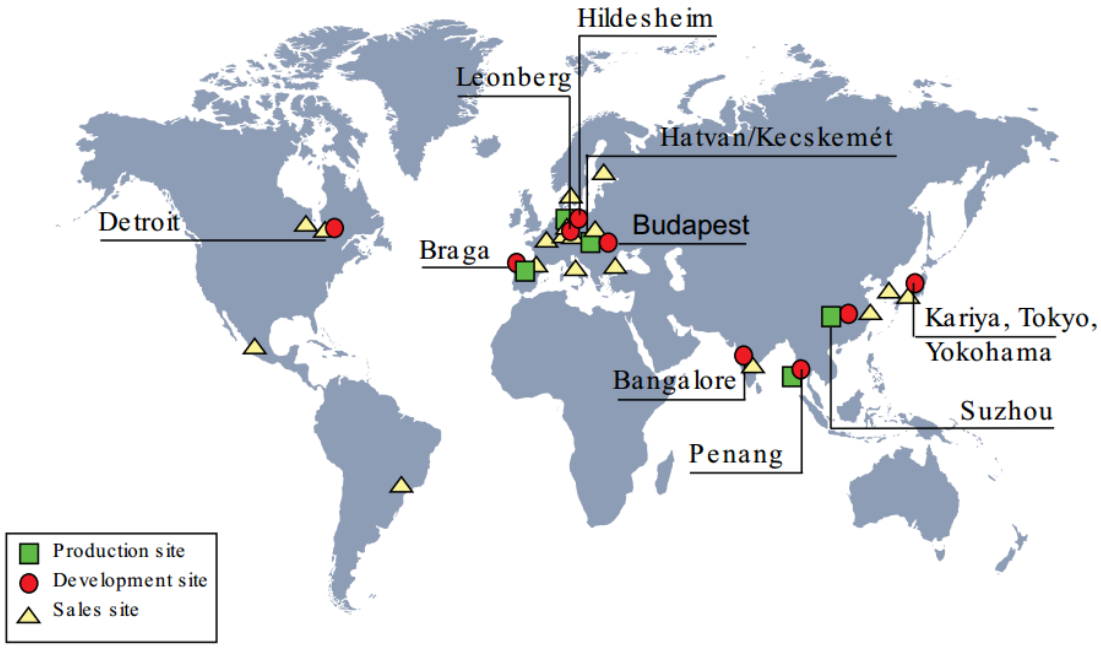


Figure 14 Bosch Car Multimedia division worlwide (values for 2010). In 2010, BrgP had 2150 associates, with a total of 5170 associates in the Car Multimedia division (Multimedia, 2017)

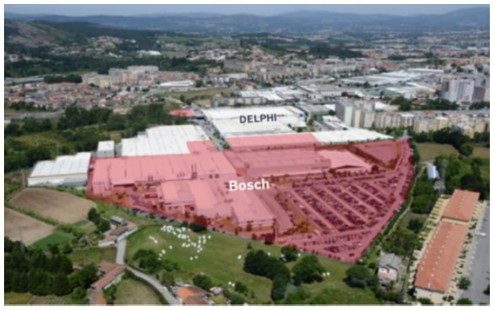


Figure 15 BrgP industrial plant. Adapted from the official presentation provided by BrgP.

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The subsidiary was established in October 1990 under the name Blaupunkt Auto-Radio Portugal Lda (Figure 18). At the time the subsidiary had two functional areas: manufacturing (auto radio manufacturing for Blaupunkt) and after sales services. In 2008 the subsidiary was restructured, which included the selling of Blaupunkt brand and also of the aftermarket radio business segment. From that moment on the plant focused only in original equipment for the car industry and was renamed at that time Bosch Car Multimedia Portugal S.A. Currently the subsidiary is the main private employer in Braga's region. It has a production plant and a research and development department (ENG & MFI), after sales assistance (ASA), an electronic service and a centre of complex electronic systems and Bosch IT (CI/FSR-IB), responsible for supporting the Iberia facilities. The Bosch Car Multimedia also offers specialized services through its Competence Centre (CoC). The CoC provides services for the identification and production of new technologies and services. MFI (manufacturing international) provides samples production and ENG provides services for mechanical development, layout, hardware and samples production. Figure 16 shows the historical milestones at BrgP.

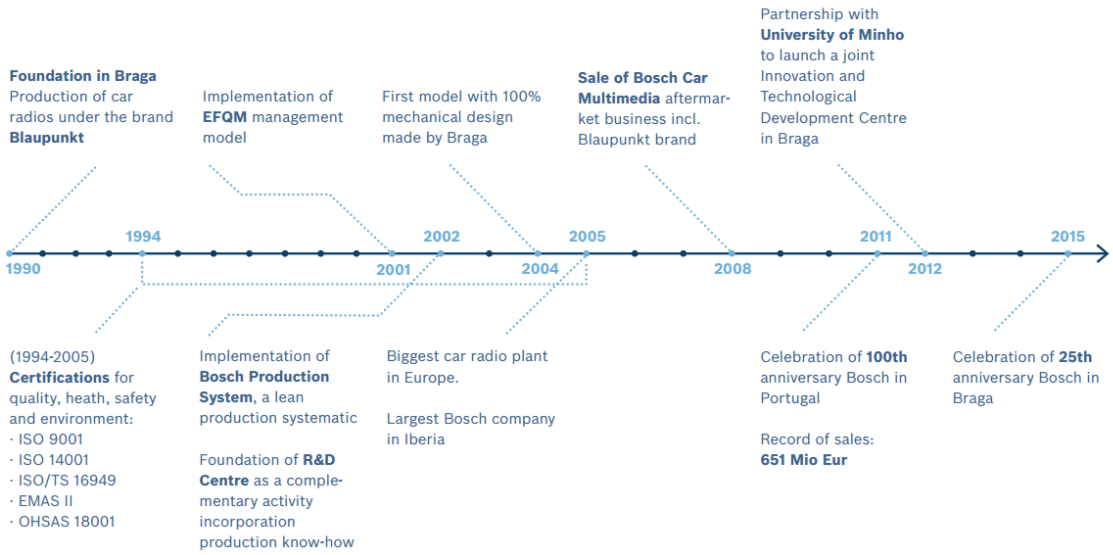

Figure 16 BrgP historical milestones since the company formation in 1990 (EFQM, 2015a).

BrgP produces complex electronic products, mainly navigation systems and car radios to the automotive industry (approximately 5 million systems annually). This includes smart integrated solutions for entertainment, navigation, driver assistance functions. Bosch Car Multimedia division has also significantly contributed towards making the driving task safer and more economical using different technologies. A connected car requires multiple features such as cloud access, smartphone integration and/or application frameworks, along with the more increasingly important security and privacy requirements. In 2015, the company portfolio (Figure 17 and Figure 18) when awarded the EFQM European Award for Excellence included: "navigation systems (1 million), instrumentation systems (0.7 million) and high-end car radios (0.3 millions) for the automotive industry, steering angle sensors for ESP-system (5.4 million), electronic controllers for heating equipment, and controllers for household appliances (EFQM, 2015a)."

Figure 17 Bosch Braga Car Multimedia Product Portfolio.

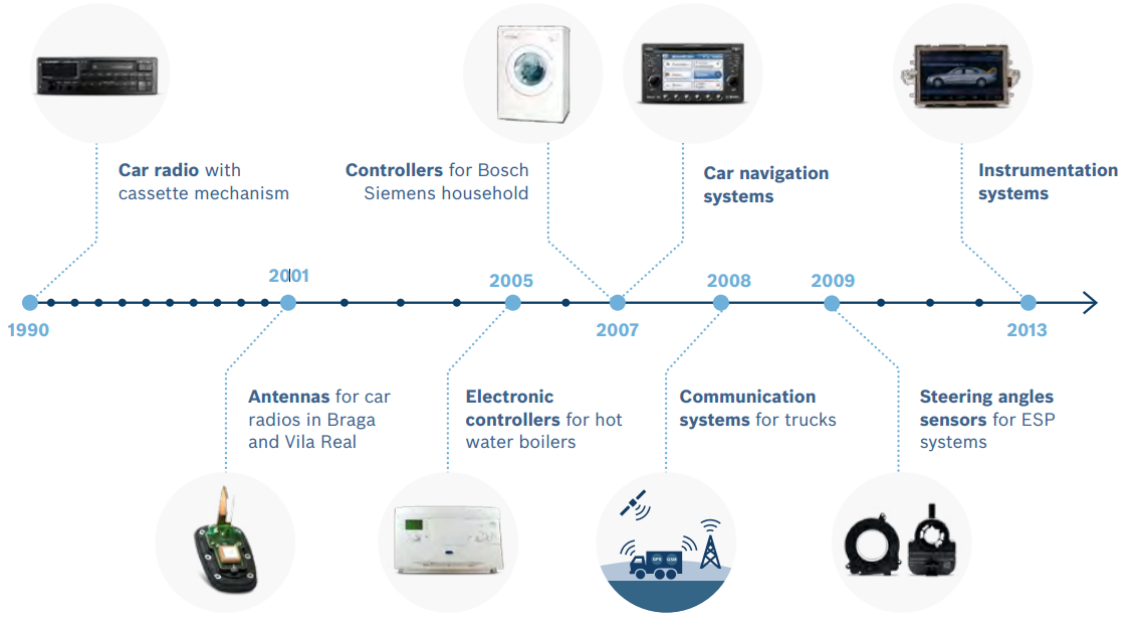

Figure 18 BrgP Production Portfolio since the company formation in 1990.

The company has received many awards for quality (2008 and 2011), energy efficiency (2011), good practices (2008). In addition, BrgP has been Recognized for Excellence by the European Foundation for Quality Management (EFQM)[7] in 2007 and won the award in 2015. Besides, the company is also certified in Environment and Eco-Management and audit scheme (ISO14001 and EMAS III), Occupational Health and Safety (OHSAS18001), Quality management system (ISO 9001 and ISO/TS16949).

4.3.2 BrgP Subsidiary role, strategy and activity

The Portuguese BrgP subsidiary reports to export over 90% of its production to more than 50 countries where the multinational is present. This unit is currently the major exporter and employer of Bosch group in Portugal. The activity of the subsidiary in Portugal can be divided into three main areas: production of complex electronic products, services and research and

[7] EFQM is a not-for-profit membership foundation in Brussels, established in 1989 to increase the competitiveness of the European economy. As a European Foundation, they inspire organisations to achieve sustainable excellence by engaging leaders to learn, share and innovate using the EFQM Excellence Model.

development. The services include consultancy support in the development of new products and technical solutions, engineering and after-sales assistance (Bosch Portugal, 2017b).

BrgP's strategy is aligned with the Car Multimedia division orientation, being therefore customer-oriented. The sector is working towards creating a "Driving Convenience" in each vehicle. For that, the vehicle should be equipped with smart integration of multiple solutions (entertainment, navigation, telematics and driver assistance). The automotive and multimedia industries are constantly evolving which requires BrgP to combine a clear strategy with flexibility to respond to unexpected changes. The company reports being proficient in combining stability with flexibility, as well as to operating successfully and profitably in the long-run. The reasons that explain the success of BrgP over time are multiple: varied product portfolio, lean production, competitive cost base and also its human resources, which are highly competent.

BrgP was able to upgrade from a production unit only becoming increasingly more important for the Bosch group. This occurred due to the vision of the management team and also to the support of the EFQM to the company. The company is now highly independent of the parent company. The value chain of BrgP includes all the primary and support activities that are conducted at the parent company such as production, development, maintenance, IT, logistics, quality and also human resources management. BrgP is autonomous up to 80%[8], meaning that it can promote new partnerships, new products and partially new services. The strategy is defined by the parent company in Germany for all subsidiaries and it is then adapted locally (by the technical director at BrgP) so that the goals are achieved. Currently, BrgP is the leading subsidiary for Human-Machine Interface (HMI) technologies in production. It is highly competent in

[8] Percentage value provided by Prof. Dr. José Oliveira during a formal interview. Prof. Dr. José Oliveira is responsible for the Innovation Projects & EFQM Model (BrgP/TEF-P).

sample production, it has high knowledge of technologies for complete product testing, it is a benchmark in total production maintenance and also in lean logistics, besides having a competitive local network of plastic and metal suppliers' network. BrgP values its suppliers and is currently contributing for their end-to-end development.

The research and development unit of BrgP was founded in 2002. It supports the company with the development of products and services related with the Car Multimedia projects, as well as in the development and production of car radios. Bosch is working on cutting-edge technologies that will soon replace car radios. The R&D activities conducted at Braga have increased in the recent years in order to support the changes in the products portfolio. The R&D unit in Braga and employs engineers from multiple backgrounds (different functional areas), from project managers to manufacturing planners and also quality engineers.

The competence of the human resources working in these centres is acknowledged by the parent company, resulting in the collaboration and expatriation of highly qualified engineers to other R&D units of the group in Europe. According to Prof. Dr. José Oliveira[9], this interactions are enhancing the competences and the value-added of this Portuguese subsidiary. The BrgP is also actively searching for financing programs that promote interactions with local stakeholders towards locally leveraged innovation. Currently the R&D unit in Braga employs over 100 employees, a number that will grow up to 300 in 2018.

R&D has contributed for the subsidiary to achieve excellence. The story of BrgP development is passionately described by José Rodrigues Oliveira in TEDx Braga 2016 (José Oliveira | TEDxBraga, 2017). BrgP has now gained attention worldwide mainly due to the direct and deep relationship with UMinho, which enabled the subsidiary to develop innovative projects related with the Human

[9] Responsible for the Innovation Projects & EFQM Model (BrgP/TEF-P)

Machine Interface (HMI), developing and producing innovation solutions such as head-up displays and gestural sensors that improve the HMI experience. The relationship with UMinho aims at enabling BrgP to develop new and importance competences in the development and production cycle of advanced car multimedia solutions. The developments of new mobility solutions for the automotive industry intend at bring Bosch one step closer to fully automated driving. At the same time, this partnership will allow BrgP to achieve a higher competitiveness at an international level.

BrgP together with UMinho has actively been seeking financing through public programs that support the company's innovation mobility strategy. The list of projects approved and financed by these programs can be found in Table 6. They are expected to lead to the recruitment of over 90 engineers by BrgP and 170 researchers by UMinho between 2015 and 2018.

Project No.	Financing Program	Date of Approval	Scope	Total Investment (million €)
36265	COMPETE	09.04.2014	HMIEXCEL - I&D crítica em torno do ciclo de desenvolvimento e produção de soluções multimédia avançadas para automóvel	19,40
22631	COMPETE	07.01.2013	Next Generation Products 2014	29,32
POCI-01-0247-FEDER-002797	Portugal 2020 / FEDER	01.05.2016	INNOVCAR .: Inovação para Veículos Inteligentes	32,31
POCI-01-0247-FEDER-002814	Portugal 2020 / FEDER	01.05.2016	iFACTORY .: Novas Capacidades de Industrialização	22,35

Table 6 Research and development projects financed by community funds at Bosch Car Multimedia.

4.3.3 Subsidiary Top Management team and Management structure

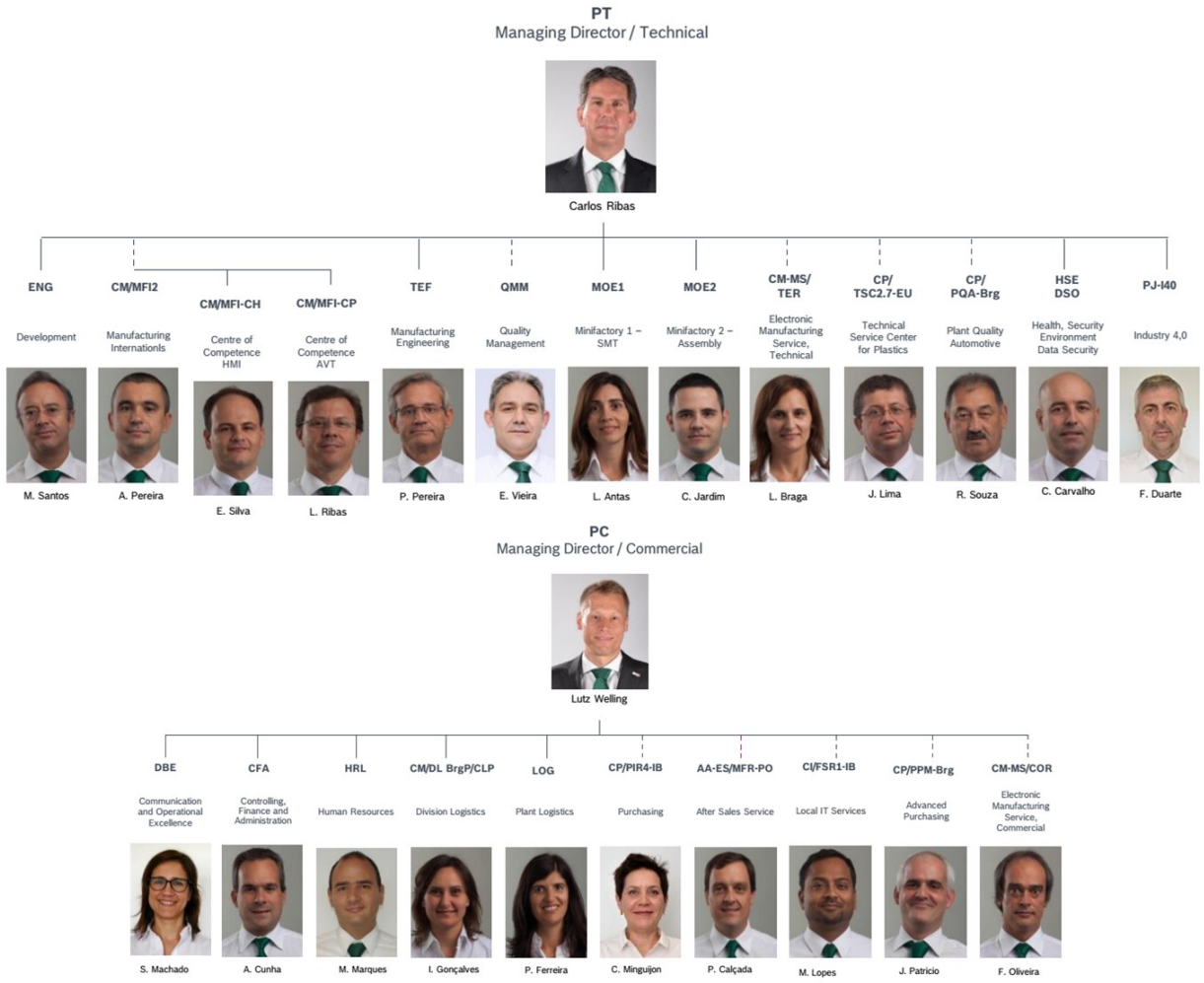

Figure 19 BrgP structure. Note that until 2015 the company representative was Mr. João Paulo Oliveira. The company internally re-structured after the arrival of Mr. Carlos Ribas in September 2015. This information was retrieved by analysis of the EFQM reports where the previous company structure can be depicted. (Multimedia, 2015a, page 10.)

The current chairman of Bosch Car Multimedia is Mr. Carlos Ribas da Silva (technical director). The administration board is composed by: Mr. Markus Fechke; Mr. Lutz Welling (commercial director); Mr. Dr. Sven Ost; Mr. Joerg Pollak; Mr. Jonio Maia Reis; Mr. Luís Santos; Mr. João Ferreira and Mr. João Brás. Mr. Carlos Ribas da Silva was appointed in August 2015 as Managing Director/Technical after Mr. João Paulo Oliveira leave to guide Portucel international expansion. Dr. Sven Ost (board member) is currently responsible for the R&D conducted at Bosch, together with the team that manages the Innovation Projects & EFQM Model (TEF, ENG and CM/MFI divisions in Figure

19). Figure 19 shows the company's management structure. It is organized into two main areas: technical and commercial functions. Both are in close contact with Bosch headquarters.

4.3.4 BrgP processes, products & services

Figure 20 presents a schematic diagram of the management model by processes that have been implemented in BrgP. It includes all activities of the value chain together with two inputs: at the beginning market requirements and at the end market satisfaction. This view is applied to multiple projects conducted within the company, such as the one reported in Ricardo Resende master thesis from UMinho (Ricardo Resende, 2012, figure 44, page 51).

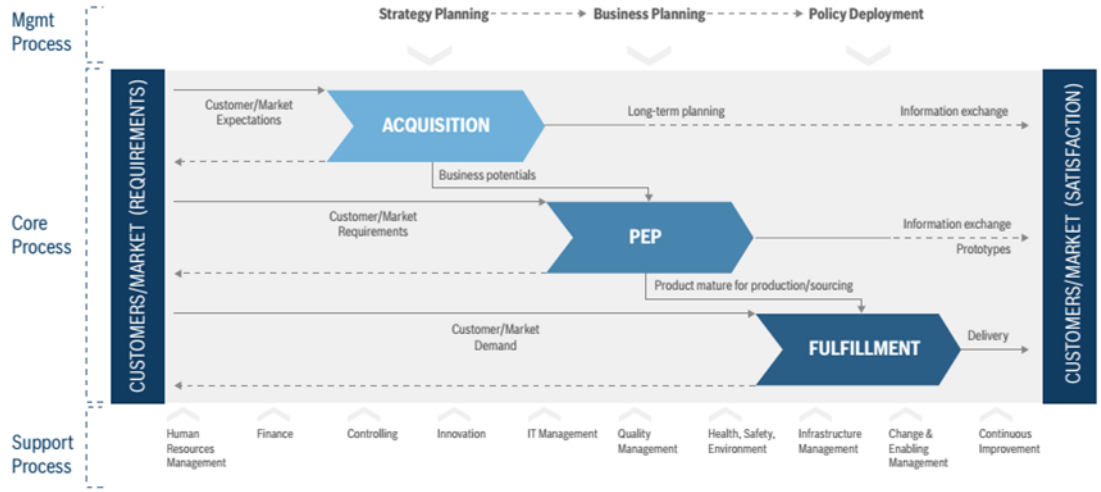

Figure 20 BrgP management model by processes (EFQM, 2015e).

Note that the subsidiary strategy per industry sector is defined by the Bosch MNC and is then locally adapted. In BrgP there are "area coordinators" responsible for multiple processes. This approach aims at improving the organizational processes, maintaining the strategic direction of the subsidiary. Besides the management model, Bosch also has a value stream mapping, fundamental to create added value. The HMI excellence marketing strategy is of extreme importance for the company since it has allowed BrgP to be considered as a reference for innovative and technological know-how in the automotive

industry. Production also plays a major part in the company's view. The "Bosch Production System" (BPS) is designed to eliminate waste in production and all related business processes. In addition, it allows the identification of opportunities for improvement (i.e. quality, costs, and supply performance). The full list of processes, products and services is presented in Figure 21.

	Approach Title	Description	Evidence Available
5a1	**Management Model by Processes**	The process management approach intends to design, explicitly manage, and improve organizational processes, maintaining an alignment with the strategic direction for BrgP.	The process management is defined and managed centrally, where the pro-cess owners for each process are nominated as described in the process landscape. At BrgP the "Area coordinators" are also nominated for each pro-cess.
5a3	**Value stream mapping (VSM)**	The Value Stream Planning method is a central element in optimizing the order fulfilment process. It is used to fully understand and document the processes of creating added value.	The Value Stream Planning consists of two components: 1. Assessing and visualizing the current situation, known as Value Stream Mapping (VSM). 2. Developing and visualizing the target situation, known as Value Stream Design (VSD).
5c1	**Personnel Marketing**	Strategic activities to improve the employer's branding and attractiveness.	Partnership with the UM by allocating interns, participating in studies, awarding prizes to best students. Partnership with ATEC and EPB, also by awarding prizes. Participating in Employment fairs to attract students.
5c2	**Human Machine Interface Excellence Marketing strategy**	Contributing to position Portugal as a country with a highly qualified workforce that produces valuable knowledge that can be applied throughout the world.	Placing BrgP as a reference for innovative and technological know-how (for cutting-edge car multimedia technology, as well as for development and production processes).

	Approach Title	Description	Evidence Available
5d2	**Bosch Production System (BPS)**	With the BPS vision we define where we want to go. In the process we use "True North" as a reference point, as it characterizes the ideal condition of a waste-free order fulfilment process.	The Bosch Production System is our production system for the design and continuous improvement of the order fulfilment process. BPS remains the framework for manufacturing and SMART factories.
5e2	**Customer's view**	BrgP builds sustainable relations with its customers, who are aligned with our strategic goals included in BSC.	The customers created and directed a common system to collect evaluations of our products/ services.
5e3	**Customer satisfaction**	The main goal of the survey is to receive feedback from the customer about our direct contacts and to know the customers' level of satisfaction.	The Customer Support Section performs a sur-vey to collect the needs and ex-pectations of the customers' lev-el of satisfaction. The survey re-sults are presented in the revision meeting by the Management.

Figure 21 BrgP processes, products and services. Adapted from (EFQM, 2015e).

4.3.5 BrgP Innovation Process

The research and development centre of BrgP was established in 2002. At the time it employed 45 people. Currently more than 100 engineers dedicated to R&D tasks are working at the R&D centre. The evolution of investment into R&D conducted in Braga is shown in Figure 22.

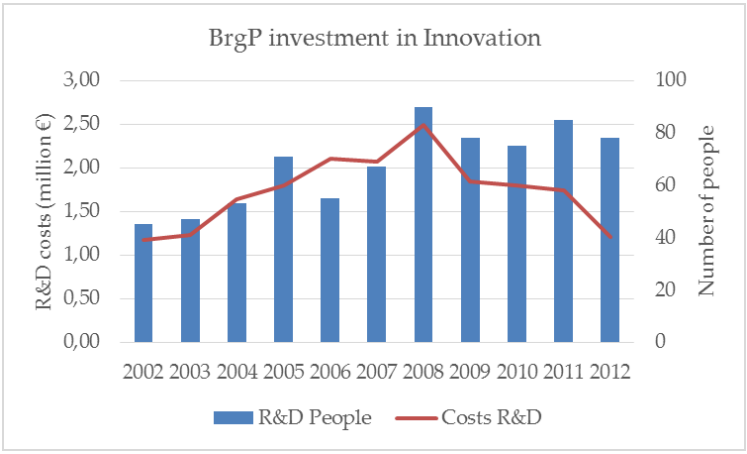

Figure 23 BrgP investment in innovation (Paula & Pinheiro, 2013).

Figure 22 Innovation, research and development activities conducted at BrgP. Adapted from official information provided by the company.

The objectives of this unit are: generating new ideas, organizing resources and guidelines for project implementations. The activities conducted in BrgP are presented in Figure 23. The company is currently developing new head-up-

displays, mechanical and electronical concepts, manufacturing and logistic processes and new sensors. In the near future, the innovation targets are cost reduction and quality improvement.

A schematic overview of the innovation process conducted at BrgP is presented in Figure 24 [10].

The innovation process at BrgP called "innovation funnel" is divided into three main stages: idea generation (innovation strategy); pre-study (innovation idea management) and concept study (innovation feasibility process). Each of these stages ends in an innovation gate (IG), where the assessment of the results achieved and the assessment of the idea potential are conducted. The IG (represented with a square in Figure 24) assessment determines whether the innovation process proceeds or it needs to be adapted until a suitable solution is defined. The main assessment criteria are commercial, market, technical, planning and report requirements.

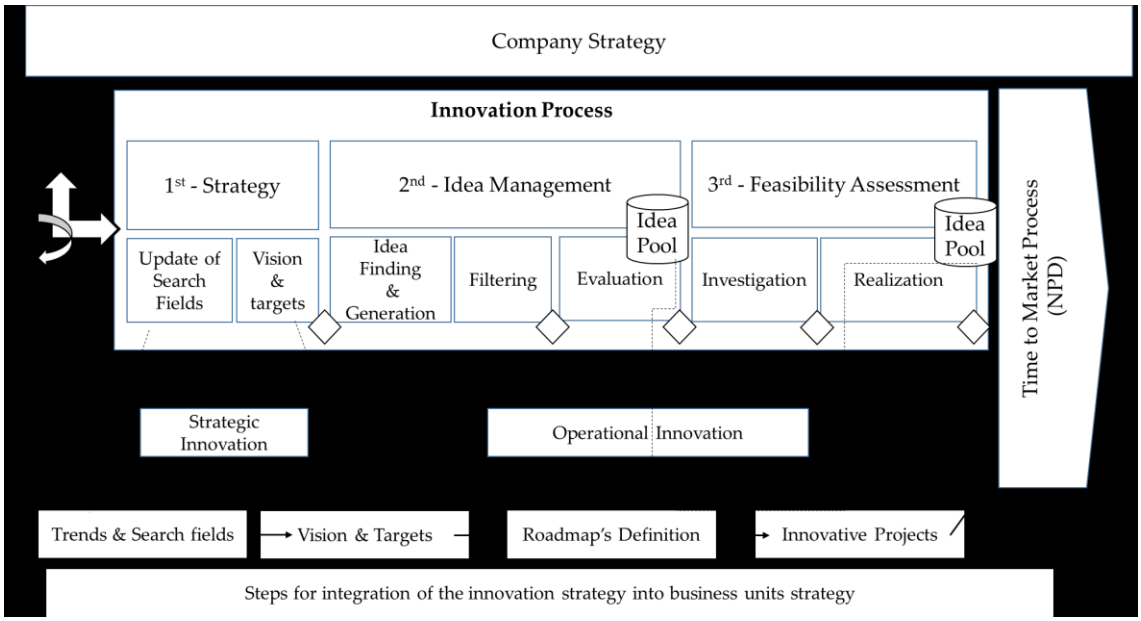

Figure 24 BrgP Innovation Funnel. Adapted from (Pinheiro, 2013) *and* (Simões and Santos, 2015)

[10]The schematic results from the integration of Alexandra Pinheiro master thesis at UMinho and a case study regarding Bosch Aveiro conducted by Simões and Santos in 2015.

The first stage is derived from the product strategy and strategic planning defined by BrgP. Current market trends are identified and described by the car multimedia and its centre of competence and used to determine high relevant markets in the near future. This defines the subsequent search fields and the subsidiary vision to ensure business sustainability. The IG0 tends to be more general since it acts as a bridge between the business plan and the innovation process.

The idea management process encompasses the aggregation of multiple internal (Bosch people) and external ideas (i.e. suppliers). Regarding this process, BrgP has a bonus system to reward the employees with the best business ideas. The aggregated ideas are sorted and classified and subject to an evaluation taken into account several characteristics: time, level of innovation, complexity, basic technical specifications, supplier markets and most importantly, their capacity to be adapted to meet market needs. This process allows for the creation of an Idea Pool. This idea pool is then cross mapped with the subsidiary roadmap. Once this process is completed, a feasibility assessment test is conducted where the ideas are further investigated. This includes further technical specifications but also marketing and commercial planning. One important aspect considered during this stage is the user experience. This concept was early integrated in Bosch MNC in 2000 and it aims at putting the user needs at a center stage, ensuring that innovations meet customer requirements and satisfaction levels.

Ultimately, the ideas approved from the third stage are used to define innovation projects that lead to new product developments (NPD). The NPD roadmap is called time-to-market process (TTM).

The ideas generated at Bosch aim not only at creating new technologies but also at replacing old ones, to the benefit of its clients. Therefore it requires the effort of multiple players within Bosch, other divisions, other processes. The linear model assumes a constant interaction between the people of the innovation

processes and the remaining company collaborators. To ensure that this relationship is successful and allows innovation to be achieved and implemented, the reward incentive program installed plays a major role.

Besides internal information regarding how to solve problems and the incentives for innovation, the company actively promotes this culture by displaying within its headquarters (Germany, Sttugart) multiple information such as plan-do-check-act cycles that can be visually analysed at BrgP.

Bosch believes in the concept of "simultaneous engineering". This means that multiple internal stakeholders perform tasks concurrently. Figure 25 presents how this simultaneous engineering process is performed within Braga and also between the centers of competence for the automotive industry within Bosch MNC.

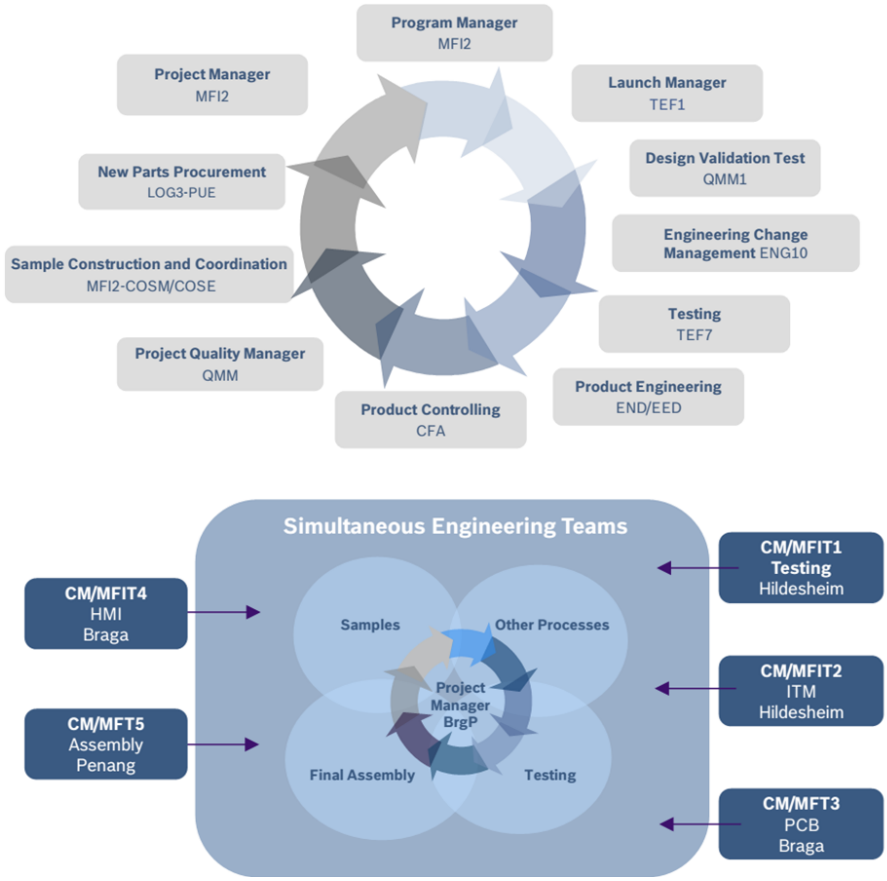

Figure 25 BrgP concept of simultaneous engineering.

4.3.6 Stakeholders, Customers, Competitors and Suppliers

BrgP stakeholders can be depicted in Figure 26. The company strategy also takes into account the needs and expectation of the stakeholders.

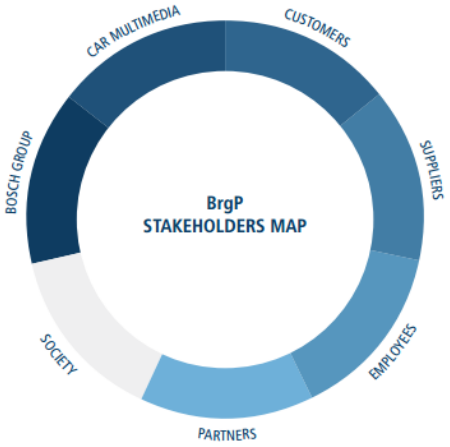

Figure 26 Bosch Braga stakeholders (EFQM, 2015c).

BrgP doest not have a strong presence on the Portuguese market. The competitors are also multinational companies such as Denso Corporation and Delphi Automotive Systems, tier one suppliers of the automotive industry. The main list of customers of Bosch Car Multimedia division (total customer over 45) includes major players (OEM) in the automotive industry such as BMW, John Deere, Mercedes-Benz, and Iveco. In addition, BrgP also has other smaller scale customers.

BrgP has both national (10%) and international suppliers (90%: 55% in China, 34% in Europe and 0.8% in the United States) in a total of 426. Suppliers play a major role for the company since assembly of the products is performed at the BrgP unit. The inbound and outbound movement of materials occurs using trucks, air and sea freights and also express shipments. Figure 27 presents the values of logistics in BrgP for 2015.

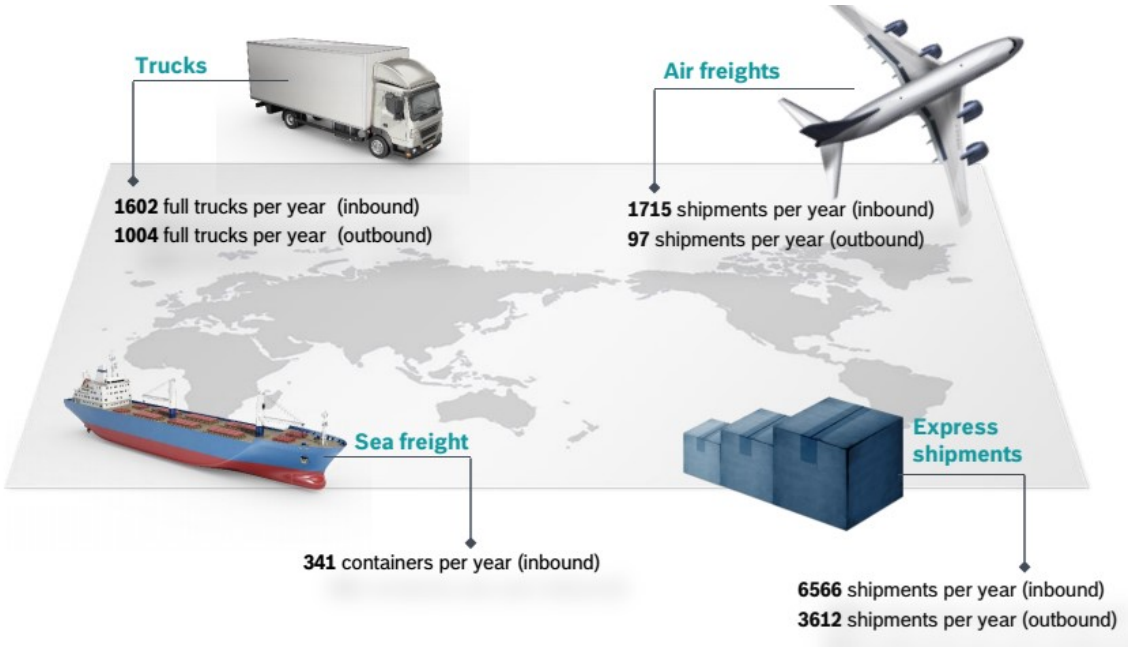

Figure 27 Bosch Braga logistics in 2015.

BrgP works closely with suppliers on improvements and on their development. Developing suppliers follows Bosch's lean manufacturing methodology and it is Bosch's strategy to empower its suppliers. An effort of this vision is the recently news of the Portuguese Government new incentive programme called "Suppliers Club – Clube de Fornecedores" that aims at developing 40 supplier companies in areas such as quality; on-time delivery; efficiency or even logistics. This program has a global budget of 100M€ and is expected to result in an increase in the number of BrgP's national suppliers from 10% to 15-25%. BrgP and UMinho are technical and scientific leaders of the project (Bosch Portugal, 2017a; Governo de Portugal, 2017).

People are one the key assets of BrgP. Therefore the company's vision is to provide its employees with tools that allow them to develop themselves and become highly capable and efficient. Several internal campaigns are carried out by BrgP human resources department with the goal of enhancing human resources. There is an employees' suggestion and reward system that aims at motivating employees to identify improvements for the company, resulting in subsequent compensations. There is also an internal sets of tools (training

programs, technical programs, communication) that allow each individual to evolve and bring more added value for the company (EFQM, 2015d).

4.3.7 Main economic and financial indicators

Table 7 shows Bosch Car Multimedia, S.A. key financial and economic indicators for the period 2008 – 2015.

	2008	2009	2010	2011	2012	2013	2014	2015
Operating revenue / turnover	356,56	422,81	591,08	651,55	552,18	446,26	435,24	523,20
Sales	347,25	408,53	586,90	651,26	552,97	446,45	433,15	515,58
P/L before tax	0,58	4,47	17,14	33,95	17,50	19,35	17,76	16,81
Net income	6,22	5,49	13,45	27,01	14,41	11,76	13,79	14,40
Cash flow	20,28	19,62	27,87	40,30	26,57	22,99	25,07	25,97
Total assets	92,88	120,07	145,11	159,39	124,65	118,16	125,42	169,88
Shareholders' equity	54,18	59,67	73,42	81,47	68,77	66,02	68,03	68,62
EBITDA	15,83	17,77	31,64	47,52	29,95	30,67	29,10	28,48
VAB	68,62	61,64	79,13	102,56	81,89	77,77	80,24	83,03
Economic profitability (%)	0,62	3,72	11,81	21,30	14,04	16,38	14,16	9,89
Financial profitability (%)	1,06	7,50	23,35	41,67	25,44	29,31	26,11	24,49
General liquidity	1,86	1,59	1,68	1,61	1,56	1,57	1,47	1,15
Indebtness (%)	41,67	50,31	49,40	48,89	44,83	44,13	45,75	59,60
Number of employees	1731	1832	2001	2156	2100	1860	1954	2084
Cost of employees	43,21	40,62	47,57	54,99	51,93	47,09	51,14	54,55

Table 7 Bosch Car Multimedia key financial results. Values presented in million euros with exception of the rations and number of employees. The gross profit margin is not available. Source: SABI.

Apparent Productivity of Labour	2008	2009	2010	2011	2012	2013	2014	2015
Bosch Braga	0,40	0,34	0,40	0,48	0,39	0,42	0,41	0,40
Industry	0,60	0,46	0,60	0,46	0,40	0,43	0,41	-
Ratio	1,51	1,36	1,51	0,96	1,02	1,02	1,00	-

Table 8 Apparent labour productivity. Values presented in thousand euros/employee. Industry CAE Rev.3 .Source: Pordata.

In 2015 total operating revenue was around 523 million euros (Figure 28), with an economical profitability of 10%. The company has recently increased its number of employees to 2084 in 2015 (an increase of 6.7% when compared with 2014) and new employees will soon be recruited. Based on this information (VAB

and number of employees), the apparent labour productivity (ALP) was calculated and compared with the industry values (Table 8). It can be perceived that Bosch has been having a steady ALP over time. Since 2011, the ALP of the company is equal to the ALP of the industry, showing that it was able to overcome the Portuguese crisis in 2009. In addition, it has doubled its operating revenue from 2008 to 2011. Multiple financial indicators show the same trend over time: net income, EBITDA and P/L before tax. The company reports a net income of around 15 million euros for 2015 (Figure 29).

The company (on their official website) reports exporting more than 90% of its production. Figure 34 presents the import and export analysis BrgP since 2008. In 2015 BrgP exported 82%, whereas Bosch Thermotechnology - Aveiro exports 83% and Bosch Security Systems - Ovar 93% to the community and non-community markets.The remaining percentage is sold in Portugal (internal market). There is no available information regarding the Robert Bosch S.A and Robert Bosch Portugal SGPS S.A. in Lisbon. Even though BrgP claims to have 10-15% of local suppliers, according to Sabi the actual percentage is much higher (Figure 30). These discrepancies in numbers may be explained by the complexity of the financial structure of Bosch in Portugal.

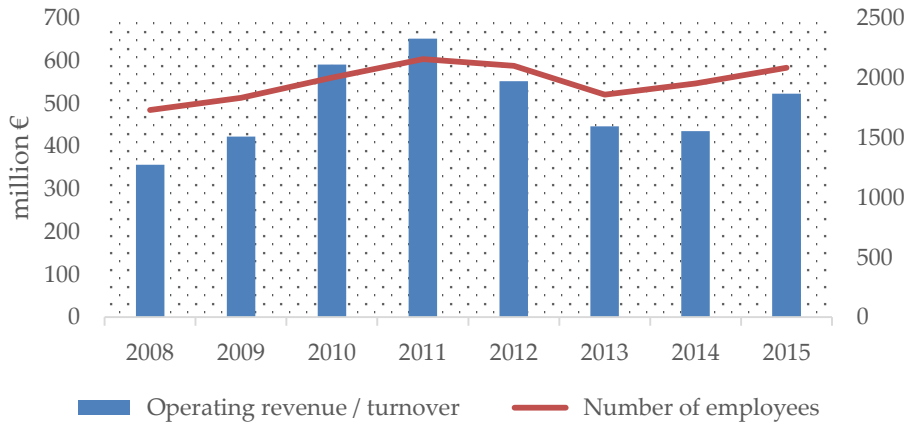

Figure 28 Bosch Car Multimedia operating revenue and number of employees in the period of 2008-2015. Source: SABI.

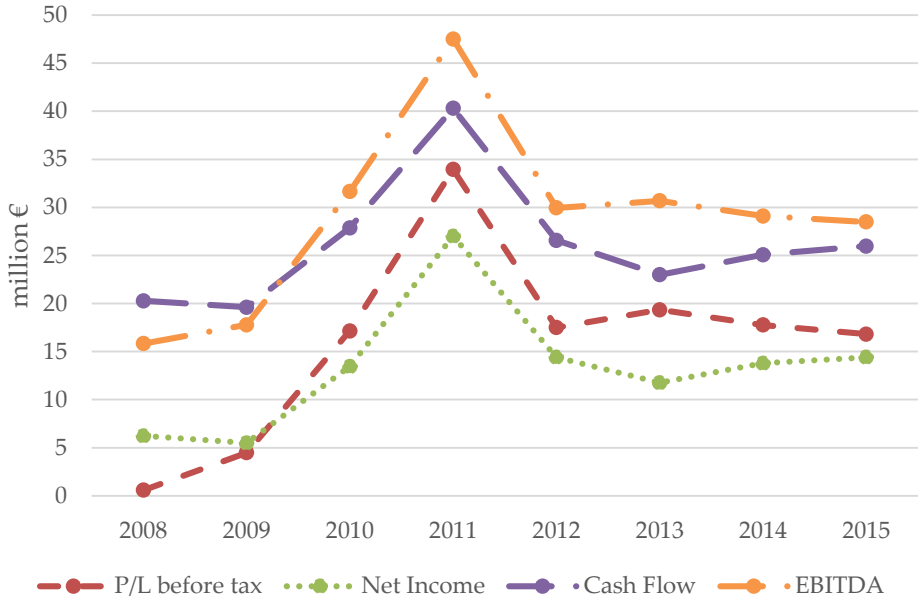

Figure 29 Bosch key financials in the period 2008-2015. Values presented in million €. Source: SABI.

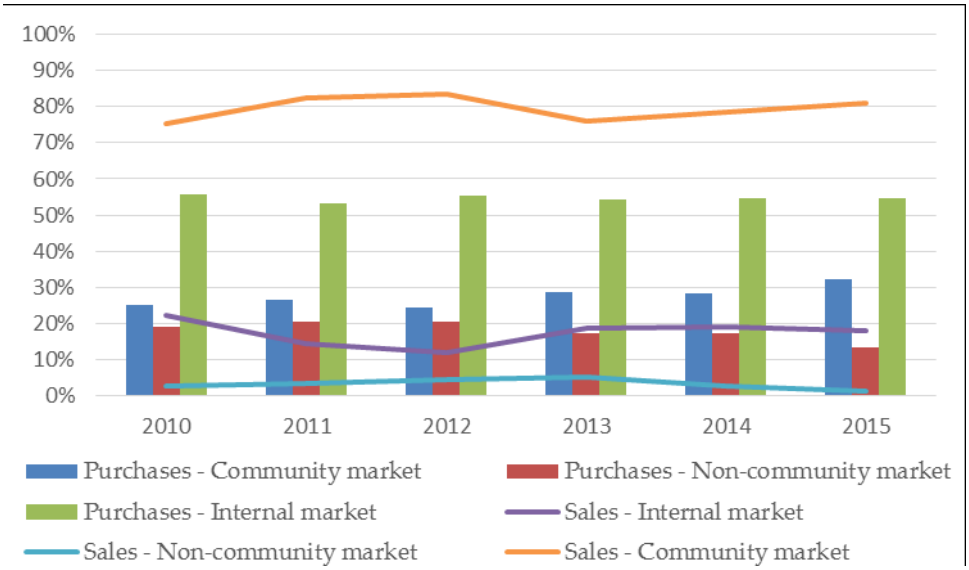

Figure 30 Bosch Braga Import and Export analysis. Internal market refers to Portugal. Community market refers to Europe zone. Non-community market refers to countries outside the Europe zone. Values presented in %. Source: SABI.

4.4 Evidence of Local knowledge creation and transfer in Bosch Car Multimedia S.A. – HMIExcel project with the University of Minho

This section aims at presenting the HMIExcel project, which was the strategic project identified by Bosch Braga as one key example of local innovation being conducted with local partners. Firstly, an overview of how Bosch engaged in such a partnership is explained. Then the project is thoroughly described in terms of financing, lines of research, the teams, the partners, the governance model and the results obtained, including the economic benefits for the region. Discussion and analysis of the information will be performed in chapter 5.

Prof. José Oliveira identified the "HMIExcel - critical R&D in the framework of the development and production cycle of advanced multimedia solutions for automobile" as the key project that will allow us to understand how knowledge is being created and transferred locally by BrgP.

The project, the vision and the start of the partnership created with UMinho is thoroughly explained by Prof. José Oliveira TEDx Conference in Braga 2016. In a nutshell, in 2010, Braga was above all a production unit (even though with an R&D centre since 2002), with recognized experience and know-how in the automotive industry. At the time José Oliveira asked and encouraged his administration (both in Portugal and in Germany) to participate in the 2011 EFQM Excellency awards. The company is audited in May 2011. EFQM concludes that Bosch Braga was not leveraging the local partners; in this case referring directly to partners that could foster innovation based science (i.e. UMinho). The company later that year was awarded the excellence award and the journey begins. Dr. Sven Ost (board member) and Prof. José Oliveira discuss whether the subsidiary would be available and ready for a strong, complex, disruptive, structural partnership with UMinho. Once BrgP made that decision,

the next step was to engage UMinho partners to participate. The initial meeting with Prof. Dr. António Cunha (UMinho Dean) occurred in October 2011. José Oliveira explained the Dean that for the project to be successful, the team to be selected, necessarily should have the following characteristics: high abstraction ability, with macro vision, people with scientific knowledge but with industry mind-set. The UMinho Dean selected Prof. Dr. João Monteiro (President of the Engineering School at UMinho) and Prof. Dr. António J. Pontes. From Bosch the team was composed by Prof. José Oliveira and Prof. Dr. Pedro Delgado. In July 2012, the partnership was formalized with a visit of the Prime-Minister to BrgP unit.

Between October 2011 and the project official start in May 2013, several back and forth meetings occurred between the people assigned from BrgP and UMinho. In José Oliveira opinion the initial lines of research and the initial funding (around 7M€) was not high enough to allow the project to be disruptive, innovative and changing. BrgP initial goal was to invest above 15M€. The financing structure of the project involved Portugal Global - Trade & Investment Agency (AICEP), National Innovation Agency (ANI), COMPETE, BrgP and UMinho. At the time the financing entities in Portugal at the time were not comfortable and prepared to manage such a potential high impact project, even though since the beginning the Portuguese government recognized that the project was of nationally strategic interest. Nevertheless, in April 2013 the project is finally submitted to the appropriate financing programs. It is approved in May 2013, homologated in April 2014 and completed in June 2015. The project time-line is shown in Figure 31.

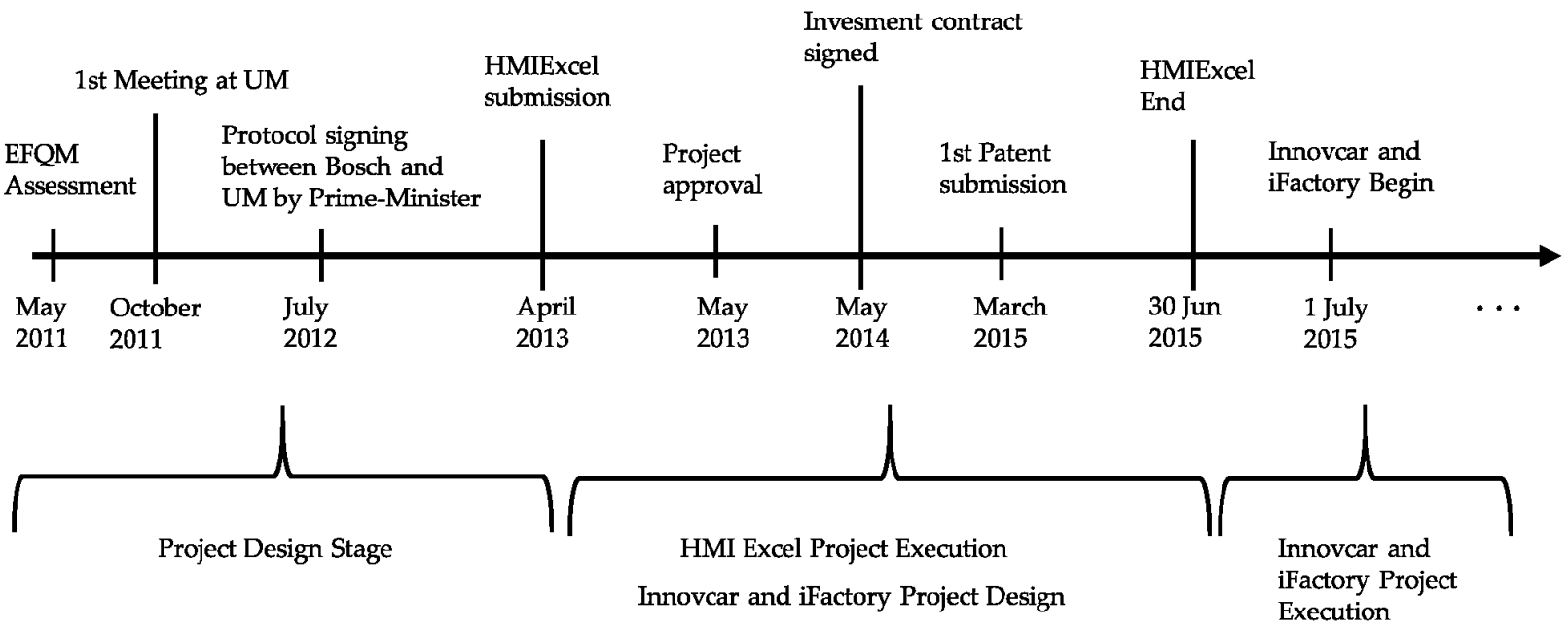

Figure 31 HMIExcel project time-line with key moments.

The project aimed at developing global products, processes and innovative solutions, enabling the opening of new dimensions in automobile mobility, revolutionising the relationship between driver, passenger and vehicle.

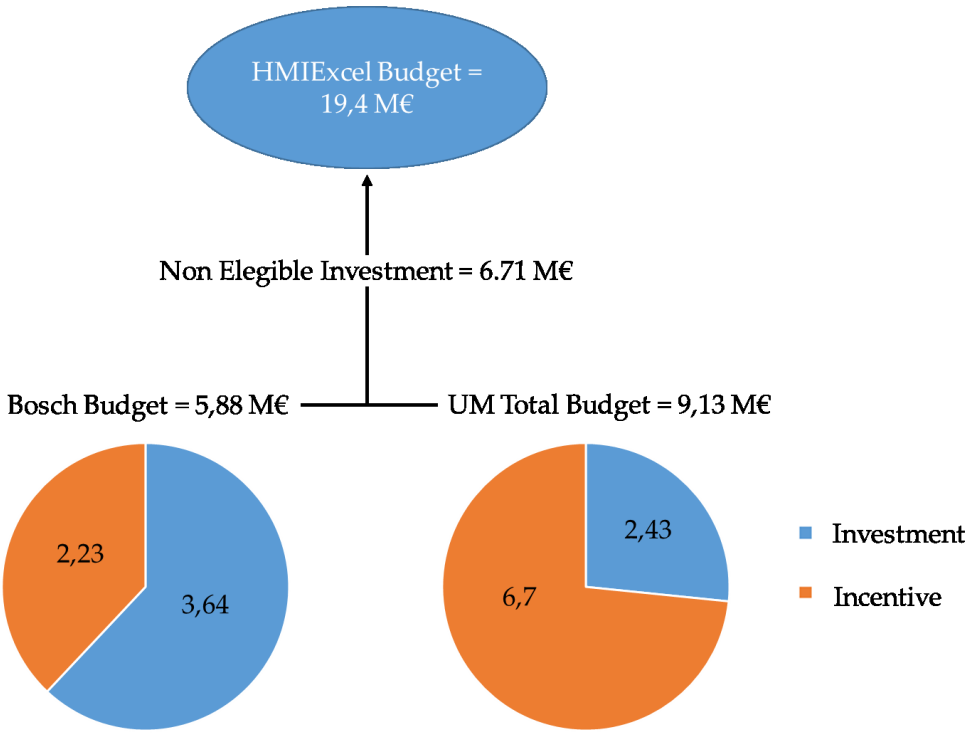

Figure 32 HMIExcel financial analysis. BrgP invested 60% and University Minho 40%. Bosch Braga had an incentive of 50% and University of Minho 75% of the eligible investment.

The budget for the project was 19.4 M€ with different funding's for both BrgP and UMinho. Figure 32 presents the financing breakdown per partner of the project. ANI, under a protocol signed with AICEP, analysed the application, the project merits and calculated the eligible expenses and the incentives[11].

4.4.1 Project R&D Teams and Lines of Research

The HMIExcel project was composed of 13 different lines of research. The project aims at answering new HMI challenges by using new materials for products and also by the use of innovative tools in production processes. This is in line with BrgP current and future strategy, which has been the continuous replacement of the classic car radios with cutting edge automotive multimedia

[11] Information obtained via interview to Eng. Miguel Barbosa, ANI administrator – Appendix VI.

technologies. The project's main purpose is aimed at answering a set of technical and scientific issues that these new multimedia products have.

The project's main objectives included state-of-the-art research, inception, design and implementation of (COMPETE, 2017a):

- New chassis concepts for automobile solutions;
- Constructive and coating solutions for better multimedia head display's legibility under specific illumination conditions;
- New multimedia solutions with validated design, ergonomics, usability, perception and safety in human-machine interfaces;
- Systems for automotive sensorization;
- New techniques, tools and quality control instruments for: PCBs developing and production; 100% image detection and surface defects in head-displays;
- Systems and protocols for the evaluation of new multimedia solutions in developing and pre-industrialization processes;
- Integrated systems for planning, control, managing, monitoring and reporting of developing, production and quality stages of the new set of multimedia solutions.

The main technological areas that are focused within the project include: electronics and instrumentation; information technologies and telecommunications; materials and mechanical technologies; human factors; industrial engineering and management. The 13 lines of research identified embrace three different domains: product development, quality control and also production management. Each line of research has a different and strategic importance for Bosch. For instance, the production management systems developed within the course of the project will allow BrgP to be more prepared to answer the challenges of Industry 4.0. Table 9 presents the 13 lines of research.

For each line, the industry problems identified and possible solutions are presented. In addition, the project team leaders and the corresponding R&D teams composition is also shown. Each line of research had two project leaders at each institution (2+2).

Overall the project involved about 300 people (around 265 researchers) from the two partners. Besides, it lead to the employment of 35 new engineers by BrgP and 95 new researchers by University of Minho.

R&D Line	Goal	Objective/Problem	Possible Solution	Bosch Project Leader	UMinho Project Leader	Bosch and UMinho R&D Team *
L01	Screwless chassis	Disadvantage in the use of screws	Eliminate screws	Pedro Bernardo	Luís Alves	18 (4+14)
L02	Chassis with plastic housing	Avoid weight	Build chassis with polymers	Pedro Bernardo	António Pontes	16 (4+12)
L03	Angle Sensors	External interferences	Develop new systems to measure in angular position	Diógenes Araújo	Luís Rocha	10 (5+5)
L04	SMART Manufacturing Control	Maximize planning and production efficiency	Integrated software system	André Gonçalves	Paulo Martins	26
L05	iFloW – inbound flow visualization	Need to live track suppliers	Develop software system	Pedro Vaz Silva	Ricardo Machado	21
L06	Warpage prevention	Avoid PCBs damage	Investigate thermal properties of PCBs	Pedro Delgado	Luís Alves	8
L07	Optical bonding	Reduce reflection in the displays	Enhance displays quality image	Tiago Martins	Júlio Viana	5
L08	Cosmetic defects on display and fascia (scratches)	Develop automatic cosmetic defects	New detection processes	Boris Bret	Michael Belsley	7
L10	Functional defects in displays ("Tiny dots")	Detect defects	New low-cost detection processes	Boris Bret	Eduardo Pereira	9
L11	Land pattern design by thermal simulation	Allow higher control over welding processes	New method for thermical design of PCBs	Miguel Peixoto	José Carlos Teixeira	16
L12	Quality Function Deployment (QFD)	Enhance Bosch products quality	Application of Bosch Engineering system in critical production units	Pedro Delgado	José Meireles	9
L13	Image projection on windshield – augmented reality	Need to develop innovative technology solutions	Develop fixing solutions for augment reality within head up displays	Vitor Pais	Jorge Cabral	23 (15+8)
L914	Human Machine interfaces (HMI)	Increase driving safety	Develop an advanced automotive cockpit	Nuno Ribeiro	José Mendes	26

Table 9 HMIExcel 13 lines of research. The number of elements per team was analysed photographically within the project official maganize. Official reports regarding the human resources of the project are still being compiled.

4.4.2 Project Partners

Several internal and external partners of University of Minho participated in the project. Table 10 and Table 11 identifies those partners, their core competences and their value added.

Partners External to UMinho	Center Name	R&D Lines of participation	Value-Added
#1	PIEP - Innovation in Polymer Engineering	L02 and L06	Previous knowledge in material characterization and numerical modelling that allow to achieve the L02 objectives; Programming languages knowledge that allowed a fast development of a software tool for L06.
#2	TECMinho	13 lines	Responsible for the protection of the intellectual property produced.
#3	CCG - Center of Graphical Computation	HMI (L914)	Provided technical and scientific knowledge in human factors and human machine interface.

Table 11 University of Minho – external partners that participated in the HMIExcel.

Partners from UMinho School of Engineering	Center Name	Core Competences
#1	Algoritmi Centre	Eletrical and Eletrotechnical Engineering; Software and Multimedia systems;
#2	Centre of Physics	Physical production; Optics
#3	Institute for Polymers and Composites (IPC)	Polymer Engineering
#4	Mechanical and Material Technologies Centre (CT2M)	Functionalized Materials; Dynamic of Mechanical systems

Table 10 University of Minho – School of Engineering centers that participated in the HMIExcel.

4.4.3 Governance Model and Project Management teams

The financial dimension and the technical complexity of HMIExcel lead to the necessity of defining two management levels: the program management and the project management. The program comprises all project lines that are connected and contribute to the same objectives.

Both program and project management governance models can be depicted in Figure 33 and 34. These governance models were the foundation for the success of the project (Pinto et al., 2016).

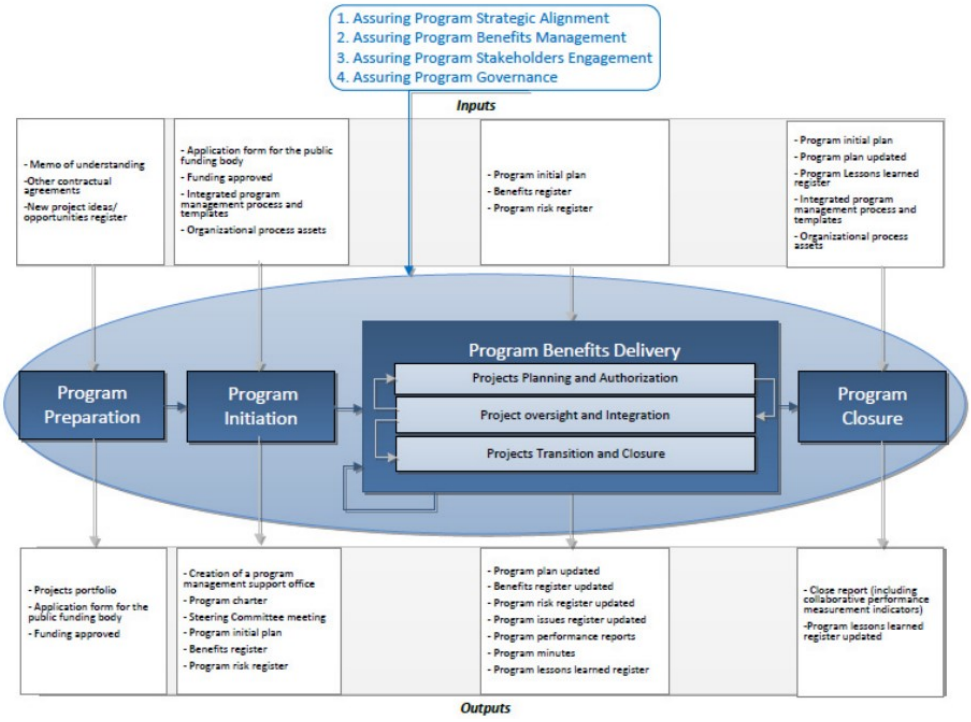

Figure 33 HMIExcel program governance model. Prof. Dr. José Oliveira was the program manager for BrgP and Prof. Dr. Eduardo Bacelar Pinto was the program manager for UMinho.

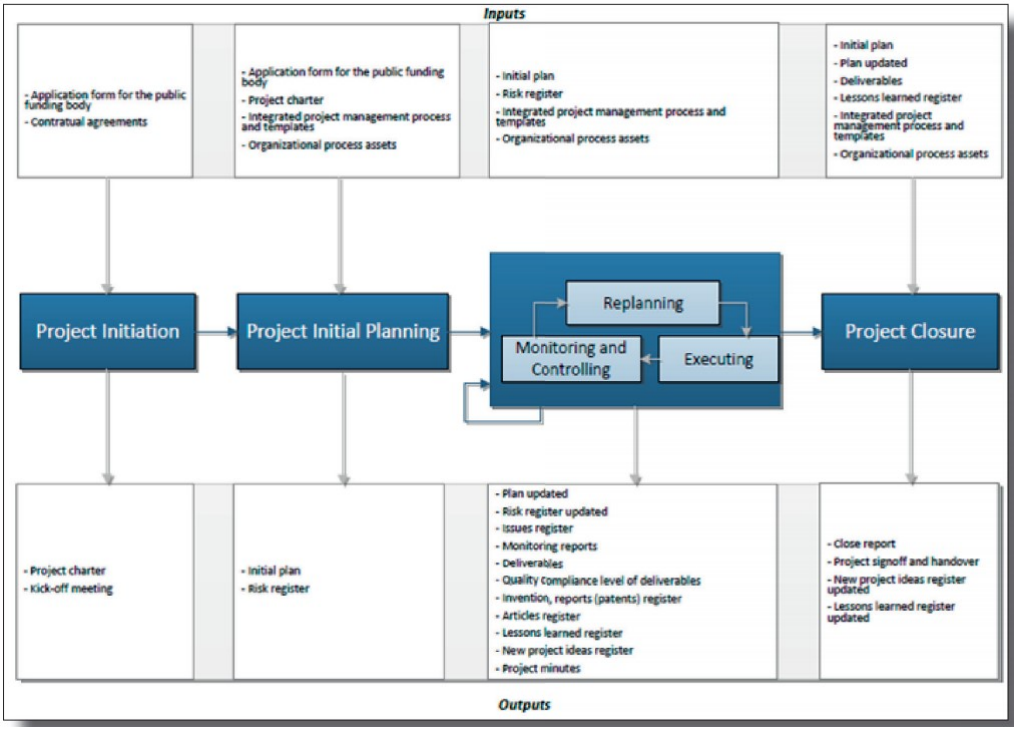

Figure 34 HMIExcel project governance model. Prof. Dr. Pedro Delgado was the project manager for BrgP and Prof. Dr. António J. Pontes was the project manager for UMinho.

The coordination teams included both staff from BrgP and UM. The coordination team was comprised of two levels: strategic and operation coordination. On the one hand, the strategic team was responsible for ensuring the program governance and engagement of the key stakeholders. On the other hand, the operation team was responsible for the operationalization of the multiple R&D lines of the project. For this purpose, project management officers (PMOs) were defined. The PMOs[12] were responsible for monitoring the current state of the projects, alignment of objectives, technical and personal problems-solving, quality verification, promoting communication between BrgP and UM and to monthly report the evolution of each project line to the strategic team. There were 2 PMOs for the financial component of the projects and 4 PMOs to monitor all projects from UMinho. The number of PMOs from BrgP was proportionally lower (2). Total number of program and project meetings to

[12] PMOs background was typically five years of economics/engineering with a post-graduation in industrial management.

discuss technical and management issues surpassed 500 over the 25 months of the project.

4.4.4 Project Results

HMIExcel led to the registration of 12 patents up to 31 June 2015 (Figure 35). The number of patents registered was higher than predicted (10). Besides patents, the project planned to complete 176 prototypes, having managed 170. The remaining six were already being executed at the end of the project. 100% of the generated intellectual property belongs to Bosch.

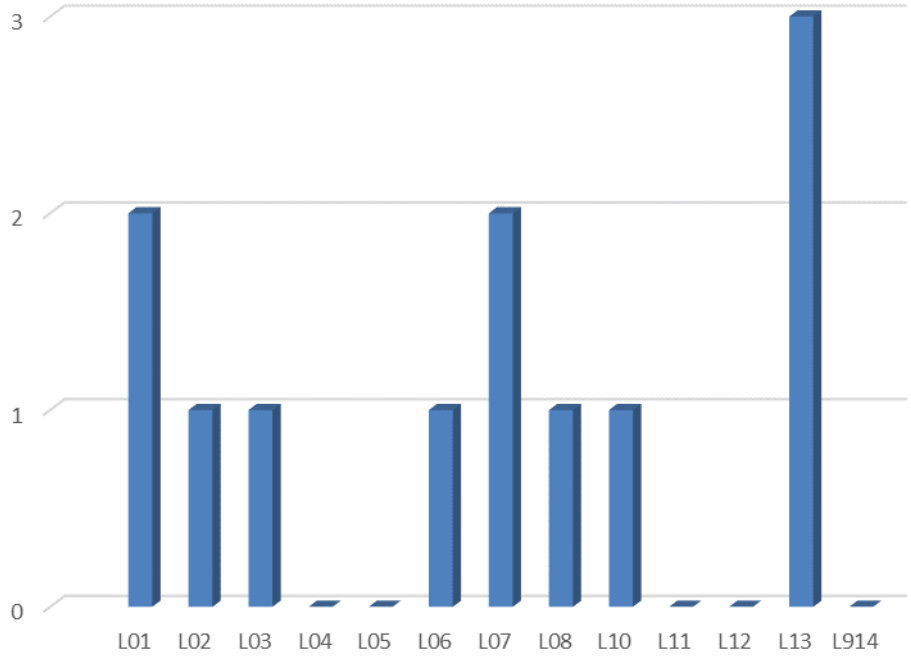

Figure 35 HMIExcel project resulting patents per line of research until 31.06.2015.

HMIExcel had multiple effects in the Portuguese Economy. Firstly, it allowed the employment of 130 people for both BrgP and the University of Minho. The Portuguese economy benefits from this process as the people that were employed were highly-qualified, trained and financed by the Portuguese government at public universities. These engineers bring value added, knowledge and a greater visibility for the company, the university and the government. It is important for

the development of the country that talented engineers graduating from our top universities are quickly employed in their field of studies. Simultaneously, this project allowed the creation of a Ph.D. programme at the University of Minho (doctoral program in Advanced Engineering Systems for Industry (AESI) resulting in 16 graduates per year from 2018).

Chapter 5
Discussion

In this chapter the work developed is analysed. This thesis aims at providing insights and answers to three research questions (RQ). This chapter will be structured into three parts: in section 5.1, the theoretical model determinants and the linkage intensity between BrgP and UMinho is analysed; Section 5.2 analysis Bosch Car Multimedia knowledge creation and transfer activities, as well as the factors that influence these processes (RQ 1 and 2); finally section 5.3 the economic impact of such activities on the Portuguese economy are presented (RQ 3).

5.1 Linkage Intensity between Bosch Braga and UMinho

The interviews conducted at Bosch Braga and UMinho aimed at identifying multiple aspects of the partnership. These aspects were defined by the theoretical model previously explained in chapter 2. Table 12 presents an overview of the information on the HMIExcel project, according to the 2 partners, where information on multiple aspects of the project is presented.

Project Characterization	BrgP	UMinho
Project Goals (product innovation, processes, organizacional,….)	Product and Processes innovations	Development of Products and Innovative competitive solutions on a global scale
Local Organization whose relationship with Bosch Braga will be evaluated	Bosch Braga	University of Minho
Contact Person at each partner	Prof. Dr. José Oliveira	Prof. Dr. Eduardo Pinto
Identification of other partners in the project	PIEP, TECMinho, CCG	PIEP, TECMinho, CCG
Who initiated the project?	Bosch Braga	Bosch Braga
Project begin date	May 2013	2011 - May 2013
Project end date	June 2015	June 2015
Project results	12 patents, 95 people hired	12 patents, 16/32 articles, 170 deliverables
Number of People involved (both partners)	310	300
Research and Development Costs	19.4M€ (60-40%)	19.4M€ (60-40%)
The project was supported by community funding? If so, at what extent (%) ?	Yes (COMPETE)	Yes (50% Bosch, 75% UM)
Main contribution(s) of each partner to the project	Industry Problems definition	UM - fundamental knowledge based on the state-of-the-art
Main contribution(s) of the remaining partners	TECMinho - patent registration; PIEP - polymers knowledge ; CCG - Information systems and human factors	TECMinho - patent registration; PIEP - polymers knowledge ; CCG - Information systems and human factors

Table 12 HMIExcel project general information. The 2 partners agreed as regards the main characteristics of the project.

Following the theoretical model, we have confirmed that both BrgP and UMinho have a set of features that influence their activity (Table 13). Both organizations have a complex network of national and international relationships.

Their strategy is clearly different as BrgP aims to maximise profits whereas the university is concerned with preparing young professionals' for the future, as well as conducting research and development activities.

Both partners have a massive knowledge stock. This is visible by the multiple products, patents and research and development activities conducted at BrgP. The knowledge stock of UMinho is based also in patents but typically the key performance indicator used is the number of indexed publications within Scopus (1997 papers).

Firm-specific influences of the partnership between Bosch Car Multimedia and University of Minho		Units of measurement used	BrgP	UMinho
Internal and External Network	Number of intra and inter-firm relationships	Numeric	120 (40 local, 80 international) *	178 (108 local, 70 international) **
Strategy	Firm's strategy	Non-Numeric	Growth in people, production and sales (expected 1000M€ in BrgP); Continue the profitable investment and cooperations in R&D to create solutions for the automotive industry;	Activity growth in three main sectors: teaching; research and development; interaction with society **
Knowledge stock	Firm's competences, know-how and value added. Dependent of the diversity and accumulated experience.	Non-Numeric	Patents, products, R&D	1997 indexed scopus papers, 13 patents, products
Absportive Capacity	Firm's ability to recognize the value of information and then adapt and adjust accordingly (examples)	Qualitative scale (very low-low-average-high-very high)	Very High (real time scouting; ability to bring value added in multiple projects related with autonomous driving	Very High (ability to learn, adapt and adjust to different scenarios)
Location-specific influences	Factors that affect positively and negatively the potential relationships with locals and foreign firms (e.g. government mechanisms, fiscal and economical policies)	Non-Numeric	**Positive:** Access to qualified people, proximity to the airport and to universities, fiscal policies towards R&D. **Negative:** energetic costs, few building sites available	**Positive:** Access to motivated students, proximity to the airport, industry partners and other universities

*Table 13 Firm-specific influences of both Bosch Braga and University of Minho. * information retrieved from Bosch official information. ** information retrieved from the annual report of UMinho.*

Regarding the absorptive capacity, it plays a major role when understanding an organization's ability to recognize the value of information and ability to actuate over the collected information. This feature was evaluated by the interviewers using a qualitative scale and multiple examples. The representant of BrgP assumes that the subsidiary has a very high absorptive capacity and that becomes evident on its ability to anticipate and predict future market trends in the automotive industry. Their role as a centre of competence within the Bosch MNC demands that BrgP to be one step ahead of its competitors. On the other hand, the interviewer from UMinho believes that the university also has a very high absorptive capacity given their researchers abilities to understand and

interpret different ideas by performing state-of-the-art reviews (meaning that the university researchers have a very high ability to fast learn new concepts).

Location is another feature that influences an organizations production, services and research activities (Table 14).

Location-specific influences of the partnership between Bosch Car Multimedia and University of Minho	Units of measurement used	BrgP	UMinho
Factors that affect positively and negatively the potential relationships with locals and foreign firms (e.g. government mechanisms, fiscal and economical policies)	Non-Numeric	**Positive:** Access to qualified people, proximity to the airport and to universities, fiscal policies towards R&D. **Negative:** energetic costs, few building sites available	**Positive:** Access to motivated students, proximity to the airport, industry partners and other universities

Table 14 Location-specific influences of both Bosch Car Multimedia and University of Minho.

Examples of such factors are the access to qualified people, the transportation costs or even government policies that may benefit or hurt the business. On this topic, both BrgP and the UMinho believe that their geographic location has many advantages (i.e the proximity to the airport and to several universities). BrgP also acknowledges favourable fiscal policies towards R&D activities. As a downside feature, BrgP location does not allow for any further physical expansion (as it was shown in Figure 15 – BrgP buildings surrounded by other firms).

Analysis and understanding of location and both organizations specific influences is critical towards the understanding of the linkages intensity created between the two partners. The linkages intensity will allow the assessment of the potential for local knowledge spillover resulting from this interaction.

The theoretical model distinguishes three different linkage attributes: quality, quantity and scope. Information on each linkage attribute for both BrgP and UMinho are presented in Tables 15, 16 and 17, respectively.

Quality dimension in the partnership between Bosch Car Multimedia and University of Minho		Unit of Measurement Used	BrgP	UMinho
Depth	Intensity of inter-organizational interactions for non-pecuniary benefits (e.g social, learning or improvement opportunities)	Non-numeric examples	Social (i.e. innovation days) and Learning opportunities (PhD programme)	Social (i.e innovation day's), Learning and Improvement (equipment for laboratories, universities roadmaps re-aligned to match science + industry, better prepared students, PhD programme)
	Extent of learning which occurs due to interactions between subsidiary and local organization at employee or team level	Qualitative scale (very low-low-average-high-very high)	Very High (at every level)	Very High; "Bosch has learned from UM and the UM has learned from Bosch"
Duration	Time since relationships between Bosch Braga and UM first formed, inclusing those at both employee and team level	Numeric	2011	2011 (even though previous friendship relationships between members)
Transfer	Extent of inter-organizational tacit knowledge transfer	Qualitative scale (very low-low-average-high-very	Very High	Very High
	Extent of inter-organizational codified resource and technology transfer		Very High	Very High

Table 15 Quality linkage dimension between Bosch Braga and UMinho – HMIExcel project.

The quality dimension is divided into three areas: depth, duration and transfer. As it can be perceived from Table 15, the relationships created between BrgP and UMinho are robust, complex, combining personal and institutional relationships.

The project allowed for multiple social and learning opportunities for both organizations. University of Minho benefited from the extra financing for equipment and it has also contributed to align the university roadmap with the industry needs. In addition, a PhD programme was created in 2015/2016, available for 16 students every year. This PhD program on advance engineering systems for industry is hosted at BrgP and was created given the fact that both partners identified that there was a gap that needed to be fulfilled. In addition, BrgP is also financing 25% of the research grants, as well as supporting the university fees of their employees enrolled in this program. The learning process within HMIExcel was one of the key results of the project. As Professor Eduardo Pinto said, "BrgP has learned from UMinho and the UMinho has learned from BrgP". Both partners recognize that the learning process that occurred was

massive and beneficial for everyone (example: the preparation of the paperwork for the investment approval from COMPETE).

An important feature that should also be taken into account when considering the success of the project is the duration of the relationships. Even though formally the relationships started in 2011, there were already previous minor projects (less than 1M€ of investment) in which people from BrgP and UMinho cooperated. This fact is important to understand the availability of the partners to cooperate since that these small scale (6-10 people) projects already allowed BrgP to understand the key competences that UMinho could bring to the partnership.

Regarding the knowledge transfer within the project, both partners classify the extent of knowledge creation and transfer as very high. The intellectual property created is 100% owned by BrgP. The PMOs teams from both partners were fundamental in the process of knowledge transfer. The PMOs were responsible for monitoring and transmitting the tacit and non-tacit knowledge created. To perform this, weekly meetings were conducted using BrgP internal communication tools (Bosch controlled systems such as the company intranet). In addition, multiple visits to both university and Bosch facilities took place in order to perform field-tests aimed at guaranteeing that the concepts and requirements were being fulfilled. Notwithstanding the physical proximity of BrgP and UMinho (4.7 km), the researchers at UMinho were not particularly found to visit BrgP facilities. BrgP would provide the researchers involved in the project with free access to the research and development and production units, to their internal systems, as well as access to food supplies, free of charge.

Table 16 presents the information on the Quantity dimension. It is divided into two main areas: number and value.

Quantity dimension in the partnership between Bosch Car Multimedia and University of Minho		Unit of Measurement Used	BrgP	UMinho
Number	Number of inter-firm relationships formed by the Bosch Braga and/or UM	Numeric	40	178 (108 local, 70 international) *
	Number of different firms with which linkages are formed by Bosch and/or UM (i.e., number of distinct partners within the relationship of each firm)	Numeric	n.d.	n.d.
Value	Value of local sourcing and/or supply associated with linkages formed by the subsidiary	Numeric (%)	10%	19.1% *
	Value-added associated with linkages formed by the subsidiary	Non-numeric examples	"The project allowed to increase the R&D team with quality - the Bosch unit shifted from being a production unit to become a centre of excellence"	"The project allowed the university for extra financing and state-of-art equipment (Done lab). At the same time, there is also value created for the industry (more competitive, more attraction) and also for the society (qualified engineers, talent retention in Portugal)

*Table 16 Quantity linkage dimension between Bosch Braga and UMinho – HMIExcel project.. N.D = non disclosed. * Information obtained from the annual report of UMinho.*

The number of inter-organizational relationships formed by each organization can be considered high. As previously referred, both of them have an extended internal and external network. BrgP identified having 40 relationships with suppliers as regards R&D activities. These suppliers guarantee 10% of the supply of the company (considering all purchasing activities). The value analysis allows an understanding of the possible motivations associated with linkages conducted by both organizations. For BrgP, this linkage with UMinho is extremely valued by the organization since, with HMIExcel, BrgP was able to recruit and increase the number of engineers in its R&D teams. Given the fact that these people were already familiar with the Bosch environment (from the interactions during the project), these recruits were expected to be able to produce value for the company faster. For UMinho, this linkage also brings multiple benefits for the university. The project allowed extra financing and state-of-the-art equipment, such as those

acquired by the Done Lab, inaugurated in late November 2016 (Universidade do Minho, 2016a, 2016b).

Scope dimension in the partnership between Bosch Car Multimedia and University of Minho		Unit of Measurement Used	BrgP	UMinho
Type	Range of different types of linkages formed (supply chain, collaborative)	Binary	Supply Chain - specific areas	Supply Chain - specific areas
	Extent to which value-chain activities are performed by UM or Bosch Braga (in-house vs outsourcing)	Binary	Bosch - In-house	Bosch - In-house
Breadth	Range of industries (or sectors) in which linkages formed (or extent of network constellation)	Numeric	1 industry	1 industry
	Extent to which value-chain activities are performed in host country vs internationally (or local business network vs. International corporate network)	Binary	Host country (at Bosch)	Host country (at Bosch)

Table 17 Scope linkage dimension between Bosch Braga and UMinho – HMIExcel project.

Finally, regarding the scope dimension (Table 17), it has to do with the activities being developed cooperatively by the partners. There are two main areas: the type and the breadth. Both partners provide the same answers to the questions that aimed to evaluate the type (research and development activities at specific points of BrgP supply chain, everything conducted within BrgP) and the breadth of the relationship (everything performed in Portugal, with the project focusing one single industry – automotive – but different sectors within the automotive industry. Even though both partners provided the same answers, research activities were being conducted simultaneously at BrgP and UMinho. The integration of results obtained from the research conducted was performed at Bosch Braga.

5.1.1 Overview of the linkages between Bosch Car Multimedia and University of Minho

The model used allowed us to understand the linkages intensity between two partners. The operationalization of each variable of the model (not explicitly defined in the original work) was important to classify qualitative and quantitative aspects of each linkage dimension (total of 18 attributes analysed).

All three dimensions were classified as high, meaning that there was indeed reliable and structural foundations in the quality, quantity and scope. Of the three, quantity linkage is the one that needs to be further clarified. The operationalization of this linkage in the original model rather focus on the number of intra-firm relationships by each firm instead of analysing the number of inter-firm relationships. When analysing the partnership between BrgP and UMinho, it became evident that there was one relationship with multiple inter-partner relationships (1 partnership, multiple connection points between Bosch and UMinho in different fields: engineering, electronics, software). The more the number of inter-partner relationships, the higher the intensity of the linkage.

We also saw from the model that both program managers were synchronized in the promotion of the partnership potential (similarity of answers to the questionnaire). The theoretical model states that, depending on the intensity of the linkages, both partners enhance their learning and development potential. This HMIExcel project clearly shows that there was and is a massive learning and development potential for both the local organizations and firms' (in this case, a foreign subsidiary of a multinational company) that produced linkage-induced spillovers. This project clearly demonstrates that and it is also recognized by BrgP and UMinho. In addition, the model also states that such potential may originate linkage-induced spillovers (technological spillover). This conclusion is in line with the literature review conducted that shows that knowledge spillovers resulting from vertical supply chain linkages leads to the economic development of host countries (Jindra et al., 2009). A technological spillover is defined as "the beneficial effects of new technological knowledge on the productivity and innovative ability of other firms and countries"(Jesselyn & Mitchell, 2015). Technological spillovers occurred. The HMIExcel allowed the company to be recognized as a centre of competence in new multimedia automobile solutions based on advanced human-machine interaction systems (HMI). To sustain this,

multiple products that arose from this project are already in the market: NissanConnect for Nissan Qashqai; combined head-up displays for Mini; totally re-programmable head-up displays for the new BMW i8 and also for the Audi TT (Jornal de Negocios, 2015).

5.2 Bosch Car Multimedia Innovation

Bosch has been one of the most relevant multinationals with subsidiaries in Portugal. It is the main foreign private employer and also the company with the highest export rate. This results from the vision and leadership of its management team (Bosch Portugal, 2017b)(AICEP Portugal Global, 2017).

Currently, BrgP can be considered as a centre of excellence (Cavanagh & Freeman, 2012) for Bosch MNC. It is likewise recognized by Bosch MNC. This conclusion was also achieved by Carvalho (2016) master thesis where he studied the role of management in the subsidiary development. Even though the strategy is defined by the parent company, BrgP is the centre of excellence in the HMI domain. It develops products and conducts research and development in multiple fields (i.e. production, design, engineering, software). Its innovation centre, one of the 94 of the multinational, currently employees 100 engineers. This number will soon increase up to 300 given the numerous complex and disruptive projects that are currently running in Braga (Bosch Car Multimedia, 2017b). Both current and past projects have one key partner: University of Minho. The protocol established in 2012 between both partners is one of the main reasons why BrgP is now even more widely recognized in the automotive industry. BrgP was able to deep understand the EFQM insights and their road to innovation is closely connected with EFQM. The management team vision was also critical since they were responsible for the HMIExcel project planning and execution, but also for the planning of two new projects (innovcar and iFactory). It should be pointed out that the current CEO was nominated in September 2015, right after

the end of HMIExcel and the beginning of the two new projects. Nevertheless, the analysis of the impact of the change in the top management team on innovation is out of scope of this thesis. In addition, such analysis cannot be achieved with this case study, given the time-frame of the HMIExcel project.

5.2.1 Bosch Car Multimedia knowledge creation process

The knowledge creation process within the scope of the HMIExcel project started with the definition of current problems/improvement opportunities that would allow Bosch to become a centre of competence in human-machine interfaces. This project was influenced by the EFQM assessment since it answered to the challenge proposed to BrgP: leveraging the creativity, knowledge stock and innovation capabilities of UMinho (José Oliveira | TEDxBraga, 2017).

BrgP innovation funnel (previously presented) was fundamental in the early stages of the project (between 2011-2013), along with inputs from UMinho. We verified that the knowledge stock of Bosch, specifically Bosch innovation funnel, was of extreme importance because all of those idea pool verification processes (quality gates) conducted prior to the actual technical developments itself were the key to success. This verification required the participation of multiple stakeholders, therefore minimizing the risks. This innovation had a clearly defined process with defined inputs, evaluation criteria, benefit expectations, linkages to strategy, etc. This idea pool definition was conducted between three partners: the university and both BrgP and Bosch in Germany. It allowed to identify problems, to validate market opportunities, to align the marketing strategy, define a precise but flexible roadmap so that each R&D line could be successful. The innovation funnel of the subsidiary provides the foundation for the ideas identification, maturation and implementation. The success of the

project was based on a good application built on an extended state-of-the-art review (of possible solutions for already known problems and also of market seeking opportunities).

Even though there was a history of small projects between both partners, the complexity of this project required a specific set of human resources. This was one of the criteria that Bosch presented to the UMinho dean. The people that would work for this project had to be passionate, with high abstraction abilities, with macro vision, people with scientific knowledge but with industry mind-set. The program management teams selected and the invited co-project leaders from each partner and the number of researchers required to fulfil each project line objectives were decided by the project leaders. Each project line had two project leaders to prevent deviations of the objectives due to external factors (e.g. sickness). The knowledge was created following the traditional research and development phases: problem identification, state-of-art research, proposed methodology, roadmap planning, execution, implementation, quality verification and conclusion.

Once this process was completed, BrgP has its own time-to-market process (TTM) that is out of the scope of this thesis. Nevertheless, it can be concluded that when BrgP is creating knowledge with partners, the innovation funnel of Bosch provides the necessary structure that contributes to the success of the project.

Regarding the knowledge creation process at Bosch, we could confirm that the process clearly follows the structure of the SECI model proposed back in 1995. The socialization between individuals of both organizations was the starting point for knowledge development. It was recognized that prior interactions between both partners already existed but not with the dimension and the possible impact of this one (projects below 1M€, 6-10 people). BrgP highly stimulates an environment of sharing and cooperation between people from multiple divisions, with rewards to the employees for innovative ideas. All these

ideas go through the innovation funnel. In addition, suppliers and/or individuals can also participate in Bosch open innovation platforms available in the company website (Bosch, 2017).

5.2.2 Bosch Car Multimedia knowledge transfer

Regarding knowledge transfer from UMinho to BrgP and vice-versa, it is important to mention that every single collaborator on the project signed a consortium contract/non-disclosure agreements. The transfer between both partners was baptized by Bosch as "simultaneous engineering", meaning that the interaction frequency, classified as extremely high – daily, was the method frequently used. The concept of simultaneous engineering means that the results of the research being conducted were immediately integrated into the products and updated over time.

Besides communication, work-place meetings often occurred. These meetings typically occurred at BrgP (mainly for safety reasons). The tacit knowledge was transferred in the form of deliverables (172 – later converted in patents) and the explicit knowledge in the form of PowerPoint presentations, scientific articles and project reports. The knowledge was transmitted personally and with the internal communication platforms of Bosch (Bosch intranet). UMinho develop its own platforms since non-controlled existing systems (gmail, skype, usb drives, dropbox's) were not allowed.

The transfer of tacit and non-tacit information was one of the aspects where the relationship between both partners could have been improved. Bosch internal rules do not allow the use of social media (i.e. facebook, skype), common e-mail accounts (i.e. gmail) or usb flash-drives to transmit and share information (for safety reasons). Bosch suggested the use of their own controlled internal systems to perform all this tasks, which was not very well accepted by UMinho

researchers. The PMOs played a major role of being able to bring everyone to the same table in terms of communication and files sharing.

Scientific papers' publication was the task that involved the greatest controversy. The university values the publication of scientific articles. In constrast, the company aims at maximizing profits and margins, and it is not interested in publishing the "know-how", diffusing it to their competitors and the community. In fact, the papers written by the university teams could not be submitted without previous feedback and approval from Bosch.

Another method used to transfer knowledge from UMinho to BrgP was the direct hiring of university researchers. With this project, Bosch minimized risks and costs to the company as the majority of the researchers were employed by the university. Typically most of the researchers that were granted scholarships were latter recruited by BrgP. BrgP minimizes the risk in the sense that these researchers were already knew of the people with whom they would be working, and were also familiar with BrgP and its objectives. During the project, BrgP people had a good opportunity to assess the value of these researchers both on the technical and human dimensions.

Once the knowledge was transferred to BrgP, its integration occurred immediately with the acquisition and adaptation of new machines and/or the creation of new processes. The benefits of this knowledge were variable depending on the line of research and the market. Nevertheless, it is expected that in the next few years, BrgP increases its revenue from to 600M to 1000M€.

Within Bosch Braga, employees were able to learn from the knowledge created through multiple mechanisms: workshops, learning activities and also through Bosch's intranet.

Regarding the knowledge transfer within Bosch network, the created knowledge is typically transferred (95%) in the form of final products. The current state-of-the-art in knowledge transfer defends that the best way to

transfer knowledge is with expatriation of human resources, high communication frequency and incentive schemes (as reported earlier in chapter 2). Bosch Braga is often in contact with the remaining subsidiaries/suppliers but there is no incentive scheme for knowledge sharing. Besides, even though it is possible to have international careers within Bosch, expatriation of human resources to other subsidiaries to teach them specific details and know-how regarding the technology created was not conducted for this project. Nevertheless, when strictly necessary, human resource expatriation is used to transfer tacit knowledge. It has been used in the past.

BrgP also reports transferring tacit knowledge through video-conference. These video-conferences occur between BrgP and the remaining subsidiaries working in the car multimedia division, as well as with Bosch headquarters. Bosch representant stated that both tacit and explicit information is shared using this method. Bosch feels comfortable in transferring information like this since "it requires a certain level of interpretation to understand. The information displayed has much more to be seen and understood than the actual information on a specific slide".

Finally, regarding the knowledge transfer within the external network, the project that was studied does not enable us to make a clear assessment. The company has currently 10% of local suppliers (42 approximately) and aims at increasing this percentage up to 25%. To perform this, the company just recently announced, together with the Portuguese government, the creation of the "suppliers club", where tacit knowledge from Bosch and from other companies will be transferred to supplier companies.

5.2.3 Factors that influence knowledge creation and transfer

It is interesting to analyse the level of funding supported by the incentive program for each institution. Analysing the number of people involved from each partner, the investment levels and the fact that Bosch owns 100% of the rights to the knowledge created (patents), it can be said that even though there were benefits for both partners, BrgP is the one benefiting the most. Given the fact that UMinho is a public institution, the project could have been affected by the bureaucracy involved with the purchasing processes of components (supply materials) that needs to be conducted at these types of institutions. Typically this purchasing processes require time to contact multiple suppliers, analysis of budgets, design specifications[13]. Depending on the investment necessary, a public call may also be required. All this factors together may have caused delays in the delivery of important components that were required for the continuous research processes.

As previously explained, the PMOs played a major role in assuring that the project went smoothly. It is outstanding that the 2011 goals were achieved and even surpassed in terms of project results. The deviations that occurred were very few and the merit, in Bosch opinion, belongs to the high-qualified teams that worked in the project. The PMOs were always present during the two years of the project. Both partners agreed that the hardest task within the project was not the technical-scientific challenges but being able to align agendas and interests, ensuring the proper motivation and involvement of all partners and people involved. Some team-building activities to promote social contact between partners were organized but these would only occur twice a year.

Therefore it can be concluded that human resources (active management of human resources and project teams) were one of the key success factors. BrgP

[13] Caderno de encargos

did not look to work with the "best researcher/ greatest genius"; BrgP focused instead in working with the researcher that had the technical and soft skills to engage with the industry in a partnership towards knowledge creation. Joining together experienced industry-focused engineers with fresh graduated engineers turned out to be very important for the success of this partnership. On the one hand, fresh young engineers are more flexible and willing to design and experiment brand new ideas. On the other hand, experienced engineers have with them the experience of working in an highly competitive industry. They get to be inspired by the young engineers and the young engineers are provided with experienced mentors that can guide them towards success. This symbiosis was present from the beginning of the project and now the employees of BrgP have a mind-set towards innovation. In addition, innovation is one of key performance indicators used by BrgP human resources in the evaluation of its employees.

Another important factor that contributed to the success of the project was the UMinho availability to work with an industry mind-set. BrgP benefits from the quantity and the quality of talent available at UMinho. Besides talent, for BrgP, flexibility, agility and speed are characteristics that enable the creation and transfer of knowledge.

A negative effect related to the success of the project is the recruitment of these same qualified engineers by competitors. Even though BrgP already provides on average better wages and overall better working conditions than its competitors, key research and development people from Bosch have been head hunted by its competitors. Nevertheless, the company recognizes that this is price of its success.

The cooperation between universities and industry has been studied by multiple authors (Etzkowitz & Leydesdorff, 2000)(Santoro & Gopalakrishnan, 2000)(Pertuze, Calder, Greitzer, & Lucas, 2013)(Bruneel, D 'este, & Salter, 2010). The factors that diminish barriers to cooperate (alignment of objectives, long-

term relationships and strong communication linkage) were exploited. The long-term relationship between both partners was one of the keys to success. Despite this, one of the challenges that could have negatively influence the project was ensuring the proper motivation and communication mechanisms between BrgP and UMinho. Even though their physical proximity, the researcher teams from both parties struggled in effective communication given Bosch strict regulations regarding communication and transfer mechanisms to be used. In addition, frequent travel to BrgP facilities was not very well accepted by the university researchers. Besides communication, the vision and the mind-set of the industry and the university differs. This can be clearly seen when analysing the official magazine of the HMIExcel, where the 13 lines of research were explained by the leaders of each line. On the Bosch side, we have a more formal speech, without any specific notes to technical details whereas in the UMinho side, we have a more "article-based" approach, where each line is presented providing the objective, method, results obtained and conclusions. This different vision/mind-set could have negatively impacted the overall project. But Bosch was one step ahead. Since the beginning they were already aware of this given their previous small projects conducted with UMinho. Therefore, having selected university researchers with an "industry-vision" instead of a "paper-vision" was fundamental to ensure the success of the partnership. Two innovation days that joined the people involved from both parties occurred during the project. The program managers concluded that these interactions should be further promoted and therefore in the on-going projects (innovcar and iFactory) there are at least two innovation days per year.

5.3 The outcomes for the Portuguese economy

The last section of the interviews conducted with BrgP and UMinho was directed towards understanding the views of each partner on the impact of the project in the local economy (part IV of Appendix IV and V). Both partners agreed that this project had a very high impact with multiple effects on the local economy. BrgP emphasized the employment of highly qualified engineers and also by retention of talent that has graduated from local Universities. BrgP is actively recruiting engineers graduating from UMinho. At the same time, for BrgP this project also had national impact given the disruptive ambitions and the overall results of the project. For UMinho, this project major contributions were the levels of employment, as well as the incorporation of products and services from small medium sized companies that were contracted for small projects. UMinho believes that qualified foreign direct investment can bring multiple benefits such as the ones aforementioned.

Promoting the interaction and cooperation in R&D projects between the industry and the universities may benefit the Portuguese economy. Additionally, the technology developed and integrated into products lead to an increase in the exports of the company. Germany based companies are the ones that invest the most in Portugal in the industry sector since they value our capabilities and working capacity (Brandenburg, 2015). In 2014, Germany based companies invested 449M€ in Portugal (Brandenburg, 2015). At the same time, the occurrence of knowledge spillovers is connected with specific characteristics of the host country environment – location specific influences (Hallin & Lind, 2012). Both organizations acknowledge that the current fiscal incentives towards research and development activities were important. HMIExcel contributed towards increasing Portugal's competitiveness, as it enabled highly reputable national technological research, development and production to be presented to the world, comparable to other best practices in Europe and worldwide. The

technological developments generated with the project will result in an increase of Bosch sales between 600M€ to 1000M€ between 2015 and 2018. The Portuguese government and multiple agencies (AICEP, ANI, COMPETE) were an integral part of the success of the project.

Comparing BrgP gross value added (GVA) with the industry GVA (CAE Rev.3 26400/26110 – Manufacture of consumer electronics – available in Pordata), it can be perceived that BrgP represented 19.1% in 2013 and 19,8% in 2014 (the industry number for 2015 has not been yet revealed). From this analysis, it can be perceived that Bosch share increased 0.7% during the first part of the project.

Finally, the Braga regional economy was also stimulated since multiple commodities (house construction sites, services) in the city were created to support its business growth. One example of this was the creation of a bus transport line to support the industrial businesses located in Braga, facilitating the mobility of people working in the industry.

BrgP is the leading pioneer in R&D since that, besides the projects approved and currently being executed in Bosch Braga (innovcar and iFactory – 50M€), will be investing 100M€ in the project "Suppliers club" that will improve the capacity of 40 national suppliers with know-how, agile, flexible and competitive that will lead to an increase in competitiveness (Bosch Car Multimedia, 2017a, 2017b). In addition, Bosch Thermotechnology - Aveiro already signed a partnership protocol with the University of Aveiro towards the development of new innovative and efficient water heating solutions (19M€)(Bosch Termotecnologia, 2016). Finally, Bosch Security Systems - Ovar is already in conversations with the University of Porto.

The automotive industry is one of the industries that the Portuguese government leverages to attract foreign direct investment. A study recently conducted by AICEP identified multiple factors pointing out why players in the automotive study should invest in Portugal (AICEP - Portugal Global, 2017).

Portugal is a competitive location since it benefits from location advantages (first class logistic transfer worldwide using airplanes, trains, boats and also motorways), better costs (less industrial land and hourly labour cost), and highly qualified universities. In addition the Portuguese government is currently promoting incentives & grants as well as financial and tax incentives for companies to conduct research and development activities. With this incentives, Portuguese government not only aims at attracting foreign direct investment but also at targeting qualified Portuguese engineers working abroad to return to the country and engage in high added-value activities.

Taking a macroeconomic perspective, projects of this nature are very important to attract foreign direct investment for Portugal. Government agencies such as AICEP and ANI also have a major role in spreading the word of the benefits of re-allocating and starting technological projects in Portugal. Portugal provides a competitive location to conduct innovation. This is recognized by the Global Competitiveness Ranking, where Portugal ranks 46 out of 138 countries (UNCTAD, 2016). In addition, Portugal is classified as stage 3 (innovation-driven) together with 36 other countries. This means that Portugal is providing an environment that is promoting innovative activity supported by both the public and the private sectors. It also means that there is investment available for R&D and the presence of high-quality scientific research institutions that can generate the basic knowledge needed to build new technologies. The university-industry R&D collaboration rank is the lowest rank for Portugal and projects of the nature of HMIExcel should be promoted, therefore allowing the overall improvement of Portugal image towards university-industry R&D collaboration. An overview of the international benchmarking of Portugal is presented in Figure 36.

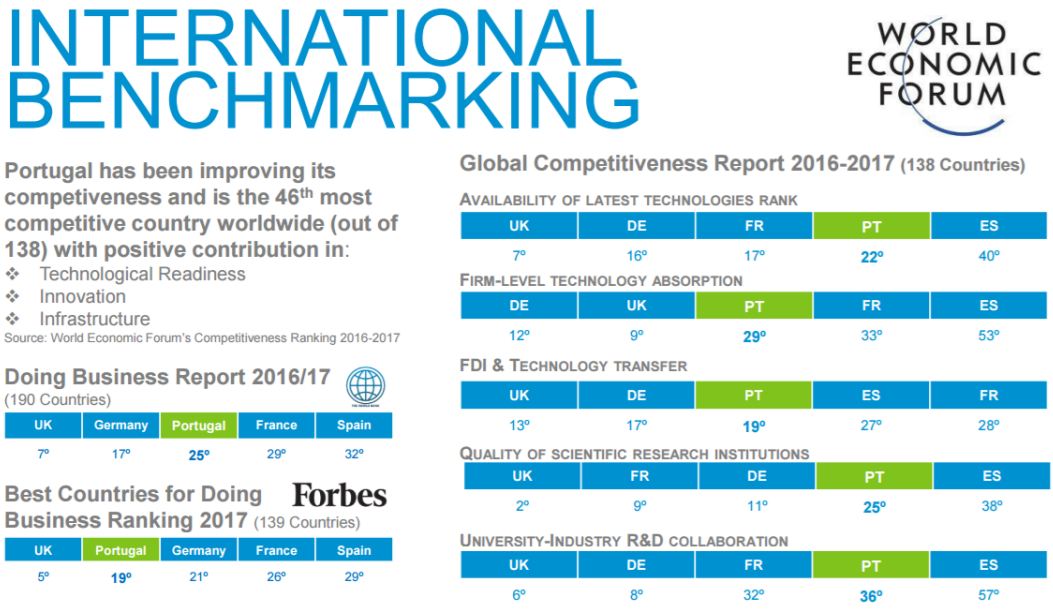

Figure 36 AICEP automotive industry evaluation - international benchmarking of Portugal, United Kingdom, Germany, France and Spain (AICEP - Portugal Global, 2017) .

Chapter 6
Conclusion

This final chapter of this thesis gives an overview of the developed work. The main contributions of this work, including the answers to the research questions are then presented. In the end of this chapter, several limitations are analysed and clues for future research are proposed.

This thesis aims at making a contribution to the literature on knowledge creation and transfer by subsidiaries of multinational companies and their effect on host countries. We examine how foreign subsidiaries from multinational companies are creating knowledge locally, how they are transferring it, the factors that influence these processes and how the local economy is benefiting from the interaction of foreign subsidiaries with local stakeholders.

The literature on foreign direct investment in Portugal has not yet paid much attention to the importance of the innovation being created locally by foreign subsidiaries. It can now be said that innovation processes consist of both leveraging local pools of knowledge as well as creating and interacting with local stakeholders that enhance the creation of knowledge. The local context benefits from these interactions since it increases the levels of financing to local organizations, allows the subsidiaries to evolve and become centres of excellence, enhancing their sales and exports. This contributes to the development of the subsidiaries locally, reducing the risk of relocation to other countries and therefore the Portuguese economy gets to be more competitive. Moreover, Portugal may attract similar investments from other multinationals.

To the best of the author's knowledge, this thesis represents the first attempt in identifying who are the subsidiaries of multinational companies in Portugal

that are creating and transferring knowledge that is developed locally. To perform this identification, our search focused one industry sector that typically report having research and development costs, which might indicate that knowledge creation is taking place: the manufacturing industry (Gunasekaran, 1999). Using Sabi database, we were able to identify 928 foreign subsidiaries in Portugal (CAE Rev. 3). Once this identification was concluded, in order to validate whether this 928 companies were indeed creating knowledge, the ideal scenario would be to contact all of them to ask about their R&D expenses. Given the timeframe available to carry out this thesis, we decided not to proceed with this task. Nevertheless, we cross-matched these 928 subsidiaries with information on programs that support research and development activities and we found that a combined total of 132 subsidiaries (total of 262 projects, with 929.4 million € of eligible expenses and 377.8 million € of incentives) had projects approved (8 subsidiaries are using both programmes: Acco Brands, AIS Automotive, Aspock, Blocotelha, Bosch Car Multimedia and Bosch Security Systems, Heliflex, Pentaplast and PREH Portugal - Portugal 2020 and QREN-COMPETE – Appendix II and III).

In order to understand the current state-of-the-art regarding subsidiaries development and knowledge creation and transfer, we conducted an extensive literature review on these topics leading to the identification of the key authors and studies developed thus far. To conduct a case study where the topics of knowledge creation and transfer could be understood in depth, we adapted a framework from Axele Giroud & Scott-Kennel (2009) and we further developed it. This model was chosen due to the fact that it allows us to understand how two organizations (one foreign subsidiary and one local organization) interacted and how could this interaction lead to knowledge creation and transfer. Building on the literature reviewed, we enhanced the original model including specific features: the knowledge stock and local organizations (that are not firms). The

literature review showed us that local universities/research institutes may have a relevant role as suppliers or even partners of the subsidiary in innovation processes. Then, the model was used to understand the intensity of linkages created between two partners in a specific project. We used the linkages' attributes proposed by the initial model to understand how knowledge was being created and transferred, the factors that influenced it and how it impacted the Portuguese economy. The addition of the knowledge stock was of massive importance to the developed work because it is indeed a specific feature of each firm and other organizations that contributes to the success of partnerships towards knowledge creation activities. The knowledge stock in the form of number of patents, products, scientific articles published, gives both partners reliable data to evaluate the experience and capabilities of each other.

The extension of local firms to local organizations, where research centres and universities are included, was also relevant given the fact that these organizations are increasingly important to the innovation capacity of multiple firms. The traditional roles of universities are education, science and basic research. In recent decades, universities have been cooperating in knowledge and technology transfer to industry, commercialisation of knowledge (incubator for academic spin-off companies) and have therefore a more active role in the innovation systems of the country. Universities and research centres are a source of highly qualified labour that have the skills, the knowledge (basic science to excellent scientific work) and a set of tools to work with and transfer innovation to the industry. The relationships between universities and firms (university-industry linkages) are becoming more frequent in past years since universities have the ability to become important knowledge sources and innovation partners. In addition, the varieties of relationships that can be formed maximize the potentiality for innovation for both partners (e.g. joint use of facilities, R&D contracts and informal knowledge exchanges).

Bosch Car Multimedia was the case-study selected (one key strategic project analysed - HMIExcel). We chose to study BrgP because Bosch is widely recognized as one of the most innovative companies in the world. Once we developed the framework that would allow us the understand how a project/process was being developed by two partners, we designed a questionnaire that mainly focused on BrgP relationships with its parent company and the relationship with one key partner that could be identified towards the creation and transfer of knowledge.

We were able to present the subsidiary history since establishment and their journey towards innovation. The EFQM agency as well as the University of Minho play a major role in this journey. The relationship with UMinho (official since 2012) is key to the innovation that has been and is being conducted at Bosch.

The HMIExcel project was the project identified by BrgP that allowed us to perform our case-study. The complex, disruptive nature of the project with multiple different results (patents, deliverables, and scientific publications) allowed us to identify certain Bosch-specific features regarding knowledge creation and transfer mechanisms. In addition, given the disruptive nature and the financial dimension of the project, financed by public programmes, it also allows us to understand the positive impact it had in the local economy.

This partnership had benefits for the company, the university, the city of Braga and the country.

BrgP minimizes risk and maximizes innovation profit when engaging with UMinho in such a partnership. On the one hand, UMinho benefited from the substantial extra financing, roadmap alignment, an increase in employability ratios, visibility to the industry, and also state-of-the-art laboratories (Done lab) that are also crucial for the success and development of universities. Projects of this nature allow the university to re-focus its research and development efforts in solving concrete problems that the industry has; this then leads to a greater

articulation and communication between the entities from the national R&D system (SCTN) and the industry, with benefits for both. For instance, one positive effect of this cooperation is the fact that researchers that teach at UMinho acquire knowledge that can latter lead to changes in the bachelor and master programmes, improving the education and enhancing the background of UMinho students. The University had access to extra financing in a period in which government spending was being reduced as a consequence of the troika's intervention in Portugal. At the same time, this project brought visibility to the University given its key role for local and national development. Given the success of the partnership, multiple companies have contacted UMinho in order to understand if the University is available to engage in similar partnerships. UMinho representant informed us that currently the University is open to discuss further partnerships. UMinho values partners (including BrgP) that are flexible, with macro-vision, and particularly BrgP is a partner that "know who they are, what they have and where they want to go – the University was not a supplier for the Bosch Car Multimedia neither Bosch Car Multimedia was a patron *(mecenas)* of the University"[14]. Conversely, companies that want to engage with UMinho in similar partnerships but without a clear roadmap for innovation, should be willing to allow the University to lead their innovation projects and learn from the experience and accumulated know-how.

On the other hand, Bosch gains scientific-based knowledge from UMinho, with the added advantage of being able to recruit and integrate in the company highly motivated young engineers that work together with the experienced industry driven engineers from Bosch. The company was able to improve and enhance its market leader positioning by sharing risks and costs with University of Minho in the research and development stage. The geographical proximity

[14] Information obtained via interview from Prof. Eduardo Pontes from UMinho.

and the competences of UMinho were identified previously to the EFQM award, but only after that specific recommendation this journey really began. Being able to have such an exclusive partnership with UMinho allows Bosch to be one step ahead of its competitors in the HMI domain, leveraging good technology (products and services that are on the frontiers of scientific knowledge) created in Portugal and exported worldwide. The company became more competitive with creativity and innovation culture as the foundation for success.

We showed the strengths and weaknesses of this relationship that has brought a number of positive effects for both partners as well as for the Portuguese economy. This study allowed us to understand in depth how BrgP is creating knowledge in close cooperation with the identified key local partner.

Regarding the knowledge creation and transfer processes and the factors that affected it, we were able to see that the Innovation funnel of Bosch with inputs from UMinho played a decisive role in identifying the key lines of research. The innovation model together with the experience and the availability of both partners in interacting in the early stages of the project maximized the innovation potential of the project. At the same time, both partners developed knowledge in specific topics such as applications for public program financing. This knowledge stock is already being used in the applications for the Innovcar and iFactory projects that were submitted and approved during the HMIExcel execution. This allows us also to perceive that both partner's absorptive capacity is high. In addition, very recently the Suppliers club project, which has an even higher budget, was also approved. This clearly shows the competence, the skills and the knowledge acquired by the partners in the application processes. The correct identification of the human resources profile, previously performed by Bosch Car Multimedia, was also a key factor to the project. Human resources management was of critical importance. Having researchers available to think "industry" instead of "basic science" was a decisive factor in the success of the project.

Geographical proximity and frequent communication were also factors contributing positively. Nonetheless, the communication between both entities could have been improved. The history of cooperation (even though with small projects) between BrgP and UMinho was also a positive factor since it allowed to create personal relationships (that facilitate then later approaches and also showed each partner their competences). The project also led to externalities, such as the creation of the PhD program (Centro ALGORITMI, 2017). It is also important to mention that another contributing factor were the fiscal policies implemented at the time by the Government (System of Financial Incentives to support Industry R&D – SIFIDE – Appendix VI).

Regarding the outcomes of these processes for the local economy, improved image/marketing and competitiveness of the country as a R&D prime location can be urderlined. The Portuguese government was several times in Bosch Car Multimedia and also the Economy minister at the time, Mr. António Pires de Lima, made a formal visit to Bosch headquarters in Germany (Observador, 2015). For the government, this project was of high strategic interest. The levels of employment increased, fresh talent from universities was immediately integrated in the industry, the local economy was stimulated and the country also benefited from the exports and commercial relations that Bosch has and therefore the Portuguese economy benefits from this dynamic. Besides, the government claimed that Bosch was being a leading example in leveraging local innovation. It is important for the government to attract foreign direct investment that fuels economic growth and leads to job creation. Projects of this disruptive nature may also be important towards the creation of public policies towards research and development activities. FDI in R&D seems to be especially important to these economic goals. This is currently recognized by the Government in the National Reform and Stability Programme 2016-2021, where it is stated that FDI is one key factor towards the economic growth of Portugal,

as well as very relevant for innovation. Portugal will invest in FDI attraction policies with a joint effort from AICEP and managing entities from Portugal 2020 to create a fast track for R&D projects in specific key strategic clusters for innovation (retail; automobile; tourism and agro-industries). This policies aim at increasing the competitiveness of the companies through internationalization and innovation (República Portuguesa, 2016).

This thesis has several limitations. One limitation of the foreign subsidiary identification list results from the fact that we have restricted our search in the manufacturing industry, whereas there may be other sectors where research and development activities are also relevant (like software, financial services, health services, etc). Even though the extensive state-of-the-art research conducted, there is a gap of information regarding the relationships between firms and universities. The literature has already payed attention to these relationships and so it would have been important to also study in more detail other examples from the literature. The developed theoretical model was important as it provided guidance for the questionnaire development. Nevertheless, a clear relationship between the model and the research questions was not achieved. Even though the knowledge creation and transfer were included within the linkages dimension, the impact on local economy was not defined in the model. The unit of analysis of the model is a relationship between both partners. In this thesis, this relationship was only analysed under the light of one key strategic project. To maximize the usefulness of the model, it would have been important to analyse multiple projects between both partners. Regarding the developed case study, only one interview with each partner was conducted. It would have been interesting to interview the remaining partners from UMinho (Table 12 and 13 – section 4.4.2), the PMOs, and also some employees and researchers from Bosch Car Multimedia and the University. This would allow us to understand more deeply the personal and professional ties between both partners, as well as

contacting with the people that were actually leading the innovations. Given the fact that we only analysed one foreign subsidiary and one key strategic project, it limits the possibility of generalizing how foreign subsidiaries are engaging in knowledge creation processes. Nevertheless, for the foreign subsidiaries located in Portugal, it can be said that this model of innovation – partnerships with universities – is the model being currently implemented in the three subsidiaries: Bosch Car Multimedia, Bosch Thermotechnology - Aveiro (public) and Bosch Security Systems - Ovar (non-public yet).

In terms of future work, it would be interesting to further identify all the foreign subsidiaries that are creating and leveraging local knowledge in Portugal. To perform this identification, cross-matching this list of subsidiaries with the information from Statistics Portugal would be interesting. In addition, a creation of a database with more variables than only the identification of the foreign subsidiary would be important. Variables such as R&D expenses, number of partners (local or international), number of people involved, number of patents/products/services developed, application to public financing programs would provide researchers with key critical information to study the impact that these companies might have in the local economy. The developed framework should be further developed in order to include specific linkage dimensions that allow not only understanding the learning potential for both partners, but also the positive/negative impact that the relationships might have in the local economy. Once this upgrade is performed, it would be interesting to further study other key projects in which UMinho participates. This would allow for direct comparison between projects. Projects conducted not only at Bosch Car Multimedia but also replicating this analysis in Bosch Thermotechnology - Aveiro and also Bosch Security Systems - Ovar is also of interest. Additionally, it would be interesting to study R&D projects of Bosch with other partners (suppliers). Foreign subsidiaries located in different geographical locations, in

different industry sectors could be also interesting to study. This line of research will soon be pursued since there are already contacts and interest from industry partners in conducting another case study.

Finally, regarding the knowledge creation and transfer processes at Bosch, given the current projects being executed and new ones already being prepared, much attention should be given to Bosch subsidiaries in Portugal. Bosch is being disruptive, leading innovation in processes and products in Portugal. It would be of extreme interest to leverage the work developed with this thesis (developed framework, developed questionnaire) and study how the "suppliers club" project will benefit not only Bosch internally (including the Bosch parent company) but also all the supplier companies selected for this 100M€ project. It could also be interesting to study how these projects could have a demonstration effect to other companies and partner organizations. Finally, as previously referred, projects of this disruptive nature are clearly of strategic interest for the Portuguese government. The government should promote the benefits of such relationships worldwide so that even more quality FDI can be attracted to Portugal.

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Appendix

Appendix I – List of 928 foreign subsidiaries in the manufacturing industry (Source: Sabi database).

1	A.A.TEIXEIRA, LDA
2.	A.MENARINI PORTUGAL - FARMACÊUTICA, S.A.
3.	A.Q.P.- ALIADA QUÍMICA DE PORTUGAL, LDA
4.	ABL - TECHNIC PORTUGAL, UNIPESSOAL, LDA
5.	ABRESSA - ABRASIVOS DE PORTUGAL, LDA
6.	ACCO BRANDS PORTUGUESA, LDA
7.	ACCORD HEALTHCARE, UNIPESSOAL, LDA
8.	ACEROL, COMÉRCIO E INDÚSTRIA DE AÇOS INOXIDÁVEIS, UNIPESSOAL, LDA
9.	AÇOMONTA - SOCIEDADE DE ARMADURAS, S.A.
10.	ADAICO - AUXILIARES DE AUTOMAÇÃO, INDUSTRIA E CONSTRUÇÃO, LDA
11.	ADP FERTILIZANTES, S.A.
12.	ADRIANO RAMOS PINTO - VINHOS, S.A.
13.	ADVANCED ACCELERATOR APPLICATIONS (PORTUGAL), UNIPESSOAL, LDA
14.	AEG TELECOMUNICAÇÕES, S.A.
15.	AEROPRECISÃO, LDA
16.	AGA - ÁLCOOL E GÉNEROS ALIMENTARES, S.A.
17.	AGROSUNA - AGRICULTURA, LDA
18.	AIR LIQUIDE MEDICINAL, S.A.
19.	AIS AUTOMOTIVE INTERIOR SYSTEMS PORTUGAL, LDA
20.	AKZO NOBEL CAR REFENISHES, S.L.
21.	ALCOBRE - CONDUTORES ELÉCTRICOS, S.A.
22.	ALIMENTAÇÃO ANIMAL NANTA, S.A.
23.	ALIMOMAR - INDÚSTRIA E COMÉRCIO AGRO-ALIMENTAR E IMOBILIÁRIA, S.A.
24.	ALKAR MIRRORS PORTUGAL, LDA
25.	ALLIED MOTION PORTUGAL, LDA
26.	ALP INDUSTRIE - FLIGHT CASES, LDA
27.	ALQUIBALAT - LOCAÇÃO MODULOS PRÉ-FABRICADOS, UNIPESSOAL, LDA
28.	ALRON - PRODUÇÃO DE JANTES EM ALUMÍNIO, UNIPESSOAL, LDA
29.	ALSTOM - ENERGIAS RENOVÁVEIS PORTUGAL, UNIPESSOAL, LDA
30.	ALSTOM PORTUGAL, S.A.
31.	ALSTOM TRANSPORTE PORTUGAL, UNIPESSOAL, LDA
32.	ALTRICS PORTUGAL, UNIPESSOAL, LDA
33.	ALUBIKE - BICICLETAS, S.A.
34.	ALUBLISTER EUROPA - PRODUÇÃO E COMERCIALIZAÇÃO DE EMBALAGENS PARA INDÚSTRIA, S.A.
35.	ALUFLOW, S.A.
36.	ALVA - CONFECÇÕES, S.A.
37.	AM - ALFREDO MARQUES, S.A.

38.	AMBIPROMIC PORTUGAL, LDA
39.	AMCOR - TOBACCO PACKAGING PORTUGAL, LDA
40.	AMCOR FLEXIBLES NEOCEL - EMBALAGENS, UNIPESSOAL, LDA
41.	AMCOR FLEXIBLES PORTUGAL, LDA
42.	AMEND PORTUGAL - COMÉRCIO E IMPORTAÇÃO DE COSMÉTICOS, LDA
43.	AMÊNDOAS DE PORTUGAL MATEOS, S.A.
44.	AMTROL-ALFA - METALOMECÂNICA, S.A.
45.	AMY'S KITCHEN, UNIPESSOAL, LDA
46.	ANDRITZ OY - SUCURSAL EM PORTUGAL
47.	ANITA PORTUGAL, CONFECÇÕES, LDA
48.	ANSELL PORTUGAL - INDUSTRIAL GLOVES, SOCIEDADE UNIPESSOAL, LDA
49.	ANTALIS PORTUGAL, S.A.
50.	APADIL - ARMADURAS, PLÁSTICOS E ACESSÓRIOS DE ILUMINAÇÃO, S.A.
51.	APBP - ARTISTAS PINTORES COM A BOCA E O PÉ, LDA
52.	APLI PAPER - SOCIEDADE UNIPESSOAL, LDA
53.	AQUITEX - ACABAMENTOS QUÍMICOS TÊXTEIS, S.A.
54.	ARA SHOES PORTUGUESA, UNIPESSOAL LDA
55.	ARCELORMITTAL CONSTRUÇÃO PORTUGAL, S.A.
56.	ARLACO - COMÉRCIO E INDÚSTRIA DE MATERIAL ELECTRÓNICO, LDA
57.	ARMEDIC - ESPECIALIDADES FARMACÊUTICAS, LDA
58.	ARNEG PORTUGUESA - FÁBRICA DE EQUIPAMENTOS FRIGORÍFICOS INDUSTRIAIS E COMERCIAIS, LDA
59.	ARROZEIRAS MUNDIARROZ, S.A.
60.	ASF PORTUGAL, UNIPESSOAL, LDA
61.	ASPÖCK PORTUGAL, S.A.
62.	ATELIER DES CRÉATEURS - CONFECÇÃO ARTESANAL, LDA
63.	ATOM - CONSTRUCTIO & MECHANICA, S.A.
64.	AUTOMATNICE PORTUGAL, S.A.
65.	AUTONEUM PORTUGAL, LDA
66.	AVERY DENNISON R.I.S. IBERIA - SUCURSAL EM PORTUGAL
67.	AVON AUTOMOTIVE PORTUGAL, LDA
68.	AZEITE LUGAR DO CRUZEIRO, LDA
69.	BA VIDRO, S.A.
70.	BALDACCI - PORTUGAL, S.A.
71.	BARBOTINA - FÁBRICA DE ARTIGOS CERÂMICOS, S.A.
72.	BAREFOOTERS - EUROPE, LDA
73.	BARNISOL - ACABAMENTOS PARA MOBILIÁRIO, LDA
74.	BARRANCARNES - TRANSFORMAÇÃO ARTESANAL, S.A.
75.	BASÍLICO - ACTIVIDADES HOTELEIRAS, RESTAURAÇÃO E CATERING, LDA
76.	BELCHIM CROP PROTECTION PORTUGAL, UNIPESSOAL, LDA
77.	BELPHAR, LDA
78.	BENTELER - INDÚSTRIA DE COMPONENTES PARA AUTOMÓVEIS, LDA
79.	BERNARD FABRE, LDA
80.	BETÃO LIZ, S.A.
81.	BIMBO - PRODUTOS ALIMENTARES, SOCIEDADE UNIPESSOAL, LDA
82.	BINDOMATIC PORTUGAL - PRODUTOS DE ESCRITÓRIO, UNIPESSOAL, LDA
83.	BIOFUN - PRODUTOS BIOLÓGICOS DO FUNDÃO, LDA

84.	BIRLESIK METAL VE ISIL ISLEM SANAYI VE TICARET LIMITED SIRKETI, SUCURSAL EM PORTUGAL
85.	BITZER (PORTUGAL) - COMPRESSORES PARA FRIO, S.A.
86.	BLB - INDÚSTRIAS METALÚRGICAS, S.A.
87.	BLOCOTELHA - STEEL CONSTRUCTIONS, S.A.
88.	BOBIMADE - INDÚSTRIA DE BOBINES, S.A.
89.	BODUM PORTUGUESA - PRODUÇÃO, S.A.
90.	BOLLINGHAUS STEEL, S.A.
91.	BOLONIA TESTING INSTRUMENTS, UNIPESSOAL, LDA
92.	BOLZE & MOOGY - SUCURSAL EM PORTUGAL
93.	BOMBAS GRUNDFOS (PORTUGAL), S.A.
94.	BONDUELLE (PORTUGAL) - AGROINDÚSTRIA, S.A.
95.	BORGSTENA TEXTILE PORTUGAL, UNIPESSOAL, LDA
96.	BORGWARNER EMISSIONS SYSTEMS PORTUGAL, UNIPESSOAL, LDA
97.	BORMAN PORTUGUESA - QUIMICOS E SISTEMAS DE HIGIENE, LDA
98.	BORRACHAS PORTALEGRE, SOCIEDADE UNIPESSOAL, LDA
99.	BOSCH CAR MULTIMÉDIA PORTUGAL, S.A.
100.	BOSCH SECURITY SYSTEMS - SISTEMAS DE SEGURANÇA, S.A.
101.	BOSCH TERMOTECNOLOGIA, S.A.
102.	BOURBON AUTOMOTIVE PLASTICS MARINHA GRANDE, S.A.
103.	BRACAMONTE - AGRO-PECUÁRIA, LDA
104.	BRADCO - FABRICAÇÃO E COMERCIALIZAÇÃO DE MARROQUINARIA, S.A.
105.	BRASMAR - COMÉRCIO DE PRODUTOS ALIMENTARES, S.A.
106.	BREMSEN SERVICE COMPANY LIMITED - SUCURSAL EM PORTUGAL
107.	BRESFOR - INDÚSTRIA DO FORMOL, S.A.
108.	BROSE - SISTEMAS DE FECHADURAS PARA AUTOMÓVEIS, UNIPESSOAL, LDA
109.	BROSSECAR - INDÚSTRIA E COMÉRCIO DE ESCOVAS AUTO, UNIPESSOAL, LDA
110.	BROWNE EWALL TECHNOLOGY & MERRYLEGS, LDA
111.	BROWNING VIANA - FÁBRICA DE ARMAS E ARTIGOS DE DESPORTO, S.A.
112.	BRUNSWICK MARINE - EMEA OPERATIONS, LDA
113.	BTP TOCHA, UNIPESSOAL, LDA
114.	C.C.A. - CERÂMICA CULINÁRIA E ALIMENTAR, S.A.
115.	C.C.CABLERIAS MANUFACTURING, UNIPESSOAL, LDA
116.	CABOPOL - POLYMER COMPOUNDS, S.A.
117.	CACHAPUZ - EQUIPAMENTOS PARA PESAGEM, LDA
118.	CALA MURTA, UNIPESSOAL, LDA
119.	CALÇADA, S.A.
120.	CALEIRAETERNA - FABRICO E COMÉRCIO DE COMPONENTES E MÁQUINAS PARA CALEIRAS, S.A.
121.	CALZABLAN, SOCIEDADE UNIPESSOAL, LDA
122.	CAME PORTUGAL, UNIPESSOAL, LDA
123.	CAMINHOS DE CABOS, BASOR ELECTRIC, LDA
124.	CAMO - INDÚSTRIA DE AUTOCARROS, S.A.
125.	CANCÉ - CONSTRUÇÕES METÁLICAS, LDA
126.	CARBOGAL ENGINEERED CARBONS, S.A.
127.	CARGILL II - NUTRIÇÃO ANIMAL, S.A.
128.	CARL ZEISS VISION PORTUGAL, S.A.

129. CARLO GAVAZZI, UNIPESSOAL, LDA
130. CARPINTARIA MAGALHÃES E FAUSTINO, LDA
131. CARTONARTE - INDÚSTRIA DE CARTONAGEM, LDA
132. CAST IBÉRIA, S.A.
133. CATRAPORT, LDA
134. CBI - CHASSIS BRAKES INTERNATIONAL PORTUGAL, S.A.
135. CEMOPOL-CELULOSES MOLDADAS PORTUGUESAS, S.A.
136. CENTRO DE ABATE DE COELHOS - JOAQUIM DE JESUS RAMOS, S.A.
137. CERÂMICA DO VALE DA GÂNDARA, S.A.
138. CEREALTO SINTRA FOODS, S.A.
139. CERFRIT, UNIPESSOAL, LDA
140. CERTIKIN PORTUGAL, LDA
141. CHAMARTIN IMOBILIÁRIA, SGPS, S.A.
142. CHÂTEAU STA.MARIA - EXPLORAÇÕES VITIVINÍCOLAS, LDA
143. CHIMIGRAF IBÉRICA, S.L.
144. CHIORINO PORTUGAL, LDA
145. CHRISTEYNS PORTUGAL - COMERCIALIZAÇÃO DE PRODUTOS DE LIMPEZA, S.A.
146. CHRISTIAN DIETZ - FÁBRICA PORTUGUESA DE CALÇADO, LDA
147. CIARGA - ARGAMASSAS SECAS, S.A.
148. CIE STRATIS - TRATAMENTOS, LDA
149. CIMD - COMPANHIA INDUSTRIAL DE MATERIAIS DUROS, S.A.
150. CIMENTAÇOR - CIMENTOS DOS AÇORES, LDA
151. CIMPOR - INDÚSTRIA DE CIMENTOS, S.A.
152. CIMPOR PORTUGAL, S.G.P.S., S.A.
153. CIN - CORPORAÇÃO INDUSTRIAL DO NORTE, S.A.
154. CIN INDUSTRIAL COATINGS, S.A.
155. CINAVE - COMPANHIA DE INSTRUMENTOS DE NAVEGAÇÃO AERONÁUTICA, LDA
156. CINCA - COMPANHIA INDUSTRIAL DE CERÂMICA, S.A.
157. CIPAN - COMPANHIA INDUSTRIAL PRODUTORA DE ANTIBIÓTICOS, S.A.
158. CK STORES PORTUGAL, UNIPESSOAL, LDA
159. CLADD & MANUFACTURING SERVICES PORTUGAL, UNIPESSOAL, LDA
160. CLESTRA HAUSERMAN - SUCURSAL PORTUGUESA
161. CLEVER REINFORCEMENT IBÉRICA - MATERIAIS DE CONSTRUÇÃO, LDA
162. CLOVER - PORTUGAL, LDA
163. COCKBURN & CA, S.A.
164. CODAN PORTUGAL - INSTRUMENTOS MÉDICOS, S.A.
165. COELHO & FRAGOSO, S.A.
166. COFACO AÇORES - INDÚSTRIA DE CONSERVAS, S.A.
167. COFFEE ITHAKA PORTUGAL, UNIPESSOAL, LDA
168. COFICAB PORTUGAL - COMPANHIA DE FIOS E CABOS, LDA
169. COIMPACK - EMBALAGENS, LDA
170. COLDTECH MANUFACTURING PORTUGAL, LDA
171. COLOROBBIA PORTUGAL - INDÚSTRIA CERÂMICA, LDA
172. COMMUNISIS PORTUGAL, UNIPESSOAL, LDA
173. COMPANHIA AGRÍCOLA DE PENHA GARCIA, S.A.
174. COMPANHIA INDUSTRIAL DE RESINAS SINTÉTICAS, CIRES, LDA

175. CONESA PORTUGAL, S.A.
176. CONFECÇÕES S.GREGÓRIO, LDA
177. CONSULTOOR - CALÇADO ORTOPÉDICO, LDA
178. CONTIBRONZES - FUNDIÇÃO CONTÍNUA E CENTRÍFUGA, S.A.
179. CONTINENTAL - INDÚSTRIA TÊXTIL DO AVE, S.A.
180. CONTINENTAL LEMMERZ (PORTUGAL) - COMPONENTES PARA AUTOMÓVEIS, LDA
181. CONTINENTAL MABOR - INDÚSTRIA DE PNEUS, S.A.
182. CONTINENTAL TEVES PORTUGAL - SISTEMAS DE TRAVAGEM, LDA
183. CONTROL PET, S.A.
184. COOL HAVEN - HABITAÇÕES MODULARES E ECO-SUSTENTÁVEIS, S.A.
185. COPIDATA, S.A.
186. COPO TÊXTIL PORTUGAL, S.A.
187. CORK SUPPLY PORTUGAL 3 - MATÉRIAS PRIMAS, UNIPESSOAL, LDA
188. CORK SUPPLY PORTUGAL 4 - ROLHAS TÉCNICAS, UNIPESSOAL, LDA
189. CORK SUPPLY PORTUGAL, S.A.
190. CORKSRIBAS - INDÚSTRIA GRANULADORA DE CORTIÇA, S.A.
191. COSFIBEL - PORTO, INDÚSTRIA DE EMBALAGENS, LDA
192. COSMOPAK - INDÚSTRIA DE COSMÉTICOS E EMBALAGENS, S.A.
193. COVANCE CLINICAL & PERIAPPROVAL SERVICES LTD - SUCURSAL EM PORTUGAL
194. COVERCAR PORTUGAL, LDA
195. COVIPOR - COMPANHIA VIDREIRA DO PORTO, LDA
196. CPP - CONSULTORES DE PRODUÇÃO PUBLICITÁRIA, LDA
197. CREDIN PORTUGAL - PRODUTOS ALIMENTARES, S.A.
198. CRISAL - CRISTALARIA AUTOMÁTICA, S.A.
199. CRONOS, LDA
200. CROWN CORK & SEAL DE PORTUGAL - EMBALAGENS, S.A.
201. CSM IBÉRIA, S.A.
202. CT - COBERT TELHAS, S.A.
203. CTH PORTO - INDÚSTRIA ALIMENTAR, UNIPESSOAL, LDA
204. CUBIMATÉRIA - POLIMENTOS, UNIPESSOAL, LDA
205. CUPA PEDRAS, LDA
206. CURRAL DE ATLANTIS - SOCIEDADE VITIVINÍCOLA, LDA
207. CURTIDOS MARTINEZ LEAL, S.L. - REPRESENTAÇÃO PERMANENTE
208. CURTISS WRIGHT SURFACE TECHNOLOGIES, UNIPESSOAL, LDA
209. D.I.N. - DESENVOLVIMENTO E INOVAÇÃO NUTRICIONAL, S.A.
210. DAI - SOCIEDADE DE DESENVOLVIMENTO AGRO-INDUSTRIAL, S.A.
211. DALPER - CUTELARIA E PRODUTOS DE MESA, S.A.
212. DALPHI - METAL PORTUGAL, S.A.
213. DANBANHO - EQUIPAMENTOS SANITÁRIOS E MATERIAIS DE CONSTRUÇÃO, S.A.
214. DANOSA EUROFOAM, LDA
215. DARDICO - AGRO-INDÚSTRIA, S.A.
216. DAT SCHAUB (PORTO) - INDÚSTRIA ALIMENTAR, S.A.
217. D'AVÓ - INDÚSTRIA DE PRODUTOS ALIMENTARES, S.A.
218. DAWN FOODS PORTUGAL, S.A.
219. DAYTON PROGRESS - PERFURADORES, LDA
220. DE HEUS - NUTRIÇÃO ANIMAL, S.A.

221. DECATROP - INVESTIMENTOS IMOBILIÁRIOS E TURÍSTICOS, S.A.
222. DEJEMAGRAN, UNIPESSOAL, LDA
223. DELPHI AUTOMOTIVE SYSTEMS - PORTUGAL, S.A.
224. DELTA HEAT SERVICES HOLDING B.V. (SUCURSAL EM PORTUGAL)
225. DF - ELASTOMER SOLUTIONS, LDA
226. DFG PORTUGAL, LDA
227. DHOLLANDIA - PLATAFORMAS, LDA
228. DIAFARMA - PRODUTOS FARMACÊUTICOS E DE DIAGNÓSTICO, LDA
229. DIASEN IBERICA, LDA
230. DIERRE IBÉRICA - INDÚSTRIA DE PORTAS, S.A.
231. DIKAR PORTUGAL, UNIPESSOAL, LDA
232. DIMOLDURA, MOLDURAS E COMPONENTES, S.A.
233. DOCEREINA - SOBREMESAS, LDA
234. DOCTORGUMMY, LDA
235. DOMAINES MAGREZ PORTUGAL - SOCIEDADE UNIPESSOAL, LDA
236. DONZÉ-BAUME PORTUGAL - INDÚSTRIA DE RELÓGIOS E POLIMENTO, UNIPESSOAL, LDA
237. DOREL PORTUGAL - ARTIGOS PARA BÉBÉ, UNIPESSOAL, LDA
238. DORIA - SOCIEDADE UNIPESSOAL, LDA
239. DOSE & RINNE PORTUGUESA - FÁBRICA DE ACESSÓRIOS DE LATÃO, LDA
240. DOUBLET PORTUGAL, LDA
241. DOW PORTUGAL - PRODUTOS QUÍMICOS, SOCIEDADE UNIPESSOAL, LDA
242. DPAQ, LDA
243. DURA AUTOMOTIVE PORTUGUESA - INDÚSTRIA DE COMPONENTES PARA AUTOMÓVEIS, LDA
244. DÜRR SYSTEMS SPAIN, S.A. - SUCURSAL EM PORTUGAL
245. DUX - INTERIORES, S.A.
246. DYSTAR - ANILINAS TÊXTEIS, UNIPESSOAL, LDA
247. E - STONE, LDA
248. ECCO'LET (PORTUGAL) - FÁBRICA DE SAPATOS, LDA
249. ECOSLOPS PORTUGAL, S.A.
250. ECP PLATFORM S.L. - SUCURSAL EM PORTUGAL
251. EDA - ESTOFAGEM DE ASSENTOS, UNIPESSOAL, LDA
252. EDIÇÕES PIAGET, LDA
253. EDINFOR IMÓVEIS, S.A.
254. EDSL - EMBALLAGES - DIFFUSION (PORTUGAL), SOCIEDADE UNIPESSOAL, LDA
255. EFACEC ELECTRIC MOBILITY, S.A.
256. EFACEC ENERGIA - MÁQUINAS E EQUIPAMENTOS ELÉCTRICOS, S.A.
257. EFACEC ENGENHARIA E SISTEMAS, S.A.
258. EFACEC HANDLING SOLUTIONS, S.A.
259. EGT - INDUSTRIE, UNIPESSOAL, LDA
260. EID - EMPRESA DE INVESTIGAÇÃO E DESENVOLVIMENTO DE ELECTRÓNICA, S.A.
261. ELECTRO ARCO, S.A.
262. ELEVOLUTION - ENGENHARIA, S.A.
263. ELSPEC PORTUGAL - SOCIEDADE UNIPESSOAL, LDA
264. EMBALGRÉS - CERÂMICA EM GRÉS S.A.
265. EMBRAER PORTUGAL - ESTRUTURAS EM COMPÓSITOS, S.A.

266.	EMBRAER PORTUGAL - ESTRUTURAS METÁLICAS, S.A.
267.	EMBRAER PORTUGAL, S.A.
268.	EMPRESA DAS ÁGUAS DO VIMEIRO, S.A.
269.	EMUCA, SOCIEDADE UNIPESSOAL, LDA
270.	EMUGE-FRANKEN, REPRESENTAÇÃO PERMANENTE EM PORTUGAL
271.	ENDEKA CERAMICS, S.A.
272.	ENEOP 3 - DESENVOLVIMENTO DE PROJECTO INDUSTRIAL, S.A.
273.	ENERCON GMBH, SUCURSAL EM PORTUGAL
274.	ENERCONPOR - ENERGIAS RENOVÁVEIS DE PORTUGAL, SOCIEDADE UNIPESSOAL, LDA
275.	ENERLAND, LDA
276.	ENGTOOL, S.A.
277.	ENVIRONMENT CLIM, LDA
278.	EOC-BELGIUM, N.V. - SUCURSAL EM PORTUGAL
279.	ERICSSON - TELECOMUNICAÇÕES, LDA
280.	ERION MANTENIMIENTO FERROVIÁRIO, S.A. - SUCURSAL EM SUCURSAL
281.	ESCHMANN TEXTURA INTERNACIONAL - TRANSFORMAÇÃO DE FERRAMENTAS, UNIPESSOAL, LDA
282.	ESCUDO.COM - SISTEMAS INFORMÁTICOS, LDA
283.	ESEFLY - ENGINE SERVICE EUROPE, UNIPESSOAL, LDA
284.	ESMALGLASS (PORTUGAL) PRODUTOS CERÂMICOS, S.A.
285.	ESMALTICER - ESMALTES CERÂMICOS, LDA
286.	ESMERALDA, INDÚSTRIA DE CALÇADO, LDA
287.	ESPAÇO RURAL - RECUPERAÇÃO E DESENVOLVIMENTO DE ESPAÇOS RURAIS, LDA
288.	ESPLENDORABSTRATO, LDA
289.	ESPORÃO PRODUÇÃO BIOLÓGICA, LDA
290.	ESPORÃO, S.A.
291.	ESSEX PORTUGAL, UNIPESSOAL, LDA
292.	ESSILOR PORTUGAL - SOCIEDADE INDUSTRIAL DE ÓPTICA, LDA
293.	ESTALEIROS DO NORTE - EMBARCAÇÕES PROFISSIONAIS E DESPORTIVAS, LDA
294.	ESTRELA - ELEVADORES, UNIPESSOAL, LDA
295.	ETESPO - ROCHAS ORNAMENTAIS, LDA
296.	ETIQUETAS DOMINGO PORTUGAL - UNIPESSOAL, LDA
297.	ETMA - EMPRESA TRANSFORMADORA DE MÁRMORES DO ALENTEJO, S.A.
298.	EUGSTER & FRISMAG - ELECTRODOMÉSTICOS, LDA
299.	EUROCAST PORTUGAL VIANA, S.A.
300.	EUROCER - INDÚSTRIA DE SANITÁRIOS, S.A.
301.	EUROCHEMICALS - PORTUGAL, S.A.
302.	EUROFIRST - FABRICO E COMÉRCIO DE TAMPAS DE VISITA A SERVIÇOS, LDA
303.	EURONAVY - TINTAS MARÍTIMAS E INDUSTRIAIS UNIPESSOAL, LDA
304.	EUROPA&C - EMBALAGEM, S.A.
305.	EUROPA&C CARTÃO OVAR, S.A.
306.	EUROPA&C DISTRIBUIÇÃO DE MADEIRA, LDA
307.	EUROPA&C KRAFT VIANA, S.A.
308.	EUROPASTRY PORTUGAL, S.A.
309.	EUROPEAN SEAFOOD INVESTMENTS PORTUGAL, S.A.
310.	EUROSAP - COSMÉTICA, S.A.

311. EUROSTYLE SYSTEMS PORTUGAL - INDUSTRIA DE PLÁSTICOS E DE BORRACHA, S.A.
312. EVERTIS IBÉRICA, S.A.
313. EVERTIS, S.A.
314. EVOLUTIS - CONFORTO E AMBIENTE, LDA
315. EXIDE TECHNOLOGIES RECYCLING II, LDA
316. EXIDE TECHNOLOGIES, LDA
317. EYSSA TESIS - TECNOLOGIA DE SISTEMAS ELECTRÓNICOS, S.A.
318. EZPELETA PORTUGAL - MÓVEIS DE JARDIM, LDA
319. F.I.T. - FOMENTO DA INDÚSTRIA DO TOMATE, S.A.
320. F.P.L. - FÁBRICA DE PRODUTOS DE LUXO, LDA
321. FÁBRICA ARTESANAL DE TAPETES BEIRIZ II, LDA
322. FÁBRICA DE CERVEJAS E REFRIGERANTES JOÃO DE MELO ABREU, LDA
323. FAEBER LIGHTING SYSTEM, LDA
324. FARAME, S.A.
325. FARMALAVI - PRODUTOS FARMACÊUTICOS, SOCIEDADE UNIPESSOAL, LDA
326. FARMINOVA - PRODUTOS FARMACÊUTICOS DE INOVAÇÃO, LDA
327. FASSALUSA - PRODUÇÃO E COMERCIALIZAÇÃO DE MATERIAIS DE CONSTRUÇÃO, LDA
328. FATER PORTUGAL, UNIPESSOAL, LDA
329. FAURECIA - ASSENTOS DE AUTOMÓVEL, LDA
330. FAURÉCIA - SISTEMAS DE ESCAPE PORTUGAL, LDA
331. FAURECIA SISTEMAS DE INTERIOR DE PORTUGAL - COMPONENTES PARA AUTOMÓVEIS, S.A.
332. FERFOR - EMPRESA INDUSTRIAL DE FERRAMENTAS E FORJADOS, S.A.
333. FERREIRA, LDA
334. FERRO - INDÚSTRIAS QUÍMICAS (PORTUGAL), LDA
335. FERSEM - ESTRUTURAS METÁLICAS, LDA
336. FERTIGAL, LDA
337. FERVOMECÂNICA - METALOMECANICA, UNIPESSOAL, LDA
338. FES-FRAGMENTAÇÃO, ESCOLHAS E SELECÇÃO DE METAIS, S.A.
339. FIBOPE PORTUGUESA - FILMES BIORIENTADOS, S.A.
340. FICO CABLES - FÁBRICA DE ACESSÓRIOS E EQUIPAMENTOS INDUSTRIAIS, LDA
341. FIMA OLÁ - PRODUTOS ALIMENTARES, S.A.
342. FIMPER - EMBALAGENS METÁLICAS, S.A.
343. FISIPE, S.A.
344. FLEXICEL PORTUGAL, UNIPESSOAL, LDA
345. FLEXIPOL - ESPUMAS SINTÉTICAS, S.A.
346. FLEXIREL - LABORATÓRIO DE CLICHES, LDA
347. FLEXOSPUMA - COMÉRCIO E INDÚSTRIA DE ESPUMAS PARA CALÇADO, LDA
348. FLUIDRA PORTUGAL, UNIPESSOAL, LDA
349. FOLLOW THE ADVICE - IMPRESSÃO DIGITAL TÊXTIL , LDA
350. FONT SALEM PORTUGAL, S.A.
351. FOOT - FACTS, LDA
352. FORMAS E CONSTRASTES, UNIPESSOAL, LDA
353. FOSS IBERIA S.A, SUCURSAL EM PORTUGAL
354. FRENCH FASHIONS PORTUGUESA DE MALHAS, LDA
355. FULEMM PT, UNIPESSOAL, LDA

356. FUNDIÇÃO DE ÉVORA, LDA
357. FUNFRAP - FUNDIÇÃO PORTUGUESA, S.A.
358. FUTRIFER - INDÚSTRIAS FERROVIÁRIAS, S.A.
359. FUTURE RENTAL MANUFACTURING, LDA
360. GABELEX - INDÚSTRIA DE TECTOS METÁLICOS, S.A.
361. GABOR PORTUGAL - INDÚSTRIA DE CALÇADO, LDA
362. GAFIDES - GARMENT FINISHING AND DISTRIBUTION EUROPEAN SERVICES, S.A.
363. GALCOPOR - GALVANIZADOS DE PORTUGAL, LDA
364. GALLOVIDRO, S.A.
365. GAMA UNO - FABRICO E COMERCIALIZAÇÃO DE PRODUTOS CERÂMICOS E SANITÁRIOS, LDA
366. GANAIN LUSITÂNIA, UNIPESSOAL, LDA
367. GANASSINI, UNIPESSOAL, LDA
368. GANAU PORTUGAL CORTIÇAS, S.A.
369. GASIN II - GASES INDUSTRIAIS, UNIPESSOAL, LDA
370. GASOXMED - GASES MEDICINAIS, S.A.
371. GEBO PACKAGING SOLUTIONS PORTUGAL, S.A.
372. GENCOAL, S.A.
373. GENERAL CABLE CELCAT, ENERGIA E TELECOMUNICAÇÕES, S.A.
374. GENERIS - FARMACÊUTICA, S.A.
375. GEOINERTE, LDA
376. GEOSTONE - PRODUÇÃO E COMERCIALIZAÇÃO DE ARTIGOS DECORATIVOS, LDA
377. GERLA, UNIPESSOAL, LDA
378. GESTAMP AVEIRO - INDÚSTRIA DE ACESSÓRIOS DE AUTOMÓVEIS, S.A.
379. GESTAMP CERVEIRA, LDA
380. GESTAMP VENDAS NOVAS, UNIPESSOAL, LDA
381. GEWISS PORTUGAL - INDÚSTRIA DE MATERIAL ELÉCTRICO, UNIPESSOAL, LDA
382. GKPLASTIKUP, LDA
383. GLOBAL DE PILHAS - BATERIAS E ACUMULADORES DE ENERGIA MOVEL, LDA
384. GLOBAL SALMON PORTUGAL, UNIPESSOAL, LDA
385. GLOWOOD - INDÚSTRIA, S.A.
386. GOMÁ CAMPS-PORTUGAL - FABRICANTE DE PAPEL, S.A.
387. GONVARRI - PRODUTOS SIDERÚRGICOS, S.A.
388. GOPACA - FÁBRICA DE PAPEL E CARTÃO, S.A.
389. GPTECH - TECHNOLOGY CENTRE, S.A.
390. GRAND CRU - CORTIÇAS, UNIPESSOAL, LDA
391. GRANDAÇOS - SERVIÇOS MAQUINADOS PORTUGAL, UNIPESSOAL, LDA
392. GRANDE ENSEADA - VINEYARDS AND WINE INVESTMENTS, S.A.
393. GRANDVISION SUPPLY CHAIN (PORTUGAL), S.A.
394. GREIF FLEXIBLES IBÉRIA, S.A.
395. GREIF PORTUGAL, S.A.
396. GRÉS PANARIA PORTUGAL, S.A.
397. GRID SOLUTIONS PORTUGAL, LDA
398. GROHE PORTUGAL - COMPONENTES SANITÁRIOS, LDA
399. GROZ-BECKERT PORTUGUESA, UNIPESSOAL, LDA
400. GRUNDÉNS PORTUGAL, LDA
401. GRUPO ANTOLÍN LUSITÂNIA - COMPONENTES AUTOMÓVEL, S.A.

402.	GRUPO ANTOLIN VALENÇA - COMPONENTES AUTOMÓVEL, SOCIEDADE UNIPESSOAL, LDA
403.	GS STAALWERKEN PORTUGAL, LDA
404.	H.B.FULLER PORTUGAL, PRODUTOS QUÍMICOS, S.A.
405.	H.M.R.- TÉCNICA DE PLÁSTICOS E DE CONSTRUÇÃO, LDA
406.	HAASE E KUHN PORTUGUESA - AGULHAS TÊXTEIS, UNIPESSOAL, LDA
407.	HANON SYSTEMS PORTUGAL, S.A.
408.	HANSAHOLDING - SOCIEDADE GESTORA DE PARTICIPAÇÕES SOCIAIS, LDA
409.	HAWORTH PORTUGAL - MOBILIÁRIO DE ESCRITÓRIO, S.A.
410.	HBM FIBERSENSING, S.A.
411.	HELIFLEX TUBOS E MANGUEIRAS, S.A.
412.	HEMPEL (PORTUGAL), LDA
413.	HERDADE DA COMPORTA - ACTIVIDADES AGRO SILVÍCOLAS E TURÍSTICAS, S.A.
414.	HERDADE DOS COELHEIROS, LDA
415.	HGT PORTUGAL - INDÚSTRIA DE RELÓGIOS E POLIMENTO, UNIPESSOAL, LDA
416.	HIKMA FARMACÊUTICA (PORTUGAL), S.A.
417.	HODSDON & BANCROFT, LDA
418.	HOMONATURA DOIS - LABORATÓRIO HOMEOPÁTICO E PRODUTOS NATURAIS, LDA.
419.	HOVIONE FARMACIÊNCIA, S.A.
420.	HUBER TRICOT - CONFECÇÕES, LDA
421.	HUF PORTUGUESA - FÁBRICA DE COMPONENTES PARA O AUTOMÓVEL, LDA
422.	HUSQVARNA PORTUGAL, S.A.
423.	HUTCHINSON (PORTO) - TUBOS FLEXÍVEIS, SOCIEDADE UNIPESSOAL, LDA
424.	HUTCHINSON BORRACHAS DE PORTUGAL - SOCIEDADE UNIPESSOAL, LDA
425.	HYDRACOOLING, LDA
426.	I LOVE TEXTILE ONLINE BOUTIQUE SHOP, LDA
427.	I.VIRTUAL - IMPRESSÃO DIGITAL, LDA
428.	IBERAGAR - SOCIEDADE LUSO-ESPANHOLA DE COLOIDES MARINHOS, S.A.
429.	IBERCOAL, LDA
430.	IBERFIBRAN - POLIESTIRENO EXTRUDIDO, S.A.
431.	IBERIAN SWEETS, UNIPESSOAL, LDA
432.	IFA - INDÚSTRIA DE FERRAGENS DE ÁGUEDA, S.A.
433.	I-GEN, LDA
434.	IKEA INDUSTRY PORTUGAL, S.A.
435.	ILUNION LAVANDARIAS DE PORTUGAL, UNIPESSOAL, LDA
436.	IMAGEM IMPAR - CENTRO DE COMUNICAÇÃO VISUAL, LDA
437.	IMEGUISA PORTUGAL - INDÚSTRIAS METÁLICAS REUNIDAS, S.A.
438.	IMPERIAL - PRODUTOS ALIMENTARES, S.A.
439.	INCHEMICA - INDÚSTRIA QUÍMICA DE ESPECIALIDADES, SOCIEDADE UNIPESSOAL, LDA
440.	INDÚSTRIAS ELECTROMECÂNICAS GUERRA HERMANOS, UNIPESSOAL LDA
441.	INTELLIGENCE DIAMOND - LISBON, LDA
442.	INVACARE (PORTUGAL) - SOCIEDADE INDUSTRIAL E COMERCIAL DE ORTOPEDIA, LDA
443.	INVENTUS - PRODUTOS QUÍMICOS, LDA
444.	INVIVONSA PORTUGAL, S.A.

445. IPIAC MADRID SL - SUCURSAL EM PORTUGAL
446. IPL - INDÚSTRIA DE ARTIGOS DE PAPEL, S.A.
447. IPTE IBERIA - AUTOMAÇÃO INDUSTRIAL, LDA
448. IRBAL, S.A.
449. IREMSEM, LDA
450. ISOTRANSFO, UNIPESSOAL, LDA
451. ISRINGHAUSEN - ASSENTOS, LDA
452. ITALAGRO - INDÚSTRIA DE TRANSFORMAÇÃO DE PRODUTOS ALIMENTARES, S.A.
453. ITALSUGHERO PORTUGAL, UNIPESSOAL, LDA
454. ITCS - TRADING, CONSULTORIA E SERVIÇOS INTERNACIONAIS, LDA (ZONA FRANCA DA MADEIRA)
455. ITRON - SISTEMAS DE MEDIÇÃO, LDA
456. J.&F. KRÜTH PORTUGAL, LDA
457. J.C.COIMBRA II - DISTRIBUIÇÃO, S.A.
458. J.CARVALHO MACEDO, LDA
459. J.NADAIS - INDÚSTRIA E COMÉRCIO DE MADEIRAS, S.A.
460. J3LP - FABRICO DE PRODUTOS METÁLICOS, LDA
461. JACL PRODUCTS - PRODUÇÃO DE COMPONENTES AUTOMÓVEIS, LDA
462. JACOB ROHNER - TÊXTEIS, S.A.
463. JADO IBERIA - PRODUTOS METALÚRGICOS, SOCIEDADE UNIPESSOAL, LDA
464. JANOSCHKA PORTUGAL - PRÉ-IMPRESSÃO DE EMBALAGENS, UNIPESSOAL, LDA
465. JANSSEN - CILAG FARMACÊUTICA, LDA
466. JERISA - EMPRESA DE CONFECÇÕES, LDA
467. JOÃO DE DEUS & FILHOS, S.A.
468. JOAQUIM FRANCISCO INÁCIO, SUCESSORES, S.A.
469. KAPSCH CARRIERCOM - UNIPESSOAL, LDA
470. KATHREIN AUTOMOTIVE PORTUGAL, SOCIEDADE UNIPESSOAL, LDA
471. KAUTEX TEXTRON - PRODUTOS PLÁSTICOS, SOCIEDADE UNIPESSOAL LDA
472. KAWNEER PORTUGAL, UNIPESSOAL, LDA
473. KEMET ELECTRONICS PORTUGAL, S.A.
474. KERN - AGRICULTURA E COMÉRCIO, SOCIEDADE, LDA
475. KGS DIAMOND PORTUGAL, UNIPESSOAL, LDA
476. KIRCHHOFF AUTOMOTIVE PORTUGAL, S.A.
477. KLAVENESS FOOTWEAR, S.A.
478. KLC - INDÚSTRIA DE TRANSFORMAÇÃO DE MATÉRIAS PLÁSTICAS, LDA
479. KLOCKNER PORTUGAL, UNIPESSOAL, LDA
480. KUNG PORTUGUESA - CONFECÇÕES DE VESTUÁRIO, LDA
481. LA PERLA (PORTUGAL), UNIPESSOAL, LDA
482. LA PIERRE DANS TOUS SES ÉTATS, LDA
483. LABESFAL - LABORATÓRIOS ALMIRO, S.A.
484. LABO PORTUGAL - PRODUTOS QUÍMICOS, S.A.
485. LABOPLASTE - PLÁSTICOS PARA LABORATÓRIO, LDA
486. LABORATOIRE NUXE PORTUGAL, UNIPESSOAL, LDA
487. LABORATOIRES BAILLEUL PORTUGAL, S.A.
488. LABORATÓRIO NORMAL - PRODUTOS FARMACÊUTICOS, LDA
489. LABORATÓRIOS ABAD PORTUGAL, LDA
490. LABORATÓRIOS ATRAL, S.A.

491. LABORATÓRIOS INIBSA, S.A.
492. LABORATÓRIOS VIR PORTUGAL, LDA
493. LABORATÓRIOS VITÓRIA, S.A.
494. LABVITAL, LDA
495. LACER II HEALTHCARE, LDA
496. LAGAR DO FARO, UNIPESSOAL, LDA
497. LAKKOM INTERNACIONAL - DECORAÇÃO, LDA
498. LALLEMAND IBÉRIA, S.A.
499. LAMÁRMORES, LDA
500. LAMPRE PORTUGUESA - REVESTIMENTO E TRANSFORMAÇÃO DE METAIS, LDA
501. LANKHORST EURONETE PORTUGAL, S.A.
502. LARA - LARANJA DO ALGARVE, S.A.
503. LEGRAND ELÉCTRICA, S.A.
504. LEICA - APARELHOS ÓPTICOS DE PRECISÃO, S.A.
505. LENOPOR - COMERCIALIZAÇÃO E PRODUÇÃO DE TÊXTEIS E VESTUÁRIO, LDA
506. LEONISCHE PORTUGAL - INDUSTRIA DE CABLAGENS, LDA
507. LIFRESCA - SOCIEDADE DE PRODUTOS HIGIÉNICOS, S.A.
508. LINDE PORTUGAL, LDA
509. LINKPRINT - GRÁFICA, LDA
510. LISARDO CONDE ABELLEIRA, UNIPESSOAL, LDA
511. LIVID JEANS, UNIPESSOAL, LDA
512. LIVINGSHELL PORTUGAL, LDA
513. LUMELCO PORTUGAL - SOCIEDADE UNIPESSOAL, LDA
514. LUSIFLES - DESENHO E PRE-IMPRESSÃO, LDA
515. LUSIMAT, S.A.
516. LUSO FINSA - INDÚSTRIA E COMÉRCIO DE MADEIRAS, S.A.
517. LUSOMAPEI - PRODUTOS QUÍMICOS PARA A CONSTRUÇÃO, S.A.
518. LUSOMEDICAMENTA - SOCIEDADE TÉCNICA FARMACÊUTICA, S.A.
519. LUSORBEA - MONTAGEM DE BICICLETAS, UNIPESSOAL, LDA
520. LUSOSIDER - AÇOS PLANOS, S.A.
521. LYSAPLAST PORTUGAL, UNIPESSOAL, LDA
522. M.B.O. BINDER - MÁQUINAS GRÁFICAS, S.A.
523. MACFARLAN SMITH PORTUGAL, LDA
524. MAFERDI RUBER, LDA
525. MAFLOTEC - EQUIPAMENTOS PARA A INDÚSTRIA DE MOLDES, LDA
526. MAGNA DONNELLY I.C.A., INDÚSTRIA DE COMPONENTES PARA AUTOMÓVEIS, SOCIEDADE UNIPESSOAL, LDA
527. MAHLE - COMPONENTES DE MOTORES, S.A.
528. MALESCI - FARMACÊUTICA, LDA
529. MALUESP - FABRICAÇÃO DE MOLDES DE AREIA, LDA
530. MANITOWOC CRANE GROUP PORTUGAL, LDA
531. MAPORAL - MATADOURO DE PORCO DE RAÇA ALENTEJANA, S.A.
532. MARCEL ROBBEZ MASSON PORTUGUESA - FÁBRICA DE OURIVESARIA, S.A.
533. MAREDEUS PORTUGAL, UNIPESSOAL, LDA
534. MARIA GONZAGA - GUARDA ROUPA, LDA
535. MARIAN, LDA
536. MARTIN CALDEIRAS, LDA

537. MATADERO INDUSTRIAL DE CORTEGANA, FILIAL DE PORTUGAL, S.A.
538. MATUTANO - SOCIEDADE DE PRODUTOS ALIMENTARES, LDA
539. MAUTOMOTIVE PORTUGAL, UNIPESSOAL, LDA
540. MAXAMPOR, S.A.
541. MB LUSITANA DE MATRIZES, S.A.
542. MCCORMICK PORTUGAL - PRODUTOS ALIMENTARES, SOCIEDADE UNIPESSOAL, LDA
543. MCGA PORTUGAL, UNIPESSOAL, LDA
544. MECACHROME AERONÁUTICA, UNIPESSOAL, LDA
545. MEDIRM - FABRICO E COMÉRCIO DE DISPOSITIVOS MÉDICOS, LDA
546. MEDISP - PRODUTOS HOSPITALARES, S.A.
547. MEGAÇO - PRODUTOS SIDERÚRGICOS, LDA
548. MEGATECHIND - INDÚSTRIAS MARINHA GRANDE, LDA
549. MEPHISTO PORTUGUESA - FÁBRICA DE CALÇADO, LDA
550. MEPVOUTES - FABRICO DE COMPONENTES PARA CALÇADO, UNIPESSOAL, LDA
551. MERIT MEDICAL PORTUGAL, S.A.
552. MEY TÊXTEIS, S.A.
553. MFS - MOURA FÁBRICA SOLAR - FABRICO E COMÉRCIO DE PAINÉIS SOLARES, LDA
554. MGI COUTIER LUSITÂNIA, UNIPESSOAL, LDA
555. MICROCROSSWISS, UNIPESSOAL, LDA
556. MILLA MED PORTUGAL, SOCIEDADE UNIPESSOAL, LDA
557. MITSUBISHI FUSO TRUCK EUROPE - SOCIEDADE EUROPEIA DE AUTOMÓVEIS, S.A.
558. MNI, UNIPESSOAL, LDA
559. MODULUS, LDA
560. MOLAFLEX - COLCHÕES, S.A.
561. MOLCER - MOLDES E EQUIPAMENTOS CERÂMICOS, SOCIEDADE UNIPESSOAL, LDA
562. MOLD-TECH PORTUGAL - TRATAMENTO E REVESTIMENTO DE METAIS, LDA
563. MOVEON - COMPONENTES E CALÇADO, S.A.
564. MPV - MECÂNICA DE PRECISÃO DO VEZ, UNIPESSOAL, LDA
565. MQS - MAKERS OF QUALITY SEATING, UNIPESSOAL, LDA
566. MTEX - SOLUTIONS, S.A.
567. MUNDITÊXTIL - COMÉRCIO INTERNACIONAL DE TÊXTEIS, UNIPESSOAL, LDA
568. MURÇAS, S.A.
569. MUXIMA BIO PT, UNIPESSOAL, LDA
570. MYORTHOPEDICS, LDA
571. NABAD - CALÇADO, LDA
572. NATURANA PORTUGUESA - CONFECÇÕES, UNIPESSOAL, LDA
573. NEC PORTUGAL - TELECOMUNICAÇÕES E SISTEMAS, S.A.
574. NEMOTO PORTUGAL - QUÍMICA FINA, UNIPESSOAL, LDA
575. NEPTUNOSABER, S.A.
576. NESTLÉ - PORTUGAL, S.A.
577. NETEX - NOVA EMPRESA TÊXTIL, LDA
578. NEW ENZYMES, LDA
579. NICEPELLETS, LDA
580. NILORN PORTUGAL - INDÚSTRIA DE ETIQUETAS, LDA
581. NIMCO PORTUGAL, LDA
582. NISSAN BATTERY MANUFACTURING PORTUGAL, S.A.

583. NÍVELVOLUME, LDA
584. NOBRE ALIMENTAÇÃO, LDA
585. NOLTIA SYSTEM, LDA
586. NOMAD TECH, LDA
587. NORTHERN FISH IBERIA - FORSÖL, LDA
588. NOSTRUM FISH, UNIPESSOAL, LDA
589. NOUGATINE, LDA
590. NOVA FUNDÍNIO, S.A.
591. NST APPAREL (EUROPE), LDA
592. NUTPOR - PRODUTOS ALIMENTARES, UNIPESSOAL, LDA
593. NUTRE - INDÚSTRIAS ALIMENTARES, S.A.
594. NUTRICAFÉS - CAFÉ E RESTAURAÇÃO, S.A.
595. O.F.TEXTEIS, LDA
596. O.MUSTAD & SON PORTUGAL - EQUIPAMENTOS DE PESCA, LDA
597. OCTAVIA STRUCTURES - ESTRUTURAS DE ALUMINIOS, UNIPESSOAL, LDA
598. ODLO PORTUGAL - TEXTÊIS, LDA
599. OERLIKON BALZERS COATING SPAIN, S.A. - SUCURSAL EM PORTUGAL
600. OFF.SPIN - TÊXTEIS, UNIPESSOAL, LDA
601. OGMA - INDÚSTRIA AERONÁUTICA DE PORTUGAL, S.A.
602. OKE TILLNER - PERFIS, LDA
603. OLBO & MEHLER TEX PORTUGAL, LDA
604. OLD ALCHEMIST - RESEARCH & DEVELOPMENT OF SUSTAINABLE TECHNOLOGIES, LDA
605. OLIVEIRA SÁ, S.A.
606. OLVE FARMACÊUTICA, LDA
607. OM PHARMA, S.A.
608. OMEN PT, UNIPESSOAL, LDA
609. OMYA, S.A.
610. ONDAPADRÃO - ENCHIMENTO E COMERCIALIZAÇÃO DE ÁGUA, UNIPESSOAL, LDA
611. OPTIMIZE PORTUGAL - PRODUTOS ÓPTICOS, UNIPESSOAL, LDA
612. ORICA MINING SERVICES PORTUGAL, S.A.
613. OSBORN UNIPOL, LDA
614. OTTER PORTUGUESA - INDÚSTRIA DE CALÇADO, LDA
615. P&I - DISPLAYS & PACKAGING, S.A.
616. P.C.F. - PRODUÇÃO DE CALÇADO DE FELGUEIRAS, LDA
617. PACHECO & IRMÃOS, LDA
618. PAGAMO MECO, S.A.
619. PAINCO - PAINEIS PARA A INDUSTRIA ELECTRONICA, LDA
620. PALPITEMANIA - UNIPESSOAL, LDA
621. PANPOR - PRODUTOS ALIMENTARES, S.A.
622. PANRICO - PRODUTOS ALIMENTARES, LDA
623. PAPELEIRA COREBOARD, S.A.
624. PARKE, DAVIS - PRODUTOS FARMACÊUTICOS, LDA
625. PASCOAL & FILHOS, S.A.
626. PAVESTONE, LDA
627. PAVIGRÉS - CERÂMICAS, S.A.
628. PEAK ISR BETÕES, SOCIEDADE UNIPESSOAL, LDA

629. PEDISANA - COMPONENTES DE CALÇADO, S.A.
630. PEDRO PORTUGUESA - FÁBRICA DE CALÇAS, LDA
631. PENSOBETÃO - FABRICAÇÃO DE BETÃO PRONTO, UNIPESSOAL, LDA
632. PENTAPLAST, S.A.
633. PEPPERVANILLA, UNIPESSOAL, LDA
634. PÉROXIDOS FARMACÉUTICOS S.A. - SUCURSAL EM PORTUGAL
635. PESCATUM - CONSERVAS E PESCA, S.A.
636. PESSOA DA VINHA, LDA
637. PETER KAISER - EQUIPAMENTOS E SERVIÇOS PARA A INDÚSTRIA DE CALÇADO, LDA
638. PEUGEOT CITRÖEN AUTOMÓVEIS PORTUGAL, S.A.
639. PHARMASAC - PRODUTOS FARMACÊUTICOS, LDA
640. PIEDADE, S.A.
641. PIETEC - CORTIÇAS, S.A.
642. PLANETA - PLÁSTICOS, S.A.
643. PLANOS FERRÍCOS PORTUGAL - PRODUTOS SIDERÚRGICOS, SOCIEDADE UNIPESSOAL, LDA
644. PLASFIL - PLÁSTICOS DA FIGUEIRA, S.A.
645. PLASTIMAR - INDÚSTRIA DE MATÉRIAS PLÁSTICAS, S.A.
646. POLIFINIX, LDA
647. POLIGAL PORTUGAL, UNIPESSOAL, LDA
648. POLYMARK PORTUGAL, LDA
649. POOLPLACA PORTUGUESA - PLÁSTICOS, LDA
650. PORTALEX ALUMÍNIO, S.A.
651. PORTALUM - PORTUGUESA DE ALUMÍNIO, LDA
652. PORTITAL - ARTIGOS DE CORTIÇA, LDA
653. PORTUBIKE INTERNATIONAL COMPANY, LDA
654. POWER BLADES, UNIPESSOAL, LDA
655. PPG REVESTIMENTOS PARA AUTOMÓVEIS, A.E.I.E.
656. PRALISA - PRODUTOS ALIMENTARES E PESCAS, S.A.
657. PRATS LUSITANIA - INDÚSTRIAS DE ÓPTICA, S.A.
658. PRAXAIR - PORTUGAL GASES, S.A.
659. PREH PORTUGAL, LDA
660. PREMIER TECH IBEROTO, UNIPESSOAL, LDA
661. PREPARADORA DE PINHÕES, LDA
662. PRETTL ADION PORTUGUESA, LDA
663. PREVINIL - EMPRESA PREPARADORA DE COMPOSTOS VINÍLICOS, S.A.
664. PRÍNCIPE DA PALMA - ACTIVIDADES HOTELEIRAS, UNIPESSOAL, LDA
665. PRIORISURPRISE, LDA
666. PROBOS - PLÁSTICOS, S.A.
667. PRODUCEMBAL - PRODUÇÃO DE EMBALAGENS, LDA
668. PRODUTOS DE REVESTIMENTOS PARA CONSTRUÇÃO P.R.B. - PORTUGAL, UNIPESSOAL, LDA
669. PROJINKO SOLAR PORTUGAL, UNIPESSOAL, LDA
670. PROLACTO - LACTÍCINIOS DE SÃO MIGUEL, S.A.
671. PROMOL - INDÚSTRIA DE VELAS, S.A.
672. PRONOVIAS PORTUGAL, UNIPESSOAL LDA
673. PROSIVOGAL TRANSFORMAÇÃO DE METAIS, UNIPESSOAL, LDA

674.	PROSPA - LABORATÓRIOS FARMACÊUTICOS, S.A.
675.	PROTILIS PORTUGAL, LDA
676.	PURATOS - PRODUTOS E ARTIGOS PARA A INDÚSTRIA ALIMENTAR, S.A.
677.	PUSH SAFETY, LDA
678.	Q.S.P.A. - SOCIEDADE VITÍCOLA, UNIPESSOAL, LDA
679.	Q8 KUWAIT PETROLEUM PORTUGAL - COMÉRCIO E DISTRIBUIÇÃO DE PRODUTOS PETROLÍFEROS E DERIVADOS, UNIPESSOAL, LDA
680.	QALIAN PORTUGAL, SOCIEDADE COMERCIAL DE PRODUTOS AGRO-PECUÁRIOS, UNIPESSOAL, LDA
681.	QUIMICER PORTUGAL, S.A.
682.	QUIMIDOIS - INDÚSTRIA QUÍMICA, LDA
683.	QUINTA AND VINEYARD BOTTLERS - VINHOS, S.A.
684.	QUINTA DA MOITA REDONDA - SOCIEDADE AGRÍCOLA, LDA
685.	QUINTA DO NOVAL - VINHOS, S.A.
686.	QUINTA DO PASSADOURO - SOCIEDADE AGRÍCOLA, LDA
687.	QUINTA DO PEGO - SOCIEDADE AGRÍCOLA E VITIVINÍCOLA, S.A.
688.	QUINTA VALE DAS VINHAS, SOCIEDADE AGRÍICOLA, LDA
689.	QUINTAS & QUINTAS - CONDUTORES ELÉCTRICOS, S.A.
690.	RAINBOW CONVERGE, LDA
691.	RAUSCHERT PORTUGUESA, S.A.
692.	RAYMONDCOR - CORTIÇAS, UNIPESSOAL, LDA
693.	RCP INTERNATIONAL, S.A.
694.	RECHAPAL - SOCIEDADE DE RECHAPAGEM E RECAUCHUTAGEM DE ALVAIÁZERE, S.A.
695.	RECKITT BENCKISER PORTO ALTO, LDA
696.	RED TOWER, LDA
697.	REFLECTIL - PRODUTOS PARA SEGURANÇA E CONFECÇÕES, LDA
698.	REGIGANT RECICLAGEM E ENERGIA, S.A. (ZONA FRANCA DA MADEIRA)
699.	RELVAS II - ROLHAS DE CHAMPANHE, S.A.
700.	REMBO - CONFECÇÕES, LDA
701.	RENAULT CACIA, S.A.
702.	RENAULT PORTUGAL, S.A.
703.	RENOLIT PORTUGAL, UNIPESSOAL, LDA
704.	REPSOL POLÍMEROS, S.A.
705.	RGVS IBÉRICA - SOCIEDADE IBÉRICA DE PRODUÇÃO DE ARTIGOS DE DESPORTO, UNIPESSOAL, LDA
706.	RIA BLADES, S.A.
707.	RIDGEVIEW PORTUGAL, LDA
708.	RIEKER PORTUGUESA - FÁBRICA DE CALÇADO, LDA
709.	RIOFATO - CONFECÇÕES, LDA
710.	RITMOS INSÓLITOS, LDA
711.	RMX - TÉCNICAS DE DESENVOLVIMENTO E EXECUÇÃO, LDA
712.	ROCA TORNEIRAS, S.A.
713.	ROCA, S.A.
714.	ROCIM - AGROINDÚSTRIA, LDA
715.	RODA PORTUGAL - MATERIAIS PARA ARBORICULTURA, LDA
716.	RODMAN LUSITÂNIA - CONSTRUÇÃO E REPARAÇÃO NAVAL, S.A.

717. ROERIG - PRODUTOS FARMACÊUTICOS, LDA
718. ROPRE, LDA
719. ROQUEVALE - SOCIEDADE AGRÍCOLA DA HERDADE DA MADEIRA, S.A.
720. ROSES AND GAMES - UNIPESSOAL, LDA
721. ROSMANINHAROMA, UNIPESSOAL, LDA
722. RUDOLF - PRODUTOS QUÍMICOS, S.A.
723. RUMO FINAL - PRODUTOS ALIMENTARES, LDA
724. S & A - SOCIEDADE INDUSTRIAL DE APERITIVOS, S.A.
725. S.F.P.C. - SOCIEDADE FRANCO PORTUGUESA DE CAPACETES, S.A.
726. S3 PORTUGAL - DESENVOLVIMENTO DE CIRCUITOS MICROELECTRÓNICOS E SOFTWARE INTEGRADO, S.A.
727. SÁ & SOBRINHO, S.A.
728. SACOPOR - SOCIEDADE DE EMBALAGENS E SACOS DE PAPEL, S.A.
729. SAERTEX PORTUGAL, UNIPESSOAL, LDA
730. SAFEBAG - INDÚSTRIA COMPONENTES DE SEGURANÇA AUTOMÓVEL, S.A.
731. SAFE-LIFE - INDÚSTRIA DE COMPONENTES DE SEGURANÇA AUTOMÓVEL, S.A.
732. SAICA PACK PORTUGAL, S.A.
733. SAINT - GOBAIN WEBER PORTUGAL, S.A.
734. SAINT-GOBAIN ABRASIVOS, LDA
735. SAINT-GOBAIN SEKURIT PORTUGAL - VIDRO AUTOMÓVEL, S.A.
736. SAKTHI PORTUGAL, S.A.
737. SALHER PORTUGAL - EQUIPAMENTOS PARA TRATAMENTO DE ÁGUAS, LDA
738. SAMMIC - EQUIPAMENTOS DE HOTELARIA, LDA
739. SAMVARDHANA MOTHERSON PEGUFORM AUTOMOTIVE TECHNOLOGY PORTUGAL, S.A.
740. SANITANA - FÁBRICA DE SANITÁRIOS DE ANADIA, S.A.
741. SANKYO OILLESS PORTUGAL - COMPONENTES PARA A INDUSTRIA DE MOLDES, LDA
742. SANTOS & SANTOS, S.A.
743. SAPA EXTRUSION AVINTES, S.A.
744. SAPEC - AGRO, S.A.
745. SAPEC - QUÍMICA, S.A.
746. SAS - AUTOSYSTEMTECHNIK DE PORTUGAL, UNIPESSOAL, LDA
747. SASAL - ASSENTOS PARA AUTOMÓVEIS, S.A.
748. SATEPOR - INDÚSTRIA DE TRAVESSAS DE BETÃO, S.A.
749. SCHAEFFLER PORTUGAL, UNIPESSOAL, LDA
750. SCHERDEL - MOLTEC - MOLAS TÉCNICAS, LDA
751. SCHNEIDER ELECTRIC PORTUGAL, LDA
752. SCHNELLECKE PORTUGAL, UNIPESSOAL, LDA
753. SCHRÉDER ILUMINAÇÃO, S.A.
754. SCHREIBER FOODS PORTUGAL, S.A.
755. SEARLE LABORATÓRIOS, LDA
756. SECIL PREBETÃO - PRÉFABRICADOS DE BETÃO, S.A.
757. SECOMOC PORTUGAL, CALDEIRARIA, LDA
758. SEDA IBÉRICA - EMBALAGENS, S.A.
759. SERVIER PORTUGAL - ESPECIALIDADES FARMACÊUTICAS, LDA
760. SETGEMFREE - JOALHARIA, LDA

761. SEW - EURODRIVE PORTUGAL, LDA
762. SF MOLDES, S.A.
763. SFA, LDA
764. SHAMIR OPTICAL, LDA
765. SHOTIC EUROPA - INDÚSTRIA DE ALUMÍNIO, LDA
766. SIDUL AÇUCARES, UNIPESSOAL, LDA
767. SIECO - TECNOLOGIAS PARA O MEIO AMBIENTE, LDA
768. SIEMENS, S.A.
769. SIKA PORTUGAL - PRODUTOS CONSTRUÇÃO E INDÚSTRIA, S.A.
770. SILICÁLIA PORTUGAL - INDÚSTRIA E COMÉRCIO DE AGLOMERADOS DE PEDRA, S.A.
771. SINERGIS FARMA - PRODUTOS FARMACÊUTICOS, LDA
772. SINTERSA PORTUGAL, LDA
773. SIOFAB - INDÚSTRIA DE REVESTIMENTOS TÊXTEIS, S.A.
774. SIOUX PORTUGUESA - FÁBRICA DE CALÇADO, UNIPESSOAL, LDA
775. SISARQ - COMÉRCIO DE SISTEMAS PARA ALUMÍNIO, LDA
776. SLEM - SOCIEDADE LUSO ESPANHOLA DE METAIS, LDA
777. SMURFIT KAPPA - PORTUGAL, S.A.
778. SN MAIA - SIDERURGIA NACIONAL, S.A.
779. SN SEIXAL - SIDERURGIA NACIONAL, S.A.
780. SN TRANSFORMADOS, S.A.
781. SNA EUROPE (INDUSTRIES), LDA
782. SNEF PORTUGAL ELECTRICIDADE, UNIPESSOAL, LDA
783. SNPS PORTUGAL, UNIPESSOAL, LDA
784. SOCIEDADE AGRÍCOLA CASA DE VILACETINHO, S.A.
785. SOCIEDADE AGRICOLA DA QUINTA DO VESÚVIO, LDA
786. SOCIEDADE AGRÍCOLA DA ROMANEIRA, S.A.
787. SOCIEDADE AGRÍCOLA DA SOSSEGA, LDA
788. SOCIEDADE AGRÍCOLA DO VALE DE UMBRIA, S.A.
789. SOCIEDADE AGRO PECUARIA DA QUINTA DE DAREI, LDA
790. SOCIEDADE ARTÍSTICA, MANUFACTURAS QUÍMICAS E METÁLICAS, LDA
791. SOCIEDADE DE CONSTRUÇÕES SOARES DA COSTA, S.A.
792. SOCIEDADE DE PRODUTOS FARMACÊUTICOS WANDER, LDA
793. SOCIEDADE EUROPEIA DE ARROZ - SEAR, S.A.
794. SOCIEDADE PORTUGUESA DO AR LÍQUIDO ARLÍQUIDO, LDA
795. SOCORI - SOCIEDADE DE CORTIÇAS DE RIOMEÃO, S.A.
796. SODISAL-Z6, S.A.
797. SOLIDAL - CONDUTORES ELÉCTRICOS, S.A.
798. SOLUBEMA - SOCIEDADE LUSO-BELGA DE MÁRMORES, S.A.
799. SOLVAY PORTUGAL - PRODUTOS QUÍMICOS, S.A.
800. SOMEWHERE BRIGHT, UNIPESSOAL, LDA
801. SOMUST, S.A.
802. SONY MUSIC ENTERTAINMENT PORTUGAL, SOCIEDADE UNIPESSOAL, LDA
803. SOPAC - SOCIEDADE PRODUTORA DE ADUBOS COMPOSTOS, S.A.
804. SOPHISTICATI PORTUGAL, UNIPESSOAL, LDA
805. SOUNDBIT - PROMOÇÃO COMUNICAÇÃO E IMAGEM, LDA
806. SOVEDAÇÕES II - CERCAS E REDES, UNIPESSOAL, LDA

807. SPARKS IBÉRICA, LDA
808. SPDAD - SOCIEDADE PORTUGUESA DE DISTRIBUIÇÃO DE ARTIGOS DE DESPORTO, UNIPESSOAL, LDA
809. SPECIALITY MINERALS (PORTUGAL) - ESPECIALIDADES MINERAIS, S.A.
810. SPIRALPACK - MANIPULADOS DE PAPEL, S.A.
811. SPIREL - SOCIEDADE PORTUGUESA E INDUSTRIAL DE RELOJOARIA, LDA
812. SPM SUCURSAL EM PORTUGAL
813. SRAMPORT - TRANSMISSÕES MECÂNICAS, LDA
814. STAAL MEER - CONTRACTOR AND SERVICES, LDA
815. STALLERGÈNES DHS ESPAÑA, S.A. (SUCURSAL EM PORTUGAL)
816. STEEL4U - SOLUÇÕES INDUSTRIAIS, LDA
817. STEMLAB, S.A.
818. STERICYCLE PORTUGAL, LDA
819. STOKVIS CELIX PORTUGAL, UNIPESSOAL, LDA
820. STONE PERFORMANCE, LDA
821. STRELLSON PORTUGUESA INDÚSTRIAS DE CONFECÇÃO, LDA
822. STRUCFLEX PORTUGAL - FABRICAÇÃO E COMÉRCIO DE ARTIGOS DE BORRACHA, UNIPESSOAL, LDA
823. SUN CHEMICAL PORTUGAL - TINTAS GRÁFICAS, UNIPESSOAL, LDA
824. SYMINGTON FAMILY ESTATES, VINHOS, S.A.
825. SYSAPORT, UNIPESSOAL, LDA
826. TABAQUEIRA - EMPRESA INDUSTRIAL DE TABACOS, S.A.
827. TCS EUROPE, LDA
828. TECHNOLOGY SOLUTIONS IT INT, LDA
829. TECLAVERTENTE, LDA
830. TECNICARTON PORTUGAL, UNIPESSOAL, LDA
831. TECNIFORJA - FORJAGEM E ESTAMPAGEM DE PEÇAS TÉCNICAS, LDA
832. TEKA PORTUGAL, S.A.
833. TELEVÊS - ELECTRÓNICA PORTUGUESA, LDA
834. TEMPUR SEALY PORTUGAL, UNIPESSOAL, LDA
835. TENNECO AUTOMOTIVE PORTUGAL - COMPONENTES PARA AUTOMÓVEL, UNIPESSOAL, LDA
836. TERTG, UNIPESSOAL, LDA
837. TESCO - COMPONENTES PARA AUTOMÓVEIS, LDA
838. TETRA PAK TUBEX PORTUGAL - PRODUÇÃO DE PALHINHAS PARA BEBIDAS, LDA
839. TEXLAAUTOMOTIVE - TEXTEIS, LDA
840. TEXNORTE II - INDÚSTRIAS TÊXTEIS, LDA
841. TEXSA PORTUGAL - MATERIAIS DE CONSTRUÇÃO, S.A.
842. TÊXTIL FLORES - GARCIA, S.L - SUCURSAL EM PORTUGAL
843. TÊXTIL GRAMAX INTERNACIONAL - SOCIEDADE DE TÊXTEIS E CONFECÇÕES, LDA
844. THE GROWING COMPANY, S.A.
845. THERMOEUROP PORTUGAL, LDA
846. THERMOPLAY PORTUGAL - UNIPESSOAL, LDA
847. THUNNUS THYNNUS - PESCAS, S.A.
848. TINTAS DYRUP, S.A.
849. TINTAS ROBBIALAC, S.A.
850. TOPSTUDIO BY SARONI, UNIPESSOAL, LDA

851. TORRECID PORTUGAL - VIDRADOS E CORANTES CERÂMICOS, LDA
852. TOVARTEX - INDÚSTRIA TÊXTIL, LDA
853. TPI ENTERPRISES LTD- SUCURSAL EM PORTUGAL
854. TPIH - API, PORTUGAL, S.A.
855. TRAFIURBE - SINALIZAÇÃO, CONSTRUÇÃO E ENGENHARIA, S.A.
856. TRANSAQUA - SOCIEDADE IBÉRICA DE TUBAGENS, S.A.
857. TRECAR - TECIDOS E REVESTIMENTOS, S.A.
858. TRÈVES ACOUSTIC PRODUCTS & SYSTEMS PORTUGAL, UNIPESSOAL, LDA
859. TREVIRA GMBH, SUCURSAL EM PORTUGAL
860. TRIDEC - SISTEMAS DIRECCIONAIS PARA SEMI-REBOQUES, LDA
861. TRIGO E AÇÚCAR, LDA
862. TRRVS COMPANY, SOCIEDADE UNIPESSOAL, LDA
863. TUNIPEX - EMPRESA DE PESCA DE TUNÍDEOS, S.A.
864. TUPPERWARE - INDÚSTRIA LUSITANA DE ARTIGOS DOMÉSTICOS, LDA
865. TYCO ELECTRONICS - COMPONENTES ELECTROMECÂNICOS, LDA
866. UCHIYAMA PORTUGAL - VEDANTES, UNIPESSOAL, LDA
867. UIGROUP PORTUGAL, UNIPESSOAL, LDA
868. UL ID SERVICE PORTUGAL, LDA
869. ULMA BETÃO POLÍMERO, LDA
870. UMBELINO MONTEIRO, S.A.
871. UMICORE PORTUGAL, S.A.
872. UNITED FOOD SERVICES PORTUGAL - COMÉRCIO ALIMENTAR, LDA
873. URALADA PORTUGAL, S.A.
874. V.F.I. TÊXTEIS PORTUGAL, UNIPESSOAL, LDA
875. VALFARMA - COMÉRCIO DE PRODUTOS FARMACÊUTICOS, LDA
876. VALMET, LDA
877. VALORES UNIVERSAIS, LDA
878. VALS - FABRICAÇÃO E COMERCIALIZAÇÃO DE TÊXTEIS, LDA
879. VALUE CERAMIC - COMPANHIA DE ARTES CERÂMICAS, S.A.
880. VALVER PORTUGAL, UNIPESSOAL, LDA
881. VANGUARD MARINE, LDA
882. VASCOM - CABOS E TERMOMETROS, LDA
883. VATEL - COMPANHIA DE PRODUTOS ALIMENTARES, S.A.
884. VCI - A FÁBRICA DAS CUTELARIAS, LDA
885. VEGA INDUSTRIES - COMPONENTES PARA CALÇADO, S.A.
886. VELAN - VÁLVULAS INDUSTRIAIS, LDA
887. VENTIPOWER, S.A.
888. VERALLIA PORTUGAL, S.A.
889. VERIS FARMACÊUTICA, LDA
890. VERSACE ESPAÑA, S.A.U. - SUCURSAL EM PORTUGAL
891. VGT PORTUGAL, SOCIEDADE UNIPESSOAL, LDA
892. VICTOR GUEDES - INDÚSTRIA E COMÉRCIO, S.A.
893. VILA VITA (PORTUGAL) - ACTIVIDADES TURÍSTICAS E HOTELEIRAS, LDA
894. VILARLOMBO - SOCIEDADE IMOBILIÁRIA, S.A.
895. VINHOS DE DAREI, LDA
896. VIRBAC DE PORTUGAL - LABORATÓRIOS, LDA

897. VISHAY - ELECTRÓNICA, PORTUGAL, LDA
898. VISTEON PORTUGUESA, LTD
899. VITALION - PRODUTOS FARMACÊUTICOS, SOCIEDADE UNIPESSOAL, LDA
900. VITAS PORTUGAL, UNIPESSOAL, LDA
901. VITROHM PORTUGUESA, UNIPESSOAL, LDA
902. VODAFONE ENTERPRISE SPAIN, S.L - SUCURSAL EM PORTUGAL
903. VOLITION - ARTIGOS PARA SPA, UNIPESSOAL, LDA
904. VPLOG - TRABALHO ESPECIALIZADO, LDA
905. W. & J.GRAHAM & COMPANHIA, S.A.
906. WARRE & CA., S.A.
907. WARRIORSNOW - UNIPESSOAL, LDA (ZONA FRANCA DA MADEIRA)
908. WARTSILA PORTUGAL, S.A.
909. WATERLEAU PORTUGAL, LDA
910. WATTGUARD PORTUGAL, S.A.
911. WEBASTO PORTUGAL - SISTEMAS PARA AUTOMÓVEIS, LDA
912. WEC PRODUCTION PORTUGAL, S.A.
913. WEGEURO - INDÚSTRIA ELÉCTRICA, S.A.
914. WIELAND THERMAL SOLUTIONS, LDA
915. WINSOLE - COMPONENTES PARA CALÇADO, LDA
916. WMC - WORLD MAINTENANCE OF CYLINDERS, LDA
917. WORKLÁXIA UNIPESSOAL, LDA
918. WORTHINGTON CYLINDERS - EMBALAGENS INDUSTRIAIS DE GÁS, S.A.
919. WUHAN INDUSTRIES, LDA
920. XANDRA CLAUDIM, CONFECÇÕES, LDA
921. YKK PORTUGAL - ACESSÓRIOS PARA VESTUÁRIO, LDA
922. YUDO EU, S.A.
923. ZIMMERMANN PORTUGAL, LDA
924. ZOLLERN & COMANDITA
925. ZWM - COMÉRCIO E INDÚSTRIA DE METAIS NÃO FERROSOS, LDA
926. VOLKSWAGEN AUTOEUROPA, LDA
927. +WATT PORTUGAL, LDA
928. 1100F PORTUGAL ELECTRÓNICA, UNIPESSOAL, LDA

Appendix II – List of foreign subsidiaries in the manufacturing industry with projects financed by Portugal 2020 until 28.02.2017

Company Name	Number of Projects Approved	Total Eligible Expenses Attributed to the Operation (million €)	Total Fund Approved (million €)
'ACCO BRANDS PORTUGUESA'	1	1,66	1,08
'AIS AUTOMOTIVE INTERIOR SYSTEMS PORTUGAL'	1	4,84	2,18
'ALIMENTAÇÃO ANIMAL NANTA'	1	0,02	0,01
'AM - ALFREDO MARQUES'	5	3,59	2,09
'ASPÖCK PORTUGAL'	1	6,84	2,39
'BALDACCI - PORTUGAL'	1	0,56	0,22
'BLOCOTELHA - STEEL CONSTRUCTIONS'	1	3,87	1,74
'BOSCH CAR MULTIMEDIA PORTUGAL'	2	49,83	28,92
'BOSCH SECURITY SYSTEMS - SISTEMAS DE SEGURANÇA'	2	6,81	3,07
'CABOPOL - POLYMER COMPOUNDS'	1	2,57	1,45
'CAST IBERIA'	1	2,03	1,42
'CATRAPORT'	1	6,21	2,79
'CEMOPOL-CELULOSES MOLDADAS PORTUGUESAS'	1	0,02	0,02
'COMPANHIA INDUSTRIAL DE RESINAS SINTETICAS, CIRES'	1	0,76	0,45
'CORK SUPPLY PORTUGAL'	1	2,38	1,07
'EFACEC ELECTRIC MOBILITY'	2	3,74	1,95
'EFACEC ENGENHARIA E SISTEMAS'	2	3,22	2,05
'EUROCAST PORTUGAL VIANA'	1	22,99	10,34
'FERTIGAL'	1	5,64	3,38
'FONT SALEM PORTUGAL'	1	4,11	1,85
'GESTAMP CERVEIRA'	1	7,18	3,95
'GOPACA - FÁBRICA DE PAPEL E CARTÃO'	1	0,02	0,02
'GRANDE ENSEADA - VINEYARDS AND WINE INVESTMENTS'	1	0,45	0,20
'GRES PANARIA PORTUGAL'	1	8,55	2,99
'HELIFLEX TUBOS E MANGUEIRAS'	3	1,43	0,75
'HERDADE DOS COELHEIROS'	1	0,27	0,12
'HYDRACOOLING'	4	1,43	0,71
'I LOVE TEXTILE ONLINE BOUTIQUE SHOP'	1	0,63	0,29
'IMPERIAL - PRODUTOS ALIMENTARES'	3	5,29	2,92
'KEMET ELECTRONICS PORTUGAL'	1	4,78	2,63
'KLAVENESS FOOTWEAR'	1	0,02	0,01
'MARTIN CALDEIRAS'	1	3,56	1,60
'MOLCER - MOLDES E EQUIPAMENTOS CERÂMICOS, SOCIEDADE	1	0,12	0,05
'NIMCO PORTUGAL'	2	0,27	0,12
'NOMAD TECH'	1	0,77	0,43
'NUTRE - INDUSTRIAS ALIMENTARES'	4	2,09	1,11
'P&I - DISPLAYS & PACKAGING'	1	0,02	0,02
'PANPOR - PRODUTOS ALIMENTARES'	2	8,77	3,95
'PAPELEIRA COREBOARD'	1	12,60	4,41
'PENTAPLAST'	1	7,15	3,93
'PREH PORTUGAL'	1	15,89	5,56
'RENAULT CACIA'	1	0,82	0,55
'SAINT - GOBAIN WEBER PORTUGAL'	3	0,75	0,41
'SAPA EXTRUSION AVINTES'	1	2,15	1,18
'SAPEC - AGRO'	1	1,16	0,47
'SETGEMFREE - JOALHARIA'	4	0,51	0,31
'SEW - EURODRIVE PORTUGAL'	1	1,53	0,84
'SHAMIR OPTICAL'	4	6,04	2,72
'SOCIEDADE ARTÍSTICA, MANUFACTURAS QUÍMICAS E METÁLI(	2	2,01	1,21
'SPIRALPACK - MANIPULADOS DE PAPEL'	1	2,15	0,75
'STEMLAB'	4	1,58	0,99
'TCS EUROPE'	1	15,34	9,21
'VALMET'	3	1,77	0,74
'WIELAND THERMAL SOLUTIONS'	2	4,51	1,59
Total	89	253,2670526	125,2178294

Appendix III – List of foreign subsidiaries with projects financed by QREN-COMPETE between 2008 and 2014.

Company Name	Number of Projects Approved	Total Eligible Expenses Attributed to the Operation (million €)	Total Fund Approved (million €)
'ACCO BRANDS PORTUGUESA'	1	0,43	0,21
'AIS AUTOMOTIVE INTERIOR SYSTEMS PORTUGAL'	1	3,16	1,46
'AMCOR FLEXIBLES PORTUGAL'	1	4,76	1,66
'ANSELL PORTUGAL - INDUSTRIAL GLOVES, SOCIEDADE UNIPESSOAL'	5	0,88	0,37
'ASPÖCK PORTUGAL'	2	4,85	2,18
'BA VIDRO'	1	27,08	6,77
'BLOCOTELHA - STEEL CONSTRUCTIONS'	2	3,93	1,54
'BORGWARNER EMISSIONS SYSTEMS PORTUGAL, UNIPESSOAL'	2	15,54	7,02
'BOSCH CAR MULTIMEDIA PORTUGAL'	2	44,32	16,52
'BOSCH SECURITY SYSTEMS - SISTEMAS DE SEGURANÇA'	2	11,51	4,38
'BOSCH TERMOTECNOLOGIA'	3	4,86	1,69
'BOURBON AUTOMOTIVE PLASTICS MARINHA GRANDE'	1	1,06	0,58
'BRADCO - FABRICAÇÃO E COMERCIALIZAÇÃO DE MARROQUINARIA'	1	0,01	0,01
'BROSE - SISTEMAS DE FECHADURAS PARA AUTOMOVEIS, UNIPESSOAL	1	4,14	1,45
'BRUNSWICK MARINE - EMEA OPERATIONS'	2	1,45	0,65
'CACHAPUZ - EQUIPAMENTOS PARA PESAGEM'	1	0,44	0,12
'CANCE - CONSTRUÇÕES METÁLICAS'	1	1,19	0,42
'CERÂMICA DO VALE DA GÂNDARA'	1	0,01	0,00
'CIN - CORPORAÇÃO INDUSTRIAL DO NORTE'	2	0,68	0,47
'CLEVER REINFORCEMENT IBERICA - MATERIAIS DE CONSTRUÇÃO'	1	0,31	0,20
'COFICAB PORTUGAL - COMPANHIA DE FIOS E CABOS'	2	12,56	6,16
'CONTINENTAL MABOR - INDUSTRIA DE PNEUS'	2	108,39	27,27
'CORK SUPPLY PORTUGAL'	10	4,31	2,33
'COSMOPAK - INDUSTRIA DE COSMETICOS E EMBALAGENS'	1	1,35	0,61
'DALPER - CUTELARIA E PRODUTOS DE MESA'	1	0,18	0,09
'DF - ELASTOMER SOLUTIONS'	1	0,60	0,39
'EDA - ESTOFAGEM DE ASSENTOS, UNIPESSOAL'	2	1,59	0,62
'EFACEC ENERGIA - MÁQUINAS E EQUIPAMENTOS ELECTRICOS'	9	5,14	2,54
'EUGSTER & FRISMAG - ELECTRODOMESTICOS'	1	3,57	1,60
'EUROPA&C KRAFT VIANA'	1	0,19	0,08
'EUROPASTRY PORTUGAL'	1	1,20	0,54
'EVERTIS IBERICA'	3	20,26	11,06
'FAURECIA - ASSENTOS DE AUTOMOVEL'	3	12,50	5,63
'FAURECIA - SISTEMAS DE ESCAPE PORTUGAL'	3	14,62	7,30
'FUNFRAP - FUNDIÇÃO PORTUGUESA'	2	5,05	2,28
'GABOR PORTUGAL - INDUSTRIA DE CALÇADO'	2	1,79	0,80
'GALLOVIDRO'	2	27,13	4,85
'GEBO PACKAGING SOLUTIONS PORTUGAL'	6	0,73	0,42
'GESTAMP CERVEIRA'	2	7,76	3,49
'HELIFLEX TUBOS E MANGUEIRAS'	5	1,92	0,95
'HUF PORTUGUESA - FÁBRICA DE COMPONENTES PARA O AUTOMOVEL'	2	8,43	4,59
'HYDRACOOLING'	1	0,82	0,45
'IKEA INDUSTRY PORTUGAL'	1	101,34	29,00
'ITALSUGHERO PORTUGAL, UNIPESSOAL'	1	1,26	0,69
'ITRON - SISTEMAS DE MEDIÇÃO'	1	0,43	0,13
'JOÃO DE DEUS & FILHOS'	3	2,97	1,50
'KATHREIN AUTOMOTIVE PORTUGAL, SOCIEDADE UNIPESSOAL'	1	2,99	1,35
'KEMET ELECTRONICS PORTUGAL'	7	1,42	0,52
'LABESFAL - LABORATORIOS ALMIRO'	2	10,38	4,68
'LANKHORST EURONETE PORTUGAL'	5	9,98	5,04
'LEICA - APARELHOS OPTICOS DE PRECISÃO'	1	11,41	5,07
'MAHLE - COMPONENTES DE MOTORES'	2	13,39	5,30
'MICROCROSSWISS, UNIPESSOAL'	1	3,43	1,88
'MPV - MECÂNICA DE PRECISÃO DO VEZ, UNIPESSOAL'	1	0,97	0,53
'NIMCO PORTUGAL'	3	0,63	0,26
'NOBRE ALIMENTAÇÃO'	1	10,39	4,69
'NUTRE - INDUSTRIAS ALIMENTARES'	2	12,32	6,57
'OLBO & MEHLER TEX PORTUGAL'	3	7,55	3,02
'PASCOAL & FILHOS'	1	0,39	0,27
'PENTAPLAST'	1	10,34	4,64
'PIEDADE'	1	0,19	0,08
'PLASFIL - PLÁSTICOS DA FIGUEIRA'	6	3,68	1,67
'PREH PORTUGAL'	4	30,66	13,48
'QUINTA DO NOVAL - VINHOS'	1	0,32	0,15
'ROCIM - AGROINDUSTRIA'	1	0,11	0,05
'S & A - SOCIEDADE INDUSTRIAL DE APERITIVOS'	1	0,12	0,05
'SAFE-LIFE - INDUSTRIA DE COMPONENTES DE SEGURANÇA AUTOMOVEL'	1	1,05	0,53
'SAKTHI PORTUGAL'	2	9,63	3,53
'SANTOS & SANTOS'	1	3,19	1,75
'SCHMITT-ELEVADORES'	1	0,95	0,43
'SIEMENS'	1	0,59	0,26
'TEKA PORTUGAL'	2	5,04	1,93
'TESCO - COMPONENTES PARA AUTOMOVEIS'	1	2,53	1,39
'TEXSA PORTUGAL - MATERIAIS DE CONSTRUÇÃO'	1	11,68	5,26
'UMBELINO MONTEIRO'	3	1,81	0,69
'VERALLIA PORTUGAL'	5	18,24	7,98
'WEGEURO - INDUSTRIA ELECTRICA'	3	8,59	3,26
'ZOLLERN & COMANDITA'	6	5,42	3,22
Total	173	676,091214	252,576326

Appendix IV – Interview Guideline for Bosch Car Multimedia

A informação a recolher através de entrevista visa a realização de um estudo de caso que permita responder às seguintes questões de investigação:

- Como é que subsidiárias de empresas multinacionais localizadas em Portugal criam e difundem conhecimento (na sua rede interna e externa)?
- Que fatores influenciam o processo de criação e difusão de conhecimento?
- Quais os resultados deste processo de criação e difusão de conhecimento para a economia Portuguesa?

A 1ª entrevista tem três grandes objetivos:

i) recolher informação que permita completar a caraterização da subsidiária portuguesa (Bosch Car Multimédia) de uma multinacional alemã (Bosch), que no momento se baseia unicamente em informação secundária;

ii) recolher informação sobre o stock de conhecimento (definição mais à frente) e a capacidade de absorção de conhecimento (definição mais à frente) da Bosch Car Multimédia, bem como dos fatores locais que mais influenciam estas variáveis;

iii) identificar e caraterizar dois projetos de criação e/ou transferência de conhecimento em que participaram a subsidiária portuguesa e pelo menos outra organização localizada em Portugal para posterior estudo mais aprofundado (2ª entrevista).

Parte I – Caraterização da subsidiária portuguesa da Bosch Car Multimédia

1. Quando foram criadas as restantes subsidiárias (além da Portuguesa)? Qual foi o(s) principais motivo(s) que explicam a sua constituição?
2. Quais são as actividades da cadeia de valor realizadas na sede? E nas restantes subsidiárias, incluindo a portuguesa?

Quadro 1 – Actividades da cadeira de valor ao nível do grupo (**escala de sim e não).** Há alguma actividade que de maior relevância realizada em cada local? Se sim**, indicar qual.**

		Sede	**Subsidiária PT**	**Restantes subsidiárias**
Actividades Primárias	Logística a Montante			
	Operações			
	Logística a Jusante			
	Marketing e Vendas			
	Serviço Pós-Venda			
Actividades de Suporte	Infra-estrutura da empresa			
	Gestão de Recursos Humanos			
	Desenvolvimento Tecnológico			
	Aprovisionamento			

3. Quais são as decisões estratégicas / operacionais que são tomadas pela sede?

Quadro 2 – Decisões estratégicas tomadas pela Sede **(escala de sim e não)**.

Decisões Estratégicas	**Sede**
Compras e vendas de empresas	
Novas parcerias	
Novos produtos	
Novos serviços	
Outros (identificar)	

4. Qual é a autonomia da subsidiária em Portugal? Que tipo de relação tem com a sede? Que decisões toma sem consultar a sede?
5. Quais os principais indicadores utilizados pela sede para reportar a evolução do grupo ao longo do tempo e para avaliar o desempenho do grupo e das várias subsidiárias num determinado ano? Quais desses indicadores podem ser divulgados? (**escala de sim, não)**

Quadro 3 – Indicadores utilizados pela sede para reportar a evolução do grupo

	Indicador usado pela Sede	**Resultados em 2015**
funcionários contratados (nº)		
produção elevadores (nº)		
patentes registadas (nº)		
Outros (identificar)		

6. Cada subsidiaria tem unidades de I&D? (**escala de sim, não)** Com que dimensão?

Quadro 4 – Desenvolvimento Tecnológico realizado na MNC Bosch e nas suas filiais

Desenvolvimento Tecnológico (I&D)	**Sede**	**Subsidiária PT**	**Restantes subsidiárias**
Nº Pessoas			
% Volume Negócios gasto anualmente em I&D			

7. Quais os principais fluxos (recursos financeiros, recursos humanos, produtos, serviços, informação, conhecimento) entre a sede e as subsidiárias e entre as subsidiárias? Qual a direção destes fluxos (de quem para quem)?

Quadro 5 – Ao nível do grupo (sem distinguir a subsidiária portuguesa das restantes) (**escala de sim e não**)

	Da sede para as subsidiárias	**Das subsidiárias para a sede**	**Entre subsidiárias**
Rec. Financeiros			
Rec. Humanos			
Outros recursos			
Componentes			
Produtos			
Serviços			

Quadro 6 – o caso específico da subsidiária portuguesa (**escala de sim e não**)

	Da sede para a subsidiária em Portugal	**Da subsidiária em Portugal para a sede**	**De outras subsidiárias para a subsidiária em Portugal**	**Da subsidiária em Portugal para as outras subsidiárias**
Rec. Financeiros				
Rec. Humanos				
Outros recursos				
Componentes				
Produtos				
Serviços				

Passamos, agora, a focar as perguntas mais em detalhe na Bosch Car Multimédia, Portugal.

Bosch Car Multimédia Lda

8. Qual é a data de criação da subsidiária Portuguesa? Que conhecimento foi obtido/tinham quando entraram no mercado Português? Adquiriram alguma empresa? **(técnico vs mercado (clientes)?**

9. Na história da subsidiária portuguesa, quantas fases podem ser distinguidas? Quais são os acontecimentos considerados mais marcantes?

Quadro 7 – o caso específico da subsidiária portuguesa

Key Moment	**Data**	**Descrição**
1		
2		
3		
4		
5		
6		

10. Delegações em Portugal

    a. Quando foram criadas?

    b. Com que objectivo?

    c. Que actividades realizam?

    d. Qual é o investimento/dimensão (nº de pessoas) de cada unidade?

Quadro 8 – o caso específico da subsidiária portuguesa (100% controladas por capital alemão)

Delegações PT	**Data Criação**	**Objectivo**	**Actividades**	**Investimento (nº (pessoas, orçamento)**
Braga – Car Multimedia				
Ovar – Security Systems				
Aveiro – Termotecnologia				
Carnaxide – Electrodomesticos				

Lisboa – Bosch Portugal SGPS				
Lisboa – Bosch S.A.				

11. Unidades de I&D em Portugal

    a. Quando foram criadas? Porquê três distintas / Qual é o objectivo de cada uma?

    b. Que tipo de atividades se realizam em cada uma?

    c. Qual é a sua dimensão actual (nº de pessoas/orçamento em cada uma)?

    d. Que tipo de I&D (fundamental, aplicado) é feito em Portugal?

    e. Quais as despesas anuais de I&D?

Quadro 9 – Sumário das actividades de I&D conduzidas em cada unidade em Portugal

Delegações I&D (local)	**Data Criação**	**Objectivo**	**Actividades**	**Dimensão (nº pessoas, orçamento (€)**	**Despesas anuais I&D**
Braga					
Ovar					
Aveiro					

12. Quais são os segmentos de negócio da Bosch Car Multimédia? Pela análise da Bosch Car Multimédia disponível no SABI distinguem-se 2 segmentos: Produtos e Serviços (4 áreas de negócio na MNC, 3 em PT: soluções de mobilidade, bens de consumo, tecnologia de energia e edifícios, tecnologia industrial).

    a. Qual a importância de cada segmento no total de vendas da empresa? Qual é a quota de mercado (em Portugal de cada segmento?)

    b. Quais são os resultados financeiros por segmento de negócio?

Quadro 10 – Identificação dos segmentos de negócio da Bosch Car Multimédia

Segmentos	**Peso nas vendas da Bosch Car Multimédia (%)**	**Quota mercado PT (%)**	**Resultados Financeiros (€)**	**Produção Produtos (nº)**
Produtos				
Serviços				

Uma empresa pode ter interações com outras empresas (fornecedores, clientes, …) e outras organizações (universidades, centros de investigação, instituições públicas, …) presentes no seu ambiente local, envolvendo a troca de recursos tangíveis e intangíveis. A empresa ter capacidade para aceder a competências e recursos disponíveis no contexto local pode ser importante para o seu sucesso.

13. É possível identificar tipos de empresas e outras organizações com que a Bosch Car Multimédia tem interações no contexto local, o principal objetivo da interação, os recursos envolvidos, as atividades realizadas? Ilustrar se possível.

Quadro 11 – Identificação de parceiros no contexto local

Tipo de stakeholder	Número de Parceiros	Motivo/Objetivo	Recursos envolvidos	Atividades realizadas
Fornecedor				
Cliente				
Concorrente				
Universidade				
Outras instituições do SNCT				
Outros (especificar)				

14. Qual é a estratégia da subsidiária Portuguesa? Tem sido a mesma ao longo dos últimos anos?

Parte II – Stock de conhecimento e capacidade de absorção da subsidiária portuguesa

15. O **stock de conhecimento** de uma empresa engloba as competências/experiência/know-how/valor acrescentado da empresa. O stock de conhecimento é dependente da experiência acumulada pela subsidiária, bem como da diversidade de experiências.

    a. O conhecimento que utilizem e desenvolvem é protegido por patentes (Sim/Não)? Na afirmativa, quantas patentes usam no vosso processo produtivo? Quantas patentes foram registadas pela subsidiária? Em que período de tempo? **Exemplos.**

    b. No caso do conhecimento utilizado e desenvolvido não ser protegido por patentes, como é que o protegem? Como é que avaliam a sua evolução?

16. É corrente distinguir dois tipos de **conhecimento: explícito e tácito**. Explicito é algo que pode ser lido, escrito, interpretado e explicado. Tácito é um tipo de conhecimento que não é fácil de transmitir, é complexo, difícil de criar, transferir e aprender. Transferência de conhecimento tácito requer experiencia. Os métodos mais utilizados para transferência de conhecimento envolvem expatriação de recursos humanos, comunicação frequente, e sistemas de incentivo à partilha de conhecimento entre filiais.

    a. Que tipo de conhecimento foi recebido da sede? Quando? Quais foram os mecanismos utilizados para transferir o conhecimento? Funcionaram?

    b. Que tipo de conhecimento foi criado em Portugal? Quais foram os mecanismos utilizados para criar conhecimento em Portugal? Quais foram os mecanismos utilizados para transferir o conhecimento na rede interna (para a sede e/ou para outras subsidiárias)?

Quadro 13 – Criação e difusão de conhecimento entre a sede e a subsidiária

	Da sede para a subsidiária em Portugal	Formas de transferência/ difusão	Da subsidiária em Portugal para a sede	Formas de transferência/ difusão
Explícito (exemplos)				
Tácito				

(exemplos)				

17. O conceito de "**capacidade de absorção**" corresponde à competência de reconhecer o valor de informação nova, de a assimilar e de a aplicar.

    a. Como classifica a "capacidade de absorção" da subsidiária Portuguesa? Pode, por favor, descrever um caso concreto em que a Bosch Car Multimédia tenha usado nova informação, assimilado, e transformado em produtos/serviços? **Exemplos**

Muito baixa	Baixa	Moderada	Elevada	Muito Elevada

18. Existem **fatores locai**s que influenciam o tipo de atividades conduzidas pelas MNCs e que afetam o potencial do desenvolvimento de ligações entre empresas locais e empresas com capital estrangeiro (exemplos: políticas fiscais, económicas, mecanismos governamentais).

    a. Qual é a perceção que tem da localização em Portugal? Pode, por favor, identificar 2 ou 3 fatores da envolvente/contexto que mais influenciaram positivo e negativamente a atividade da Bosch Car Multimédia? **Exemplos**

Parte III – Identificação e caraterização sintética de 2 projetos de criação e/ou transferência de conhecimento

Nota: Os projetos a identificar devem satisfazer as seguintes condições:

- Estarem concluídos, tendo como resultado a criação de conhecimento (reconhecido como tal pela subsidiária);
- Terem envolvido organizações externas no processo de criação de conhecimento e preferencialmente serem consideradas "parceiras" (no sentido de cooperação) no projeto e não apenas fornecedores de serviços (lógica de transação);
- Existir memória na organização e disponibilidade para partilhar informação.

19. Que projetos de I&D já realizados na subsidiária portuguesa são considerados estratégicos pela gestão de topo da subsidiária e do grupo? Porquê? Houve alguma participação de organizações externas ao grupo nestes projetos?

    a. Na afirmativa, é possível identificar dois projetos para um estudo mais aprofundado? Que projetos? Quais as pessoas que na Bosch Car Multimédia Elevadores e no(s) parceiro(s), na sua opinião, devem ser entrevistadas para obter um conhecimento mais aprofundado sobre o processo de criação e difusão de conhecimento através dos projetos?

    b. Na negativa, será possível identificar projetos menos estratégicos mas em que tenha existido criação e difusão de conhecimento e em que tenha havido participação de organizações externas ao grupo? Quais as pessoas que, na sua opinião, devem ser entrevistadas para obter um conhecimento mais aprofundado sobre o processo de criação e difusão de conhecimento através dos projetos?

Caracterização inicial das relações entre a Bosch Car Multimédia e cada uma de duas organizações localizadas em Portugal com as quais criou e/ou difundiu conhecimento

Identificação do Projeto	Projeto nº 1	Projeto nº 2
Objetivo(s) do Projeto (inovação de produto, processo, organizacional,….)		
Organização local cuja relação com a Bosch Car Multimédia vai ser analisada em profundidade		
Pessoa de contacto na organização local (nome, email, contacto telefónico)		
Identificação de outros participantes no projeto, para além da subsidiária e da organização local		
Quem iniciou o projeto (subsidiária vs organização local vs outro parceiro)?		
Data de início do projeto		
Data de término do projeto		
Principais resultados do projeto		
Nº de pessoas envolvidas (subsidiária/organização local/outros parceiros)		
Despesa de I&D realizada (subsidiária/organização local/outros parceiros)		
Existência de financiamento público/comunitário da despesa de I&D? Na afirmativa em que % do total?		
Principal(s) contribuição(s) da organização local		
Principal(s) contribuição(s) dos outros parceiros		

NOTA: Na pesquisa inicial que fiz, identifiquei 2 projetos de I&D apoiado por um sistema de incentivo (COMPETE) e 2 pelo Horizonte2020 Feder:

Projecto nº 36265 – I&DT – 09.04.2014 – 24M€ financiamento - HMIEXCEL - I&D CRÍTICA EM TORNO DO CICLO DE DESENVOLVIMENTO E PRODUÇÃO DE SOLUÇÕES MULTIMÉDIA AVANÇADAS PARA AUTOMÓVEL – Multi concelhos
Projecto nº 2261 – SI – 07.01.2013 – 37M€ financiamento - NEXT GENERATION PRODUCTS 2014 – Braga
Projecto POCI-01-0247-FEDER-002797 - INNOVCAR .: Inovação para Veículos Inteligentes – 47M€
Projecto POCI-01-0247-FEDER-002814 - iFACTORY .: Novas Capacidades de Industrialização – 30M€

A informação a recolher nesta parte de entrevista visa a realização de um estudo de caso que permita responder às seguintes questões de investigação:

- Como é que subsidiárias de empresas multinacionais localizadas em Portugal criam e difundem conhecimento (na sua rede interna e externa)?
- Que fatores influenciam o processo de criação e difusão de conhecimento?
- Quais os resultados deste processo de criação e difusão de conhecimento para a economia Portuguesa?

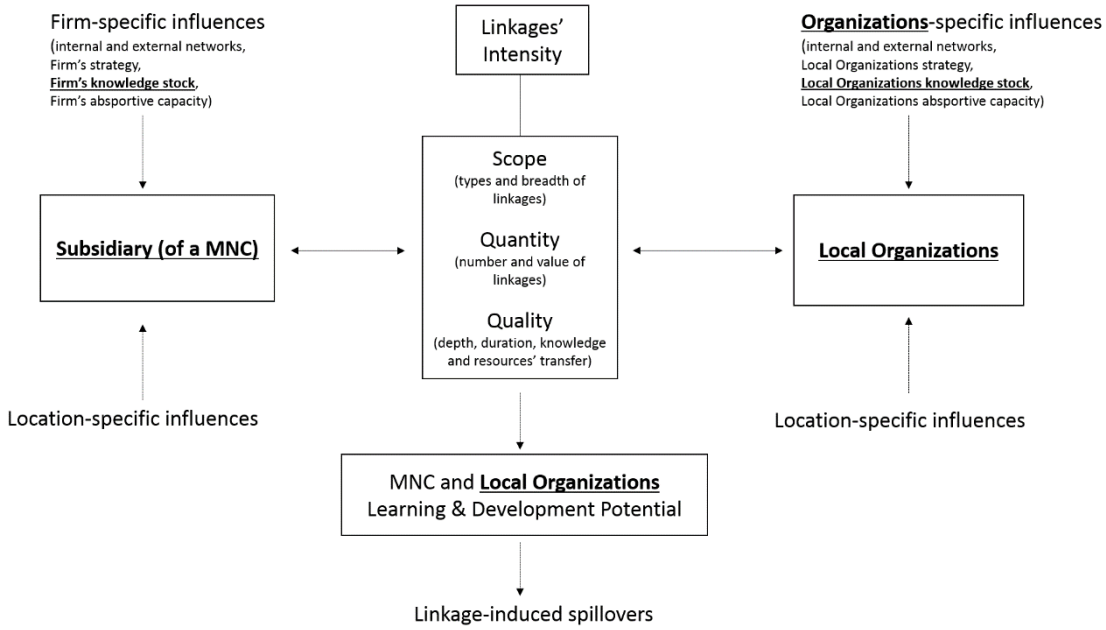
A 2ª parte entrevista tem 3 grandes objetivos:

i) Caraterização profunda de dois projetos de criação e/ou transferência de conhecimento em que participaram a subsidiária portuguesa e pelo menos outra organização localizada em Portugal;

ii) Identificação das diferentes dimensões das relações estabelecidas entre a Bosch Car e o parceiro (com base no modelo teórico previamente estudado – ver figura abaixo);

iii) Identificação de efeitos dos dois projetos na economia portuguesa.

Parte IV – Caracterização dos dois projectos de I&D identificados



Os processos de criação de conhecimento tipicamente ocorrem ao longo do tempo, partindo de necessidades identificadas, às quais se procura dar resposta.

1. No âmbito deste projecto, qual foi a necessidade identificada? Quem a identificou?
2. Após a identificação desta necessidade, o colaborador/equipa participou no desenvolvimento do projeto? Qual foi o papel que desempenhou? Contribui na identificação de potenciais parceiros? Como? Contribui no desenho do plano de projecto?

Analisando em detalhe o projecto #1 _____, os principais resultados foram _____. Estes resultados foram obtidos com base na interacção de equipas e colaboradores dos dois parceiros (Bosch Car Elevadores e parceiro _____).

3. Analisando em detalhe o projecto #1, que resultados não económicos (exemplo: aprendizagem, oportunidades de melhoria internas) decorreram das interacções entre os 2 parceiros, quer a nível do colaborador ou equipa? Pode ilustrar?

4. A frequência de contacto entre os parceiros ocorria a nível do colaborador ou das equipas? Com que frequência? A frequência de contacto alterou-se ao longo do projecto? Pode clarificar?

Muito baixa (1x por mês)	**Baixa (15 em 15 dias)**	**Moderada (1 vez por semana)**	**Elevada (1 ou + vezes por semana)**	**Muito Elevada (diariamente)**

   a. Tinham reuniões com que frequência? As interações presenciais ocorriam nas instalações da Bosch Car? E, ou ocorriam no parceiro? Qual era o local mais frequente? Que meios de comunicação à distância foram utilizados? (exemplos: Skype, plataformas de gestão de projecto) Com que frequência?

5. Que mecanismos foram utilizados para avaliar a progressão do projecto? Ocorreram desvios ao projecto? Havia um roadmap para prevenir desvios? De que forma isso afectou os resultados finais e a parceria estabelecida?

6. O conhecimento criado pelos colaboradores ou equipas foi difundido dentro da Bosch Car em Portugal usando que tipo de mecanismos? (exemplos: workshops, formação interna, aquisição novas máquinas, outros) Usam estes mesmos mecanismos para transferir outro tipo de conhecimento para os trabalhadores da empresa? Quanto tempo demorou desde o fim do projecto até á sua implementação na empresa? Qual foi o benefício para a empresa deste conhecimento criado? Refletiu-se nos resultados? Pode ilustrar?

   a. No mesmo sentido, de que forma é que este conhecimento foi difundido com a sede e as restantes subsidiárias? (exemplos: expatriação de recursos humanos, comunicação frequente, e sistemas de incentivo à partilha de conhecimento entre filiais) Com que frequência esta transferência ocorreu?

7. Como avalia a extensão da aprendizagem que ocorreu entre os 2 parceiros, quer ao nível do colaborador ou equipa? Pode ilustrar?

Muito pequena	**Pequena**	**Moderada**	**Grande**	**Muito Grande**

8. Após o término deste projecto, a parceria ainda se mantém ativa (colaboração ativa)? Que competências reconhecem no parceiro? Foi apenas 1 relação pontual ou irá ser mantida ao longo do tempo? Porquê este parceiro e não outro? Que critérios/factores são relevantes na seleção dos parceiros a manter/dispensar em processos de criação de conhecimento localmente?

9. Como classifica a extensão de transferência de conhecimento tácito entre a Bosch Car e o parceiro? **Pode ilustrar?**

Muito pequena	**Pequena**	**Moderada**	**Grande**	**Muito Grande**

a. E entre o parceiro e a Bosch Car? **Pode ilustrar?**

Muito pequena	Pequena	Moderada	Grande	Muito Grande

10. Como transferem o conhecimento tácito criado? Fazem non-disclosure agreements entre os parceiros quando criam este tipo de conhecimento? Como partilham os potenciais dividendos obtidos com o conhecimento criado?

11. Como classifica a extensão de transferência de conhecimento tecnológico e de recursos tangíveis entre entre a Bosch Car e o parceiro? **Pode ilustrar?**

Muito pequena	Pequena	Moderada	Grande	Muito Grande

a. E entre o parceiro e a Bosch Car? **Pode ilustrar?**

Muito pequena	Pequena	Moderada	Grande	Muito Grande

12. Como protegem o conhecimento explícito não patenteado?

13. Quantas ligações/relações tem a sua empresa com outras organizações, visando a criação e/ou difusão de conhecimento, nos últimos 3-5 anos?

14. Qual o número de parceiros distintos no conjunto das relações da empresa identificadas na pergunta anterior?

15. Qual o valor (%) das compras realizadas localmente que decorrem das relações estabelecidas pela subsidiária portuguesa? Qual o valor (%) das vendas realizadas localmente na sequência de relações estabelecidas pela subsidiária portuguesa com parceiros locais no âmbito de projectos de criação ou difusão de conhecimento?

16. Qual o valor acrescentado derivado das relações que a empresa estabelece com os múltiplos parceiros em actividades que visam a criação e difusão de conhecimento? **Pode ilustrar?**

17. As ligações existentes com o parceiro ocorrem ao longo da cadeira de abastecimento, ou são colaborativas? Isto é, existem relações focadas em actividades da cadeira de valor (ex: logística, marketing) – colaborativas – ou as relações ocorrem ao longo da cadeira de abastecimento (ex: fornecedores ou clientes). **Pode ilustrar?**

18. Em que medida as atividades da cadeia de valor são desempenhadas pelo parceiro local ou pela empresa (internamente vs outsourcing)? **Pode ilustrar?**

19. As relações estabelecidas entre os dois abrangem diferentes sectores de actividade? Quais? **Pode ilustrar?**

20. Em que medida as actividades da cadeira de valor envolvidas na criação ou difusão de conhecimento são realizadas localmente (Portugal) ou internacionalmente? **Pode ilustrar?**

Últimas perguntas

Impacto das interações locais no desenvolvimento da economia local

As economias externas – ou externalidades são o resultado positivo ou negativo da interação entre dois ou mais parceiros sobre terceiros que não participam na relação. As economias externas beneficiam ou prejudicam o ambiente local. Exemplos de economias externas positivas: criação de emprego local, criação de infraestruturas, saúde. Negativas: poluição, ineficiência dos mercados, etc.

21. Da relação com o parceiro _____ no âmbito do projecto 1, como classifica o(s) impacto(s) na economia local desta parceria? Que efeitos teve esta relação na economia local? **Pode ilustrar?**

Muito baixa	Baixa	Moderada	Elevada	Muito Elevada

22. Da relação com o parceiro _____ no âmbito do projecto 2, como classifica o(s) impacto(s) na economia local desta parceria? Que efeitos teve esta relação na economia local? **Pode ilustrar?**

Muito baixa	Baixa	Moderada	Elevada	Muito Elevada

23. De que forma o ambiente local favoreceu/desfavoreceu a escolha e a interação com organizações locais? Pode ilustrar?

24. Na sua opinião, considera que este tipo de ligações entre organizações locais e empresas com capital estrangeiro podem ajudar no desenvolvimento local? Se sim, porquê? E, como? Pode dar um exemplo de um benefício concreto para a economia local que tenha resultado do projeto?

Appendix V – Interview Guideline for University of Minho

A informação a recolher através de entrevista visa a realização de um estudo de caso que permita responder às seguintes questões de investigação:

- Como é que subsidiárias de empresas multinacionais localizadas em Portugal criam e difundem conhecimento (na sua rede interna e externa)?
- Que fatores influenciam o processo de criação e difusão de conhecimento?
- Quais os resultados deste processo de criação e difusão de conhecimento para a economia Portuguesa?

A entrevista tem cinco grandes objetivos:

iv) recolher informação que permita a caraterização de um parceiro estratégico da Bosch Car Multimedia, Lda;

v) recolher informação sobre o stock de conhecimento (definição mais à frente) e a capacidade de absorção de conhecimento (definição mais à frente) da organização parceira bem como dos fatores locais que mais influenciam estas variáveis;

vi) Caraterização do projeto de criação e/ou transferência de conhecimento em que participaram a Bosch Car Multimedia e o parceiro;

vii) Recolha de informação sobre as relações estabelecidas entre a Bosch Car Multimedia e o parceiro (com base nas 3 dimensões propostas no modelo teórico adotado – ver figura abaixo);

viii) Identificação de efeitos do projeto na economia portuguesa.

Parte I – Caraterização do parceiro da Bosch Car Multimedia no âmbito do projecto HMIExcel

Uma organização pode ter interações com outras empresas (fornecedores, clientes, …) e outras organizações (universidades, centros de investigação, instituições públicas, …) presentes no seu ambiente local, envolvendo a troca de recursos tangíveis e intangíveis. A empresa ter capacidade para aceder a competências e recursos disponíveis no contexto local pode ser importante para o seu sucesso.

20. É possível identificar as principais empresas e outras organizações com que tem interações no contexto local, o principal objetivo da interação, os recursos envolvidos, as atividades realizadas? Ilustrar se possível.

Quadro 1 – Identificação de parceiros no contexto local

Tipo de stakeholder	Nome	Motivo/Objetivo	Recursos envolvidos	Atividades realizadas
Fornecedor				
Cliente				
Concorrente				
Universidade				
Outras instituições do SNCT				
Outros (especificar)				

21. Qual é a estratégia da empresa/organização? Tem sido a mesma ao longo dos últimos anos?

Parte II – Stock de conhecimento e capacidade de absorção da organização parceira

22. O **stock de conhecimento** de uma organização engloba as competências/experiência/know-how/valor acrescentado da organização. O stock de conhecimento é dependente da experiência acumulada pela organização, bem como da diversidade de experiências.

    a. O conhecimento que utilizem e desenvolvem é protegido por patentes (Sim/Não)? Na afirmativa, quantas patentes usam no vosso processo produtivo? Quantas patentes foram registadas pela organização? Em que período de tempo? **Exemplos.**

    b. No caso do conhecimento utilizado e desenvolvido não ser protegido por patentes, como é que o protegem? Como é que avaliam a sua evolução?

23. O conceito de "**capacidade de absorção**" corresponde à competência de reconhecer o valor de informação nova, de a assimilar e de a aplicar.

    a. Como classifica a "capacidade de absorção" desta organização? Pode, por favor, descrever um caso concreto em que tenha usado nova informação, assimilado, e transformado em produtos/serviços? **Exemplos**

Muito baixa	**Baixa**	**Moderada**	**Elevada**	**Muito Elevada**

24. Existem **fatores locai**s que influenciam o tipo de atividades conduzidas pelas empresas/universidades e que afetam o potencial do desenvolvimento de ligações entre empresas locais, entre universidades e institutos de investigação, e empresas com capital estrangeiro (exemplos: políticas fiscais, económicas, mecanismos governamentais).

    a. Qual é a perceção que tem da localização em Portugal? Pode, por favor, identificar 2 ou 3 fatores da envolvente/contexto que mais influenciaram positivo e negativamente a atividade desta organização? **Exemplos**

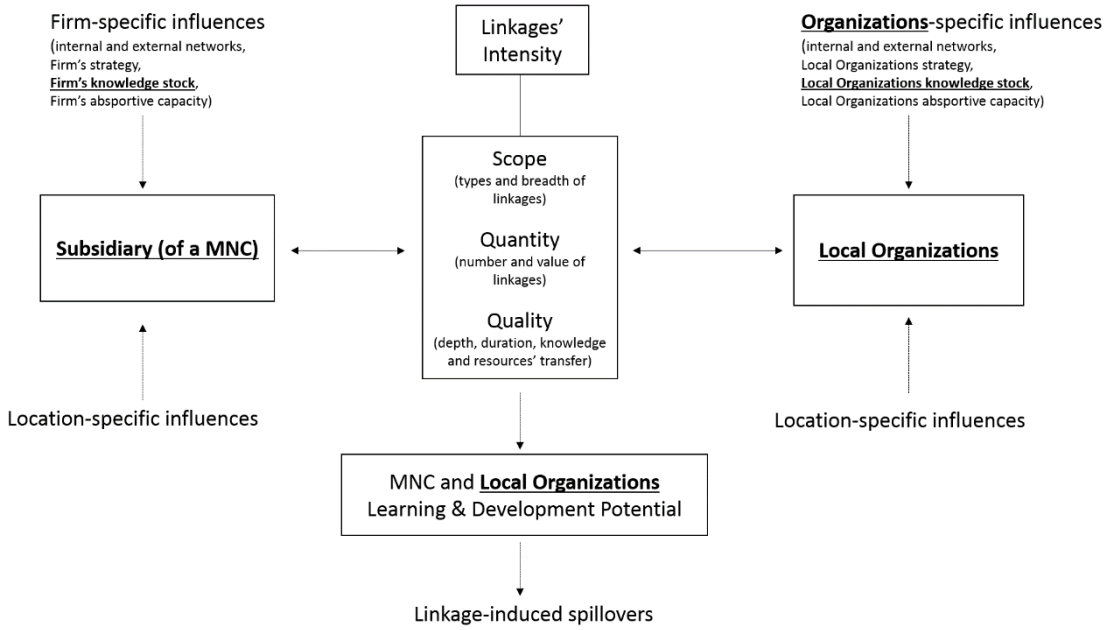
Parte III – Identificação e caraterização do projeto de criação e/ou transferência de conhecimento

Caracterização das relações do parceiro com a Bosch Car Multimedia no âmbito da criação e difusão de conhecimento

Identificação do Projeto	Projeto nº 1
Objetivo(s) do Projeto (inovação de produto, processo, organizacional,….)	
Pessoa(s) de contacto na Bosch Car Multimedia no que respeita ao projeto	
Identificação de outros participantes no projeto, para além da Bosch Car Multimedia	
Quem iniciou o projeto (subsidiária/organização local que está a ser entrevistada/outros parceiros)?	
Data de início do projeto	
Data de término do projeto	
Principais resultados do projeto	

Nº de pessoas envolvidas (subsidiária/organização local que está a ser entrevistada/outros parceiros)	
Despesa de I&D realizada (subsidiária/organização local que está a ser entrevistada/outros parceiros)	
Existência de financiamento público/comunitário da despesa de I&D? Na afirmativa em que % do total?	
Principal(s) contribuição(s) da organização local que está a ser entrevistada	
Principal(s) contribuição(s) dos outros parceiros	

Parte IV – Caracterização do projeto de I&D identificado



Os processos de criação de conhecimento tipicamente ocorrem ao longo do tempo, partindo de necessidades identificadas, às quais se procura dar resposta.

25. No âmbito deste projecto, qual foi a necessidade identificada? Quem a identificou?
26. Quais as principais funções desempenhadas pelo reitor nesta parceria? De que forma a troca de administração da Bosch afectou o projeto?
27. Após a identificação desta necessidade, o colaborador/equipa participou no desenvolvimento do projeto? Qual foi o papel que desempenhou? Contribui na identificação de potenciais parceiros? Como? Contribuir no desenho do plano de projecto?
28. Quais os critérios utilizados e os factores a ter em conta na identificação das pessoas ideias para cada projecto?

a. Houve trocas de responsáveis ao longo do tempo? Se sim porquê?

29. Para além da Bosch e da UM, este projecto teve mais parceiros. Como foram selecionados? Que factores forem tidos em conta?

30. O modelo de gestão desenhado, quer de programa, quer dos vários projectos, teve 1 papel fundamental na condução do projecto? Qual a sua importância?

    a. Como é possível que as previsões que foram feitas de objectivos tenham sido tão precisas?

31. Analisando em detalhe o projecto #1 HMIExcel, que resultados não económicos (exemplo: aprendizagem, oportunidades de melhoria internas) decorreram das interacções entre os 2 parceiros, quer a nível do colaborador ou equipa? Pode ilustrar?

32. A frequência de contacto entre os parceiros ocorreu a nível do colaborador ou das equipas? Com que frequência? A frequência de contacto alterou-se ao longo do projecto? Pode clarificar?

Muito baixa (1x por mês)	**Baixa (15 em 15 dias)**	**Moderada (1 vez por semana)**	**Elevada (1 ou + vezes por semana)**	**Muito Elevada (diariamente)**

    a. Tinham reuniões com que frequência? As interações presenciais ocorriam nas instalações da Bosch? E, ou ocorriam nas instalações desta organização? Qual era o local mais frequente? Que meios de comunicação à distância foram utilizados? (exemplos: Skype, plataformas de gestão de projecto) Com que frequência?

33. Que mecanismos foram utilizados para avaliar a progressão do projecto?

    a. Ocorreram desvios ao projecto?

    b. Havia um roadmap para prevenir desvios? De que forma isso afectou os resultados finais e a parceria estabelecida?

    c. Na revista oficial HMIExcel, vem reportados os seguintes mecanismos: distância física, existência de champions, experiencias passadas, existência laços pessoas e profissionais, modelo governação instalado. Estes mecanismos foram implementados de que forma?

34. O conhecimento criado pelos colaboradores ou equipas foi difundido dentro da Bosch Car/Universidade em Portugal usando que tipo de mecanismos? (exemplos: workshops, formação interna, aquisição novas máquinas, outros) Usam estes mesmos mecanismos para transferir outro tipo de conhecimento para os trabalhadores da empresa?

    a. Quanto tempo demorou desde o fim do projecto até á sua implementação na empresa?

    b. Quais foram os benefícios para a universidade deste conhecimento criado? Refletiu-se de que forma? Pode ilustrar?

    c. No mesmo sentido, de que forma é que este conhecimento foi difundido? (exemplos: expatriação de recursos humanos, comunicação frequente, e sistemas de incentivo à partilha de conhecimento entre filiais) Com que frequência esta transferência ocorreu?

35. Quais foram os grandes benefícios e os grandes riscos enfrentados pela Universidade nesta parceria?

36. Como avalia a extensão da aprendizagem que ocorreu entre os 2 parceiros, quer ao nível do colaborador ou equipa? Pode ilustrar?

Muito pequena	Pequena	Moderada	Grande	Muito Grande

37. Como classifica a extensão de transferência de conhecimento tácito da Bosch Car Multimedia para esta organização? **Pode ilustrar?**

Muito pequena	Pequena	Moderada	Grande	Muito Grande

a. E desta organização para a Bosch? **Pode ilustrar?**

Muito pequena	Pequena	Moderada	Grande	Muito Grande

38. Como transferem o conhecimento tácito criado? Fazem non-disclosure agreements entre os parceiros quando criam este tipo de conhecimento?

39. Como classifica a extensão de transferência de conhecimento tecnológico e de recursos tangíveis da Bosch Car Multimediapara esta organização? **Pode ilustrar?**

Muito pequena	Pequena	Moderada	Grande	Muito Grande

a. E desta organização para a Bosch? **Pode ilustrar?**

Muito pequena	Pequena	Moderada	Grande	Muito Grande

40. Como protegem o conhecimento explícito não patenteado?

41. Como partilham os potenciais dividendos obtidos com o conhecimento criado? Ao nível do colaborador? Da equipa? Da universidade? Da empresa apenas?

42. Quantas ligações/relações tem a sua organização com outras organizações, focando-se nas relações que visam a criação e/ou difusão de conhecimento, nos últimos 3-5 anos?

43. Qual o número de parceiros distintos no conjunto das relações da organização identificadas na pergunta anterior?

44. Qual o valor (%) das compras realizadas localmente que decorrem das relações estabelecidas pela organização? Qual o valor (%) das vendas realizadas localmente na sequência de relações estabelecidas pela organização com parceiros locais no âmbito de projectos de criação ou difusão de conhecimento?

45. Qual o valor acrescentado derivado das relações que a organização estabelece com os múltiplos parceiros em actividades que visam a criação e difusão de conhecimento? **Pode ilustrar?**

46. As ligações existentes com a Bosch Car Multimedia ocorrem ao longo da cadeira de abastecimento, ou são colaborativas? Isto é, existem relações focadas em actividades da cadeira de valor (ex: logística, marketing) – colaborativas – ou as relações ocorrem ao longo da cadeira de abastecimento (ex: fornecedores ou clientes). **Pode ilustrar?**

47. Em que medida as atividades da cadeia de valor são desempenhadas pela Bosch Car Multimedia ou pela organização (internamente vs outsourcing)? **Pode ilustrar?**

48. As relações estabelecidas entre esta organização e a Bosch Car Multimediaabrangem diferentes sectores de actividade? Quais? **Pode ilustrar?**

49. Em que medida as actividades da cadeira de valor envolvidas na criação ou difusão de conhecimento são realizadas localmente (Portugal) ou internacionalmente? **Pode ilustrar?** Após o término deste projecto, a parceria ainda se mantém ativa. Que competências reconhecem no parceiro? Foi apenas 1 relação pontual ou irá ser mantida ao longo do tempo? Porquê este parceiro e não outro? Que critérios/factores são relevantes na seleção dos parceiros a manter/dispensar em processos de criação de conhecimento localmente?

50. A forma de pensar e de actuar na Industria é diferente do da Academia. Nesse sentido, a gestão desta ligação e desta parceria ao longo do tempo é nitidamente uma tarefa extremamente complexa.

    a. Que mecanismos utilizaram para promover estas relações e a boa articulação dos projectos de forma a atingir os resultados?

51. Ao nível dos colaboradores contratados (35 pela Bosch, 95 bolseiros pela UM), que % deste número foi de seguida transferido para a Bosch? Com que condições financeiras? No mesmo sentido, houve elementos a passarem da Bosch para a UMinho?

Últimas perguntas

Impacto das interações locais no desenvolvimento da economia local

As economias externas – ou externalidades são o resultado positivo ou negativo da interação entre dois ou mais parceiros sobre terceiros que não participam na relação. As economias externas beneficiam ou prejudicam o ambiente local. Exemplos de economias externas positivas: criação de emprego local, criação de infraestruturas, saúde. Negativas: poluição, ineficiência dos mercados, etc.

52. Da relação com a Bosch Car Multimedia no âmbito do projecto Y, como classifica o(s) impacto(s) na economia local desta parceria? Que efeitos teve esta relação na economia local? **Pode ilustrar?**

Muito baixa	Baixa	Moderada	Elevada	Muito Elevada

53. De que forma o ambiente local favoreceu/desfavoreceu a escolha e a interação com a Bosch Car Multimedia? Pode ilustrar?

54. Na sua opinião, considera que este tipo de ligações entre organizações locais e subsidiárias estrangeiras pode contribuir para o desenvolvimento local? Se sim, porquê? E, como? Pode dar um exemplo de um benefício concreto para a economia local que tenha resultado deste projeto?

55. O que podemos esperar dos 2 novos projectos aprovados recentemente, que apontam para números ainda mais significativos? (56.8M€, 21 patentes, 62 artigos, 15 teses mestrado/doutoramento, 94 contratações pela Bosch e 165 bolseiros)

56. Esta relação da Bosch com a UMinho tem já efeitos na Economia Portuguesa. Exemplo disso é a parceria pública com a Universidade de Aveiro e a parceria que está a ser desenhada entre a Bosch Ovar e a Universidade do Porto. Ao mesmo tempo, surge também o programa Interface de capacitação de fornecedores.

    a. O modelo obtido no consorcio com a UMinho está a ser diretamente replicado nestas parcerias? Quais as diferenças?

Appendix VI – Interview Guideline and Questionnaire reply from Eng. Miguel Barbosa (ANI)

Guião de entrevista

A informação a recolher visa a realização de um estudo de caso sobre a Bosch Car Multimedia que permita responder às seguintes questões de investigação:

- Como é que subsidiárias de empresas multinacionais localizadas em Portugal criam e difundem conhecimento (na sua rede interna e externa)?
- Que fatores influenciam o processo de criação e difusão de conhecimento?
- Quais os resultados deste processo de criação e difusão de conhecimento para a economia Portuguesa?

A entrevista tem dois grandes objetivos:

ix) Recolha de informação sobre o projecto HMIExcel – relação entre a Bosch Braga e a Universidade do Minho;

x) Identificação de efeitos do projeto na economia portuguesa.

Entrevistas prévias realizadas a: Prof. Dr. José Oliveira (Bosch Braga) e Prof. Dr. Eduardo Pinto (Universidade do Minho).

1. A AICEP, a ANI, COMPETE e o Governo tiveram um papel chave na aprovação deste projecto disruptivo, complexo, com um orçamento elevado, que envolveu todas estas agências e quase 2 anos até á data da celebração do contrato final.
    a. Qual foi o papel de cada agência?

        A ANI, no âmbito do protocolo assinado com a AICEP, assegurou em sede de análise da candidatura, a elaboração do parecer técnico-científico sobre o Mérito do Projeto, apuramento das despesas elegíveis e a determinação das majorações a atribuir à taxa de incentivo. Em sede de acompanhamento e encerramento técnico-científico, a ANI interveio na análise dos relatórios técnico-científicos, na análise da razoabilidade dos investimentos apresentados, e na realização de visitas intercalares e de encerramento, com os peritos selecionados para o efeito.

    b. Que obstáculos foram encontrados e ultrapassados desde 2011 até 2013, que permitiram a aprovação do projeto em 2014?

        A candidatura em questão foi desenhada pelo consorcio (Bosch Car Multimédia e U. Minho) de acordo com as recomendações obtidas na reunião realizada em Lisboa, no dia 25 de janeiro de 2013, com a AICEP, Compete e a ANI. O consórcio acabou por submeteu a candidatura no dia 03 de maio de 2013, tendo sido aprovada em 9 de abril de 2014. Os trâmites processuais que ocorreram desde 2011 a 25 de janeiro de 2013 não é do nosso conhecimento.

        No âmbito da avaliação da proposta foram realizadas várias interlocuções com o consorcio, desde pedido de esclarecimentos, reunião com os peritos envolvidos, reformulação da proposta inicial, alteração do contrato de consórcio.

2. De que forma estas agências estiveram envolvidas ao longo do projecto?
    a. Nomearam equipas próprias? Faziam reuniões com que frequência (semanalmente/mensalmente/trimestre)? Como era feita a monitorização do projecto?

A ANI, juntamente com dois peritos selecionados para o acompanhamento técnico-científico, deslocou-se às instalações da Bosch Car Multimédia em 2014, para uma visita técnico-científica intercalar, e em novembro de 2015, para a auditoria final de encerramento.

No âmbito da execução técnica do projeto, o consórcio apresentou 5 relatórios técnico-científicos, sendo um final, os quais foram analisados pelos peritos e salvaguardado o cumprimento dos objetivos inicialmente previstos.

No âmbito da execução financeira, a ANI analisou vários pedidos de alteração de investimento, validou um conjunto elevado de editais de bolsa, e analisou a razoabilidade dos investimentos realizados face à execução técnica.

3. As economias externas – ou externalidades são o resultado positivo ou negativo da interação entre dois ou mais parceiros sobre terceiros que não participam na relação. As economias externas beneficiam ou prejudicam o ambiente local. Exemplos de economias externas positivas: criação de emprego local, criação de infraestruturas, saúde. Negativas: poluição, ineficiência dos mercados, etc.
    a. Como classifica o(s) impacto(s) na economia local desta parceria entre a Bosch Car Multimedia e a Universidade do Minho?

Muito elevada.

Expansão da empresa. A Bosch de Braga é a principal unidade produtiva, e um dos mais importantes centros de investigação e desenvolvimento da divisão Bosch Car Multimedia na

Europa, confirmando ser um dos maiores empregadores da região, com cerca de 2 mil colaboradores, que pretende nos próximos anos, criar mil novos empregos.

Duplicação da faturação da empresa.

Envolvimento da Bosch em várias iniciativas de promoção da inovação e do empreendedorismo promovidas pelos vários agentes da cidade de Braga, como a Câmara Municipal de Braga, InvestBraga, Fundação Bracara Augusta, entre outras.

Muito baixa	Baixa	Moderada	Elevada	Muito Elevada

    b. Que efeitos teve esta relação intima/parceria na economia Portuguesa**? Pode ilustrar?**

A Bosch Braga quer obter o reconhecimento dentro do Grupo Bosch, como Centro de Competência Internacional de HMI (Homem-Máquina Interface) até 2020. Para o efeito, tem implementado várias iniciativas, nomeadamente:

1. implementação do *Driving Simulator Mockup* constituindo o "HMIEXCEL ROOM" no campus de Azurém;
2. Envolvimento da BOSCH Alemanha (Corporate) na I&D das linhas do projeto HMIExcel;

3. Capacitação do consórcio para a gestão de programas e projetos em colaboração indústria-universidade.

No âmbito do HMIEXCEL, foram contratados de 35 novos postos de trabalho pela Bosch Braga, e pela U. Minho, 2 novos quadros e 95 bolseiros. Foram submetidas 12 patentes, e intenção de publicar 32 publicações científicas até 2018 (Publicações inclui artigos, livros, dissertações e teses).

c. Quais indicadores económicos foram utilizados para analisar o impacto desta parceria?

A empresa Bosch Car Multimedia iniciou as suas atividades na cidade de Braga com a produção de autorrádios para a marca Blaupunkt, e, ao longo dos anos, tornou-se num dos principais motores do desenvolvimento da região e num dos mais importantes exportadores nacionais. Atualmente, a empresa é a principal unidade produtiva e um dos principais centros de I&D da divisão Bosch Car Multimedia na Europa, a maior fábrica do grupo em Portugal – contribuindo com mais de 50 por cento do volume de vendas anual no país –, e é um dos maiores empregadores da região, com cerca de dois mil colaboradores.

d. Que imagem permite dar ao nosso País este tipo de parcerias entre a indústria e as universidades?

i. De que forma o Governo capitalizou este projecto?

Enquadrada na lista dos dez principais exportadores nacionais, a Bosch em Braga tem contribuído ativamente para a economia do país e para a construção da boa credibilidade da tecnologia desenvolvida e produzida em Braga e exportada a nível mundial.

Por outro lado, foram realizadas várias participações da U. Minho em vários eventos internacionais para promover a forte articulação entre o tecido económico (Bosch Braga) e os centros de conhecimento da zona (U.Minho, PIEP, CCG, entre outros), com o total apoio das estruturas de governo nacionais, regionais e locais, em beneficio da economia, do bem-estar da população e do progresso (científico, tecnológico e social) da sociedade no seu todo.

ii. Poderá este projecto ser usado para atrair outras empresas a re-localizarem-se para Portugal ou até mesmo iniciarem a sua actividade económica brevemente em Portugal?

Sim, este projeto insere-se numa estratégia mais vasta de política económica de atração de investimento estrangeiro qualificado. O projeto da BOSCH pode servir de "montra" para potenciais investidores internacionais, quer na área da indústria quer dos serviços.

iii. Quais politicas fiscais de incentivo á investigação e desenvolvimento podem ser atrativas para estas empresas?

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4. Na sua opinião, considera que este tipo de ligações entre organizações locais e subsidiárias estrangeiras pode contribuir para o desenvolvimento local? **Se sim, porquê? E, como? Pode dar um exemplo de um benefício concreto para a economia local que tenha resultado deste projeto?**

Inauguração do DONE Lab em 28 de novembro de 2016, na Escola de Engenharia da Universidade do Minho, em Guimarães. Com a inauguração do DONE Lab, laboratório colaborativo, os parceiros Bosch e UMinho, criaram um laboratório ímpar em Portugal, que conta com um leque de tecnologias inovadoras que permite a manufatura aditiva avançada de protótipos e ferramentas em impressão 3D de alta precisão.

Este laboratório conta um investimento de cerca de 3 milhões de euros e está dotado de equipamentos com tecnologia de ponta que possibilitam uma maior celeridade nos processos de inovação na fábrica da Bosch Car Multimedia, desde a ideia original até ao lançamento do produto no mercado.

5. O que podemos esperar dos 2 novos projectos aprovados recentemente (INNOVCAR, iFactory), que apontam para números ainda mais significativos? (Números: 56.8M€, 21 patentes, 62 artigos, 15 teses mestrado/doutoramento, 94 contratações pela Bosch e 165 bolseiros)
Que tenham o mesmo êxito que o HMIEXCEL.

Os dois projetos são uma oficialização da segunda fase do projeto HMIEXCEL. Tratam-se de projetos considerados de interesse estratégico nacional, onde se prevê a contratação de mais de 125 engenheiros e 233 bolseiros. Pese embora os dois projetos sejam nitidamente separáveis um do outro, com focos e objetivos claramente distintos e com probabilidades independentes de êxito tecnológico, os mesmos têm como objetivo o desenvolvimento de soluções que vão moldar o futuro da mobilidade, envolvendo o registo de 22 patentes até 2018.

O projeto INNOVCAR é focado nas inovações nos automóveis, tendo como objetivos a investigação e o desenvolvimento de: um novo sistema de comunicações para veículos e redes de transporte inteligentes; novos sistemas sensoriais e de deteção da envolvente; novos sistemas de interação homem-máquina (HMI) seguros; novas gerações de Head-Up Displays irão contribuir para avanços na direção da condução autónoma; novas experiências associadas à condução serão proporcionadas por linhas de produto de software e novas aplicações cloud que irão proporcionar novos serviços de entretenimento, conetividade, mobilidade e acessibilidade no contexto dos veículos e cidades inteligentes; novos sistemas de cancelamento de ruído, sensores sem ruído e chassis 100% em plástico irão permitir melhorar o ambiente no interior automóvel e a redução de consumos.

O projeto iFACTORY é focado na otimização do processo de produção fabril na linha da iniciativa de FoF (Fabrica do Futuro) do programa H2020. Os seus principais objetivos são: a investigação e desenvolvimento de novos materiais e dispositivos para controlo de qualidade, industrialização, fabrico e gestão da fábrica; a investigação e desenvolvimento de novas técnicas, sistemas e ferramentas de controlo de qualidade; a investigação de técnicas de prototipagem e de

fabrico; a investigação e desenvolvimento de tecnologias de comunicação e de sistemas de informação e de apoio à decisão para a gestão das operações da fábrica.

6. Esta relação da Bosch com a UMinho já está a ter alguns efeitos na Economia Portuguesa. Exemplo disso poderá ser a já parceria pública com a Universidade de Aveiro e a parceria não-pública que está a ser desenhada entre a Bosch Ovar e a Universidade do Porto. Ao mesmo tempo, surge também o programa Interface de capacitação de fornecedores.

b. O modelo obtido no consórcio com a UMinho está a ser diretamente replicado nestas parcerias? Quais as diferenças?

O projeto entre a Bosch Termotecnologia de Aveiro e a U. Aveiro iniciou há poucos meses pelo que ainda nada podemos concluir sobre a eficácia da parceria entre estas duas entidades.

c. Quais as vantagens que este modelo apresenta?

O projeto HMIEXCEL gerou 38 novas ideias de investigação e desenvolvimento, as quais serviram de *input* para a submissão da candidatura dos dois novos projetos (INNOVCAR e IFACTORY) pelo Portugal 2020.

Este projeto evidencia claramente uma forte ligação entre a empresa e as instituições do saber, através da aplicação na industria do conhecimento científico, promovendo a transferência de conhecimento, e alavancando a inovação empresarial.

d. Pode afirmar/desmentir se outras empresas (nacionais e internacionais) tentaram entrar em contacto com as agências referidas no sentido de "replicarem" o modelo de sucesso obtido?

Nada a referir.

Annex

Annex I – List of source of information used.

Document	Overview	Source
Annual report of University of Minho	Annual report of University of Minho for 2015 (134 pages)	Internet
Alexandra Pinheiro Master Thesis	As bases dos modelos de inovação – Estudo de Caso – Master in Industrial and Company Economy	Internet
Bosch Braga Key Information	Information regarding Bosch Braga since its establishment in Portugal (61 slides)	Bosch Braga
Bosch Braga Annual Report	Annual reports of Bosch Braga since 2008 (402 rows)	Internet (Sabi)
Bosch Braga – Kayzen lean	Kayzen awards to Bosch Braga (23 slides)	Internet
Bosch Car Multimedia Industry	Information regarding Bosch Car Multimedia Industry (14 slides)	Internet
Bosch Multinational Annual Report and Key information	Annual report of Bosch Multinational, available at the company website	Internet
Bosch Portugal	Information regarding the subsidiaries of Bosch in Portugal (multiple websites)	Internet
Case study Bosch Termotechnology	Extended case study regarding Bosch Termotecnologia (14 pages)	Internet
Clipping from HMIExcel	Social media news regarding the HMIExcel (more than 50 files)	University of Minho and Internet
Clipping from Bosch Braga and University of Minho partnership	Multiple websites with information regarding the partnership and the projects	Internet
EFQM Excellence Awards	Key Information regarding Bosch partnerships, people, processes (5 PDFs, 33 pages)	Internet

Global Competitiveness Report for 2016	Annual report of each country Competitiveness	Internet
HMIExcel Official Project Report	Information from HMIExcel (64 pages)	Bosch Braga
José Oliveira TEDx Talk – Braga	TEDx Talk of José Oliveira – Youtube (16 minutes)	Internet
List of Projects Approved by COMPETE and Portugal 2020	Excel reports regarding the companies with approved projects through COMPETE (2400 rows) and Portugal 2020 (14182 rows)	Internet
Ruben Carvalho Master Thesis	O papel dos gestores no desenvolvimento da subsidiária: o caso de uma subsidiaria alemã em Portugal – Master thesis in Management	Catholic University