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Maria Leonor Sanches Morais De Almeida

Identificação de determinantes alavancadores da Inovação no local de Trabalho

Identification of determinants leveraging Workplace Innovation

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Tese apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Doutor em Marketing e Estratégia, realizada sob a orientação científica do Professor Doutor António Carrizo Moreira, Professor Associado do Departamento de Economia, Gestão, Engenharia Industrial e Turismo da Universidade de Aveiro e coorientação do Professor Doutor Joaquim Borges Gouveia, Professor Catedrático, do Departamento de Economia, Gestão e Engenharia Industrial e Turismo da Universidade de Aveiro..

Dedico este trabalho ao meu marido Agostinho, à minha filha Joana, ao meu irmão Mário e aos meus falecidos pais.

I dedicate this work to my husband Agostinho, my daughter Joana, my brother Mário and my late parents.

O júri

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Trabalhei mais do que 25 anos em multinacionais, como responsável por centros de desenvolvimento e de serviços, onde uma das minhas responsabilidades era aquisição de trabalho para centenas de empregados localizados em Portugal, mas também noutras partes do mundo. Não consegui encontrar as respostas adequadas de como fazê-lo de uma forma otimizada apesar de ter várias parcerias na altura com entidades inovadoras no País, pelo que foi sempre um trabalho muito exigente e solitário. Os fatores essenciais na escolha dos centros a alocar trabalho tinham a ver com a competitividade dos centros e da sua capacidade de inovar. Este trabalho nasce da minha curiosidade de pesquisar como se pode ser mais inovador no local de trabalho, ou seja, de eu própria entender como posso fazer melhor e poder contribuir para a academia e para ajudar outras empresas com soluções.

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Palavras-chave Inovação no local de trabalho, Tópicos, Determinantes, *Framework*, Interdependências, Dinâmica Organizacional, Gestão de Recursos Humanos, Colaboração, Tecnologias de Informação, Outros Facilitadores, Estudos de Caso, Empresas.

Resumo

Propósito:

Há um *gap* no conhecimento que pretendemos investigar para descrever a Inovação no Local de Trabalho, nomeadamente na compreensão dos seus determinantes e das suas interdependências. Para abrangê-lo, os principais objetivos desta dissertação são: (a) fazer uma Revisão Sistemática da Literatura (RSL), que servirá de base para a análise dos principais determinantes e tópicos / temas abordados que alavancam a Inovação no Local de Trabalho; b) com base nesta RSL, propor um *framework* dos principais determinantes e das suas interdependências, que alavanquem a Inovação no Local de Trabalho e que servirá de base para a pesquisa empírica; c) com base na análise de vários estudos de caso enriquecidos pela observação de trabalho nas empresas estudadas, avaliar a pertinência e utilidade dos temas / determinantes propostos no *framework*; d) propor um *framework* enriquecido face ao anterior baseado na literatura sobre Inovação no Local de Trabalho; e e) propor uma nova definição de Inovação no Local de Trabalho.

Metodologia:

Este estudo exploratório, utiliza uma RSL, complementada por um estudo empírico qualitativo. O paradigma construtivista é usado.

O estudo empírico utiliza o método de estudo de caso e a seleção das empresas é baseada na técnica de *purposive sampling* para adequar a escolha das empresas ao objetivo desta pesquisa.

A análise *cross-case* foi utilizada para derivar e propor indutivamente a construção de uma nova teoria.

Principais resultados:

Os resultados indicam que existem 41 tópicos relevantes para a Inovação no Local de Trabalho e que estes apresentam interdependências.

As interdependências dos tópicos são representadas na forma de diagrama.

A análise cross-case foi utilizada para construir indutivamente uma nova definição de Inovação no local de Trabalho – *Workplace Innovation* – como resultado alcançado através da implementação de práticas e das suas interdependências nas áreas de Conhecimento, Recursos Humanos, Organização suportadas por ferramentas de tecnologias de informação que garantem eficiência e conectividade; e pela estratégia corporativa.

Os 41 tópicos e as suas interdependências permitiram elaborar um *framework* enriquecido, sendo os tópicos agregados em cinco determinantes: Dinâmica Organizacional, Recursos Humanos, Colaboração, Infraestruturas de Tecnologias de Informação e Outros facilitadores.

Contribuições:

Este estudo contribui para a Academia com uma nova definição sobre Inovação no Local de Trabalho, trazendo novos conhecimentos e complementando todas definições e *frameworks* da pesquisa anteriormente feita na revisão sistemática da literatura realizada.

Este estudo contribui para a Indústria ao nível da Empresa, dos seus colaboradores e dos locais de trabalho.

Pode ser utilizado como linhas orientadoras para implementação da Inovação no Local de Trabalho, aumentando a Inovação e apoiando o aumento da competitividade das empresas. Este estudo traz vantagens para a Indústria quer através de formação ou consultoria ou colaboração com a Academia, neste último caso combinando benefícios para a Indústria e a Academia, aproximando os dois mundos.

Os 41 tópicos descobertos são uma base para a implementação da Inovação no Local de Trabalho na Indústria e apontam intuitivamente em quais departamentos da empresa podem ter implicações.

Por fim, este estudo refere as suas limitações e sugere futuras áreas de pesquisa a serem exploradas em tópicos relacionados.

Keywords Workplace Innovation, Topics, Determinants, Framework, Interdependencies, Organizational Dynamics, Human Resources Management, Collaboration, Information Technologies, Other Facilitators, Case studies, Companies.

Abstract

Purpose:

There is a gap in knowledge we aim to fill to describe Workplace Innovation, through the understanding of its determinants and their interdependencies. To cover it, the main objectives of this thesis are (a) to convey a Systematic Literature Review (SLR), which will underpin the analysis of the main determinants and topics/themes addressed that support WI; b) based on this SLR, to propose a framework of main determinants and their interdependencies, which leverage WI and will underpin the empirical research; c) based on the analysis of several case studies enriched by the observation of the daily work in the companies studied, to assess the pertinence and usefulness of the topics/determinants proposed in the framework; d) to propose a framework complementing previous frameworks assessed in the literature on WI; and e) to propose a new definition of Workplace Innovation.

Methodology:

This is an exploratory study, initiated with a systematic literature review, complemented by an empirical qualitative study. The constructivism paradigm is used.

The empirical study uses the case study method, and the selection of the companies is based on purposive sampling technique to fit the purpose of this research.

Cross-case analysis is used to inductively derive and propose the construction of new theory.

Main results:

The findings indicate that there are 41 topics relevant for Workplace Innovation and that those have interdependencies.

The topics interdependencies are represented in a diagram.

The cross case-analysis was used to inductively derive a new definition of Workplace Innovation as the result achieved by implementing practices and their interdependencies in the areas Knowledge, Human Resources, Organizational, enabled by information and technology tools that ensure efficiency and connectivity, and by corporate strategy.

The 41 topics and their interdependencies produced an enhanced framework, being the topics aggregated in five determinants: Organizational Dynamics, Human Resources, Collaboration, IT infrastructures and Other Facilitators.

Contributions:

This study contributes to the Academy with a new definition on Workplace Innovation by bringing new knowledge and complementing all the frameworks and definitions on WI of the research from the performed systematic literature review.

This study contributes to the Industry at the levels of the Company, their employees, and the workplaces.

It can be used as guideline for Workplace Innovation implementation, increasing Innovation and supporting the increase of the competitiveness of the companies, it brings advantages for the Industry either through training or consulting or collaboration with the Academy, in this last case combining benefits for both Industry and Academy and approaching both worlds.

The 41 topics uncovered are a base for implementation of Workplace Innovation in the Industry and point intuitively in which company department might have implications.

Finally, this study highlights its limitations and suggests future areas of research to be explored on related topics.

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List of Abbreviations and Acronyms

CEO – Chief Executive Officer

CMMI – Capability Maturity Model Integration

CoP – Community of Practice

CRM – Customer Relationship Management

CTO – Chief Technology Officer

DT – Design Thinking

ESA – European Space Agency

FQA – Frequently Asked Questions

H2020 – Horizon 2020

HR – Human Resources

HRM – Human Resources Management

IDI – Investigação, Desenvolvimento e Inovação

IIP – Investors in People

I&K – Innovation and Knowledge

IPR – Intellectual Property Rights

ISO – International Organization for Standardization

IT – Information Technologies

KMS – Knowledge Management System

KPI – Key Performance Indicator

NDA – Non-Disclosure Agreement

OECD – Organization for Economic Co-operation and Development

PT2020 – Portugal 2020

QMS – Quality Management System

QREN – Quadro de Referência Estratégica Nacional

RIS – Regional Innovation Systems

R&D – Research and Development

SLR – Systematic Literature Review

SME – Small and Medium-sized Enterprise

USA – United States of America

WI – Workplace Innovation

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CHAPTER 1 - Introduction

Chapter 1 - Introduction

This chapter introduces this investigation, provides the motivation for the research, justifies the reasoning behind the companies' need to innovate, examines how innovation and Workplace Innovation (WI) are related and, through an explanation about the existing research on WI, its definitions, frameworks, and theoretical background, provides an overview of Workplace Innovation (WI). Moreover, this section presents some of the important challenges that companies confront today leading to the need for innovation, provides some considerations about innovation, and explains the positioning of WI in the context of innovation. The gap in the existing research is identified as well as the formulation of both the research question and the objective of the study. At the end, this chapter presents an overview of the structure and contents of the thesis.

1.1 Important Challenges that Companies Face Today

In a global market, where business competition is strong, companies need to be able to have value-added differentiated offerings, such as products and services, not only to be competitive, but also to be sustainable in the long run (Schot & Steinmueller, 2018). The business world is moving more rapidly than ever. For a long time, innovation has been considered the most important strategic stimulus to economic development and creation of value (Schumpeter, 1934) and is promoted as the critical engine of growth (Høyrup, Bonnafous-Boucher, Hasse, Lotz, & Møller, 2012). The companies' competition at the global level in a rapidly changing environment, that is not always predictable, that demands new products, requires companies to have the capability to innovate, and generate competitive advantages (Wynarczyk, Piperopoulos, & McAdam, 2013).

Senge and Carstedt (2001) also acknowledge that innovation is crucial to attain economic and social success in a context of a globalized business world. The speed of innovation needs to be potentiated by the companies' organization that in turn must be able to adapt and be more agile and respond quickly to market changes and new demands from the customer. Companies change as a result of the processes of human interaction (Borch & Arthur, 1995), this interaction is influenced by both the employees and the organization in the company. Moreover, as companies are under cost constraints, it becomes difficult to allocate the resources required to invest in innovation. These resources can be either

employees such as developers and testers, or tools or money to acquire equipment or recruit and pay new employees. There is a dilemma, and many times a conflict, between the need to generate profit for the shareholders – keep the costs optimized, increasing the companies' value – and the need to differentiate with competitive products portfolio and innovate under investment constraints. Innovation is needed to allow economic development and stimulate value-added creation (Tushman, 1997). As researched by O'reilly and Binns (2019) big established companies also embrace innovation as a way to develop new growth businesses and in some cases even to avoid decline; these authors also state that in a study performed by McKinsey, 70% of the senior executives surveyed listed innovation as a major concern. This is quantitative evidence of the importance and the current challenges that the companies face today regarding the need for innovation.

Two main factors are pointed out as essential to the base of innovation in industrial systems: the boundaries between markets and organizations and the intra-company organization (Ozman, 2009). One possibility to generate innovations, according to Johansson and Lööf (2014), is to have companies combining internal development and external knowledge sources to facilitate the exchange of knowledge using a network formation platform. Johansson and Lööf (2014) and Ozman (2009) suggest that both inter and intra-company co-operations are relevant to produce innovation. These conclusions are also confirmed by the study of Wynarczyk et al. (2013) that affirms that innovation is not an individual process anymore, but an interactive process involving companies and knowledge at the national and global levels.

There are different types of existing research about innovation in the companies, as illustrated by the examples just referred to (Johansson & Lööf, 2014; Ozman, 2009; Wynarczyk et al., 2013) that produce either scientific knowledge or have a practical impact on companies, or both. The perspective of this investigation is complementary to the existing ones, it is to explore the daily life in companies thus exposing how, in their relations with other companies or entities, their people, their organizations, their structures, and other unknown factors may contribute to increase the level of the company's innovation at the workplace. This leads to an introduction to the concept of Workplace Innovation.

1.2 Workplace Innovation; Definitions and Frameworks

As previously presented, companies have the need to show competitive advantages when positioned in a global business market. Workplace innovation is a relevant way to increase

the competitive advantage of a company in a global market (Oeij, Dhondt, & Korver, 2011). One possible alternative way to build competitive advantage in the companies is to establish Workplace Innovation with the appropriate organizations and structures in the companies, enabling the usage of highly skilled employees giving them more responsibility, flexibility and means to innovate starting at the shop-floor (Womack & Jones, 1996). According to Khan and Mohiya (2020, p. 3865), *" Employees being prolific in the workplace is equally essential to survive in the global job market*". Their study has the focus of identifying the Determinants of SMEs employees' creativity and their impact on innovation at workplace, establishing a connection between the creativity of the employees at the workplace, with the capability that generates to Innovation and to the survival, that can also be understood as competitiveness, of the companies.

The process of innovation seems to be well studied. However, innovation also occurs at the workplace (Pålshaugen, 2015) generating workplace innovation, and this – WI - has not been studied systemically. This investigation seeks to study WI, through the identification of the determinants that leverage innovation at the workplace, and the observation of their interdependencies.

Research on WI uses definitions and frameworks/ models to describe it. Starting with the main definition identified, WI is defined as *"The implementation of new and combined interventions in the fields of work organisation, human resource management and supportive technologies"* (Pot, 2011, p. 404-405). According to Pot (2011), WI is considered complementary to technological innovation. Pot's (2011) definition of WI emphasizes possibilities to increase innovation at a lower cost, involve the company's stakeholders, and achieve innovation in the workplace. In this study he reports that by taking factors such as autonomous teams as part of the work organization, one plant produced 50 per cent more, with 50 per cent fewer staff members in each shift. WI represents a fundamental transformation of work and of organizational operations that focus on organizational initiatives, in order to improve both business performance and employee satisfaction (Isa & Tsuru, 2002). It may improve organizational performance and the quality of life, through changes in the companies' strategies and organizational practices (Eeckelaert et al., 2012). It can also take into account the type of management philosophy, support strategic choices, and consider different views of organizational structures (Howaldt, Oeij, Dhondt & Fruytier, 2016). WI plays an important role in improving motivation and working conditions that lead to increased labor productivity, enhanced innovation capability, and may improve organizational performance. Also, knowledge and skills in workplace practices play an

important role in increasing a company's performance (Bjornali & Støren, 2012). There are other definitions of WI and all have the Organizational and Human Resources Management (HRM) aspects in common (Eeckelaert et al., 2012; Howaldt et al., 2016; Isa &Tsuru, 2002;) as in Pot (2011).

Although Prus, Nacamulli & Lazazzara (2017) also studied WI, the lens through which their research was explored, did not result in a model or framework proposal. Their main goal was to perform a systematic literature review concerning WI (1996-2016) and their findings suggest that WI is a heterogeneous process of renovation occurring in eight dimensions, namely the: work system, workplace democracy, high-tech application, workplace boundaries, workspaces, people practices, workplace experience and workplace culture and that the concept of innovation within those dimensions has changed throughout the years. The main conclusion of their work was the proposal of a new definition of WI as a process of renovation altering structural, cultural, organizational, and experiential characteristics of workplaces that create social value. It is not evident that their study provides a basis to identify the determinants that leverage WI.

Three studies were identified in the literature while searching for models and frameworks to describe WI or were related to WI. In the first study Martins and Terblanche (2003) acknowledge five determinants of organizational culture that are likely to influence creativity and innovation, not specifically WI, these are: strategy, structure, support mechanisms, behavior that encourages innovation, and open communication. In the second study Kim and Bae (2005) present a model to improve organizational performance and the way people interact with each other in the WI environment. In the third study Totterdill and Exton (2014b) argue that employee involvement and participation at all levels of the organization are important drivers of WI. However, despite their importance, these three studies have no explicit framework covering the determinants leveraging WI.

The level of creativity and innovation in organizations, as studied by Martins and Terblanche (2003), is determined by its organizational culture and how both creativity and innovation are stimulated, suggesting that there might be what could be called an innovation culture. Martins and Terblanche (2003) model identified the determinants of organizational culture most likely to influence creativity and innovation. Creativity is seen, in this context, as a support tool for innovation, which generates new and useful ideas for products, services, processes and procedures originating from individuals or groups in a specific organizational context. After analyzing several existing models, these researchers concluded that there is no agreement on what type of organizational culture is needed, to improve innovation and

creativity. In their framework they define seven dimensions of organizational culture (Martins & Terblanche, 2003): Strategic vision and mission, Customer focus, the Means to achieve objectives, Management processes, Employee needs and objectives, Interpersonal relationships, and Leadership. From those dimensions they identify the following five determinants related to organizational culture that support innovation and creativity: strategy, structure, support mechanisms, behavior that encourages innovation, and open communication. They conclude that those determinants play a role as they can inhibit or support innovation and creativity, depending on how they influence everyone's behavior. They propose that more empirical research is needed to derive conclusions on the determinants of organizational culture. The contribution of individual creativity to organizational innovation depends not only on the employees' capabilities but also on how the organization accommodates them (Wipulanusat, Panuwatwanich & Stewart, 2017); this reinforces Martins and Terblanche (2003) framework.

Kim and Bae (2005) put forward a second model in the context of a discussion about shop-floor employees being part of the improvement of organizational performance (formal aspects) and the way people interact with each other (informal aspects), which seem to be important factors for WI (Kim & Bae, 2005). The analysis of both formal and informal organizational and tangible and intangible factors (or resources) presents several challenges, because of their complexity and difficulties in measuring them. The framework proposed by Kim and Bae (2005) describes the organizational part of WI in three main components: input (external and internal environments affecting the organizational systems), the organizational system (organizational design and employee representative (ER) systems/HRM systems) and output (organizational performance). It proposes an alignment among organizational design and work processes, ER systems and HRM systems leading to high organizational performance, but it does not show enough evidence relating to tangible and intangible resources. They conclude that WI produces desirable organizational outcomes. However, they also claim that organizations may be prepared for small changes but not for fundamental changes. Some empirical studies (Dhondt, Pot & Kraan, 2014; Pot, 2011) confirm that there is a positive correlation between innovation practices and the productivity of the company, complementing Kim and Bae (2005) research, and suggesting that the way companies are formally organized contributes to organizational commitment and wellbeing.

Finally, in the third framework WI is defined as a joint intelligence, the fifth element (Totterdill & Exton, 2014b), or a form of culture and employee engagement resulting from the

combination of four elements – (1) job design and work organization, (2) structures and systems, (3) learning, reflection and innovation, and (4) workplace partnership. They conclude that employee involvement and participation at all levels of the organization can create a tangible effect in workplaces and that WI can be implemented only if those practices are introduced at every level of the organization. These elements raise some important aspects that are related to employee empowerment/ engagement and employee involvement and work organization that are supported by other studies (Dhondt et al., 2014; Pot, 2011; Truss, Shantz, Soane, Alfes, & Delbridge, 2013; Yalabik, Popaitoon, Chowne, & Rayton, 2013). Totterdill and Exton (2014b) also raise the need to establish partnerships, increasing workers' communications and openness to embrace change.

Comparing the three frameworks just detailed, there are certain findings that probably could be considered as commonalities. These are: Organizational aspects, as referred to explicitly in Kim and Bae (2005) and Martins and Terblanche (2003) studies and indirectly through the mention of the involvement of all the organization in Totterdill and Exton (2014b) study, and Human Resource Management (HRM) in Kim and Bae (2005) and Totterdill and Exton (2014b) studies, mainly due to the fact that the former explicitly refer to HRM systems and the latter consider competence development and learning that normally are responsibilities of HRM, as relevant. Martins and Terblanche (2003) identify one aspect that is not explicitly considered in the other two frameworks that is what are referred to as structures. Totterdill and Exton (2014b) also refer to structures; however, due to the difference in time of the studies – eleven years – it is debatable whether the word "structures" refers to the same object and is comparable, so this might not be a communality and it was not considered in this study as such. Workplace partnership and learning, are collaboration related aspects that are considered only in Totterdill and Exton (2014b). The most recently proposed framework (Totterdill & Exton, 2014b) is the most complete of the three as it contains organization, human resources and structures, not simultaneously present in the other frameworks.

From these different perspectives, it is possible to understand that there are new approaches complementing previous ones and that WI research must continue and be complemented. There is no consensus yet on the determinants that leverage WI and no interdependency among determinants is discussed.

1.3 Workplace Innovation: Theoretical Background

An overview about existing research on WI is given in this section. It looks for ways to better understand WI and how much is currently explained and what might represent a contribution to innovation.

The way employees work and relate to each other in a company context is one of the main contributors to WI. It is also at the heart of WI programs (Pot, 2011) and a company's competitive advantage (Oeij et al., 2011). Innovation is often associated with change (Drucker, 1985), as it may involve a company's organization and strategy, workers' attitudes, and organizational culture, that plays an important role in innovation (Humphreys, McAdam, & Leckey, 2005; Martins & Terblanche, 2003; Totterdill & Exton, 2014b). WI involves the way people work and the level of autonomy employees have (Dhondt et al., 2014). As an enabler of economic growth, WI can be considered an intangible strategic asset that brings innovation. This provides the first theoretical indication of the possibility that WI leads to Innovation.

Existing research shows that WI is, to a large extent, the improvement of people's working environments and working life (Oeij et al., 2011). There is literature about job control and different types of employee participation regarding WI (Dhondt et al., 2014). Addison (2005) claims that combinations of innovative practices and worker representation can yield substantial gains in productivity. Employee participation and employee involvement are common objects of research, and it has been suggested that employee involvement in the decision making process increases organizational effectiveness (Ang, 2002). Among the different types of employee participation, Dhondt et al. (2014) focus on the direct participation of employees in the workplace, which they call job control. Their study provides recommendations on how to create job control opportunities and increase employees' direct participation, to improve organizational performance and the quality of life, contributing to more innovative workplaces. This position is as well supported by Hammond, Neff, Farr, Schwall and Zhao (2011), who show that individual factors, the characteristics of the job, and factors in the environment are moderately associated with the innovations produced at the individual level in the workplace. Leaders have also been identified as playing an important role as shapers of the work environment, influencing the innovative behaviors of employees, especially in challenging situations. This is also a result proposed by Bryson, Forth, and Kirby (2005) who concluded that high-involvement management practices have a positive impact on labor productivity. These results reinforce the links between WI and innovations produced at the individual level, from a theoretical scientific perspective.

These proposals indicate the need to combine practices at the levels of higher management, leader, and worker, in order to have employee autonomy or employee engagement/ empowerment. For this to happen, it is necessary that there is an articulation and trust in the relationship between the leadership and worker levels, and this needs to be supported by the organizational setup in the company. Von Treuer and McMurray (2012) confirm that organizational strategies supporting job autonomy and co-worker cohesion are conducive to WI.

In the context of WI, changes in the way people work require innovative human resources practices, supported by the organization (McCartney & Teague, 2004a). It is important to have mechanisms in place to ensure that knowledge is not lost. It is necessary to build mechanisms to have co-workers collaborating. It is also important to provide them with the right means to obtain the knowledge and skills needed and further develop themselves, through HRM practices (Brown, Harte & Warnes, 2007), or through partnerships (Teague, 2005).

The importance of the "silent game", played by the employees who ignore work changes, needs to be taken into account to increase employee involvement and participation as well as cooperation among all personnel (Koski & Jarvensivu, 2010) in order not to underestimate the employees' informal power. In the work context, job security is also highlighted (Rees, 2001). Teamwork and job autonomy, which allow employees to increase their influence over decisions that affect them in their jobs, contribute to an innovative workplace (McCartney & Teague, 2004b; Xerri, Nelson, Brunetto & Reid, 2015). Stimulation of creativity, the unblocking of innovation and problem solving can also be encouraged through the participation of both managers and employees, as mechanisms to solve problems and engage people (Totterdill & Exton, 2014c). Creativity, as part of program development among business school graduates, is conducive to WI (Ghosh, 2014).

Ghosh (2015, p.1132) states that, "*Workplace innovative activity can be assessed by the number of innovations, the speed of implementation of innovations and the newness of an innovation as well as by relative innovative activity in comparison to competitors."* and suggests that it is possible to measure WI through the evaluation of the number of innovative ideas, how fast they are implemented and their degree of newness in comparison with the competition. It is debatable whether the result would be a comparison between workplaces or between companies. An interesting idea that might be suggested, as an interpretation of Ghosh (2015), is that companies with higher levels of workplace innovation implementation could possibly generate more innovations. In any case, most studies on WI are related to

innovation and are mostly in the organizational area. This study reinforces the idea of WI being conducive to innovation.

1.4 Innovation and Workplace Innovation

At this point it is important to understand the basic principles and definitions of innovation and how Workplace Innovation (WI) fits into it.

According to the Oslo Manual (OECD & Eurostat, 2005, p.46) innovation is: "*The implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations*." This definition is widely accepted in both academia and industry. However, although innovation takes place in organizations, Workplace Innovation (WI) is not explicitly part of the definition of innovation according to the Oslo Manual (OECD & Eurostat, 2005). During this investigation, the Oslo manual issued a new version, therefore the new definition could be analyzed. In the more recent edition of OECD and EUROSTAT (2018, p.22) the new definition of innovation is: *"An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)".* Even though there is a concern in both versions of the Oslo Manual (OECD & Eurostat, 2005, 2018) to define innovation, the focus is to define it to have a common understanding to measure it. The assumption is that innovation is an activity or an outcome of an activity (OECD & EUROSTAT, 2018), and no reference to WI is made. However, its importance is crucial as a driver of both product and process innovation.

It is important to position WI in the context of innovation and to distinguish between the two definitions, WI, and innovation. The omission of WI has also been recognized as a subject of scientific research that requires further investigation (Dhondt & Hootegem, 2015; Jilcha, Kitaw & Beshah, 2016). This represents a broad spectrum of interrelated organizational approaches, which are absent in the definition of innovation provided by OECD and Eurostat (2005, 2018).

When comparing the definitions of innovation and WI, one can see that they are complementary, as they target different aspects of innovation. The definition of innovation, based on the Oslo Manual (OECD, 2005), takes a conceptual approach, clustering the

different types of innovation. Workplace innovation complements the definition of innovation, by adding to the factors of process, product, marketing and organizational methods, new explicit factors from the daily operation of the companies, such as the way the work is organized, the management of human resources and the technologies that are used to support the work. According to Pot (2011), the way those added factors, that characterize workplace innovation, are managed, affects the ability to innovate, making this an important contribution to the holistic understanding of innovation.

A Systematic Literature Review (SLR) on the determinants leveraging WI is conducted in this research as a first step to identify the main determinants leveraging WI and to understand the interdependencies among them.

1.5 Identification of the Gap in Knowledge

After analyzing all the existing frameworks and definitions for Workplace Innovation (WI), it was not possible to identify any research explicitly indicating a definition or a framework describing WI in a such a way that one would be able to learn what the determinants that leverage WI are, nor what the interdependencies among those determinants are. Such a framework, if it existed could lead to a possible guide and support for the companies wishing to implement Workplace Innovation with all the benefits previously presented in this introduction.

It was possible to identify aspects in the literature that might contribute to the implementation of WI but it was not possible to identify a study with a systemic approach explicitly indicating the determinants of Workplace Innovation and their interdependencies. The literature shows that WI is beneficial and may enhance the ability to innovate, as it is possible to verify that when certain practices are used at the workplace in a company, they are conducive to innovation. By bringing innovation this covers the companies' need to be more competitive, but these studies neither put together the different practices nor aggregate them into determinants nor show their interdependencies. This is the gap in knowledge we aim to fill, to describe Workplace Innovation through the understanding of its determinants and their interdependencies.

1.6 Research Question and Objectives

Research Question:

Taking into account the importance of innovation (OECD and Eurostat, 2005, 2018), namely product and process innovation as both outcome and process and the clear gap of workplace innovation as an under researched topic as a driver of innovation. The following research question was defined:

- What are the determinants leveraging Workplace Innovation and what are their interdependencies?

Research Goal:

In order to address the formulated research question, the following objectives were proposed: a) to convey a Systematic Literature Review (SLR) on workplace innovation, which will underpin the analysis of the main determinants and topics/themes addressed that support WI; b) based on this SLR, to propose a framework of determinants and their interdependencies, which leverage WI and will underpin the empirical research; c) based on the analysis of several case studies enriched by the observation of the daily work in the companies studied, to assess the pertinence and usefulness of the topics/determinants proposed in the framework; d) to propose a framework complementing previous frameworks assessed in the literature on WI; and e) to propose a new definition of Workplace Innovation.

This will be achieved by performing an exploratory study complemented by an empirical qualitative study.

To achieve this objective, it is necessary to execute the following main steps:

First: to perform a systematic literature review, to obtain the current scientific knowledge about the determinants leveraging workplace innovation.

Second: to propose a framework with the determinants that leverage workplace innovation. This will be done after the first step, by looking into the literature for existing gaps, interpreting the articles' core ideas and arguments and from there inductively deriving the topics and determinants of workplace innovation.

Third: to perform an empirical study to validate how workplace innovation is implemented in the companies. Interviews will be performed in the companies selected and where qualitative research is going to be carried out. The case study methodology (Yin, 2014) will

be used. The cases will be conducted in selected innovative companies. An interview guide will support the interviews. The data will be gathered and analyzed. This analysis will include the study of the interdependencies among the determinants.

Fourth: to analyze all the results, evaluate possible enhancements for the framework and propose a new framework with the main determinants that leverage WI and their interdependencies, that complements the definitions and the frameworks previously discussed and the one that will result from the SLR and be used as preparation for the case studies.

Fifth: to complement previous research on WI with a new definition.

This study is expected to contribute to the advance of the scientific knowledge through theory building by proposing a framework of determinants and their interdependencies, which leverage WI, and to bring practical implications for the Industry as the framework could be used to shape guidelines to implement WI in companies.

1.7 Structure of the Thesis

In chapter one: the introduction, the motivation for the investigation is presented; the theoretical frameworks and basic concepts of workplace innovation are included; the gap that is addressed in this research is justified, the research question is formulated, and the goal of this research is determined.

In chapter two, the results of the Systematic Literature Review (SLR) and the methodological approach selected are presented. The criteria used to perform the SLR are described, and the results achieved are also presented and summarized. The conclusions inductively derived from the SLR are discussed. It ends with a proposal for a framework of the determinants of the levers of Workplace Innovation. The results of this analysis are the base for the elaboration of the case studies, where the empirical study is performed.

In chapter three the methodology used in this research, namely the selection of the case study methodology, the criteria for selecting the companies, the case studies and the data analysis are described.

Chapter four presents the case studies, one by one followed by a cross-case study analysis and the results obtained. It also includes and presents an analysis of the determinant's interdependencies.

In chapter five there is a discussion about the framework proposed, the interdependencies between determinants and the result of the qualitative empirical study (case studies). It ends with the proposal of a Workplace Innovation enriched model including the interdependencies among the determinants. A discussion of the new enriched model proposed in relation to the previous definitions and frameworks is also conducted.

Chapter six presents the conclusions and limitations of the research completed and suggestions for further possible areas of research.

CHAPTER 2 - Systematic Literature Review

Chapter 2 - Systematic Literature Review

This chapter presents a Systematic Literature Review (SLR) on workplace innovation. It describes the methodology and criteria used to perform this SLR, an overview of the type of research identified, the results and the discussion. It finalizes with a proposal of a framework to leverage WI that will encompass the rest of the PhD thesis.

2.1 Methodological Approach Used to Perform The SLR

This chapter follows the SLR method as presented by Denyer and Tranfield (2009). The SLR aims to keep abreast of the current scientific knowledge about WI. The stages proposed by Denyer and Tranfield (2009) are followed as basic guidelines for this SLR.

One of the main characteristics that differentiates a SLR from a traditional narrative review is that it is a replicable, transparent and a scientific process, aiming to minimize bias (Tranfield, Denyer, & Smart, 2003). The scientific papers used as basis for the research should be independent from the researcher, once the circumstances of the research are documented.

This chapter follows the five steps proposed by Denyer and Tranfield (2009): definition of the research question, location of studies, selection and evaluation of studies, analysis and synthesis and presentation of results.

All of the performed steps and the documentation here presenting which options were made, ensure as a whole a protocol definition, so that any researcher that follows the same steps will reach the same result, ensuring the replicability of the results of the SLR.

In the first step, as discussed in chapter one, the RQ was defined. The second step, conducting the literature review, involves the decision of the keywords of the search, namely “Workplace Innovation”. The keywords are particularly important in delimiting the subject area. This second step, location of studies, also includes the decision where the studies search is performed. The search was performed based on an electronic search in academic journals and the sources of information selected were extracted from five databases: EBSCO, Emerald Insight, Science Direct, Scopus and Web of Science. These five databases are well-established, reliable academic databases and are comprehensive enough to include the most relevant research contributions. Only scientific journal articles

were included, as those are considered to have the highest impact in the management field with the most validated knowledge (Podsakoff, MacKenzie, Bachrach & Podsakoff, 2005). No distinction or restriction was done among authors, its country of origin or journal of publication, as the goal was to capture different perspectives. To ensure transparency and reliability in the search, and to allow the availability of the information needed to prepare the second part of this study, the empirical part, a final date had to be set for the academic search, according to the schedule defined for the PhD works, this date was defined at the end of 2017, meaning that this SLR was finished in the middle of 2018.

The third step involved the selection and evaluation of the articles, the review itself. This SLR involved reading the abstracts and the selected papers to identify the relevant topics and looking for patterns or categories able to aggregate them at a higher level. This led to the fourth step, analysis, and synthesis in which the detailed content analysis was performed. The fifth and last stage of a SLR is reporting and disseminating the results (Denyer & Tranfield, 2009), which is one of the aims of this thesis: present and discuss the findings, and propose paths leading to further research.

In order to analyze the content of the papers, a matrix with the following data records was prepared: author, year, reference, name of the journal, relevant topics identified, type of research study, methodology used, and context in which the research was carried out. Table I summarizes the terminology used for the data records' naming, for the analysis of the articles, during the SLR.

The content analysis involved an interpretative synthesis, based on the article's content core ideas and arguments, from which the topics and determinants of workplace innovation were inductively derived, following Jones, Coviello, and Tang (2011). Topics are the fundamental concepts and subjects under consideration in each paper, according to the best interpretation of the research team. Annex I in the Annexes presents the information gathered in the SLR, based on the following content: (a) selected published paper; (b) main topic covered; (c) main WI determinant; (d) methodology used; and (e) context in which the paper was developed. Additional numbering of the topics, as well as some statistics, is included to enable a better understanding of the results. This review applied a systematic process involving inductive thematic analysis of search results (Braun & Clarke, 2006), and sought to organize the literature into patterns of topics and determinants.

Table I: Terminology used for analysis of the articles

Article Reference	Author(s), year
Topic	Main Topics covered in the paper
Determinant	Topics Aggregated at a higher level
Method	Analysis of approaches used in the studies
Context	Analysis of the realities under study

Through all the stages of this SLR the research team discussed the selection criteria, and the articles were evaluated and discussed in terms of contents, conclusions, or propositions, until a common understanding was achieved.

To assess the quality of our review, we identified some quality assessment criteria. First, our study tries to assure validity by overcoming source bias and triangulating databases and search engines. It also tries to overcome debriefing bias by triangulating researchers. The reliability of our study is assured by the degree of methodological transparency, protocol development, and reliability of selection principles.

The initial search resulted in 353 papers. As several databases were used, duplicated papers (87) were removed. Based on the large number of articles retrieved (266), it was decided to screen and analyze the abstract to make sure that the articles selected were tuned to the object of this research. After a close scrutiny of the abstracts, the research team decided to exclude 191 papers as their content – trade unions, employee negotiations rights, gender, race, discrimination of workers, public policies, politics, government, non-for-profit organizations, social organizations, outsourcing, environment, psychology, facility management and workplace layout – did not pertain our WI research aim. The decision to remove the articles involved an interactive process among the research team, to reach a consensus. The objective was to look for results that clearly represent the reality of WI to bring a broad contribution not affected by any kind of discrimination or too much specificity. The final dataset of 75 selected articles were identified and selected for full-text review as the primary source of data for the analyses.

Table II shows the number of selected articles after all refinement criteria were applied.

Table II: Results of SLR – selected articles

Database search result	353
Duplicate articles	87
Articles excluded by filtering	191
Selected articles	75

The articles were published in 51 different journals, which gives an indication that WI has a crosswise importance in business/economics. Table III lists all the journals in which more than one article has been published, representing 37 articles in 13 journals. This means that 49% of the articles have been published in 25% of the outlets.

Table III: Main sources of publication

Journal	No. of articles
World Review of Entrepreneurship, Management and Sustainable Development	5
The International Journal of Human Resource Management	5
Economic and Industry Democracy	4
Strategic Direction	3
Industrial Relations: A Journal of Economy and Society	3
Personnel Review	3
European Journal of Innovation Management	2
European Journal of Work and Organizational Psychology	2
Industrial and Labor Relations Review	2
International Journal of Social Quality	2
Journal of the Knowledge Economy	2
Management Research Review	2
Industrial Relations / Relations Industrielles	2
	37

2.2 Systematic Literature Review (SLR) Results

This section is organized in six parts as follows: in the first one there is an overview about SLR followed by five others, where each of the five determinants found in the SLR are analyzed.

2.2.1 SLR Overview

Based on the outcome of the selected SLR papers (listed in Annex I in the annexes), the main objective of this section is to articulate and present the results about the determinants (and the underlying topics), the methods used and the contexts of the research studies.

As a result of the detailed content analysis performed on the 75 papers, 38 topics emerged, and they are addressed 191 times in the research overall (see annexes, Annex I).

This section seeks to confront the topics that resulted from the SLR with Pot (2011) definition. The following topics, emerged from the SLR, fit in Pot (2011) definition, as presented in the Introduction chapter:

- Work organization (Alasoini et al., 2010; Geary, 1999; Howaldt et al., 2016; Kalmi & Kauhanen, 2008; Friedrich, Sjöberg & Friedrich, 2016; Lapointe & Cucumel, 2016; Lorenz, 2015; McCartney & Teague, 1997; Oeij & Vaas, 2016; Oeij et al., 2014; Payne, 2004; Pot, Totterdill & Dhondt, 2016; Totterdill & Exton, 2014a; Urbach, Fay, & Lauche, 2016).
- HRM (Bernier, 1999; Brown, Harte, & Warnes, 2007; Lee & Kang, 2012; Camuffo & Volpato, 1995; Dokko, Kane, & Tortoriello, 2013; Furmańska-Maruszak & Sudolska, 2016; Isa & Tsuru, 2002; Lee, 2004; Muenjohn & McMurray, 2016; Oeij et al., 2011; Pettine, Cojanu & Walters, 2011; Plijter, van der Voordt, & Rocco, 2014; Pot, 2011; Preenen, Oeij, Dhondt, Kraan, & Jansen, 2016; Rees, 2001; Totterdill & Exton, 2014c; Walsworth & Verma, 2007; Zheng, Hyland, & Soosay, 2007).
- Support technologies (Black & Lynch, 2004; Humphreys, McAdam, & Leckey, 2005; Pettine et al., 2011; Williams & LaBrie, 2015).

The SLR on WI also covers topics that are not covered by Pot (2011) definition:

- Knowledge sharing (Andersson, 2013; Brown & Dearnaley, 2016; Dokko et al.,

2013; Svare, 2016; Totterdill & Exton, 2014c). This topic might be an addition to the initial definition as a collaboration initiative, which is directly relevant to innovation, as combining different knowledge might lead to combined ideas and new products and innovations.

- Change Management (Badham & Ehn, 2000; Bamber, Bartram, & Stanton, 2017; Erickson & Jacoby, 2003; Hammond et al., 2011; Kim & Bae, 2005; Koski & Jarvensivu, 2010; Teague, 2005). This topic appears to be relevant and an add-on to the initial definition as through the papers it was recognized that overcoming barriers might be a factor that could enable innovation.

- WI implementation support (Alasoini, 2009; Badham & Ehn, 2000; Erickson & Jacoby, 2003; Walsworth & Verma, 2007). This is a topic that recognizes that having dedicated resources with knowledge and a mandate to implement WI will add value. This is something we need to add to the initial definition.

- Real job training environment (Brown & Dearnaley, 2016).

- Regional innovation (Andersson, 2013; Svare, 2016).

- Communities of Practice (CoP) (Macpherson & Antonacopoulou, 2013).

The two last topics (above listed) in particular are about collaboration, which is a determinant that is not explicitly referenced in Pot (2011) definition. The only collaboration possible to identify in Pot (2011) definition is at work organization among employees. The two new topics describe a different type of collaboration, at a level that could be external to the company, such as when there is a region that is recognized as being innovative in an industry (Andersson, 2013; Svare, 2016) or when a group of companies form a community to share best practice and cooperate (Macpherson & Antonacopoulou, 2013).

Existing research shows that WI is, to a large extent, the improvement of people's working environments and working life (Oeij et al., 2011). In the SLR, work organization, employee empowerment/ job autonomy, competence/ skill development and human resource work practices are the four main referred topics object of research contributing to WI. For example, allowing employees to increase their influence or informal power used over decisions that affect them in the workplace is identified in research as contributing to a more innovative workplace.

Work organization and employee empowerment/ job autonomy are related to the way companies are organized. Skill development and human resource work practices are related to the way human resources are treated within the companies' practices. In addition, to these four main topics, other topics related to organization and human resources were identified with fewer studies, as leadership, organization type, organizational guidance, new training practices and pay and incentive systems.

Innovation at the workplace can be achieved through approaches that revolve around the employee. However, other topics were identified such as WI implementation support, where some research points to the need for specific professionals dedicated to the WI implementation tailored to each organization, planning actions, overcoming barriers, adding context-specific detail to the implementation of WI in each organization (Badham & Ehn, 2000). This need is confirmed by examples derived from different behaviors in different companies (Marks, Findlay, Hine, Thompson, & McKinlay, 1997) where the same challenges are faced. Another topic identified is change management where it is suggested that more emphasis needs to be put on divergent strategies and interests within and between organizational actors (Koski & Jarvensivu, 2010) to ensure alignment and cooperation among all personnel. It is also suggested that HR could play a different role in WI acting as change agents (Bamber, Bartram & Stanton, 2017). The topic called 'external factors', influencing WI from outside the company, includes aspects such as: the ability to adopt innovations, institutional and legal factors, contextual influences inherent to each country and a level of education that builds innovation and creativity competencies in professionals. The topic 'external factors' includes aspects external to the company able to impact the way the workplace can be shaped and, in its ability, to impact innovation.

Aspects that are not considered under topic 'external factors' are related to collaborative approaches, such as co-operation actions leveraging knowledge gathering, problem solving, labor management cooperation between peers/supervisors and partnerships. A different approach to creating knowledge and consequent innovation is through 'other topics', including regional innovation (Andersson, 2013), bringing productivity and competitiveness to a region, Communities of Practice (CoP), team work and knowledge sharing. Research also indicates that the topic 'information and technology usage' is relevant to the leverage of WI.

In summary 38 topics emerged from the SLR, which were combined in five higher hierarchical classes, that we call determinants. These determinants were inductively derived from the similarities among the 38 topics. These five determinants are:

Organizational Dynamics, Human Resources Management (HRM), Collaboration, Information Technologies (IT) Infrastructures and Other Facilitators.

Considering the 38 topics, the weights of the five determinants are approximately: Organizational Dynamics – 45%, Human Resources Management – 18%, Collaboration – 18%, Information Technologies Infrastructures – 11% and Other Facilitators – 8%. The weights are calculated based on the total number of topics, which are addressed under each determinant. This can be observed in Annex I in the Annexes.

Research on WI is mainly performed based on data collected from the Industry (34%), or based on available secondary databases (28%), and only 8% is performed on data collected in small and medium-sized enterprises (SMEs). There are practically no studies addressing Research and Development (R&D) and only 3% deal with services. 26% of the studies deal with areas such as Healthcare, Medicine, Nursery, Municipal sector, and Business Schools. The highest percentage of research in industry is triggered by the fact that more innovative workplaces might create companies' competitive advantage for companies (Oeij et al., 2011). The high percentage of research using secondary databases might arise from the availability of data from global surveys, such as the European Working Conditions Survey or country-based surveys as the Netherlands Employers Work Survey and the Canadian Workplace and Employee Survey.

As previously explained, each of the 75 papers analyzed were classified in terms of the research method used as approach in the studies. The resulting classification shows that quantitative research (Empirical Quantitative: 48%) outnumbers qualitative research (Empirical Qualitative:12%, Conceptual:24%, in sum 36%), although there are 16% of case studies where the contribution can be to both quantitative and qualitative research (Starman, 2013), so it maybe there is a predominance of quantitative data but it might be awfully close. It is also relevant to highlight that overall empirical research (60%), meaning quantitative and qualitative summed with Case Study (16%) added are more prominent (76%) than Conceptual (24%) studies, which suggests that there is prevalence for studies reflecting reality and field expertise. These figures are shown at the end of Annex I in the Annexes.

2.2.2 Analysis of the Organizational Dynamics Determinant

This determinant emerges as a contribution of the following main topics: the way the work is organized, the amount of autonomy and empowerment given to employees, leadership capability within the organization, the type of the organization put in place, the corporate strategy, the organizational culture, the organizational guidance, the knowledge management and the employee engagement.

At organizational level the topics identify the relationship between WI and the organization (Bamber et al., 2017; Bjornali & Støren, 2012; Howaldt et al., 2016; Humphreys et al., 2005; Lapointe & Cucumel, 2016; Pot et al., 2016), the importance of organizational guidance (Dhondt et al., 2014; Macpherson & Antonacopoulou, 2013; McCartney & Teague, 1997; Rees, 2001), appropriate approaches to leadership (Dhondt et al., 2014; Friedrich et al., 2016; Furmańska-Maruszak & Sudolska, 2016; Macpherson & Antonacopoulou, 2013; Muenjohn & McMurray, 2016; Muenjohn &McMurray, 2017; Zwanikken, Alexander, & Scherpbier, 2016), and establishing longitudinal development programs to support non-technological innovation (Humphreys et al., 2005). It is also the organizational dynamics that defines to a big extent, how the work is organized, and the level of autonomy given to the employees, meaning that the type of organization can hinder or support WI.

The topic work organization is related with policies and strategies of the organization, the way work is distributed among employees, the way jobs are conceived, work practices, the processes, procedures and guidelines in place and team work dynamics (Alasoini et al., 2010; Geary, 1999; Howaldt et al., 2016; Kalmi & Kauhanen, 2008; Friedrich et al., 2016; Lapointe and Cucumel, 2016; Lorenz, 2015; McCartney & Teague, 1997; Oeij et al., 2014; Oeij & Vaas, 2016; Payne, 2004; Pot et al., 2016; Totterdill & Exton, 2014a; Urbach et al., 2016). Some of those studies also discuss job autonomy and employee empowerment. A more knowledgeable based distribution of work, leading to higher quality, could potentially produce more innovations, by generating a more innovative workplace.

Organizational strategies that support job autonomy and co-worker cohesion are conducive to WI (Von Treuer & McMurray, 2012), may foster innovation and creativity, and can also contribute to company performance (Preenen et al., 2016). Team work, as well as job autonomy (Beirne, 2013; Dhondt et al., 2014; Ghosh, 2015; Long, 1989; Subramaniam & Moslehi, 2013), allow employees to increase their influence, and may contribute to more innovative workplaces (McCartney &Teague, 2004b; Xerri, Nelson, Brunetto & Reid, 2015)

where employees are more engaged (Ang, 2002). There is research pointing to the contribution of creativity to WI (Yeh-Yuna & Liu, 2012).

The topics of the Organizational Dynamics determinant (17 of 38) account for 45% of the topics from the selected papers.

2.2.3 Analysis of the Human Resources Management (HRM) Determinant

The two main topics leveraging WI identified under this determinant are: Competence / Skill Development and Human Resources (HR) / Work Practices. These two topics are complemented by other topics, as Pay and Incentive Systems, New training practices, and Information flow.

Acquiring more skills and being better trained pays off for WI (Zwanikken et al., 2016). HRM has a role in forecasting the skills that the employees will need in the near future (Bamber et al., 2017).

Innovation cannot depend only on the current employees' knowledge; it is essential to have competence and skill development mechanisms in place, to ensure that knowledge grows in the company, and that the employees have a career development path. Optimized use of human talents contributes to WI (Oeij & Vaas, 2016). The identification of competencies fostering innovation and professionals who can generate innovation are key to the company, in a WI context (Bjornali & Støren, 2012). Other relevant practices are competence development plans to foster employees' capabilities (Furmańska-Maruszak & Sudolska, 2016), skill-creation systems (Finegold & Wagner, 1998) and employees autonomy in choosing training methods (Walsworth & Verma, 2007).

The topic HR / Work Practices must be supported by the organization (McCartney & Teague, 2004a; Teague, 2005). It is a topic involving several aspects, including the motivation of the employees (Hammond et al., 2011), employee management/ involvement/ relationships and job role (Bartram, 2011; Lee & Kang, 2012; Oeij et al., 2014), human factors (Badham & Ehn, 2000), and job design/ redesign (Beirne, 2013). Fiat is one of the examples where a set of different human resources practices was introduced to achieve WI with a lean approach by introducing team work, flexible compensation, and multi-skilling (Camuffo & Volpato, 1995). This was achieved through an organizational change process supported by the principles of dynamic capabilities.

Research also focus on other HRM topics including incentive payment, performance appraisal and suggestion systems (e.g. ideas for improvement) and information sharing meetings (Bayo-Moriones & Galdon-Sanchez, 2010). One of the possible practices associated to WI is the link between reward and objectives, monetary compensation linked to performance or more generally variable pay (Bayo-Moriones & Galdon-Sanchez, 2010; Black & Lynch, 2004; Isa & Tsuru, 2002; McCartney, John; Teague, 1997; Pot, 2011; Walsworth & Verma, 2007). This means that a percentage of the monetary compensation could be associated with the achievement's level of a set of tasks.

Culture is an important dimension and, as previously discussed, organizational culture is an important topic, which is part of the determinant Organizational Dynamics, it is also recognized that culture in the country context is relevant and the topic Country Culture was found to be an important contributor to the HRM determinant. Although research does not establish how country culture directly influences WI, it provides some recommendations towards taking into account, both national/ country and corporate/ organizational culture (Muenjohn & McMurray, 2016), as well as individual and organizational needs (Plijter, van der Voordt, & Rocco, 2014).

The topics of the Human Resources Management determinant (7 in 38) account for 18% of the topics from the selected papers. The number of subjects addressed by the research under this determinant (57 of 191) is 30%, which indicates a relatively intensive focus on HRM topics.

2.2.4 Analysis of the Collaboration Determinant

The main topics contributing to this determinant are co-operation actions, knowledge sharing, interface management, teamwork, CoP, regional innovation and internal marketing.

The topics co-operation actions and interface management cover partnerships (Totterdill & Exton, 2014b), the ability to connect with external sources to acquire new knowledge (Alasoini et al., 2010), the capability to establish relations in the workplace (Brown & Dearnaley, 2016; Dokko et al., 2013) and to co-operate with suppliers, competitors and customers (Svare, 2016), as a source of knowledge, market needs and innovation. The topic knowledge sharing focuses on, bridging the theory-practice gap, using innovation to unblock techniques (Totterdill & Exton, 2014c), practical knowledge use, combining and

transforming knowledge in the workplace in an innovative way. Intra-company collaboration is especially important in team work (McCartney & Teague, 2004b; Teague, 2005) and autonomous self-organized teams (Totterdill & Exton, 2014b). Team work is key for team innovation (Wipulanusat et al., 2017) and especially important in rapidly changing industries. Besides team work, intra-company collaboration also includes other labor management co-operations, as knowledge sharing meetings among employees and cooperation between management and staff (Pot, 2011).

Another possible way to connect people is through CoP, which may foster the sharing of information and collaboration in order to overcome the company's boundaries (Macpherson & Antonacopoulou, 2013). A different approach to get knowledge and consequent innovation is through regional innovation (Andersson, 2013; Svare, 2016) bringing productivity and competitiveness to a region, as in so called regional innovation systems which facilitate collaboration among several players.

This determinant emphasizes the relevance of WI in facilitating the gathering of knowledge and the absorption of knowledge from all possible sources outside the company. It also highlights the relevance of connecting people, talking to peers, having self-managed teams, solving problems in a community all of which may be supported by information and technology as part of the IT infrastructures determinant.

The topics of the determinant Collaboration (7 of 38) account for 18% of the topics from the selected papers.

2.2.5 Analysis of the Information and Technology (IT) Infrastructure Determinant

The most important topic of the IT Infrastructure determinant is the information and technology (IT) usage.

Lifestyle, the business environment (becoming more and more global) and the type of available resources are changing over time. Not only are new ways of working and behaving emerging every day, but organizations have at their disposal new capabilities and workplaces have access to new resources. Research confirm the importance of the topic 'information and technology usage' at the workplace (Black & Lynch, 2004; Oeij & Vaas, 2016; Pot, Totterdill, & Dhondt, 2016). The use of new IT infrastructures is of high relevance, as it reduces information and communication costs, allowing the faster spread of information, reducing travel needs, increasing productivity, improving training capabilities at

lower costs (Williams & LaBrie, 2015), fostering online learning environments (Pettine et al., 2011) and using automation to improve job quality (Findlay et al., 2017). There are some obstacles or difficulties in the adoption of new technologies in some sectors where technology might not be used as a daily tool (Lee, 2004). This suggests that, even when available, technology may not be used effectively, indicating a possible problem in lack change management. Another advantage of using IT systems is reducing the number of errors, contributing to quality improvement, which is vital in many industries namely in healthcare (Avgar, Givan, & Liu, 2011).

The topics of the determinant Information Technology Infrastructure (4 of 38) account for 11% of the topics from the selected papers.

2.2.6 Analysis of the Other Facilitators Determinant

The three main topics identified under this determinant were Change Management, WI implementation and External factors.

Professionals or facilitators dedicated to the WI implementation able to adapt to each organization are necessary. They should develop plans to overcome barriers, adding context-specific solutions to the implementation of WI in each organization (Badham & Ehn, 2000). The decision to implement WI must be part of the company's corporate strategy. Management must also be involved in/ committed to WI implementation (Erickson & Jacoby, 2003), with dedicated people to create or improve new workplace processes (Walsworth & Verma, 2007) and to ensure replication of good practices of WI implementation (Alasoini, 2009). A possible way to overcome resistance during the WI implementation and get support is to implement change management programs (Badham & Ehn, 2000; Hammond et al., 2011; Kim & Bae, 2005; Koski & Jarvensivu, 2010; Teague, 2005). Research shows differences between the WI implementation programs in different countries with different contexts (Payne, 2017).

The need to establish change management programs to promote and support change is confirmed in examples derived from different behaviors in different companies (Marks et al., 1997) facing the similar challenges.

The topic external factors covers: the level of innovation adoption in the company (Lee, 2004), contextual influences (Hammond et al., 2011), environmental/ institutional factors and other structural factors (Jilcha & Kitaw, 2017; Lapointe & Cucumel, 2016), and the

benefit for WI of having professionals trained in creativity and innovation (Bjornali & Støren, 2012; Ghosh, 2014; Zwanikken et al., 2016) in higher education. This topic has not so much to do with the company internally but can have an important external impact on the company.

The topics of the determinant Other Facilitators (3 of 38) account for 8 % of the topics from the selected papers.

2.3 Summary of the SLR Results and Proposed framework

In this section there is a summary of the SLR achieved results and a proposal of a framework.

This SLR covered the 75 selected papers (in Annex I in the Annexes). It released 38 different topics that were aggregated in five determinants, as proposed in Figure 1: Organizational Dynamics, HRM, Collaboration, IT Infrastructures and Other Facilitators.

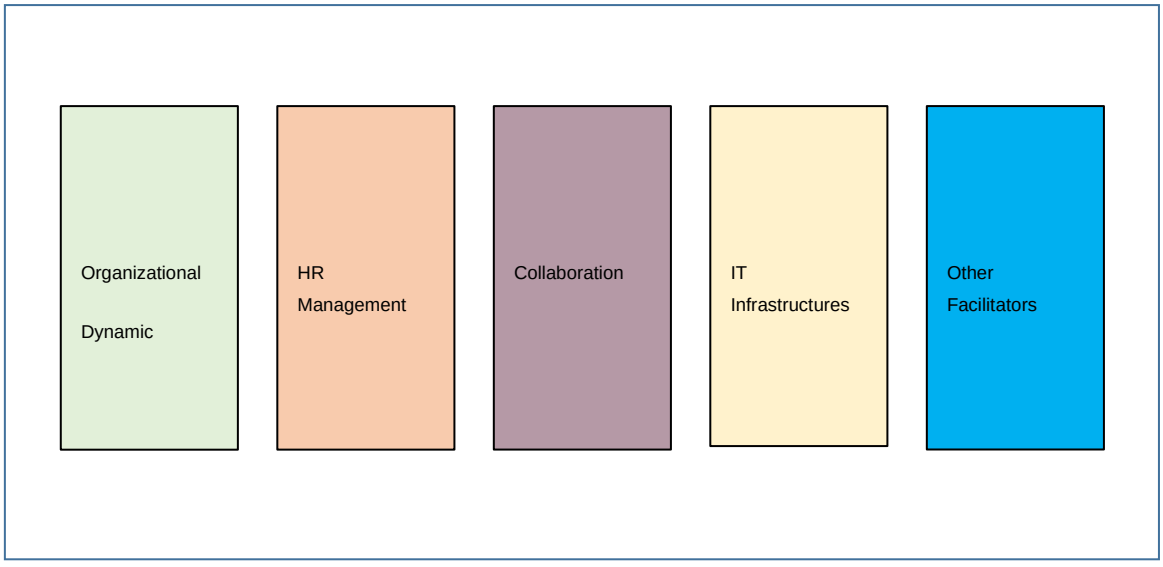

Figure 1: Main determinants of Workplace Innovation: proposed framework (own preparation).

The proposal of the framework of determinants leveraging WI, emerging from the SLR, as shown is Figure 1, is based on a framework, with five determinants. The topics belonging to each determinant are represented in Annex II in the Annexes. Some of the topics have

an intra-company focus other can be impacted from outside the company. This framework is taken as basis for the preparation of the empirical study,

This holistic view on WI, that emerged from the SLR, represented in the form of this framework, is more complete than the individual models and definitions presented in the Introduction chapter. This is justified in next section.

2.4 Discussion of the SLR Results

This section comprehends a discussion of the SLR results, namely the comparison of the proposed framework versus the previous existing ones.

We seek to discuss and compare the proposed framework of determinants leveraging WI resulting from the SLR, represented in Figure 1 and in Annex I of the annexes, with the frameworks and definitions identified in the context of Workplace Innovation, already presented in chapter 1.

The first observation (see also Table IV), is that the three models or frameworks (Kim & Bae, 2005; Martins & Terblanche, 2003; Totterdill & Exton 2014b) presented in chapter 1 focus mainly on organizational and HRM aspects. None included IT Infrastructure. Although collaboration is addressed indirectly by Totterdill and Exton (2014b) none of the three models considers topics such as support for WI implementation, and online learning environment, among other topics. The framework that emerged from the SLR combines several of the determinants partially identified in each model, providing a holistic view and identifies new topics grouped under new determinants, such as IT infrastructure and Other Facilitators.

The models reviewed in the literature have some limitations that are corrected in the framework proposed. For example, the model proposed by Martins and Terblanche (2003) was based on three dimensions of organizational culture. As a result HRM, Collaboration and the Other Facilitators determinants are not covered by Martins and Terblanche (2003). The model proposed by Kim and Bae (2005) addresses organizational performance and covers HRM, change management and organizational design extensively, but does not cover collaboration or IT infrastructure. Finally, the model of Totterdill and Exton (2014b) although robust, does not include IT infrastructure.

The framework proposed with five determinants complement, the three analyzed frameworks (Kim & Bae, 2005; Martins &Terblanche, 2003; Totterdill & Exton, 2014b) as each covers different aspects. Moreover it also extends Pot (2011) definition, by introducing Collaboration and Other Facilitators determinants, which were absent on Pot (2011) definition.

The proposed framework (Figure 1) is the base for the empirical study preparation (case studies described in chapter 4), as previously explained.

Table IV: Framework Comparison

Article Reference	Organizational Dynamics	Human Resources Management	Collaboration	IT Infrastructures	Other Facilitators	Observations
Figure 1 (proposed framework)	X	X	X	X	X*	*Other Facilitators: Change Management, Support to WI implementation and External factors.
(Kim & Bae, 2005)	X	X	----	----	----	ER is also considered which is out of the scope of this research (Unions)
(Martins & Terblanche, 2003)	X	----	----	X**	----	**the word “structures” proposed in the framework means not obligatory IT infrastructures. The model is overall about innovation not specifically at the workplace.
(Totterdill & Exton, 2014b)	X	X	X	----	----	

CHAPTER 3 - Methodology

Chapter 3 - Methodology

The first part of this work is composed of two chapters. In the first, a theoretical framework for Workplace Innovation is introduced and the research question and the objective to achieve are defined. In the second, a systematic literature review of the existing research on Workplace Innovation (WI) is performed. Further the methodology and criteria used to do it are described, the results are presented and discussed, leading to the proposal of a framework to leverage WI that encompasses the rest of the PhD thesis.

The purpose of this chapter is to explain the methodological approach followed throughout the course of the second, empirical part of this investigation, its analysis, and the subsequent steps.

This chapter describes and summarizes the first part of the thesis, to facilitate the understanding of the overall work for the reader, creating a common thread that runs through the thesis.

3.1 Summary of the First Part of the Investigation

3.1.1 Research Question and Objective

The aim of this investigation, as presented in chapter 1, is to answer one research question, namely, to identify the determinants leveraging Workplace Innovation and what, if any the interdependency among those determinants is.

Having examined this question, the objective of this investigation is then to propose a framework of the determinants which leverage WI, showing their interdependencies.

3.1.2 Systematic Literature Review

A systematic literature review (SLR) is conducted in chapter 2, making it possible to access the current scientific knowledge about the determinants leveraging workplace innovation. The SLR was performed following the method as presented by Denyer and Tranfield (2009). The aim of the SLR was to be informed about the current scientific knowledge concerning

WI. The stages proposed by Denyer and Tranfield (2009) were followed as the basic guidelines for this SLR.

According to the best interpretation of this researcher, the content analysis of the relevant papers from the SLR was performed and the main topics, which refers to the fundamental concepts and subjects under consideration in each paper, were noted. The SLR uncovered 38 different topics. These topics were inductively aggregated into five determinants.

These five determinants are the base for the proposed framework of determinants leveraging workplace innovation shown in Figure 1, at the end of chapter 2. Table IV, in chapter 2, compares the existing frameworks and the framework proposed that inductively emerged from the SLR, before the empirical study was performed. This proposed framework was the basis to prepare the empirical study, which consisted of performing case studies of companies and the subsequent analysis of the data collected.

The scientific contribution this SLR makes is to provide a holistic overview of WI and a proposal for a new improved framework, compared to the previous research. After completing the SLR the work proceeds with an empirical study, looking into the reality of companies by interviewing the main participants and observing work practices and attitudes in order to propose an enriched framework of determinants which leverage WI, showing their interdependencies. The unit of analysis of this research is workplace innovation in the company.

3.2 Second Part of The Investigation

The second part of the investigation focuses on the empirical work, that allows the objective of the overall investigation to be achieved.

Main Structure of following sections

This section is structured in three parts. Section one presents and justifies the research paradigm used in the thesis. Therefore, the main research paradigms and methodologies are addressed. Section two describes the preparation of the case studies, namely the selection of the companies and the interview guide. Section three describes the methodology used for data gathering, performing the interviews and the data analysis.

3.2.1 Research Paradigms and Associated Methodologies

The options taken in choosing the methodologies are derived from the way the problem under investigation is formulated (Yin, 2014).

The methodology is just one of the three components of a paradigm. A paradigm is essentially composed of three elements, the methodology, the ontology and the epistemology (Guba & Lincoln, 1994; Sobh & Perry, 2006), it is a framework that guides the researcher, throughout her or his work, not only regarding methodological choices but also ontologically and epistemologically (Guba & Lincoln, 1994; Perry & Brown, 1999; Sobh & Perry, 2006).

A paradigm can be regarded as a set of beliefs (Guba & Lincoln, 1994) and those are differentiated, based on the answers to the ontological, epistemological and methodological questions the researchers must pose when they focus on the problem to solve, when researching. The way these questions are answered guides the decision as to which research paradigm should be followed.

In brief, the ontological question has to do with the vision of reality, the epistemological question with the nature of the interviewees (because the owners of the knowledge, in this research, are the interviewees) and what can be known, and the methodological question with how the researcher can obtain the information she believes it is possible to get (Guba & Lincoln, 1994). In the work of Guba and Lincoln (1994) they propose aggregating the paradigms into four groups, this scheme was later enhanced by the research of Sobh and Perry (2006).

The answers to the previously ontological, epistemological and methodological questions above described are also typified and grouped according to the four paradigms of Sobh and Perry (2006). The four Paradigms are: Positivism, Constructivism, Critical Theory and Realism; this is shown in Table V.

It is necessary in this study to pose the ontological question, whether reality is something tangible and unique and if it is possible to uncover only one reality in this work context in order to understand the appropriate ontological positioning. The expectation is that, while exploring information in different companies, data is recorded from different interviewees in different contexts, different realities, and the answers report how WI is experienced in each company. During the interviews, besides recording replies, the daily work of the

interviewees needs to be observed, such as their behaviors, their attitudes, and the company's organizational setup regarding its daily work.

Table V: Scientific Paradigms

Element	**Positivism**	**Constructivism**	**Critical theory**	**Realism**
Ontology	Reality is real and apprehensible	Multiple local and specific "constructed" realities	"Virtual" reality shaped by social, economic, ethnic, political, cultural, and gender values, crystallized over time	Reality is "real" but only imperfectly and probabilistically apprehensible and so triangulation from many sources is required to try to know it
Epistemology	Findings true – researcher is objective by viewing reality through a "one-way mirror"	Created findings – researcher is a "passionate participant" within the world being investigate	Value mediated findings – researcher is a "transformative intellectual" who changes the social world within which participants live	Findings probably true – researcher is value-aware and needs to triangulate any perceptions he or she is collecting
Common methodologies	Mostly concerns with a testing of theory. Thus, mainly quantitative methods such as: survey, experiments, and verification of hypotheses	In-depth unstructured interviews, participant observation, action research, and grounded theory research	Action research and participant observation	Mainly qualitative methods such as case studies and convergent interviews

Source: Sobh and Perry (2006, p.1195)

In epistemological terms the research team analyzed whether it was possible not to get involved directly by collecting knowledge through data without the interviewer/researcher participation. It was proposed that while the interviewees would be oral, it would be essential to observe the environment in the company, looking for findings that could bring contributions to the object of research, meaning that it would be necessary to collect more data, such as by observing, and not only that collected verbally from the interviewees' explanations or replies.

Finally, to answer the methodological question, how can the inquirer uncover the information s/he believes it is possible to obtain, the research team decided to use a guide

for the interview, mainly to introduce the topics at the beginning of the interviews. Then, each interviewee would be encouraged to speak hoping to get her/him deeply involved on the subject and thereby obtain the majority of the information needed. By doing this, the expectation was that if the topics under observation were not covered in the conversation, then the researcher would have to reformulate the question (supported by the interview guide) or find a way to obtain to the knowledge desired, by explaining the research and its goals better.

The next step was to compare the replies obtained to the ontological, epistemological and methodological questions, with the ones in Table V, and by doing so, an analysis of what paradigm to consider was undertaken (Sobh & Perry, 2006). The conclusion of this analysis led to the decision that the constructivist paradigm should be used in this research. The suitability of the constructivist paradigm to our research was possible to reconfirm by comparing it with the other three paradigms with the intention to determine if they would fit our research better.

Positivism is often used as the departure point when there is deductive process, starting with a hypothesis or hypotheses to be tested, which is not the case, as we did not have those. In Critical Theory the researcher usually has a passive role which would be inappropriate because the researcher had to play an active role in the interviews. The only viable alternative paradigm of these three might have been Realism where the objective is to look for reality. However, in Realism the reality is stated to be probably true, concerning abstract things, so it is not clear that knowledge is created whereas in Constructivism, even though occurring in a subjective world of thoughts and interpretations, it is expected that the researcher creates knowledge dependent on the interaction between the interviewer and the interviewee. From the perspective of a constructivist, truth refers to a particular belief system held in a particular context (Perry & Brown, 1999). The researcher has to be a *"passionate participant"* while doing the field interviews (Guba & Lincoln, 1994, p.112). This is the way that it is possible to collect the data that serves the purposes of this research.

Moreover, we are convinced that constructivism is the best approach for this investigation, as it is aimed at reconstructing the knowledge that people hold, and the knowledge of reality will be gained through the interpretivism of social constructions such as, meeting people, shared documents, observations, consciousness, tools, discussions, common understandings and other artifacts (Klein & Myers, 1999), while remaining open to new suggestions and new ideas even though if not in the interview guide. As WI is an under researched theme, there is the need to perform a SLR on workplace innovation, to obtain a

systemic view on WI, and based on an exploratory study inductively determine the main determinants and topics/themes addressed that support WI to construct a framework of determinants and their interdependencies, followed by an empirical work to test this framework, building as objective a resulting enhanced framework.

Having determined the paradigm to follow in this research it was now possible to progress to the methodology.

Case Study Justification

In this investigation, after the SLR was performed and a first framework was inductively derived, the creation of a guide to perform an empirical study to validate how workplace innovation is implemented within the companies was necessary. For this reason it was decided to embrace the case study methodology (Yin, 2014).

The choice of the case study method was justified by the need to have an extensive and in-depth description of the WI phenomenon (Yin, 2014). It was expected with the case study method *"to contribute to our knowledge of individual, group, organizational, social, political and related phenomena"* (Yin, 2014, p.4), through this research, in the WI context within the companies. It was necessary to perform interviews, to interpret the interviewees' behaviors and perceptions and observe and understand how they work to have a clear view of the reality of, and to understand the phenomenon of, WI. This was done with a combination of both semi-structured interviews and by interpreting what the interviewees said.

Using case studies makes it possible for the researcher to record observations as well as information to be collected from the multiple participants. Another reason to use case studies is the need to deepen the inquiries to gain an understanding of the WI phenomenon. This is done, by having the researcher close to the phenomenon by performing in-depth semi-structured interviews, in the companies.

The researcher targets the interviewee's insights and behaviors and then tries to understand the complexities and processes of the interviewees and organization, giving them the opportunity to share their views without too much guidance, but having previously clarified the initial research subject. In this way it is expected to collect as many perspectives, as close to reality, as possible, that will lead to an understanding of the WI phenomenon and to the enhancement of the framework. The characteristics of this

investigation suggested the adoption of an exploratory study approach considering the aspects of the contexts and specificities under study, as previously described.

Primary data was used. The data was collected from companies in the specific context of this research. Multiple views derived from the analysis of the data collected would enable the interpretation and description of the reality (Klein & Myers, 1999), by comparing the phenomena observed and reported in each of the companies where the case studies were performed.

WI might be considered a complex social phenomenon, when the objective is to capture a real-world perspective such as studying/prospecting a respondent's daily work, team group behaviors, managerial attitudes, and other aspects that are not easy to quantify. This is one of the reasons why this study uses a qualitative approach.

Justification of the Qualitative and Exploratory Study

It was decided to follow a qualitative method due to the nature of the problem to be explored. A qualitative research is a research strategy with a subjective exploratory character and is usually inductivist, constructivist and interpretivist (Bryman & Bell, 2011).

A qualitative study allows researchers to understand the reality in the companies (Creswell, 2003), exploring an event, activity, or process, concerning an individual in depth rather than to assess a root-cause effect relation deductively. In this investigation we need to have an in-depth understanding of a specific phenomenon, which are the determinants that leverage workplace innovation.

Qualitative research is usually exploratory and is used when it is not known what exactly to expect or how all the issues are defined, it is often based on observations about attitudes, perceptions or intentions (Acaps, 2012). The researcher is involved in the process of data collection (Neumann, 1997). It is expected to be able to observe intangible factors such as cultural aspects. Data collected using qualitative methods is often presented in the form of a case study (Acaps, 2012). It is possible to find a comparison of Qualitative and Quantitative Research according to Acaps (2012, p.12) in Table VI.

Table VI: Qualitative and Quantitative Research

	Qualitative Research Method	Quantitative Research Method
When to use it	• When in-depth understanding of a specific issue is required • To understand behavior, perception and priorities of affected community • To explain information provided through quantitative data • To emphasize a holistic approach (processes and outcomes) • When the assessor only knows roughly in advance what he/she is looking for Recommended during earlier phases of assessments	• To get a broad comprehensive understanding of the situation • To get socio-demographic characteristics of the population • To compare relations and correlations between different issues • When accurate and precise data is required • To produce evidence about the type and size of problems • When the assessor knows clearly in advance what he/she is looking for Recommended during latter phases of assessment
Objectives and main features	• To explore, understand phenomena • Provides in depth understanding of specific issues • Detailed and complete information, contextualization, interpretation and description • Perspectives, opinions and explanations of affected populations toward events, beliefs or practices	• To seek precise measurement, quantify, confirm hypotheses • Provides a general overview • Provides demographic characteristics • Objective and reliable • Apt for generalization • Objectively verifiable • Prediction, causal explanation
Data format	• Data can be observed but not measured • Mainly textual (words, pictures, audio, video), but also categorical	• Data which can be counted or measured. Involves amount, measurement or anything of quantity • Mainly numerical and categorical values
Answers the questions	Answers questions arising during the discussion • How? • Why? • What do I need to look for in more detail? Questions are generally open ended	Answers a controlled sequence of questions with predetermined possible answers • What? • How many? Questions are closed
Perspective	• Looks at the whole context from within • Searches for patterns • Lends itself to community participation. Seeks depth of perspective though ongoing analysis (e.g. Waves of data)	• Looks at specific aspects from the outside
Methods	• Individual interviews • Key informant interviews • Semi-structured interviews • Focus group discussions x Observation	• Quick counting estimates • Sampling surveys • Population movement tracking • Registration • Structured interviews
Sampling	• Non random (purposive)	• Random
Study design and instruments	• Flexible, the assessor is the primary instrument for data collection and analysis	• Fixed, standards control the assessor's bias.
Questionnaire tool types	Checklist with open questions and flexible sequence	Predetermined questionnaire with sequence and structure
Analysis	• Use inductive reasoning • Involves a systematic and iterative process of searching, categorizing and integrating data • Describes the meaning of research findings from the perspective of the research participants • Involves developing generalizations from a limited number of specific observations or experiences • Analysis is descriptive	• Uses deductive methods • Descriptive statistics • Inferential statistic

Source: Acaps (2012, p.12)

Table VI indicates the appropriateness of using a qualitative method in this research as, among other aspects, it requires an in-depth acquaintance of a specific issue, to understand the behavior and the perception of the respondents in order to interpret the WI phenomenon, the data can also be observed but is difficult to measure. The questions in the interview are open, in the sense that they are a motivation or provide a context to allow the interviewee to elaborate on the topic, with a descriptive analysis.

Qualitative research and case study research can be conducted within different research paradigms (Ponelis, 2015). The option, as justified above, is to adopt the constructivism paradigm in this research. Qualitative methods such as case studies may address theory-building (Borch & Arthur, 1995; Ponelis, 2015; Yin, 2014). Case studies call for methodologies contributing to contextual social insights.

Exploratory study provides the flexibility to study areas which are not sufficiently explored, allowing the generation of new ideas and may support the theory building (Ponelis, 2015), That is the objective of the study, such as proposing a new enriched WI framework.

The context for the case studies is based on research conducted in companies with activities in Portugal. The reality concerning WI in the companies, is the object under study in these case studies.

The data is analyzed, after the case studies are performed, based on facts, observations, and inductive reasoning (explained in the next section).

3.2.2 Preparation of Case Studies

This section explains two main aspects concerning how the case studies were prepared, namely the selection of the participating companies and the interview guide.

3.2.2.1 Selection of The Companies

For the purpose of this research, the interviews were to understand the phenomenon of WI, and how it is implemented in the companies. By carrying out more than one case study it was possible to obtain different perspectives and be informed about different forms of implementation.

The purposive sampling technique (Etikan, Musa, & Alkassim, 2016; Guarte & Barrios, 2006) was used, in other words there was a deliberate choice of the participant companies based on the characteristics those companies possess, according to how suitable they were for the purpose of the study.

The Purposive Sampling technique is often used in qualitative research to identify and select the information-rich cases (Etikan et al., 2016). Purposive Sampling (Sharma, 2017) is not without risks as, potentially, it may include research bias, due to selecting companies based only on the researcher's personal judgment. To overcome this, firstly the selection was made by the whole research team and not by only one researcher, secondly, and following the purposive sampling technique, it was decided to examine the selection of the companies from as many angles as possible. This was achieved by using heterogeneous sampling, meaning that, to enrich the outcome of the qualitative study, companies with different technological endowments, years of existence, and sizes were selected.

All the companies selected are innovation-based, this was the main criterion for the selection of the companies, supporting the purpose of this study.

The companies selected, the technological heterogeneity, the context, the age, and the number of the employees are documented in Table VII.

Table VII: Case Study companies

Company	**Alpha**	**Beta**	**Gamma**	**Delta**	**Epsilon**
Technological Endowments	Telecommunications, Financial Services, Public Sector, Mobility, Energy, Utilities.	Power Systems	Telecommunications, Public Sector, Energy, Finance, Industry, Aerospace, Transportation and Defense	Next Generation Driving Machines	Mobility
Context	Service	R&D	Service R&D	R&D	R&D
Founding	1989	2013	1999	Middle 2018	2009
Number of Employees	2.000	25	380	400	200

As may be seen in Table VII, the companies selected cover a high diversity of technological fields such as: Telecommunications, Power systems, Finance, Industry, Aerospace, Transportation and Defense, Next Generation Driving machines and Mobility.

The companies' ages also represent diversity, as they range from starting in 1989 to the middle of 2018. The same applies to the number of employees, which runs from 25 to 2.000 employees.

It was expected that this heterogeneity of companies could enrich the research and the nature of this exploratory study.

Naturally, the reasoning behind using five companies and not two or ten or more, may be put into question. The aim of the researcher was to find a balance between having a reasonable sample of innovative companies, with a much-needed degree of heterogeneity and that these companies be in Portugal and the amount of time it takes to perform a case study. Bearing in mind that the whole project had to be completed within the time frame of a PhD thesis. The results of this thesis work may be a basis for further research with a broader sampling and encompassing an enriched framework as is proposed in chapter 5.

All the companies selected are linked to innovation, they are listed, as being associated to COTEC Portugal – "Associação Empresarial para a Inovação", this is an association of businesses directly connected with innovation. COTEC Portugal ("COTEC PORTUGAL," 2015) is a leading Think and Action network for the diffusion of advanced technology and cooperation for business innovation. Its mission is to promote the competitiveness of companies established in Portugal, through the development and diffusion of a culture and a practice of innovation and the knowledge residing in the country. There are currently one hundred and seventeen companies that are associates of COTEC Portugal which represent 16% of the GDP and 8% of the private employment in Portugal. Details of the companies are provided in chapter 4.

3.2.2.2 Interview Guide

One of the methodological steps in a case study is its design (Yin, 2014, p.191), this means defining the case and establishing a logical connection between the research question and the data to be collected. In this research this connection is established using the support of an interview guide.

The interview guide can be found in Annex III in the annexes. This was elaborated for the preparation of the semi-structured interviews (Srivastava & Thomson, 2009) in the companies. The guide is used to support the researcher during the interviews, it is not meant to be shared with the interviewees. The guide makes it possible for the researcher to introduce the items and then observe, capture and listen to a fluid conversation without interrupting and note any new topics different from his/her previous knowledge, and also to ensure that the direction of the interview is not lost.

The interview guide was prepared based on the WI framework proposed in Figure 1 and addresses all the themes that emerged from the SLR. The 38 topics are represented in the framework, under each determinant, listed in Annex I, in the annexes. All the topics from the proposed framework were listed and numbered and their numbering is included in Annex II in the annexes.

The interview guide (Annex III) has two columns, the first one has, per row, the description of the item under interview, the second one contains the underlying topic numbering (as seen in Annex II).

The interview guide can be found in Annex III. In the next section the grounds that allowed the researcher to elaborate the final version of the interview guide will be explained, as this involved one interview to pilot a preliminary interview guide.

3.2.3 Data Gathering and Analysis

3.2.3.1 Conducting Interviews

It is important to start by explaining how the contacts with the companies were established and the interviews were scheduled, before proceeding with the details of the data gathering.

During the first contact with the companies, either via phone or in person, the research and its objectives were explained. In general, there was a good level of acceptance and interest shown in the research. All the companies contacted agreed to be part of the research, only requesting anonymity. This requirement was imposed by all companies, a non-disclosure agreement (NDA) had to be signed by the research team, meaning that the name of the company, the writing about, or indication of any specificity that would lead to the recognition of the company, could neither be used in the thesis report nor in any of the researchers'

work. The companies also asked if there were other companies involved in the case studies which we confirmed. The number of companies involved was not disclosed.

After establishing the first contact, an email was sent to each company, with a summary of the research, the context of the work to be performed in the companies (empirical work for the thesis) and a request to perform the interviews.

The major difficulty encountered was the scheduling of the interviews. It was difficult for the researcher to settle the scheduling of the interviews, there were often changes in the appointments scheduled due to the interviewees' lack of availability due to unpredictable business events or customer requests.

In 2018, the research team approached one of the companies to run an interview, based on a preliminary interview guide, as a pilot test. In this first field work the researcher explained the context of the research, and triggered by that, the company's CEO talked in a content-rich way about the reality of the company in the context of innovation. The company's head of innovation also participated in the meeting providing complementary information and afterwards a site visit took place.

There was, for the researcher, important knowledge gained from this pilot interview in 2018, one was the confirmation of the value of the semi-structured interviews that is also supported by relevant research (Srivastava & Thomson, 2009), and that this type of interview proved to be efficient, providing a lot of information and covering topics we had targeted as well as others we had not considered before. Another conclusion that was reached was that the preliminary interview guide had too many items and that as they were formulated as questions, this could lead the interviewee to be guided in his/her answers. Moreover, during the interview, the researcher did not wish to interrupt to ask questions and it proved to be difficult to verify if all the items had been covered, as it was a long list. Close to the end of the session the researcher asked the CEO to talk about some items that were not covered, but in the majority they were, as was confirmed later in the data analysis.

The interview guide was reformulated, as it was aimed at uncovering the aspect of innovation within the companies. For each item the questions were replaced by subjects, formulated, as for instance, "tell me how you handle this item in your daily work". This reformulation seemed to be more appropriate to collect the data we needed, because it did not restrict the interviewee to a closed question but instead introduced a topic for conversation, that would allow the interviewer to listen, interpret and observe, avoiding influencing the answers. Also, the interview guide was shortened (without leaving out any

topic) to allow the researcher to verify quickly during the interview whether all the topics on the guide had been covered.

In the following year in 2019 over 20 interviews were conducted in the five companies. The spoken language used was generally Portuguese, but English and in one case German was used as well. The documentation provided was in English and Portuguese.

The interviews were held in each company as scheduled. In the majority of the cases people gave permission to record the interviews, so that the interviewer could concentrate on observing and focus on the interpretation of what was being said and taking notes about it. Additional questions were asked to obtain more details on a subject, or when it was verified that some topics from the interview guide were not covered by the interviewees, but care was taken not to abruptly interrupt the interviewee's line of thought.

The people interviewed were selected according to the level of information they possessed on the topic of interest, their knowledge of the company and experience, but also taking into consideration their willingness to participate and their availability.

The means of access to the interviewees was heterogeneous, it was facilitated either by the head of innovation, by the facility manager, by a board member or by the CEO. The people who selected the interviewees were aware of the research objectives and cooperated to find the appropriate people to speak to. During the visits to the premises, if the researcher wanted to ask to anyone a question, such as a developer or tester, to perform a quick triangulation of information, this was always allowed and no restriction was imposed, besides a reasonable timing. The employees involved had positions ranging from top executives, at the board level, to employees at the development or testing level without any management responsibility.

An overview of the interviews held, including the date they occurred, the interviewees, an estimation of the total amount of time spent on the interviews and the date/year when those were performed are listed in Table VIII.

In Alpha, a large company, the head of Marketing and Brand (a board member) knew in detail all the company's work processes and the ones he did not know he promised to send by email, he indicated two employees from two divisions to be interviewed.

Table VIII: Interviews in each company

Company	Alpha	Beta	Gamma	Delta	Epsilon
Employees Interviewed	• Head of Marketing and Brand (Board member). • 2 Employees from 2 divisions, in service-oriented projects.	• CEO (Board member). • Head of Innovation, Research and Development • 2 Employees from different Agile projects	• CEO (Board member). • Head of Facility Management. • Head of Quality Management (/Innovation). • 2 Employees from different Agile projects.	• CEO (Board member). • Head of Happiness. • Facility Manager. • 2 Employees.	• CEO (board member). • Head of Research and Innovation. • Head of Development. • Product team leader. • 2 Employees.
Number of interview hours	14	17	20	12	20
Start year of the interviews	2019	2019	2019	2019	2018
End year of the interviews	2019	2019	2019	2019	2019

In Beta, a small company, it was possible to interview the Chief Executive Officer (CEO) and the head of Innovation. The head of innovation indicated two developers to be interviewed.

In Gamma there was first an interview with the CEO, afterwards the Facility Manager was interviewed, followed by the Head of Quality Management who indicated two employees to be interviewed and provided from that point on all the missing information by email or Skype. The Quality Manager also performs the role of Head of Innovation/ Innovation Sponsor in the company.

In Delta there was a first interview with the CEO who was very cooperative and afterwards sent a comprehensive email about the innovation implementation in the company. There was an interview with the Head of facility Management that named the Head of Happiness for specific topics related to the employees' benefits and two employees working on the project of a scrum team (the meaning will be explained in chapter 4, in the context of Agile development methodology).

In Epsilon there was a first interview with the CEO and the head of innovation in 2018 where their way of handling innovation was presented and there were interviews in 2019 with: the CEO, the head of Research and Innovation, the head of Development, a Project Leader and an employee working on a Project (using waterfall development methodology, that will

be explained in chapter 4). The 2018 interviews were a support for the preparation of the final interview guide for all the interviews in 2019, as previously stated.

The interview process was a long one, considering that five companies were involved and that there were 38 topics included in the formulation of the 20 items in the interview guide. Moreover, the interviews were not limited to the 38 topics as during the interviews and observations, other new and relevant topics also appeared. The interviews were performed as semi-structured interviews at the company premises. If there were any doubts, follow-up phone calls or video calls were established, to clarify any pending questions or details after the interviews. There was also information received via email.

The researcher adopted an exploratory approach in the interviews with the aim of obtaining an in-depth comprehension of the subject while listening to all the interviewees and the insights provided, in order to inductively derive a better perspective of WI. Further, the interviews were designed to understand how WI is implemented in the companies.

An inductive perspective concerning the WI phenomenon was obtained by comparing the different results.

3.2.3.2 Data Gathering

There is now a description of how the data was registered and processed.

The data gathered is the one usually used in case studies as referred by Yin (2014), and represents the sources of evidence. The data was either: recorded in the interviews and complemented by notes taken by the researcher, the direct observations registered, or emails and documentation received from the companies. The documentation received was in the form of internal communications, annual reports, and other complementary information received after the interviews.

The data analysis was performed according to several steps. Firstly, each case study was described with an exploratory approach stating the relevant aspects observed in each company and how they were dealt with. Secondly, a comparison among companies/cases was performed and organized by topic to highlight the practices in each company to verify similarities and differences. This second analysis provided a full view of all the topics identified while performing the empirical work, including the verification if there were new

topics. Thirdly, efforts were made to understand interdependencies among the topics. All these steps are documented in chapter 4.

After performing this data analysis, a subsequent analysis was performed to evaluate how the initial framework proposed in Figure 1 and based on the evidence identified in the reality of the companies in the empirical work (the case studies), could be enriched.

The objective of the final step, based on all the interpretation of the data, was to propose an enriched framework, where it is possible to see the interdependencies among the determinants. This proposal is presented and discussed in chapter 5.

3.2.3.3 Data Verification: Triangulation and Validation

After the data is collected one activity that needs to be completed is to verify the data (Yin, 2014), often one of the ways is via triangulation methods (Carter, Bryant-Lukosius, Dicenso, Blythe, & Neville, 2014; Thurmond, 2001).

The information related to secondary quantitative data was verified from the reports provided by the companies, meaning the number of employees, the data concerning the foundation of the company and other similar corporative data. This secondary quantitative data is included in chapter 4 in each case study description and was confirmed.

This study is mainly qualitative. The fact that a large amount of data was gathered, originating from different sources: more than one interviewee, emails, documentation, formal yearly reports, supported the triangulation of data and their validation.

Validating the data is a component of all good research (Creswell & Clark, 2017). In qualitative research the focus on the validation relies on determining if what the interviewee reported is accurate compared with what the researcher observed and analyzed. One possible strategy to validate, is to compile the major findings about each company and send it back to key participants in the study (Miles & Huberman, 1994). However, the companies were not prepared to do this validation, the only validation possible was done via phone. This happened when the researcher was not sure about a particular point and so called the company and talked with the interviewee to check if his/her understanding was correct.

Finally, the conclusions reached and derived from the results of the case studies and all the interactions discovered about the phenomenon under study should lead the researcher to

the elaboration of an improved framework, which describes the WI phenomenon better than the previous existing ones, thus building a theory.

3.3 Methodology Overview

This section shows, in the form of a diagram, the steps taken throughout the thesis to present the work and its findings clearly to the reader.

The methodology approach followed during this investigation is represented in the form of a diagram in Figure 2 as described in this chapter. This provides an overview for the reader.

During this research after the theoretical introduction and identification of the gap in knowledge, the research question was formulated, the objective explained and after completion of the SLR about WI, key topics emerged, determinants were inductively derived from them and a Framework Proposal was elaborated.

Then there was a detailed preparation of the subsequent empirical study, meaning the justification of the choices of paradigm, the exploratory qualitative study and the case study approach.

Finally, how the case studies and data analysis were performed is explained, and the path to reach the conclusions which resulted in the inductively derived enriched framework proposed.

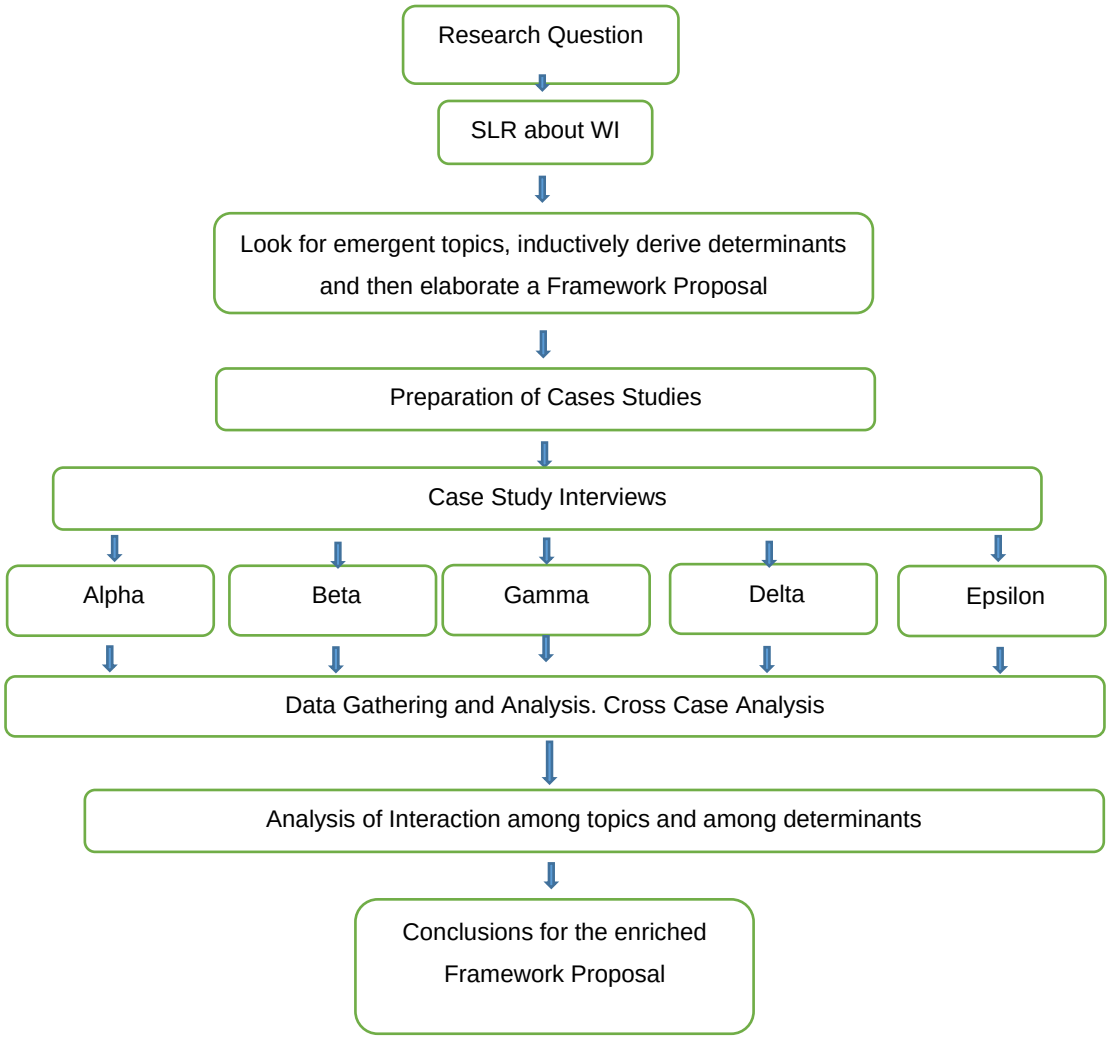

Figure 2: Diagram of the Methodology Overview.

CHAPTER 4 - Results

Chapter 4 - Results

4.1 Introduction

This chapter presents the overall findings of practices implemented in each of the five case studies conducted in the companies, as well as a cross-case studies analysis, organized by topic. The interdependencies among topics derived from the data gathered are represented at the end of the chapter. Each case study was conducted in one company. The companies are named Alpha, Beta, Gamma, Delta and Epsilon, for confidentiality reasons, as the name of the companies cannot be disclosed.

In this chapter the data collected is presented in two steps. In the first step the data content, describing the findings of each company per case study, is organized by the determinants defined in chapter 2. In the second step, a cross-case analysis is performed, aiming at comparing the case studies, deepening the analysis, and the data content is compared at topic level (the topics under each determinant can be found in Annex I in the Annexes).

This chapter describes the findings in each company, through different means, such as notes, information recorded during the interviews, direct observations, documents provided by the companies and public information.

4.2 Findings Per Case Study

4.2.1 Alpha

Alpha is an Information Technologies (IT) Service Provider, established in 1989, with over 2000 employees as of 2019.

The reported sales volume in 2018 was roughly €150 million. The sales volume in Portugal accounts for 46% of that total, the remaining 54% being from international businesses. The European sales volume accounts for 69% of the international business, which is 37% of the total sales volume of this company. The company currently has offices in Angola, Dubai, Mozambique, Portugal, Spain, Turkey, and the United Kingdom.

This company was recognized in 2018, by Euronext, as a European innovative company, due to its engagement and investment in innovation and development and is included in a technology index of the most innovative European companies.

4.2.1.1 Organizational Dynamics

The company organizes its activities into three business divisions and one shared services division supporting the other three. Considering this type of organization, one can claim that Alpha follows a multidivisional competitive type of organizational structure. Each business division receives global business targets at company level, being responsible for optimizing the operating profit in each project, across all business divisions, so that the businesses rely on the development and work of the teams in each business division.

One business division is organized in sub-divisions according to the type of market to address, namely: Telecommunications, Financial Services, Public Sector, Mobility, Energy and Utilities. Another business division is designed to provide outsourcing services to customers. Finally, the third business division provides Venture Capital to support investment strategies in innovative solutions. There are also shared services, for internal support to all business divisions, namely: IT Infrastructures, HR Management, Financial, Legal, Brand Services/ Marketing and Logistics.

The knowledge used in one project, within one business sub-division, is reused by the same team in the following projects, based on a socialization process (Nonaka, Toyama, & Konno, 2000), transferring tacit to tacit knowledge, and this is one of the ways WI is supported, with the strong involvement and participation of the employees' knowledge in all stages of the project, thereby enabling innovation. During the interviews it was mentioned that there is also a sharing of daily practices used among employees, from other business divisions, in an informal and sporadic way conducive to WI, even though it was stated and verified that there is no procedure that supports this knowledge share. This might derive from the lack of procedure, to regulate the usage of Knowledge Management existing mechanisms (which will be discussed later in this chapter), currently hindering an externalization process to occur, as it would be the transformation of tacit to explicit knowledge.

All interviewees stated that innovation in this company emerges from customer needs. Solutions and products are created based on customer needs, using innovative approaches from design up to delivery. The documentation produced in the projects (a source of

inspiration for solutions) is the minimum required by the customer, therefore, the appropriate balance between experienced and newcomer developers, testers or project managers is always needed in a new project, to ensure that the accumulated tacit knowledge is present in the team and will be used in project execution.

There is no innovation sponsor or person dedicated to promoting innovation in the company. In the interview with a board member, he considers that there is an open innovation policy in the company, by using internal mechanisms as well as external co-operations and scientific ecosystems around the company. Internal mechanisms were exemplified with techniques such as Design Thinking (DT), with support from Stanford University, that were used in two situations: when any new employee joined the company, in their induction phase; and for experienced employees with the goal to leverage creativity and push innovation forward, supporting the innovative approach in the customer solutions design. Currently, training in DT is not being conducted due to cost pressure and because the accumulated knowledge of people trained in DT can be reused during training-on-the-job for new employees.

Cooperation and knowledge share at both levels, intra and outside the company, as just described, also confirmed as per previous research (Andersson, 2013; Brown & Dearnaley, 2016; Dokko et al., 2013; Svare, 2016; Totterdill & Exton, 2014c), are paths contributing to WI.

The company has a vision, mission and values, defined by the board, as part of its corporate strategy, promoting the organizational culture of the company, which is formulated and shared to all employees.

The company's statement for its vision and strategic orientation is as the following: *"Be simple and happy through Technology".* The mission statement is: *"to simplify everything which is delivered by the company to their customers",* technology being just an enabler. With this mission statement, the company wants to convey to customers the confidence that the technological knowledge it owns can help them solve their problems, in an easy way that fits their needs.

Examples of values (that follow an inside-out approach) are "*I listen", "I share", "Leadership"*, or *"I connect".* As an example, the value *"I listen"*, aims to convey the message that all employees in the company must be willing to learn, to listen, to see, to let others talk, to recognize everyone's work, to collaborate, to be humble, to have the will to learn and grow and to be proud of it. One of the other values, *"leadership",* is formulated in the

following way: *"Leadership is part of our culture. This makes everyone have a responsibility to develop an ecosystem where everyone can go further. And this is reflected in our behaviors".* The creation of the ambition to "*go further"* has the spirit as explained in an interview by one board member to innovate and be conducive to do so continuously. All values explained above help to shape WI, expressing what is expected from all employees.

The interviewees state they act autonomously and feel empowered to develop customer projects, as they have the mandate to serve the customer in the best way, also getting involved in customer discussions when needed, which contributes to innovation production and to WI. A discussion with a customer is potentially an opportunity to detect a product or service gap and open the possibility to develop a new idea to close that gap, by innovating. Solving a customer need is a source of innovation.

The interviewees mention that their daily work is based on a joint work of employees with different activities to perform, behaving as leaders, empowered and targeting to have the best setup for the project, tailored for that delivery, without any direct interference from board level management. Employees' focus on delivery means handling the project as if it was their own, in their own company, and that is reflected in their own behaviors and pro-active attitudes, contributing to the willingness of always doing the best for their customers and being more innovative in projects, in an environment conducive to WI.

The span of control in the organization, meaning the number of employees per line manager is, on average, between 10 to 15, which indicates that this organization is not very hierarchical. Moreover, even though each employee has a line manager, there is no formal organogram or organization chart in this company. Employees are organized according to project needs, with a dynamic allocation. In each business division there are project teams composed of employees with different roles, such as project managers, account managers, integrators and developers, working in teamwork. Each of the roles has a job description. Those employees work with autonomy, and are accountable for a common goal, to maximize operating profit, within the quality parameters defined for each project (Key Performance Indicators – KPIs). Management considers that each employee must be empowered and accountable to propose and discuss within their teams the best way to fulfill customer requests. Autonomy and employee empowerment are contributors to WI, according to the results from the SLR.

There are situations where either a developer, a tester or a project manager, meaning an employee who is not from the sales team, detects a market business opportunity and

addresses it with the account manager, who has that customer responsibility. In such a situation, then an assessment is performed, both the customer and the solution are discussed, and a decision is reached of whether an offer is going to be sent to the customer. In case a solution is proposed, during the following discussions with the customer, the respective employee is entitled to negotiate the project price, being accountable for the operating profit, as previously mentioned.

During the interviews, the employees involved reinforced the fact that there is good cooperation with their supervisors. To deliver the project, the project organization is based on project-oriented teamwork. Employees are empowered by this type of project organization, acting as influencers, using informal power, as often they are not line managers/supervisors. This is in line with one of the outcomes of the SLR where teamwork is key for team innovation (Wipulanusat et al., 2017) and is especially important in rapidly changing industries, as is the case, thereby supporting WI.

For every new customer request, the information is registered in a Customer Relationship Management (CRM) tool. This is a repository of information and it is also a way to enable information sharing as well as an element of knowledge management (KM). A board member explained that there are several mechanisms to ensure KM throughout the company. These are called “applicational mushrooms”, which are a set of different tools, namely an intranet, a messaging system internally used to allow fast communication and message exchange, a tool to document and store projects, a newsletter and, in some cases, an additional newsletter at business division level. It is a fact that several KM elements exist, and the aforementioned tools can be considered KM related, as a relevant base for innovation and for WI, but it was not possible to identify a procedure describing a KM system or any guidelines for their use, except for CRM. KM was one of the topics identified in the SLR that contributes to WI. In the case of this company, even though there is no well-defined process or set of procedures for KM, there is a base of tools supporting access to information, which is a base for WI. The company also has key performance indicators (KPIs) defined to measure its organizational performance to follow up on business targets, dependent upon the business’s needs, which are not in focus of this research.

4.2.1.2 Human Resources Management

The interviewed board member considers that employee talent is key for technological innovation development. For this reason, several initiatives take place to value people and knowledge. One of the ways to recruit or develop talented people is through university co-operations. This company has connections to universities and scientific ecosystems, establishing strategic co-operations and taking part in joint initiatives. Another possible way to support talent is through training. These two aspects, co-operations with universities (which will be described under the collaboration determinant) and training, are measures that support WI literature.

Employee training is part of their skill development and career planning. Employee training records are kept, facilitating the process to identify training gaps. The HR department is the "owner" of the training process and looks also in specialized HR consultancy companies for ways to optimize learning, avoiding travels and minimizing costs, facilitating bringing knowledge to the workplace. One of the ways is to use open learning academies and select and recommend online courses to the line managers to discuss with the employees which are the most appropriate.

There are investments in training, both on soft skills and technical subjects, and this contributes to increase employee satisfaction, as demonstrated by the results of surveys conducted internally in the company. Training planning is a joint work coordinated between the line manager, the human resources (HR) department and employees. The HR department supports training on soft skills, as for presentation techniques or consulting skills, and training sessions for yearly mandatory courses for all company employees, such as for ethics, quality, or safety. Mandatory courses in a company are courses which all employees must attend; this is usually determined by the company's corporate strategy. The technical training is organized by each business division. Whenever possible, e-learning (or online training) is the ground for daily training at the workplace, which is needed to perform the job.

When the employees are recruited, they go through a period called the induction phase, organized by the HR department, where newcomers learn what the company considers essential for every employee to know, before starting their jobs. One of the factors that was mentioned in the interviews was that the employees are trained, since their initial stage in the company, to behave like a manager and a leader and not as in other companies as a

consultant or a commercial representative. This is aligned with the values promoted in this company, e.g., leadership, as previously discussed.

This company has pay and incentive systems, based on two methods applicable according to the employee's role in the organization, and the performance evaluation method is valid for each employee. One method is based on awarding a premium depending on the employee's performance, without any previous agreement. The other method applicable to a specific group of employees, which have been in the company for some time or with greater responsibility, is defining the salary (fixed part) together with incentivized objectives (variable part). The variable part can make up from 20% to 50% of the yearly salary. It was found that there are no objectives defined related with innovation, instead they are related with financial figures mostly coming from the global company level. The results of an employee's performance evaluation influence his or her pay and incentive values. The employees contribute to it, at least by optimizing the operating profit of the projects and consequently of the company.

There are four evaluation moments throughout the year, every three months each employee receives feedback about their performance. There is a 360-degree evaluation of each employee, in most of the cases. The pay and incentive system and how it is defined, according to the board member's statement in the interview, is conducive to innovation as, even though there are no specific innovation objectives, in order to optimize operating profit it is required to be creative and find innovative approaches, therefore being a relevant topic for WI.

The employees in this company are, as previously mentioned, allocated to a business division addressing a customer, a group of customers or an area of expertise. It is not easy to perform job rotation: "*it is not in our DNA*" was stated in one interview with a board member. One outcome of employee satisfaction evaluations is that a high percentage of employees feel that they are not at risk of losing their job as they have the perception they are needed in the company and this reduces attrition in the company, maintains knowledge, and increases innovation capabilities. The interviewed board member expressed his opinion that the two facts may be related, low job rotation and job stability perception.

Evaluation of employee satisfaction is not done every year. One of the statements given during the interviews was: "*it is not fashionable to work in this company compared with other younger companies or startups*". This was one of the results of a survey performed by the HR department. The company wants to change this situation, looking for ways to better

promote the company and making it look more compelling to work, particularly because they want to retain innovative employees, already working in the company, and they also want to attract and recruit people from the market or newcomers with innovation skills, directly from university. At the time of the interviews, the company was in a rebranding phase, targeting customers and employees, aiming at its attractiveness.

The HR department has different types of mechanisms to support employees, to tailor to the place where they are located, such as an employee care space, via e-mail, phone or skype. There is also a tool under deployment to interface with the employees, for the requests to the HR department, reducing the bureaucracy and the time to answer the employees. The HR department expects that by introducing these measures the employees can better focus on their work and that this may positively impact innovation as well.

There is country culture awareness in the HR department, as the company has offices in several countries. In the interviews, the focus of country culture was set on legal and institutional laws, affecting the offices in each country, as reflected, for instance, in the employees' work contracts. The country culture was also mentioned as relevant in the context of innovation as there are also country policies that promote innovation. An example given was Portugal, with an incentives/ tax reduction program for companies with R&D activities, impacting WI in a positive way.

Most of the employees have the possibility to work remotely (at home, for instance), all employees are entitled to an insurance health system, to the free use of a mobile phone, everyone has a laptop, and work under a flexible time schedule. Some employees are entitled to use a company car or other benefits, but no additional benefit or practice which could be specific to innovation was identified. The interviewees expressed, at the time, that they were aiming to identify more practices to create attractive workplaces. The employees interviewed consider that the HR/Work practices in place could be improved when compared to those of their peers in other companies but that they are a good basis to work with flexibility and autonomy, with fringe benefits that give the interviewees some economical and work-life balance stability, stimulating innovation and, thus, being relevant for WI.

4.2.1.3 Collaboration

There are no events organized internally at company level for best practice sharing. In the company's culture there is a policy to adopt the best existing internal practices, however there is no mechanism to promote it. There is a get together during the year at Christmas time, as a rewarding and celebrating moment. The main communication messages that are spread in the company are related to its vision and mission. The messages are transmitted on posters or through the intranet or newsletters and, as previously explained in the organizational dynamics section, those messages are the company communication messages. There is no internal communication to promote any relevant achievement from project successes or innovations.

The previously mentioned CRM system is a repository for knowledge storage and share related with customer projects' information, and this system contains information relevant to be shared, accessible to employees, contributing to WI.

In the public sector sub-division, lessons learned meetings are performed at the end of the projects, as those employees have the experience to work in virtual teams. These teams had to go through a learning curve to be able to work virtually, and this is an example where this learning is not shared with teams from other divisions, as previously discussed. In the interviews, it was mentioned that the lack of promotion of internal best practices sharing hinders the capability among divisions to share ideas, build upon them, and promote an aggregation of ideas. Setting the practice of having internal marketing initiatives could change this situation and leverage innovation, as expressed by the interviewees.

Alpha collaborates with universities, to recruit talented people, or to undertake joint projects and has agreements, with some universities, to use an agreed number of hours for consultancy, mainly for developing new advanced technologies. The company also supports and gets involved in other collaboration events which are related to innovation, taking place in 2018, namely Web Summit 2018 (entrepreneurship, innovation, and technology), IMSHARE (management and data analysis), and Hackathon (web, mobile and desktop platforms). The participation of employees in these events are twofold sources of innovation by receiving feedback about the work performed in Alpha and getting in touch with new products, new ideas, meeting and networking with people; it is a participation relevant to WI.

Alpha uses co-funding programs (by FEDER), such as Lisboa 2010, COMPETE (QREN) and COMPETE 2020 to invest in scientific and innovation initiatives.

For Alpha, customer needs are the main source of innovation. Customer needs match in the determinant Collaboration under both topics, co-operations and knowledge share. This company has challenges promoting the innovations they achieve in the divisions due to secrecy reasons and binding restrictions in customer contracts. They cannot promote the innovations developed, not even internally in the company. This is a problem for the company as not all innovations achieved can be promoted, hindering the scope of internal marketing activities.

In customer meetings, while discussing requirements, one of the sources of innovation derives from the specifications that the customers want to have in the products they are contracting. In the dialog with customers, other gaps are identified and these lead to ideas for new products and innovation, leveraging WI. Customer and market needs are present in this company, on a daily basis, as each employee is part of the factors that contribute to WI.

At the time of the interviews, the company has a partnership with a Portuguese operator in the telecommunications market to deliver a contract to a customer. This is an example of an external co-operation (with another company) to fit customer needs.

The innovation that the company generates, its knowledge and intellectual property rights are protected, through code components registration (software).

This company is part of the Community of Practice (CoP), COTEC, as previously mentioned in chapter 3, which is a forum where innovative companies meet, organizing workshops to spread achievements and knowledge from its associates, and facilitating partnerships to occur, as well as promoting events and initiatives in the context of innovation, therefore being relevant to WI.

4.2.1.4 IT Infrastructures

Information and Technology (IT) infrastructures play a crucial role in this technological company, which relies on the use of IT to perform daily business and develop and deliver customer solutions. This company provides 24/7 support services to customers. These services are provided remotely to customers, meaning that there are remote connections from the company to the customers supported by an IT infrastructure. The customer defines levels of Quality of Service with the company, the so-called Service Level Agreement (SLA), defining, for instance, response times to solve an error or to operate the network. In case

the IT systems are not available, connection to the customer is lost and it is not possible to perform the services within the contractual times defined in the SLA. In those cases, the customer can apply business penalties to the company. These are costs that reduce the operating profit of the projects and, as such, the incentives of employees are reduced and may impact their engagement and willingness or even ability to innovate.

The daily work of the company is planned under the assumption that the IT systems operate properly. Support from the IT shared services team is available 24/7, suited to the company's work needs. The company has implemented a tool to register employees' trouble ticket requests addressed to the IT team. This team also has a dedicated space to receive people face to face, for example, to bring a notebook for repair. Other mechanisms for IT support and troubleshooting in this infrastructure are a frequently asked questions (FAQ) list, a newsletter to support people with doubts aiming at minimizing requests and reducing the response time, and automated and remote processing of some of the requests, such as an update of a Software version across the company or unlocking a blocked password, through a secure process. The IT infrastructure team promotes news about released software, hardware or IT working environments that are new in the market, which is also a source of knowledge. However, the decision regarding what is to be used in each project is defined by the business divisions, under the governance and guidance of the company's board.

The IT infrastructure team also holds training sessions and customer meetings, when required by the HR department or by the business divisions, as explained by the interviewed board member.

The importance of the IT infrastructure noted and mentioned in the interviews is aligned with the outcome of the WI SLR and the relevance of IT for WI.

4.2.1.5 Other Facilitators

This company has a business division for Venture Capital Investment, in addition to the investments in innovation made in each division. This business division is always scanning and looking for innovation which might bring business possibilities to invest, internally in the company or externally, in the case of a startup or an innovative internal business idea, and this has potential to support WI. This business division has already invested in a startup company which, besides already being a success case, has potential to become a Unicorn,

which is a company valued at, at least, one billion dollars. This startup works in transaction fraud prevention (it is not possible to disclose more information about this startup due to constraints imposed by the company).

Alpha does not have a formal process of change management. This company handles each big change on an individual project basis.

This company is certified with CMMI (Capability Maturity Model Integration) level three. CMMI provides the maturity level of the Software code produced; the index can range from one to five maturity levels. This qualification certifies a particularly good level of practices in developing software. Level three means that the company focuses on achieving both project and organizational performance objectives.

This company also has other certifications, such as ISO 9001 (Quality Management System), ISO 45001 (Occupational Health and Safety Management) or ISO 14001 (Environmental Management System). The maturity knowledge derived from the level achieved in CMMI and the ISO 9001 certification can be suggested to be relevant to WI, due to the documentation and review records produced, as a source of knowledge.

This company uses a Portuguese tax reduction program applicable to companies with innovation, research, and development (Innovation and R&D) activities. In 2014 (most recent year for which there are governmental figures available for this company), with a yearly sales volume of €220 M, investment in innovation and R&D was €6.7 M, which means that approximately 3% of the sales volume was invested in innovation and R&D. This tax reduction program enables the company to reinvest, increasing the level of investment in innovation and supports WI.

The principles underpinning WI were expressed, by the board, to be daily challenges for this company. Two aspects were recognized during the interviews: first, that it is essential that people innovate at the workplace, and second, the innovation potential that resides in each employee. The competition faced by the company is very high, it has to continuously adapt and find new solutions to stay competitive, which is why being innovative is key and doing it with existing resources is also necessary, as the cost pressure from customers is very high.

The interviewed board member considers positive to have support from a WI expert from outside the company to accelerate the implementation of WI, as it contributes to leverage innovation and bring added value to the company, even though, currently, this type of

support is not in place and the interviewed board member does not know whether it is available in the market in Portugal. He is interested in the results of this research, in order to be able to evaluate if some of the results are a gap compared with today's implementation and improve the company innovation capability.

4.2.2 Beta

Beta is an Innovative Solutions Provider for Smart Power Systems, established in 2013, with 25 employees as of 2019.

This company was created as a joint venture between two companies, a Portuguese Power systems company established in 1994, with over 600 employees, and a foreign Scientific research company specialized in Power systems established in 1951, with almost 2000 employees. The foreign Scientific research company belongs to one of the biggest Power companies in the world. Beta was established with the strategic objective to support both parent companies in terms of innovation, research, and development for Smart Power Systems and to be its international innovative branch for those solutions.

The reported sales volume in 2018 was approximately €1.5 million. The sales volume in Portugal accounts for 13%, the remaining 87% being from businesses conducted internationally.

4.2.2.1 Organizational Dynamics

This company has a unique business: solutions for Smart Power Systems.

It has a simple structure organization; it consists of the board and a department comprising the researchers, (developers, testers, and project coordinators) and the head of research and development (R&D) and innovation. In this company, central services such as HR, Finance, Accounting, and IT are performed outside Portugal, by the shared services from the Portuguese parent company, based on a Service Level Agreement (SLA).

Considering these two aspects, meaning, the structure described, and the typical organizational structures, one can claim that this company has a simple organizational structure.

The corporate strategy is defined and documented in an Information Management System (IMS) where all the guidelines for the organization are included. There is an internal communication plan sharing the relevant sections of the IMS to all employees. The Mission, Vision and Values are all defined in the IMS, being influenced by the organizational and country culture of the Portuguese parent companies.

Both parent companies have a strategic goal for this company, which is building an innovative knowledge platform at international level. The outcomes of the projects developed in this company must promote efficient power systems, with specialized customer-oriented services able to undertake collaborative partnerships at international level. This requires the company to continuously look for innovation.

Employees are flexible and perform different tasks in teamwork. For example, one employee can be a project coordinator and a developer for a customer project, and also participate in a work package of a European project (e.g., Horizon 2020 – H2020 project).

Allocation of a developer or a tester to a project means the percentage of daily time allocated to a project; full allocation is 100%. In each project the employee participates either fully or partially allocated to one project. A partial allocation to a project occurs when the task to be performed by the employee in a project does not require 100% allocation of such employee. If the developer or tester is not fully allocated to a project, then s/he can be utilized in another project in the same time frame. This mode of allocation optimizes the use of resources and allows the developer or tester to get an overview of several activities that are running in parallel in the company, allowing the possibility of each employee combining different ideas into new products, generating innovation, thereby contributing to workplace innovation (WI).

In this company, the head of research and development (R&D) and innovation has the role to promote innovation, which is important for WI. The head of R&D and innovation is focused on the long-term market analysis performed by the team and looks also for new methodologies and unconventional approaches, aiming at understanding market trends, those being drivers and sources of innovation, positioning the company ahead of the other companies in this industry. This team's mission is to be the innovation driver of both parent companies, issuing innovative concepts and products, that position the parent companies as leaders in the market.

Each project is initiated by forming a team, with the required skills, to establish concepts or to perform product research and development. The skills of each employee are listed in a

competence matrix maintained by the HR department. Employees work in an autonomous way through the planned deliverables, with supervision from time to time.

The team adopted the Agile development methodology to carry the project forward. The way the Agile development methodology was implemented in this company was explained during the interviews. It consists of an iterative way of developing, using concepts as sprints, daily scrum meetings and a scrum master. In a daily scrum meeting, during a sprint (the time to implement a project's set of functionalities), the scrum master coordinated the meeting and together with the developers and testers discussed what to do on that day, and the work was distributed among all participants. It was explained that this way of working was performed, for instance, for eight days (the sprint) until a project set of functionalities is implemented and tested and available to be delivered to the customer, which is the end of a sprint. After that, a new sprint is initiated, and the process is repeated for a new set of functionalities. It was explained that the Agile process has an advantage over traditional development processes, such as Waterfall, in which all functionalities are implemented first and tested at the end, as the initial errors are propagated until the end, being more difficult to test and debug and not allowing intermedium deliveries to the customer.

The Agile Methodology way of working brings opportunities for WI, as it promotes accountability, employee engagement, possibility for role diversity in different projects, providing a good overview of the product features that have to be implemented (listed in the product backlog), according to priorities, and requiring team co-operation. Product features, which are in the product backlog and are decided not to be implemented in one sprint, can either be implemented in the next sprints, or combined (if they are dropped and are not implemented) by the scrum master/ developer/ tester with their own ideas and lead to other innovations, with an environment that leverages this approach.

When each project is concluded there is a meeting with all partners involved to discuss the strong and the weak points of the projects. This is relevant for WI as it is an occasion where it is confirmed whether all the required features were implemented, or in which new ideas emerged. It is also a good opportunity to reflect and brainstorm about new products or the evolution of existing ones, bringing innovation to the company. This is done in a systematic way; it is part of the process followed in the company and seems to be embedded as part of the culture of the company, as all interviewees mentioned it. A report of results and lessons learned is produced, generating documented knowledge, and this can be used for continuous processes, product improvement and innovative ideas generation.

Another activity undertaken is the review of process indicators. A process indicator can be for instance the number of errors identified in the review of the source code, or how many participants were involved in the code review, as explained during the interviews. This process indicator can be analyzed with another one such as the number of fault reports received in the first three months after customer delivery. By analyzing different process indicators and understanding based on the experience of other projects the obtained results it is possible to verify if the process needs to be adapted to produce better results in the final product. Moreover, when analyzing the faults sometimes they are not really faults they are customer wishes to have the product implemented in a different way, so they are rejected as errors but they are an opportunity for feeding WI in terms of process innovation- as initially presented, or in this latter case to tell the customer to issue a change request to have this new functionality- and innovation ideas.

In this company there are two types of projects, one in collaboration with the parent companies, and the other, such as international research projects which are European funded or funded by National Programs (e.g., European Space Agency – ESA, Horizon 2020 – H2020, Portugal 2020 – PT2020). Each parent company can initiate projects, and the results of the projects are aligned and shared among both parent companies.

The first deliverables from this company were specific for the international parent company, which were projects with research components that brought innovation to the company. There are worldwide challenges expected to come in Power Systems, requiring solutions to be searched, and new communication protocols to be developed.

The first projects researched by this company aimed to address, for these challenges, the first proof of concepts. The test of each proof of concept required the installation of an advanced laboratory. This is an example how a customer need, aligned with market trends, can trigger WI. After project closure, the same team that developed it continued brainstorming about those challenges and was able to reach a more advanced and innovative concept and product that can be reused in several markets. It is worth noting that the installed laboratory is an important mechanism for WI, as it provides the employee the capability to test the proof of concept in early stages, when new ideas or incremental ideas emerge.

Evaluation of employee satisfaction is performed by the Portuguese parent company. The results of the last survey conducted caused some measures to be implemented, namely periodic board communications regarding the company’s strategy, the status of

intermediate company results compared to the plan (financial and performance), and improvements to working conditions and spaces.

Weekly meetings take place with all the company's developers/ testers, the head of R&D and innovation and one board member, with the goal to share the projects' status, check whether there are scientific papers to be submitted or presented, evaluate technical proposals under preparation, to obtain funding from European or Portuguese programs, verify what is the status of scouting (look for opportunities/ calls for co-funding projects in the Power Systems sector) decide what to do if there are pending invitations, and, lastly, who is doing what, and allocating the right people to each initiative. Everybody is welcome to share their own ideas and the goal is to have people doing the work that best fits their wishes, which seems to be an environment supporting innovation at the workplace, as the employees know that they are expected to come every week to the weekly meeting with innovative ideas, eventually to be combined with other ideas and that no one is going to criticize their ideas, but they are going to receive a feedback from other knowledgeable employees about the adequacy of the ideas, as stated in the interviews they feel empowered, autonomous and engaged in their jobs and with the company. The result of this behavior has a positive impact in the company as it generates many opportunities, as described further on.

The idea process management is currently fed mainly through employees' answers to challenges, to collect suggestions, rather than employees' spontaneous proposals. The main challenger of this company is the international parent company. 90% of employees present innovative ideas or proposals to solve challenges, in parallel with their daily work, providing an indication that WI is present in this company.

The international parent company is in an emerging market where there are big challenges in the Power sector and where the potential for this new company to innovate and develop technological knowledge is huge. This allows Beta to study and explore areas well ahead of the current state of the art, as they have to research and develop new software communication and transmission protocols to be used, as explained in the interviews, probably only in the next five years, setting this way the pace of the technology and being ahead of the concurrence with a huge potential for innovation. This external market factor is an important driver to innovate at the workplace.

Employee training has two components; one is mainly organized by the Portuguese parent company, namely on soft skills or communication, and another specific, for instance, regarding laboratory tools, or more technical issues, which is organized by the company.

4.2.2.2 Human Resources Management

The salary is composed of two parts, one which is fixed, and another which is variable, indexed to incentivized objectives. Objectives are individual and related to each person's contribution to the company and to specific objectives associated with the projects. Career promotion or development depends on the level of achievement of objectives. There are individual objectives indexed to innovation goals. As explained by the head of R&D and Innovation, the fact that employees have objectives linked to innovation, that are not directly linked to their daily work, supports the level of innovation in the company, and the achievement of results of innovation objectives at the end of year means that employees are innovating at their workplaces.

The team works in a multicultural environment, with people from different parts of the world, bringing different cultural perspectives, different ways of thinking and areas with different technological knowledge backgrounds. This is especially relevant for putting together multidisciplinary skills, relevant for generating ideas and producing innovation, particularly in weekly meeting discussions attended by the entire team or in informal daily talks.

There is a competence matrix, which means that it is possible to know each employees' expertise, and, in general, the existing competences in the company. This is also a basis to identify individual knowledge gaps during training planning. Training is then held according to the two components previously mentioned. This is the base for the Competence/ skill development planning. The type of training, either on-site or online, has to do with the specificities of the training required. In this company, online or web-based training is preferred. This training at the workplace is promoted by the head of R&D and innovation as a fast way to gain the knowledge particularly needed for a project and also for idea generation, improving innovation capabilities.

Once a year there is a team off-site event, attended by all employees, consisting of two parts: one which is didactic, such as a talk about a relevant subject, and another which is recreational to contribute to the wellbeing of employees and networking, as a team building activity.

4.2.2.3 Collaboration

According to the company's corporate strategy to have a Global R&D Network, this company being the "technology arm" of the international business, collaborative partnerships are celebrated with international R&D institutions to develop a global technology network. This strategy is defined to explore the company's existing network in Europe, Brazil, Angola, Mozambique, and China.

The type of existing collaborations is either as associated members (sector associations), via collaboration protocols (e.g., with universities), via participation in international projects, or triggered by a subject (e.g., with an international R&D institution).

In 2018 this company invested in networking, with a set of interfaces with other innovative companies, looking for funding opportunities, through direct invitations to join national and international contacts, resulting in 13 Applications submitted to European and National funding programs. 8 Papers were presented in renowned conferences held abroad on the power sector. 32 Opportunities for new projects were received because of the internal scouting work and a few external invitations. There was a 100% success rate in applications submitted to the Portuguese tax incentive program for R&D activities. Patents' results will be described later in this document.

The accumulated knowledge derived from these international projects, the papers, attendance in conferences, and the network created are a source of information to be used in other innovative projects in the company conducive to an increase in the capability to innovate at the workplace.

All the works and initiatives described had to support the innovation characteristics in the applications, therefore their acceptance gives an indication of the respective innovative feature. This suggests that some of the requirements conducive to WI are in place in this company. This seems to be confirmed by the fact that 90% of employees have presented innovative ideas spontaneously or as responses to challenges.

The company has partners according to the areas where they define it is important to gain complementary knowledge. On a yearly basis, the company assesses whether the companies with which they have partnerships are providing the expected results according to the assumptions and objectives internally defined; in terms of IDI certification, this is

called Interface Management. The main assumptions and objectives as explained by the head of R&D and innovation are to overcome knowledge gaps and increase innovation.

This company has several initiatives, such as registering intellectual property rights as a base for further developments and innovations, with three patent applications (two international and one national) ongoing as of 2019, ensuring knowledge sharing in papers by presenting results of their work in conferences, performing an active scouting for opportunities for new projects (in 2018 it received 32 opportunities for new projects); the goal of all these activities is to increase the level of innovation in the company, aligned with the aim of WI. In 2018, the company also attended 27 conferences/ events in the sector. All these activities illustrate an active involvement of this company to achieve innovation.

This company's involvement, mainly with international partners in national and international initiatives, as described above, also builds networks and knowledge.

Additional knowledge share activities and internal marketing are carried out to share the projects' results using several channels, both externally, via conferences, and internally, via events called "innovation hours" where, in addition to the company's employees, the Portuguese parent company is invited to take part in these events, contributing by providing feedback. There is participation in working groups and the publication of papers and articles is encouraged. The company also provides access to scientific magazines and technical books. All these actions are relevant for WI. This company was recognized as a credible scientific entity by the Portuguese Government.

This company is also part of different communities of practice, namely, the Community of Practice (CoP) COTEC, mentioned previously in the chapter 3, a CoP to define standards in the Power sector, and in other CoPs of working/study groups in several countries in the Power sector. Many of the subjects under discussion in those CoPs require new protocols and innovative products to be developed, especially considering these are workgroups defining new industry standards.

Participation in these CoPs brings knowledge to the company from two perspectives. In an outside-in perspective, employees participate in the CoP, listen, and internalize other companies' employee knowledge; in an inside-out perspective, the company is interested to have a product with standards aligned with its own products in the market, so they argue to the other CoP members that the best solution for the industry is to follow their proposed standard. In both perspectives employees always face discussions and from there new ideas able to feed their capability to innovate at the workplace derive, increasing their

knowledge. This is a company opportunity to increase innovation ability and WI, through employee participation.

As for collaboration, priority is given to reinforce the company's networking with other entities to identify new types of partnerships and co-operations, such as joint R&D Programs, external working groups and advisory committees with the goal of standardization ahead of current technologies, generating effective innovation and setting technology trends and industry guidelines/standards.

4.2.2.4 IT Infrastructures

Usage of IT infrastructures by developers and testers, in development and testing of power systems, is part of the way of achieving efficiency in the company. Tools based on IT environments enable employees to use the current work environments, and to remotely access work, laboratories, and collaborative activities. IT infrastructures are a critical resource to enable the business for the company.

This company has laboratory facilities equipped with testing tools, allowing a joint simulation of power systems and communication networks. This enables both product testing in the laboratory and remote access at the workplace. This is achieved using IT tools and IT infrastructures. There is value added in the test validation of an innovative idea, by testing it in conditions close to those either expected to exist in the future and hard to test otherwise, as those environments and actual related field equipment do not exist yet, or, if existing, would be difficult to be available for use, or even unpracticable to use due to its size, weight and cost. Tests performed via remote access to the simulated equipment is an important added value to be generated at the workplace, as early availability of digital solutions in power systems creates the opportunity for an early introduction of innovative solutions aligned with market trends.

4.2.2.5 Other Facilitators

Best practices leading to innovation have been implemented, which were achieved mainly through implementation of the Portuguese Standard NP 4457 (CT 169 - Atividades de Investigação Desenvolvimento e Inovação (IDI), 2007).

As explained in the interview, implementing the standard NP 4457 means that a team was formed to document procedures, merging business needs with the standard principles applicable during product development. Afterwards the procedures were defined as the rules to be followed in daily work. The developers and testers interviewed confirmed the use of the procedures defined.

Besides implementing the standard NP 4457, the company has also successfully submitted to the associated certification process (since 2015), innovation, research, and development (IDI). This standard is used as the base for the quality management system of the company.

Innovation goals are set each year, related to the standard's implementation, and defined procedures, which means that the requirement to innovate is continuous throughout the year. This causes the company to have the correct setup to be able to have workplaces suitable for innovation, which is a driver for WI. This company is also certified according to the standards ISO 18001 and ISO 9000. These certifications are not directly linked with innovation but indicate, as for ISO 18001, that the company has concerns with employee health and safety and these are relevant factors contributing to the employees' engagement to the company, a topic also identified as relevant in the WI SLR.

The IDI certification, which means the innovation, research and development certification, and related defined procedures adequate to this company, namely the need to have yearly innovation objectives, requires that the company has established the appropriate mechanisms to achieve those objectives. As previously discussed, those mechanisms are in place in different angles of the organization, from the ones related to the pay and incentive system, where part of the salary is variable and is indexed to the achievement of innovation goals, to weekly meetings attended by all employees together with the board in which all new ideas are discussed, taking the company's focus on innovation seriously, just to name two of the examples already described.

This company uses a tax reduction program applicable to companies with innovation, research and development activities, boosting the financial capability of the companies to reinvest in innovation, leveraging WI. The projects submitted to the Portuguese Tax Incentive program for innovation and R&D activities had a 100% success rate in the years submitted, which brings credibility to the innovation characteristics of the activities performed in this company.

The head of R&D and Innovation explained that, as the company was recently founded, the changes in the company are not significant so far, so even though a change management process is planned to be defined, it did not emerge as a priority.

The interviewed head of R&D considers positive to have support from a WI expert to accelerate the implementation of WI and was very eager to understand the results of this research and receive feedback if some could be used to perform an improvement in Beta that can contribute to leverage innovation.

4.2.3 Gamma

Gamma provides solutions, services, and technologies for safety, and business critical IT systems. It was established in 1998, with approximately 380 employees as of 2018. The reported sales volume in 2018 was roughly €45 million. The sales volume in Portugal accounts for 20% of the total, the remaining 80% being from international sales. The company supports customers across diverse markets including telecom, public sector, energy, finance, industry, aerospace, transportation, and defense and currently has offices in Germany, Portugal, United Kingdom and United States of America.

4.2.3.1 Organizational Dynamics

The company organizes its business activity according to the following areas: Financial, Partnerships and Alliances, Technology office, Marketing & Communications, Operations, HR Management and Quality. The company has three business divisions and one shared services division supporting the other three.

Considering the above information, it can be argued that Gamma follows a Multidivisional (M-Form) Cooperative type of organizational structure, as R&D, testing (Operations) and the remaining shared services supporting three business divisions are centralized.

The quality department in this company is focused on the customer as it is pursuing continuous improvement and innovation, stimulating an innovation environment at the workplace, providing an explicit support to WI, as it will be described further on in this section. In the company there is a common quality policy and objectives ensuring the delivery of high-quality projects and services as per the company’s corporate strategy and

board guidance. The quality management system and the information security management system are documented and available in the company. Their respective documents and practices are defined to meet strategic and tactical business objectives to ensure knowledge management, innovative culture, and internal creativity in the company.

Every customer complaint is an opportunity to innovate. The quality department has a Quality Management System (QMS) implemented, acting as the main source for the knowledge management system; it is important that these systems have the relevant information available as a foundation to innovate at the workplace. All the documentation is kept, stored, and channeled to the tools defined and maintained by this department.

It is ensured that learnings from previous projects are preserved, allowing newcomers to use this knowledge supporting WI, and that no critical knowledge of the company is lost. The Quality Management Department conducts surveys with customers and when a low score is obtained, a causal analysis is performed, then measures are determined as a result. Some of the measures are related to WI, such as channeling the need for process or product improvement through incremental or disruptive innovation, to use lessons learned for the project or for the organization and to initiate corrective operational measures. Those operative measures can be established through management decisions to correct some practices (people, process and/or tool changes).

There is a process of continuous improvement to ensure that the tracking of ideas to be implemented is kept in a backlog and not lost, and that its execution is under periodic priority evaluation, until solved. The innovation requests go through an innovation backlog and the priority is discussed at Executive Committee level, demonstrating the relevance of innovation in the company and the support given by the board.

There are Key Performance Indicators (KPIs) defined by the Quality department and stored in the QMS. They are defined at Strategic, Departmental, Project and Process levels, and are followed up using a balanced scorecard tool. Every project has a dashboard, which is assessed and discussed in project meetings at least once a month. These dashboards are reported to the board of the company as input for supporting its decisions and are accessible to all employees. This is relevant for the engagement of employees to the company and to their motivation to innovate at the workplace, conducive to WI.

There is an internal initiative also supporting WI focused on innovation, which is a space close to the site where most of the employees are located. Employees know that if they go to that space, most likely they will meet other people willing to discuss ideas and to look for

complementary ideas, from which products might derive. This is fully supported by the board and is part of the company's corporate strategy. There are employees with time allocated to this type of activity to ensure that it is a live system and that the support needed is provided. This space, the innovation lab, can also be accessed virtually, via a tool accessible by employees to submit their innovative ideas, either to solve a challenge or share a new idea with business potential.

This type of initiative is an incentive and support for WI. This methodology has been in place in the company for three years. Ideas do not necessarily have to be sparked by problems from existing customers and can either be spontaneous or the result of a challenge issued by the company (open call).

There are employees in operations that also support innovation. For instance, in the delivery department, there is an Innovation and Knowledge (I&K) area that has been established to empower workers to seek innovation and to acquire and disseminate internal knowledge. This area also controls and leverages the results of R&D funded projects, for example through the Portugal 2020, QREN (Quadro de Referência Estratégica Nacional) or Artemis JU programs.

Mission, Vision and Principles are defined and promoted internally in the organization as part of the corporate strategy. There is a careful approach to communication of the company's strategy, with the purpose of all employees getting the same messages, and so even the look and feel of the workplaces and posters must be alike. One of the values explicitly promoted in this company is to achieve innovation.

For each project, internally, the appropriate people are selected according to the skills needed. Employees work in an autonomous way, oriented towards projects in teamwork. In most projects, Agile is the development methodology adopted. In this company the Agile process is used in a similar way as in Beta, as previously described; scrum master, developers and testers meet, every day, and, based on a list of activities to be performed, decide in teamwork each employee's daily assignment for each sprint. This means that the employees are empowered to select their work and can focus and develop their expertise according to their subject of interest. This way of working brings opportunities for WI, as it potentially leverages a proactive, critical and innovative mindset. As previously mentioned, in Agile methodology there are scrum teams, scrum masters and sprints, as basic mechanisms of teamwork.

This company is certified with CMMI maturity level 5 (meaning: optimizing category), the highest ranking possible in Software development maturity, indicating a culture of continuous improvement, providing a platform for agility and innovation, suitable to pivot and respond to opportunity and change. This is a way of reinforcing support of innovation generation at the workplace, as it requires procedures in the company to ensure that continuous process improvement is achieved, conducive to this level of maturity.

When the project ends there is a meeting with all involved participants to discuss the project's strong and weak points. This is relevant for WI as it is an occasion where the team checks whether all the required features were implemented or what new ideas were left out. It is a good opportunity to reflect and brainstorm about new processes, products, or the evolution of existing ones, increasing the company's innovation. A report of results and lessons learned is produced, generating knowledge, and is kept and entered in the QMS backlog.

The skills of each employee are listed in a competence matrix maintained by the HR department. It is important to have this information registered as a base for project planning and for identifying missing competences of employees, aiming at employee's further development. Skill development occurs via regular training or training on the job.

There are three types of regular training: onboarding for newcomers who join the company (this type of training usually takes place twice a month), technical training specific to the work to be done and a third type of training common to all employees. There is a department specifically dedicated to training. Employees can apply for the training on their own initiative and can also have a volume of external training, agreed with their manager, combining soft and technical skills.

Innovation starts from the application of knowledge and in order to build it, in addition to carrying out projects, acquiring new knowledge is also needed; training plays an important role to attain innovation. The company understood this rationale and created an internal academy to support employees faster. Innovation and market awareness are relevant in the technologically advanced markets where this company operates, and this is one of the main reasons why creating an environment where people are motivated on a daily basis to innovate is relevant, setting the basis for WI.

4.2.3.2 Human Resources Management

Employees' salary is composed of two parts, one which is fixed and another which is variable, indexed to incentivized objectives. The incentivized objectives can be global, related to the financial performance of the company, and individual, related to the employees' work. Global objectives are related to the company. Employees' individual objectives are pre-agreed between manager and employees. Both global and individual objectives increase the employee's engagement to the company leading to innovative work practices, which is at the heart of the concept and models of WI described in chapter 2.

Employees' career path depends on the achievement of their individual objectives. Promotion depends on matching the employee's overall progress with the opening of new career opportunities. To fully embrace those career opportunities, employees have a wide variety of training programs providing a brand-new set of skills and competence development.

Every three months a facilitator evaluates the performance and skills of employees (which are recorded in a matrix). This evaluation is aligned with the speed of market changes and intends to pro-actively accelerate the readiness of the company (through employees' knowledge) to market needs. After these evaluations are performed, measures might be defined, if appropriate, such as new training sessions.

Some of this company's work practices are benefits for employees, such as ensuring that employees feel well at the workplace, innovation being at the heart of the company. There is the possibility to work remotely, fruit is offered during the day and, in some affiliates, complimentary small free snacks are also offered throughout the day. Employees are also welcomed to organize workshops, by their own initiative. This is a way to empower and engage employees with the company, which promotes WI, as argued in chapter 2.

In this company one of the beliefs is that investing in people, through appropriate people management, brings positive results in terms of innovation. To achieve this the company investigated global best practices and decided to follow one of the best practices identified, the *"Investors in People (IIP)"* standard. The company now has a silver level accreditation given by "Investors in People", recognizing the company's work environment and positive culture. Investors in People (IIP) is a standard for people management, offering accreditation to organizations that adhere to the Investors in People Standard. IIP accreditation is based on three main elements (Improving, Supporting and Leading), producing a plan of action in nine fields. For example, in the case of this company, the

induction process was part of the plan, so when an employee joins the company, s/he must go through an induction phase and receive a welcome kit. Another component of the plan is the company's Balanced Scorecard, that is well-prepared and shared with all employees. On the second day after joining the company, a survey is sent to the newcomers to receive first feedback. This way the company can assess whether it is conducting induction in an adequate way.

HR Management follows up the number of employees leaving the company to understand the potential knowledge lost as well as the cost to retrain new employees; when a critical trend occurs, an analysis of which measures should be established to stop this movement is done and implemented.

There is an organizational culture in the sense that employees feel part of a community, have a purpose in the company and are more than engineers involved in a project. In terms of innovation and the use of Internet of Things (IoT), there was a trial in one location initiated by the Facility Management team, testing the occupation of the kitchen through sensors. The objective was to improve the kitchen's layout and space so that people could feel better when eating or could use the space for discussing new ideas, in a nice environment, when the space is not needed for meals.

These are measures to promote the wellbeing of employees, with the purpose of increasing their engagement and willingness to innovate and perform well.

4.2.3.3 Collaboration

The company collaborates with several universities, enterprises and social institutes. For instance, there is an innovation laboratory in one of the universities. This allows innovation to occur with collaboration of employees, while also being open to students or to other people (teachers, researchers, …), taking WI beyond the company's walls. The company's premises in one town are also located in one partner university in the same town. It is important for WI to have a close contact with universities as a channel feeding scientific and emerging knowledge.

Patents and the code registration are ways to protect intellectual property in case it is absolutely required, as the company does not have a goal to produce them.

The existing collaborations are either as associated members (sector associations), or via partnerships with companies for a specific purpose, for example, during a given period to execute a contract or collaboration protocols (e.g., with universities), or with entities from the national R&D and Scientific and Technological system or via participation in international or national projects. Collaboration can even be triggered by a subject, where specific knowledge needs to be acquired.

Collaborations may involve participation of the partners in the design, development, and testing of this company's products in a joint work with its employees, thereby enlarging internal scientific and technological competencies. One of the main objectives of collaborations is to create an innovation engine continuously transferring know-how and technology knowledge from experienced external technological entities to the company, creating conditions for employees to work in innovative environments producing highly innovative technologies.

Collaboration activities in the test area are supported by the lab equipment that is owned by this company and is used by partner companies to perform their tests and certifications of standards for some countries. This exchange of people participating in joint projects and testing with partners is also a source of knowledge which might be a positive influence for producing innovation at the workplace.

This company also participates in international research projects funded by European or National Programs (e.g., ESA, H2020, PT2020, QREN or Artemis JU). Usually participation involves several partners, brings new knowledge and networking with new partners, which are useful either for other international projects or bilateral partnerships even after the project is finished. This is a source of innovation and has a direct link to the ability to innovate at the workplace.

This company is also part of the Community of Practice (CoP), COTEC, as previously mentioned in the chapter 3.

4.2.3.4 IT Infrastructures

The use of IT infrastructures, such as networks, communications, and tools in software development, has been identified to be key in the company by all interviewed staff. As mentioned in the interview by the head of Quality, the quality department is responsible to support the Executive Committee by ensuring the quality of service and product, as well as

customer satisfaction, with efficient and effective management systems, and the only way to achieve this is using reliable IT systems and IT-based environments.

All systems, where the KPIs, backlogs and dashboards are stored and which form the base for the business and for innovation and WI, are IT-based, this being critical for the daily work of the company. This company has also laboratory equipment depending on the test object. All laboratory equipment relies on the proper functioning of IT.

There is an internal tool to support several bureaucratic activities to reduce the time wasted by employees so that they can focus on their core activities.

4.2.3.5 Other Facilitators

Gamma has a basic principle that employees should work where they feel better. When a new affiliate is created, employees are invited to choose if they prefer to work where they are located or if they want to join the new affiliate, preventing barriers to be created for a blind reallocation of employees. Usually there are volunteers who move to the new affiliates and this facilitates the process. The goal is to have employees in a WI environment, and them feeling engaged with the company is part of it.
There is no formal change management process defined. When a change is to be made, it is prepared in advance, creating a project, with all roadblocks identified and measures how to overcome them. Although there is no well-structured process defined, there are change management activities.
The interviewed head of Quality Management considers positive to have support to accelerate the implementation of WI and asked for the results of this research (whenever possible) to evaluate an improvement in Gamma that can contribute to leverage innovation.

4.2.4 Delta

Delta is a Digital Services Provider of Software Systems for future driving machines, established in 2018, with over 400 employees in mid-2019.

This company is a joint venture with two shareholders, owned at 51% by an international company established in 1916, with over 130000 employees (in mid-2019) and 49% by a national company established in 1998 with over 800 employees (in mid-2019).

Due to its recent establishment, there are no sales figures available at the time the case study was performed, as the company is in the investment stage. Product research and development are the main activities conducted.

4.2.4.1 Organizational Dynamics

The company organizes its business activity in a unique business, being a Digital Services Provider of Software Systems for future driving machines.

Central services, such as HR, Finance, Accounting, Facilities Management, and IT are not part of Delta, these are subcontracted to the shared services from the Portuguese parent company.

The type of organization found suggests a simple type organization. Development of products relies on teamwork. The teams are autonomous, and their focus is to achieve high levels of efficiency developing innovative products. The fact that the teams are autonomous means that each team is accountable for its results, bringing more responsibility and engagement to the teams.

Each project is assigned to the team members by choosing employees with the right skill sets, aiming to achieve new innovative products. The daily work is done based on a regular scrum team methodology, following the Agile development methodology way of working. During the interviews the researcher observed how the Agile methodology was used. The researcher concluded that Delta applies the Agile methodology in a similar way of Beta. The principle underpinning the high level of autonomy given and the inexistence of hierarchy in teams is that, as stated by one of the members of the board *“having brilliant people and not making them work in a structured way gives them the freedom they need to achieve their goals”*.

The company wants employees to focus on talent, passion, and imagination, in an Agile development methodology context where trust, ideas and collaboration are company bedrocks. By achieving those bedrocks, the company expects that the correct practices are established and conducive to workplace innovation.

It was found that people who are more experienced tend to appreciate the work of the younger employees, instead of criticizing it, which reinforces the willingness to increase WI as even if an employee fails, the culture is to accept it and understand that only after failure

is it possible to succeed. There is an organizational culture of autonomy and reinforcement of employees' strong points rather than pointing out the weak spots, which in the company is called the *"appreciation concept".*

There are job roles defined and described in the company. Employees are assigned to a job role and can choose their job titles. Even though there is a job role description, employees are encouraged to shape their job roles. The names of the job roles are creative and act as drivers with the purpose of employees being engaged and innovative at the workplace. Examples of these are, "*Scrum Knight, Rockstar Developer, UX Design Guru, Head of Interactions, Director of Happiness, Quality Guardian, or Lord of the Ledgers"*. Defining job roles and their names fit in this company for a bigger purpose, which is to have employees feeling that they are working in a different and special place where innovation is key. These job role titles are unusual in Industry, and in this company, this is intended to cause a mindset change, stimulate creativity, bring disruption, being employees empowered to feel and behave differently, exploring, inventing and contributing to the company to succeed with innovation, in a WI environment context.

Communication in the company is established in various channels such as intranet, open platforms as Skype, and via modern channels as some social networks e.g., Instagram or Yammer. The company aims at achieving knowledge sharing. However, this is not fully the case as this company was very recently established. The company promotes, as part of its corporate strategy, that networking is an important asset.

Creativity workshops take place via "meet-up" initiatives once a month, leveraging WI. The level of creativity in each employee varies, for some it is intrinsic, and others need to be stimulated and trained.

Training of employees consists of multidimensional daily training. It can be formal training programs, learning by networking with other people in the office, or by interacting with interest groups or forums, and online training using tools as Pluralsight (a technological workforce training skills platform), Udacity or Safari Books. Most of the training is performed online at the workplace, and is appropriate either to work requirement needs or, in a context of WI, when an employee has an idea and needs to access a resource, namely, to deepen the knowledge in an area or to understand the competition. There is a culture to continuously learn, to do so employees either start by networking to acquire knowledge or go to the internet and, using reliable sources, look for some material or courses to learn the lacking expertise to continue their ideas or project developments.

4.2.4.2 HR Management

The company is very recent and still in a growth stage. One of its concerns is to intensively recruit people and the existing employees are involved in this task, doing what the company calls *"team driven interview",* this means that a first interview is conducted as a screening method by technical experts and not by recruitment experts. This supports the autonomy, empowerment and engagement with the company aimed to be achieved by its employees, becoming involved in the building of the company.

When preparing the case study of this company it was possible to note that it is being shaped from the start in several WI oriented aspects, having for instance the criteria to recruit people that fit the required technical skills and have innovation capabilities as well. There is guidance for which development methodologies are going to be used and the appropriate mindset and related capabilities and skills are required to fit in that way of working.

In Delta the new projects are launched mostly based on new recruitment that is performed upon the specified required skills and there is no need to readapt and retrain employees existing before working with older technologies. This optimizes employees' elapsed time to be productive, learn system functionalities and leverages their ability to innovate faster at the workplace based on potential new features the system could include.

There is a robust performance evaluation method. Nowadays the majority of employees are evaluated by the scrum masters (one of the roles of the Agile development process, as previously described). There is an HR consultant company that is working on defining a performance evaluation system considering other elements relevant to the company.

Workplaces are set in U-shaped open spaces to facilitate the dialog and networking among employees, and there are no doors or glass boxes. In a reserved room with the appropriate equipment, a kitchen, there is always a "MasterChef" ready to make soup, finger food and cakes. When visiting and talking to employees in the open spaces, all these visible facts seem to contribute to their wellbeing and motivation. The interviewees also expressed the appreciation of these benefits offered by the company.

Employees work engaged in an autonomous way and the information from the interviewees suggests that the level of work produced was innovative, so the aforementioned conditions

seem to contribute to WI. This was one of the reasons why the international parent company wants to invest in having more people in Portugal and growing more in this company.

4.2.4.3 Collaboration

There are network events bringing new and mature employees together. Mature employees mean those transferred to Delta mostly from the parent companies, these employees can combine ideas from their past projects with the ones derived from the new area of work and exchange ideas with new employees that bring new perspectives on subjects. A form of collaboration that can generate innovation at the workplace is discussing the work performed and potential evolutions that could be included in it. Internally, co-operation among employees is visible during the interactions in scrum meetings.

Every employee in a team has a common objective, but they are in continuous contact and networking, as the company mandate is autonomy with teamwork and always working together.

There is a specific system application in the desktop (visible in the laptop) that supports innovation called *"Joy in Motion"*, that triggers actions forcing networking to occur among teams. The teams must follow the instructions provided by the system, doing some actions during the day driving innovation; this could be *"go to your colleague X and tell him or her how you would solve problem Y, you have 15 min to think about a solution before you go".*

There are All-hands meetings with all employees to communicate common information about the company. Occasionally there are guests invited from the national and/or international parent company in these meetings that bring a broader view about the company and it was reported that, overall, developers, testers, scrum masters, and all other existing roles consider this to be a positive factor and have the sense that their job is not endangered by any type of intention of disinvestment from the parent companies.

The international parent company also acts as partner and is a source of innovation and input channel provider for market trends for product development. There are also a few people from the international parent company reallocated to Portugal to establish a knowledge and contact bridge between Delta and the international parent company. Reallocated employees are very well integrated in the company and well accepted by the national people, following interviews, due to the openness to the way of working and to the drive and mandate they bring to produce innovation.

4.2.4.4 IT Infrastructures

This company considers technology to be one of the most relevant aspects of the working environment. Besides working with Software and computers specifically appropriate for Software development, the work produced is also stored in cloud systems. In other words, this means that the tools and development environments are all IT-based. There is no working environment in this company without the usage of IT, as it brings efficiency and allows resources, like people, to be available for other activities such as innovation at the workplace.

Technology and IT are considered to be critical at the workplace in this company, as it is part of the basic environment and prerequisites to be able to work, aligned with what it is referenced in the SLR for WI (in chapter 2).

Knowledge stored in repositories is accessible only when IT media are available. Another possibility to acquire knowledge when an employee must develop something, if s/he does not have such knowledge, is by attending a tutorial session on the internet, becoming able to fill that knowledge gap and overcoming difficulties.

This company has test simulation facilities, as appropriate, to test the Next Generation of Software Systems for future driving machines. The test simulation facilities are like a test laboratory, not the real environment. This is an environment that can leverage ideas and trigger more ideas at the workplace for the potential usage of innovation in an almost real environment.

4.2.4.5 Other Facilitators

Management wants to make a difference in this company, by having the purpose to inspire people to work with an innovative mindset, focused on the future way of living and working, in an approach motivating WI. It is relevant to see that employees start having that attitude and pass on that message to newcomers, as one of the criteria why they are working and like to work in the company. The test simulation tools used by the teams are also future-driven, for example, there is a test simulator of a car of the future that is in the middle of the room where people sit.

The company has been recently established, so there was no need to perform changes and no change management process is defined.

The CEO is convinced that the correct mechanisms to drive innovation are established but is interested in the results of this research (whenever possible) to evaluate an improvement in WI in Delta.

4.2.5 Epsilon

Epsilon is a Technological Solutions Provider of Mobility Services established in 2009, with over 200 employees in 2019.

This company is the spinoff of a technological innovation division of a company established in 1972 (which will be referred to as the parent company throughout the text) owned at over 50% by a large enterprise conglomerate existing in Portugal for over 100 years. Epsilon is currently owned at 84% by the parent company and 16% by a venture capital company.

The reported sales volume in 2018 was roughly €26 million. The sales volume In Portugal accounts for 70%, the remaining 30% being from business carried out in the United States of America (USA).

This company has been recognized as a very innovative Portuguese company for many years. It is one of the cases promoted as innovation best practices in the book “Boas práticas de gestão de Inovação em Portugal” (COTEC PORTUGAL, 2015).

4.2.5.1 Organizational Dynamics

The company has a functionally based organizational structure, with the following departments: Product, Implementation, Logistics & Maintenance, Business Partnerships, Finance and Marketing & Sales, with additional support areas, namely Quality & Environment, and Information & Technologies. These support areas are composed of small teams that are supported by the counterpart corporate departments located in the parent company. Other support areas subcontract the corporate departments located in the parent company.

The type of organization found suggests a functional type organization. This company has a unique business: technological solutions for mobility services; all functional areas contribute to this business.

In the interviews it was explained that some of the support areas in this company need a different approach from the one used in the corporate departments, as is the case with the Marketing and HR departments. This arises from the fact that Epsilon is the only company within the parent group with research, innovation and development, and is going through an internationalization process. This brings special demands and special support needs. A transformation is underway to bring those corporate department functions, with special support needs, closer to Epsilon. The Marketing department is already established in Epsilon and is less dependent from the corporate department. In the case of HR the process is still in an early stage. This company has a person from the corporate department, dedicated full-time to Epsilon premises, with a specific know-how and awareness of this company's specific HR needs.

The type of HR needs in this company include retaining people and promoting attractiveness of the company, which is related to WI. Another impacting factor is that this company is in an industrial park where it is easy for employees to find a job in other companies. This is a challenge that the company faces, namely losing employees (retention issues) and knowledge and a potential lack of capability to be in a suitable position to innovate and be more competitive (attract talented people). HR is working together with management to overcome these challenges.

In the organization chart of this company, in the Product department, there is a specific area with the mandate to promote innovation. During the interviews, many innovation activities were mentioned, as part of the culture of the company, this being an important environment for WI.

As explained before, there is a defined organization, including a board, a hierarchical level with the responsible person assigned to each department and underneath there are teams. In the interviews this organization was considered to have a flat hierarchy where the board has an open-door policy, being accessible to everyone.

The parent company promotes three main pillars as basic principles, Innovation, Ethics and People, applicable across all companies owned by the conglomerate. Epsilon also inherits those pillars from the parent company. The venture capital company supports Epsilon, shaping it into the industry where this company wants to operate, so that the appropriate

mission and values are formulated and communicated. This reinforces the role that innovation, and innovative workplaces, must play in the company.

In the mission and values of the company, innovation is promoted in different forms and expressions. In the Vision Statement, innovation is also stressed as important, as: “A strategy based on in-depth thinking, focused on the future and market trends”, this implies that it is not possible to have solutions ahead of market trends without innovation. Vision, mission, and values are part of the company’s internal communication plan and corporate presentation targeting the market and customers. It was explained by the head of Research and Innovation that the company through his vision statement wants to address the importance of the innovation in the communication in both ways, to the employees internally and also externally in the meetings with the customers. The company is very concerned in being recognized as innovative and being a reference as such.

This way Epsilon reaches the mission and values defined, reflecting their principles and beliefs. The mission statement is: “To enable outstanding mobility experiences by providing best-in-class ITS solutions”. There are 5 Values defined, one of them being Product Innovation: “combining the technological edge with the development of best-in-class mobility solutions.” This shows that the company is focused on innovation being part of their values and wants it to be offered and included in customer solutions. Other values are Excellence, Leadership, Client Centric and Ethics.

The research and innovation area are in the Products department. The head of this area is also an innovation sponsor. The innovation sponsor promotes innovation activities to ensure that the company participates, for instance, in European partially funded projects to bring new ideas and new technologies to the company, so that continuous innovation feeds the company and promotes team involvement in innovation activities in its different forms. The innovation sponsor is a promoter of innovation at the workplace.

There are research and innovation teams specifically exploring new technologies or working in small projects, building incremental innovations in existing solutions or products, or, for example, testing a technology applicability, namely exploring the use of artificial intelligence or analytics in the mobility sector. People are allocated to teams according to the company’s needs. There is also a close dialog with the teams developing the products and solutions to understand what their challenges are, the technological problems to overcome, decide on architectural aspects, missing capabilities or needs for specific analysis in technology trends. In the research projects there is also cooperation with universities. European

projects require consortia to be established, which is also supported by this company. At the time of this study the company is part of three consortia in European funded projects. Taking part in advanced innovation projects supports WI.

In the mobility sector, the USA market is a very advanced technological market, which is a source of innovation for this company, as the knowledge about market trends in the USA is added value to be included in solutions design as advanced features.

The teams have embedded activities in their culture, such as creativity workshops, idea brainstorming, looking for market trends, exploratory projects and combining needs from the market and gaps detected in products or complaints from customers, in a continuous search for innovation opportunities. Study groups from the European community about mobility, its trends and market evolution are also a source of innovation for this company. The company has a platform to record ideas and on demand initiatives such as meetings to discuss ideas to solve a specific problem.

Challenges from customers are opportunities to innovate. However, it is acknowledged that it would be beneficial to hold more events with external entities or people, or even promote rotation of people in pro-active ways to companies or entities whose work models or technologies could be relevant or complementary to the company's scope of work, so that this knowledge could be reinserted and injected in the company later on.

As previously explained, the organization chart shows a functional organization, with employees being allocated to departments according to their roles. Nevertheless, in the interviews it was noted that, for each project, a project manager is appointed to act as an aggregator and point of contact for all roles. The project manager sets up a virtual team, which is independent from the organizational chart, empowered by the work they have to do, reporting to the project manager and only consulting the line manager (from the department) in case they need to address a personal issue. This means that employees from different functional departments work in the same project.

Employees might be allocated to different projects at the same time. On the one hand, they do not have a view on the whole product, but on the other hand, participating in meetings and implementations where many different problems are discussed, getting different perspectives on existing challenges, allowing them to gain different types of know-how, might lead to new or combined sources of inspiration for WI. In this context, in the interviews it was mentioned that employees feel autonomous and encouraged to speak directly with the Chief Technology Officer (CTO), the Marketing area or the head of research and

innovation, for instance, if they think they can somehow contribute to improve something in the company or products, and they mention that they do not feel that there is a large chain of command in the organization.

There are job descriptions for all roles in the company. Autonomy is given to teams and to each employee, making them feel empowered and motivated, taking the opportunity to perform better and innovate, looking for more efficient ways to solve problems by risking more. This is where the innovation sponsor sees the greater benefit in working in a WI environment and not in a controlled environment. Employees need to behave as leaders to become influencers in an organization where they do not have a direct management role, but they need to lead people and projects to succeed.

To achieve innovation and provide support to innovative workplaces it is important that the company's information is not lost. To prevent the loss of information, an information repository was created based on an open-source tool, and an internal process was created so that employees know how to use it, being the for a knowledge management system.

Epsilon is certified according to the Portuguese Standard IDI: NP 4457, which provides as one of its guidelines that innovation goals should be set each year. The interviews confirm that this is a live system and not just a process. As an example, employees mention that they hold brainstorming meetings to solve concrete issues aligned with the defined goals. There is an innovation process defined. The principles expressed in the standard helped the company to structure innovation activities, as many were already being followed before certification, supporting WI, as stated by the innovation sponsor.

Each team has KPIs defined depending upon the projects, and for innovation the KPIs are set aligned with the IDI system defined in Epsilon. Reaching innovation goals can be an incentive for WI.

4.2.5.2 Human Resources Management

The income structure for each employee has a fixed part, and there is no variable part defined. The Performance evaluation is usually conducted on a yearly basis, in April, relating to the previous year. It is based on two evaluations, a self-evaluation of the employee and a line manager evaluation, which can lead to a promotion, a salary increase, a reward such as a one-time payment or a combination of the above, and to defining or updating the personnel career development plan. The reward can go from zero up to two

salaries. At that moment, non-incentivized objectives are defined for the following year. Even though there are no objectives predefined, employees have a fixed and a variable part in their pay system.

In the new evaluation model, it is foreseen that objectives become incentivized. At the end of the year, the degree of achievement of objectives will be turned into a variable part of the salary, which will be paid in April of the subsequent year, as a yearly payment. The innovation sponsor is convinced this is a good way to define innovation objectives in an individual way, giving an incentive to innovate, thereby contributing to WI.

It is also during the evaluation period that the main training plan is prepared, and it is improved or updated throughout the year if needed. There are two types of courses, those which are common to everyone, available from the parent company, and specific courses which have to do with each employee or with the area of work. There is a competence matrix, which means that it is possible to know the expertise of each employee, and the overall competences in the company.

The innovation sponsor explained that there was a general survey performed in the company where all employees participate to evaluate, for instance, their level of satisfaction, what they value in the company, the purpose of the company, their level of autonomy and what they lack in the company. The result was that there is lack of communication in the company, which is an area that needs an urgent action. A transformation project was initiated as a result of this survey. Examples of ongoing actions are promoting innovation related activities and communicating the works that are being done or holding short events to announce product launches relevant for the company. Another measure is to be open to feedback and collect ideas, thereby increasing knowledge share and promoting internal marketing initiatives and creativity, making it possible for the implementation of these measures to increase WI.

Epsilon has specific requirements for the HR area which are not supported by the parent company, raising concerns regarding the attractiveness for an employee to work in this company, as previously discussed.

This company allows employees to work remotely, as one of its work practices. Other practices include benefits related to the mobility systems they develop; all employees are entitled to an insurance health system, to the free use of a mobile phone, everyone has a laptop, and work under a flexible time schedule. In the interviews one employee mentioned that the fringe benefits motivate employees, and this brings them empowerment,

engagement, and freedom to contribute to the future of the company and to secure their work, by innovating.

This company has offices in two countries, Portugal, and the USA, therefore it is relevant to know the culture of both countries, as well as the legal and institutional laws and possible restrictions or benefits. In Portugal there are benefits for innovation (such as tax reductions) and in the USA, with 52 states and different laws, in each state the mobility sector has different laws applicable, and this must be incorporated in the products specification (when applicable). These are aspects also relevant for innovation and for defining products, as well as their evolution. Those different specificities that have to be introduced in products lead employees to think and develop using innovative approaches and contribute to be further innovation at their workplaces, building products that are either easier to customize or based on platforms able to accommodate different requests.

4.2.5.3 Collaboration

Previously, Epsilon's only customer was their parent company. Since it became an autonomous, there was no guarantee that the products and solutions developed were going to be bought, by the parent company, as was previously the case. This company became a solution provider for other companies additionally to the parent company. This strengthened the urgency to become more innovative and to be able to compete in an open market.

There was a shift in the company, looking for alternatives on how to shape the products and solutions, and where and how to sell them. There was a market approach to look for what was the overall market demand in the mobility sector, what the competition was doing, market trends, and how could the company be more innovative and create more value. These measures allowed the company to become aware of who was their competition in Portugal and abroad, which occurred when contracts with the parent company were lost. The company felt the need to innovate and to differentiate itself and look for new customers. In order to differentiate itself through technological competitiveness, one of the strategies followed was to establish cooperation, to incorporate skills from other companies and to look at technology from the perspective of being able to connect with other suppliers and work with other technological and strategic partners in an environment of open innovation and a collaborative approach in a win-win co-operation, beneficial to generate innovation.

This company went through a deep transformation, from selling products in a passive way to the same internal customer, to becoming an active player in a dynamic market, with the ability to have a product portfolio, based on the specific needs of each mobility operator, connecting all customers to the mobility ecosystem. The systems are now built in this company, using open architectures, allowing for the co-existence of different systems with an interoperable approach to customers. Employees went through this transformation process, learning how to work in this new type of competitive environment where the need to innovate at their workplace is mandatory for their survival as a company.

The logic behind choosing partners started while looking for a partner company to help solving a gap to complete a solution, on a case by case approach. Currently, the motivation to choose a partner is more than that, as it has a strategic motivation. There is an Interface Management evaluation system to evaluate the partnerships with a matrix where efficiency, value creation, execution, and new acquired knowledge of those partners is evaluated each year, through a qualitative analysis. Furthermore, several KPIs are also taken into account, such as information sharing information, partner initiative capability, commitment to the partnership, rotation of people, capability to accomplish expectations and the brand, and it is also evaluated whether the partnership is critical to the business.

Specifically, in the United States the company has a strategic partnership with a consultancy company to support Epsilon looking for new customers and the right markets to target.

Internally, the company holds a few events, namely a celebration event at Christmas time, and team building activities organized at company level or by each team, the latter being an opportunity for employees to share ideas and initiate a dialog conducive to innovative ideas or products.

The company promotes internal marketing activities, such as participation in innovation projects, publishing books with case studies, newsletters on best practices and project wins, televisions showing ongoing information and a communication plan available to everyone.

Externally, the company holds initiatives to meet with other entities and conduct workshops about relevant business topics or methodologies to leverage innovation, for instance, by meeting with a team from another company to enhance the knowledge on the Agile development methodology to increase process innovation and efficiency in the company, when applicable.

Other initiatives in which this company participates are within the original conglomerate which owns the parent company, bringing different markets together, from Industry to mobility, in a platform of ideas; there is a specific program owned by a coordinator under the mandate of the conglomerate to accelerate innovation and growth in the group and its "associates". The final goal is to have startups cooperating with each company, leveraging innovation. All these measures or initiatives promote knowledge share and are driven, to increase innovation at the workplace, as explained in this interview. The company struggles with resource limitations, the more people who can innovate in their daily activities at the workplace the better for the company, as the products are more innovative and prove to be competitive worldwide.

This company is also part of different communities of practice, namely: the Community of Practice (CoP), COTEC, as previously mentioned in the chapter 3, a CoP to define standards in the mobility sector, and a CoP of working groups at European level to create a mobility platform.

4.2.5.4 IT Infrastructures

The person responsible for innovation with an overview of all activities carried out in the company, and working in the company for over 4 years, considers it essential to have a good IT infrastructure to support the business and provide a fast response from the support team when there is a problem. This is a work-in-progress subject, as this company has special IT requirements due to its nature which are not common to the parent company and, as such, each request to buy or to change any IT infrastructure element it involves a long decision process as it needs justification, approval and implementation. The person responsible for innovation also considers it important that the Software updates required are made centrally and that the infrastructures are protected against fraud. It would be especially critical if an innovation or a customer product is subject to an external software attack.

Teams do not have a formal official system to facilitate virtual meetings / conferences, which would be a support measure as there are too many meetings running at the same time and using open access tools has limitations which are not always easy to overcome in a professional environment. An open access Software is currently being used for conference calls, but the feedback from customers on this software is not positive, and the interviewee considers this to be a point for improvement.

The IT infrastructure is used such as for online courses and to ensure connectivity, as for the majority of all the other activities in the company.

Most of the IT topics found in this company are aligned with what the interviewees believe is required to perform their work and further develop new products, even though there is still room for improvement. However, there are already some ongoing improvements such as to the network speed, in some parts of the equipment, and network availability.

4.2.5.5 Other Facilitators

There was a strategic decision to open up capital to investors, with two main objectives: they would bring product innovation and could help the company to diversify the customer base.

Internationalization was one of the goals of this company, and they were having challenges reaching this goal, being owned at 100% by the parent company. A venture capital investor company bought a part of it and brought missing competences. This venture capital company has experience in international growth of technology-based companies. This increased the level of innovation and several measures and events were implemented and took place supporting employees to produce innovation on their daily activities at their workplaces.

At the time of the interview this company has one patent registered, and one pending. In addition, it has source code components (software) and designs (hardware) registered in Europe and in the USA.

There is no formal process defined for change management in the company. As explained in an interview, the company always has ongoing changes, as it is in a dynamic mobility business market, became independent, then moved its focus from only one internal customer to becoming part of an open market and then having a new stakeholder, a Venture Capital company, in its ownership structure. One person responsible in the company has acknowledged the importance to establish a change process to accommodate transformation periods and to support, in advance, resistance from employees in those periods, hindering them from focusing on important issues, such as innovation. Finally, people tend to adapt, losing some level of efficiency.

It was also mentioned that the company had adopted innovation in the first years after it was established, even though they feel they are now more advanced in the solutions they propose, but they do not discard the possibility to adopt other innovations if this allows the company to reach an innovative customer solution faster.

The company is limited by legal and institutional factors depending on the country where they operate, and in some cases within the same country, as in the case of the USA which has 52 states, each with its own laws, and there are different contexts in each country where they operate. For example, in some states the government pays part of the mobility service, and in other states this service is paid by the user. These various external factors raise the need to have innovative approaches available, with very flexible solutions able to accommodate different contexts, legal and institutional external factors, which are not necessarily requested by a customer, but are rather imposed by a country.

The concepts underpinning WI are associated with the daily subjects that the CEO and the head of research and innovation want to have implemented, and the related challenges they face. This company would welcome if their participation in the case study could also be a benefit for them, helping to identify how they could increase innovation based on a framework.

The innovation sponsor expressed the conviction that the company has the right culture and employees. What could be improved to have more innovative workplaces and increase the level of innovation in the company would be to have more time allocated to innovation brainstorms or similar activities, more relaxed spaces with games for people to better network among themselves, train people on appropriate tools to become more structured, such as mind maps, and record all ideas possible to ensure they are not lost.

4.3 Cross-Case Studies Analysis

This section provides a cross-case analysis of the just presented case studies, organized by topic.

Throughout the text, each topic is analyzed and classified as an intra-company topic and/or an outside-company topic. This classification results from the observations performed during the test cases and the subsequent analysis. Intra-company classification involves a topic that is affected only by the company internally. Outside-company classification involves a topic that can be impacted by factors not directly under the company’s control,

but which are associated with its relation to external entities or factors. Both classifications apply to a few topics.

Whenever applicable, other topics found to have interdependency with the topic being described will be mentioned for each topic.

4.3.1 Work Organization

In all the companies under study, regardless of the organization type, project implementation or delivery is organized in teamwork. Alpha, Beta, Gamma, Delta and Epsilon follow a similar approach when allocating work to develop or deliver projects, and the differences lie in the way the teams are formed.

The way the work is organized – Organizational Dynamics determinant – shows an interdependency with the topic of teamwork – Collaboration determinant. This establishes interdependencies between the two determinants, Organizational Dynamics, and Collaboration.

In Alpha, people are allocated to the team within its business division. In this case the project coordinator can either be a line manager or any employee with leading capabilities as a project leader.

In Epsilon, to build the team, resources are moved from the functional areas of the company, according to the roles needed. In Epsilon, the team coordinator is one of the project managers.

In Gamma people are moved from the centralized R&D team, according to the expertise needed. In Gamma, the team coordinator is either a project manager or a scrum master, depending on the development methodology used (Waterfall or Agile).

In Beta, Delta, and Gamma, when the Agile development methodology is used, project members are selected from the pool of people that have the appropriate skills to carry out the project. To explain how the work is organized, when the Agile methodology is used, first the project coordination is performed by the scrum master, which is one of the roles of the Agile development methodology, independently from the company then the team employees meet every day, and, based on a list of activities to be carried out, decide in teamwork on the employees' daily assignment, these meetings being facilitated by the

scrum master. In Gamma, when the Agile methodology is not followed, team coordination is performed by a line manager or another employee with leadership capabilities and the work is organized in a different way also in teamwork but not with daily assignments, it can be assignments for each employee for two or three months depending on project size; in this case, the process followed is called waterfall and besides the team coordinator, there are developers and testers as explained in Gamma.

In the case of Beta, it was observed that the employees are not allocated only to one project, being involved in more than one project at the same time. This means that one employee can be coordinated by more than one person and that these employees have the possibility to work in different functionalities, in the same timeframe; this can be an additional source of knowledge, innovation and leaves room for creativity.

As described, in all companies, teams are coordinated mainly by employees who are not direct managers, leading other employees by influence. This was one of the reasons given in Alpha why they train people to be leaders, to be able to lead by influence with leadership capabilities and, also, to be able to have discussions with a customer in a responsible way, conducting project acquisitions for the company and feeling accountable for it. Another related factor in Alpha is the fact that they have a strong focus on optimization of operating profit, as a goal to be achieved by all employees, leading to increased Organizational Performance, to a large extent deriving from project execution.

The interviewees consider the way the work is organized as relevant for innovation. The answers given, when asking for justification, were mainly related to the capability to organize their work by themselves, in an autonomous way, leaving room for creativity, to explore new methods and news ideas, as long as the final deadline is achieved, with the expected functionality implemented. Another factor was the relation between the employee and her/his supervisor, as when there is trust employees feel empowered with autonomy and engaged in their work. In all of the companies, in the projects addressed, employees work in an autonomous way, oriented towards projects in a team. The fact that the employees work in teams also gives the possibility to interact and to exchange ideas, building new possible ideas and new approaches, and these facts lead to innovation at the workplace. This is done without resources specifically intended to produce innovation, as the daily work allows that innovations are generated when the employees work in projects at the workplace, in a WI environment. Knowledge generated in projects or new ideas can be registered in KM systems as is the case in Gamma or can be shared in weekly meetings

as seen in Beta; knowledge repositories are also a source for employees to access knowledge.

As previously argued, in each case description to build the team, when the organizational type is functional, as in Epsilon, resources are selected from different functional areas; if the organizational type is the competitive M-form, as in Alpha, then in each business division there are resources with different roles such as project managers, account managers, integrators and developers, and people are selected within the business division; if the organizational type is the cooperative M-form, as in Gamma, then resources are selected from the centralized R&D in team Operations, and allocated to each business area during the time of the project; and when there is a Simple type of organization, as in Beta and Delta, the employees are selected from the pool of available human resources that have the appropriate skills are allocated to the projects. As described, it was noted that different organization types lead to different ways of building teams.

Job roles are related to the characteristics of the project. The project characteristics determine the methodologies to be used, and each methodology requires different job roles that are part of the job design. For instance, if the Agile methodology is used, the company has the “scrum master” job designed, as seen in Beta, Delta, and Gamma.

It was possible to note interdependencies of work organization from knowledge share, for instance in Alpha, in cases where there was one experienced person in the team that participated before in another project and whose knowledge was relevant for that project, then that person shared the knowledge and supported the colleagues in the team. In this case the topics are from the Organizational Dynamics and Collaboration determinants.

In Gamma the test is performed by the team in a Computer based simulator consisting of an equipment that has hardware simulating the real time environment where the software runs. An interviewee mentioned the importance of the usage of IT, as the Computer based simulations should be appropriately supported by IT infrastructures. In case the IT infrastructures are not adequately running, it is not possible to obtain test results, or the results cannot be validated, and this implies rework and inefficiency. In this case we found interdependencies from a topic belonging to the Organizational Dynamics determinant and from two topics belonging to IT the infrastructure determinant.

In Delta, when the team had difficulties carrying out activities due to a lack of knowledge, they used new training practices, namely online free academies, or other resources such as webinars and skype sessions with other colleagues from another country to quickly gain

knowledge. These are situations in which a team's work was supported by the use of new training practices, for other situations it was explained that before the project start, employee training sessions were conducted regarding knowledge specifically needed to allow its execution.

New Training Practices is a topic identified as part of the HR Management determinant and, as described, it was used by the teams during the project work. As teamwork is part of the Collaboration determinant, in a context of a discussion of the work organization topic being part of the Organizational Dynamics topic, it indicates an interdependency of three determinants: HR Management, Collaboration and Organizational Dynamics. Moreover, new training practices uses online training environments, is part of employee training and requires IT usage, so also the IT Infrastructures determinant has interdependency with Organizational Dynamics, Collaboration and HR Management.

In Epsilon it was noted that there was a team working in a European funded project and it was explained that the knowledge acquired was relevant for the execution of other projects relevant for the company. European funded project is a topic associated with the Other Facilitators determinant. This observation leads to an interdependency between the two determinants: Other facilitators and Organizational dynamics.

Taking into consideration the Work Organization topic, the determinant to which it belongs – Organizational Dynamics – points to interdependencies with all the remaining proposed determinants. It was possible to note interdependencies among determinants, as described.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it was internal to the company.

4.3.2 Autonomy/ Employee Empowerment

In Epsilon autonomy is given to teams and this is considered by employees as an opportunity to perform better, feel acknowledged or engaged with the company and to innovate. The project is controlled through timed achievement of the planned deliverables. In terms of innovation, Epsilon, being organized per role, and focused on what to do, optimizes employees' work, reducing time wasted to get into the whole product functionality and is product specific characteristic-oriented featuring innovation.

In Alpha, autonomy is business oriented, being the employees accountable for a common goal to maximize operating profit. Alpha is under pressure to optimize operating profit, this company must always conduct a trade-off evaluation, investing in a new technology that might be more expensive versus optimized operating profit.

In Gamma employees work in line with defined objectives, and they are given autonomy and empowerment within that frame. One factor in Alpha and Gamma that is different compared to the other companies is that they have structured internal induction programs with their own academies, so that when there are newcomers, they are placed in courses embedded in each company's culture covering both autonomy and empowerment; this was explained during the interviews, as a need of those companies due to their large size.

In Beta new ideas and the willingness to innovate are welcome from employees. As expressed by the board of the company, employees are often challenged by the new market trends that also produce the effect of employee autonomy/ empowerment, looking for new solutions able to lead to innovation. In Delta, employee autonomy and empowerment are part of the company's Corporate Strategy. In Beta and Delta, autonomy/empowerment are linked to the Agile development methodology, in which autonomy is a requirement.

There is a favorable employee autonomy environment in all of the companies, as it was mentioned in the interviews. People motivated to innovate do not want to feel like they are doing something wrong or spending some minutes taking notes about a good idea, which might be shared and implemented, instead of focusing on daily activities and let the idea fade away. Autonomy/Empowerment shows an interdependency with the topic Employee and Supervisor co-operation as trust is needed from the hierarchy to focus on employee results, rather than controlling employees. Employee Autonomy /Empowerment can be reinforced or hindered depending how the leadership team interprets the innovation initiatives, either as an added value or a waste of time for the company.

From what was noted in the companies, the topic Autonomy/ Employee Empowerment seems to be interlinked with other topics, such as work organization (as previously discussed), Employee Engagement, Informal power, Leadership, and Employee and Supervisor co-operation, respectively enabling the ability to be pro-active and influence other employees, to lead people in teams or in projects, and allowing them to develop innovative ideas. These interdependencies from topics mean an interdependency of topics in the Organizational Dynamics determinant.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it was internal to the company.

4.3.3 Leadership

Leadership was seen from two perspectives, one the leaders' support from the company to innovation and the other how employees support innovation in the company through their leadership capabilities.

Leadership is incentivized in each company in a different way. In Alpha, employees are trained to be leaders since the induction phase. Leadership is also part of their values. In Beta and Delta, adopting the Agile methodology, the job roles defined for employees, and a simple organization support the development of leadership capabilities as well as leading by influence. In Gamma, support at company level, of a culture of openness, as a potential incentive to behave as a leader, and, to a large extent, the use of the Agile methodology supports the development of leadership capabilities. In Epsilon, as previously explained, they have virtual teams in project organizations, and people have to lead by influence and not by direct line management via hierarchy, employees acting as leaders to be able to influence the other employees and deliver projects successfully. Management's open-door policy in Epsilon, as an invitation to be close to the top management, provide feedback, and show initiative, is also part of an example of Leadership supporting practices conducive to innovation.

The leadership topic supports other topics, namely work organization, autonomy/ empowerment, Employee and Supervisor co-operation, organizational type, and organizational culture within the Organizational Dynamics determinant.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it was internal to the company.

4.3.4 Employee Engagement

Alpha and Epsilon both consider that Autonomy/Empowerment brings Employee Engagement. In one interview in Epsilon, it was expressed the idea that one engaged employee is committed to improve the products and contributes to innovation in an active

and autonomous way. In Beta employees interviewed stated that they are fully engaged and committed to their work, and that they like their area of work and other company policies, namely, to work in a company with an open door policy to a member of the board where they know they can always go and provide feedback; they also work in the teams in an autonomous way. Gamma and Delta have employees that have expressed in the interviews that they feel engaged and that they also like what they do. Moreover, they also claim that they are in a nice environment, an innovative workplace and by having, respectively, ones an innovation lab (where they can share and be rewarded if they have good ideas) and the others excellent laboratory simulators to test their ideas, being stimulated to do their works.

This topic has a connection to Employee responsibility with the customer, as in the cases of Alpha, Beta and Gamma. The employees often have direct access to the customers and in other cases, where they are unable to have it directly as in Delta and in the majority of the cases of Epsilon, it is possible to verify the engagement of the employees and the responsibility towards the customer final delivery.

Another related topic is Organizational Performance. This was verified in Alpha where the measurement is done through the operating profit and other defined KPIs. In Gamma there are also a set of KPIs that are periodically evaluated by the Quality department and are displayed in dashboards shared with the employees with the intent of being a source of motivation or need for action. In Beta and Epsilon, the KPIs are regulated according to the IDI objectives and, in case of Delta, according to the Agile work mode. It is not always possible to have a direct connection and conclusion between the level of Employee Engagement and the resulting KPIs, but what we were told was that if the results are good usually this means that the engagement is high.

In the case of this topic all the interdependencies among topics were identified in the same determinant Organizational Dynamics.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.5 Culture (Organizational)

Epsilon has innovation embedded in the organizational culture. It was established and designed to be the innovation branch of the parent company, so that is basically the

organizational culture that is promoted and helps supporting WI. Alpha bases its organizational culture in its vision, mission, and values, which includes innovation. Beta was created to be innovative and, from the practices described and the results achieved, innovation is the Culture, and WI is practiced. Gamma has a defined vision, mission and values and promotes its own image so that if someone visits them or when one of their employees leaves at the end of the day, it should have retained some essential messages about the company and its culture (innovation being one of them). Delta has an Agile methodology-oriented culture and additionally a vision, mission, and values, promoted also in posters on the walls. One topic is not enough to promote workplace innovation; it is the combination of all the factors that contribute to it. What can be said is that this topic seems to contribute to innovation, as the company's environment is promoting it.

The Culture of the Organization has interdependencies with all the topics of the Organizational Dynamics determinant.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.6 Organizational Guidance

This topic covers the organizational guidance in the company, as the employees' job security, meaning the type of contract they have and for instance, the decision, when more people are needed for a project, to outsource a company or to contract more employees. This topic also covers the project and company quality management control and adequately defined key performance indicators (KPIs).

Gamma has Quality Management, and it has aggregated information over the years. There are KPIs at all levels, and they register all the ideas which are not implemented and could be a potential innovation but also other business KPIs, as explained in the case study of this company. Regarding other aspects (like job security), the company transmits a positive outlook and invests in its employees by providing work conditions and job perspectives.

Beta and Epsilon, both certified by IDI, also have innovation and Quality Management systems, keep track on all the information required by the system, offer security to the employee. Epsilon has more challenges to retain their employees even though, at the time of the interviews, they were implementing measures to improve the level of attrition.

Alpha has the needed business systems in place for quality. They have the ISO 9001 certification and have the quality registers stored and kept as required. Alpha, at the time of the interview, was establishing measures to become a more attractive place to work and be able to better face the competition of startups.

Based on the Culture (Organizational) and the Organization type, the information is brought up to Organizational Guidance impacting aspects related with job characteristics and HR and Management practices. Regarding this, there are two determinants interacting: Organizational Dynamics and HR Management.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.7 Job Design

There are job descriptions for all the existing roles in Alpha, Gamma, Delta, and Epsilon. Beta also has the jobs' design aligned with the IDI process.

In the previously discussed companies, for each project the best process to follow is evaluated. Each process determines jobs characteristics that require the existence of job design. This is done only once and is then maintained as it was explained. Interdependencies were observed in the topics of Job Design, Job Characteristics, Teamwork, informal power (as people have to act as leaders without having a role defined for that in some cases, such as in matrix organizations, HR and Work practices that are usually the owners of the job design), and Information and Technology Usage. In some observations those jobs were designed in IT tools already customized for that purpose.

In this topic interdependencies between four determinants were identified: Organizational Dynamics, HR Management, Collaboration, and IT Infrastructures.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.8 Knowledge Management

There are tools for knowledge repository in Alpha and Epsilon. There is a Knowledge Management process documented for Beta and Epsilon and is considered important to support innovation activities.

Alpha does not have a Knowledge Management (KM) process defined and has several KM related tools available, referred to as applicational mushrooms. There is a policy to adopt the best internal existing practices, however there is no mechanism to promote it. Alpha considers this a gap that needs to be solved and is working on that, as the knowledge management system relies on socialization actions of the employees or on their willingness to use some of the existing tools.

Beta and Epsilon have knowledge management practices relevant for innovation. This derives from the way they have the IDI implementation and the innovation process designed.

Gamma also has the Knowledge Management System (KMS) process and tools well implemented and under the responsibility of the Quality Department.

Delta does not have a specific KM system implemented but relies on one KMS of one of the parent companies.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.9 Organization Type

From the observations, documentation, and the interviews performed, it was concluded that Alpha has a competitive M-Form type organization, Beta and Delta have a simple structure organization, Gamma has a cooperative M-Form type organization and Epsilon has a functional organization.

As it was explained in the companies, each determines its organization type according to the business they target and the company’s planned size, with the goal to optimize resources and better perform, which influences all organizational aspects of the company. For this reason, we verified diversity in the companies where the empirical study was

conducted. However, all the companies aim to aim to provide innovation-based services independently from the organization type and be known as such.

This is a topic that interacts with all topics of the Organizational Dynamics determinant and as it will be described below with other topics from other determinants.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.10 Creativity

Alpha had, for several years, creativity workshops and Design thinking workshops (conducted by Stanford University) to promote innovation. In the last years the company decided that there were enough trained people to train the newcomers and so this type of initiative is not currently being done to optimize costs; Knowledge share is now used as practice employing the trained people. Beta and Epsilon have several practices promoted by the head of innovation to perform regular brainstorming sessions, acting as creativity workshops. Gamma has a laboratory of innovation with contests and challenges which act as spaces for creation. Creativity workshops are performed via “meet-ups” initiative once a month, as a lever to increase innovation in the workplace in Delta. This company is also designing and growing the company in an environment intended for creativity; the workplaces look different; all teams sit in U shape format to be able to network and listen to each other leveraging WI.

The five companies have the goal to increase innovation but use different mechanisms in order to achieve it. Creativity is part of the innovation process, but it is also understandable that different mechanisms are needed, according to the companies’ dimension. In Beta it is possible to have 25 people brainstorming every week, in a company with 2000 people, whereas in Alpha this is not possible. As such they had the initiative to train people in Design Thinking principles to try and achieve the capability that people would be able to think in a different way and innovate. Even though Gamma is smaller than Alpha, it is much bigger than Beta, so it had the need to create others mechanisms as the innovation lab, the contests, and the support of the Innovation and Knowledge (I&K) team.

The knowledge management (KM) mechanisms previously discussed also play an important role as a knowledge source for people to improve it and be the base for further

creativity activities. As it was reported in Gamma, a customer's complaint can be a source of innovation and that is the reason why all are registered and tracked for evaluation.

It is possible to observe interdependencies between this topic and others of Organizational Dynamics, HR Management and Collaboration determinants.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.11 Job Characteristics

Job Characteristics have to do with the requirements for the job, if the employees work well under pressure, whether the task complexity is evaluated before assigning the job, or what is the level of job control (autonomy within a given job, functional support from supervisor and colleagues and organizational level decision latitude).

In all of the companies, for each activity, the jobs are assigned according to the skills the employees have (registered in a competence matrix). In Delta, as it is a recent company, employees are hired according to the required skills. This means employees are allocated with the expected workload where the estimations are done by the own employees, or by the most experienced ones from the team taking into account who is going to be participating in the project. This does not mean that in some projects overtime is not required due to the occurrence of a non-expected error in the project, but this is taken as a non-desirable but acceptable temporary occurrence.

This type of control of not overworking people is a split of responsibility between the project coordinator in the team, the line manager according to the HR / Work practices defined, and under the organizational guidance.

Job Characteristics is also about defining which roles are needed for the project and ensuring that the roles exist. In other words, it is an input for the job design or a request to define which people have the right skills to work in a project. In this sense it can be an input provider for HR to prepare training plans in case they are not available. In this topic we noted interdependencies with HR/Work Practices, teamwork, IT usage, informal power, conducing to interdependencies with other topics from Organizational Dynamics determinant and with HR Management, Collaboration, and IT Infrastructures determinants.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.12 Corporate Strategy

Corporate Strategy covered under this topic has to do with the strategy definition of the company (companywide) and all related factors (vision, mission, etc.). Alpha, Beta, Gamma, Delta, and Epsilon define their corporate strategies and share their vision, mission, and values based on an internal communication plan. The external communication is not as detailed as the internal one and is customer or technology oriented through communication messages.

Corporate Strategy topic includes the determination in each company in which business the companies want to be and how to manage it. For this reason, this topic interacts with all the topics and can be considered an intra-company topic that is "present" in the relations outside the companies when, for instance, they decide not to have some type of customers.

Alpha had for years a simple corporate strategy message based on using the technology to make the life of its customers simpler and easier and went through a rebranding phase to be more "appellative" (in their own words). Beta has as corporate strategy aim to be the international company of its parents to provide Smart Power Systems; the parent companies, especially the international one, launches challenges related to market trends and expects the company to find innovating solutions, for this WI plays an important role. Gamma aims to provide solutions, services, and technologies for safety, mission, and critical business IT systems. Innovation is part of the internal and external corporate strategy communication plan of Gamma. Delta has in its corporate strategy the goal to change the way the world moves via their software solutions for the future driving machines. Epsilon is currently looking forward to the internationalization, aiming to set the pace of market trends in mobility and in being the R&D of the parent company.

All the companies have in their corporate strategies the aim to continue being recognized as innovative companies, belonging also to the community of practice (CoP) of the most innovative companies in Portugal (COTEC), already taking profit of the innovative best practice share that is done in that forum.

This topic has interactions within all the topics of its determinant and with the other four determinants.

This topic is classified as an intra-company topic, even though it influences how the company interacts outwardly, such as the customers to address.

4.3.13 Employee and Supervisor Co-Operation

In Alpha, Beta, Gamma, Delta, and Epsilon, regarding the supervisors' level, it was referred in the interviews that there is a good cooperation between employees, Supervisors, and team leaders.

In the case of Epsilon, it was mentioned that there is the open-door policy of the board and the openness to the employees to contribute with ideas to the board of the company. In the case of Beta there is a weekly meeting with all employees' participation, with a regular participation of one member of the board where the projects are discussed; this is possible due to the size of the company, and it is an adequate moment for feedback and to share ideas in a co-operative approach. In Gamma the members of the board try to be present and visit the locations to get direct feedback from the employees, but it is not as present as in Beta or Epsilon. In Delta, until now, all people are sitting co-located with at least one member of the board, allowing for an easy access to them. Most likely the case where it is more difficult to have contact with the board is in Alpha for people who are not located in the same building due to the size of this company and the variety of locations.

At team and work levels in all the companies it was observed a good interaction among people independently from their position in the hierarchy.

As previously discussed above, on previous topics there are interdependencies between this and Leadership, Autonomy/Employee Empowerment, Work Organization, Organizational type, Culture (organizational) and Corporate Strategy, showing interdependencies within determinant Organizational Dynamics.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.14 Organizational Performance

In Alpha, Beta, Gamma and Epsilon there are KPIs defined to measure the organizational performance aligned with the business.

In the case of Beta and Epsilon, besides the global business KPIs defined by the company, there are also KPIs specific for innovation aligned with the IDI system requirements. In these two cases, the companies decide which KPIs must be defined to bring the best results respectively for each of the organizations, based on innovation goals.

Gamma has KPIs, as previously described, at many different levels; it is a structured system, with several dashboards where different types of information can be extracted.

In this company it was mentioned that, when the KPIs show a good result, usually this means that the employees have a high level of Engagement.

For Delta, the KPIs are aligned with the Agile methodology used to develop the products, and those will impact the organizational performance.

Alpha has KPIs at different levels, at macro level to evaluate the company status, as the company is big, and then per project to calculate the operating profit; a direct link between organizational performance and innovation focus was not verified.

From the observations performed, a focus in Beta, Gamma, Delta, and Epsilon was verified to have innovation to achieve a good organizational performance.

Interdependencies from this topic were observed with Employee Engagement, as discussed above and as previously discussed with Work organization, Organizational type, Culture (Organizational) and Corporate Strategy, meaning interdependencies within Organizational Dynamics determinant.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.15 Informal Power

The capability to utilize informal power is needed in organizations that use teamwork, based on the skills of the people and not on a hierarchic setup. The five companies under study have different organization types, but all use teamwork as basis for the development of the products or the delivery of the services.

In Alpha the employees are empowered by this type of project organization, acting as influencers, as they are not the line managers. In Epsilon, through their autonomy and being

a company function oriented, it is needed that the employees behave as leaders to become influencers in an organization where they do not have a direct management action, having the need to conduct people and projects to succeed; the same applies to the other companies.

This is one of the few topics where it was verified the need of the same level of influence to be in place to work as a team, independently from the position in the hierarchy.

This topic was discussed above in other topics, showing interdependencies in Organizational Dynamics (Work organization, Organizational type, Culture (Organizational) and Corporate Strategy) but in one case also at the same time with Collaboration determinant (teamwork).

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.16 Employee Responsibility with the Customer

In Alpha there is a high degree of accountability and employee responsibility with the customer, being the operating profit under the employees' responsibility, having the capability to negotiate the prices directly with the customer, so the proximity and the responsibility is high, and it is possible to verify the engagement of the employees and the responsibility towards the customer final delivery.

In the case of Epsilon, from what was observed, not all people have access to the customer; the innovation sponsor supplied the information that the employees feel responsible for everything they are doing for the customers. In Beta and Delta, both are challenged by market trends, so they are oriented to the customer of the future; they study and develop solutions for the future. In Gamma there are employees that have direct access to customers and others that have not. In Alpha and Gamma, the proximity with the customer is high, and in Epsilon the internationalization part has a direct contact with the customer. The level of responsibility with the customer is not equal from company to company, even though all are motivated to serve the customers the best possible way with innovative solutions developed at the workplace.

There are interdependencies between this topic and others from Organizational Dynamics determinant (Work organization, Organizational type, Culture (Organizational) and Corporate Strategy).

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.17 Employee Training

In Alpha and Epsilon, the planning of the employees' training is part of their skill and career development. In Alpha it is made a planning of the training in a joint work articulated among the line manager, the human resources (HR) and the employee; if the projects need special skills then additional training is performed. In Epsilon it is similar. In Beta the employees' training has two components, one part mainly organized by the Portuguese parent company, as soft skills or communication and other specific part, as for tools for laboratories or more technical, this last one organized by Beta, both relevant for WI.

In Gamma there are three types of training: onboarding (or induction) for people who are recruited (this takes place twice a month), then technical training specific for the ongoing work to be done, and then a third type applicable to everyone, where there is a department dedicated to the training. The employee can apply for trainings by its own initiative. People can also have a certain volume of external training, agreed upon with their manager, either for soft and or technical skills.

Alpha and Gamma have established academies inside the companies to support the employees. Delta is a new company, in a growth stage, and wants to use the most innovative methods for training the open academies that exist in the internet, in addition to the induction programs that it must have to receive the newcomers.

In the studied companies, whenever the employees have a lack of knowledge, it is normal to use IT tools such as the Internet or new training Practices as open Academies existing in the web or discussion forums to post questions.

In all of the companies, except for Delta (which is in an employee ramp-up phase), there is a matrix of competences per employee. This helps planning the training and check for missing skills. Delta is recent and is recruiting currently as it grows, so in this case it was

not observed the existence of a matrix, but people are being recruited according to the needed profiles.

In summary, training is a concern for all the companies, but the concepts are not equal for all. One positive aspect that was observed in all of them was an openness for people to search for new training practices, based on IT usage, such as online environments in the internet for sources of innovation that could bring knowledge and produce innovation; this may not be a formal organized training but it is an ad-hoc triggered by the curiosity and willingness of the employees. The mentioned topics: Competence/Skill development, HR/Work practices, New training practices, online environments and IT usage are topics from HR Management, Collaboration, and IT Infrastructures determinants, establishing as such interdependencies among topics. There are also interdependencies within the Organizational Dynamics determinant.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.18 Competence / Skill Development

The companies in general, as described in each case, do not make a distinction between training and Competence and skill Development; training is either a part of it or is a need to develop a project. There are Competence development plans in all of the companies, except for Delta, where this process is under implementation. Usually those are done after the evaluation moments.

Competence/Skill Development has a component of training in most of the studied companies, following the HR practices or the business/project needs.

The training is performed either via their own academies as in Alpha and Gamma or via online training or using new training practices as skype sessions with colleagues from other countries as in Delta.

It is possible to verify that this topic has interdependencies with other topics in the same HR Management determinant but also with topics from Organizational Dynamics and IT Infrastructures.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.19 HR/ Work Practices

In Alpha and Epsilon some of the work practices used are: the possibility to work remotely, all employees are entitled to an insurance health system, to the free usage of a mobile phone, everyone has a laptop allocated, and they work under a flexible time schedule; the supervisors believe that more practices are needed to have a more attractive workplace. In Epsilon the employees have benefits related to the mobility systems they develop. In Alpha there are people entitled to use a car provided by the company or other benefits, but it was not identified any additional one which could be related to innovation. In Alpha job rotation is not promoted, while in Gamma it is. Delta invests in having a nice place to work, in having snacks and soup served to the employees during some periods of the day (this last one is valid also for Gamma). Beta and Epsilon invest as a motivation factor and innovation lever to have a proximity of the employees to the board.

As discussed before, Alpha organized creativity workshops based on design thinking techniques to leverage innovation and to train people to new approaches to the problems.

It is possible to see that each company aims to install some work practices to motivate the employees and have innovative workplaces, some being more advanced than others.

In the observations performed it was possible to identify interdependencies of this topic with others within the HR Management determinant and others related with topics from Organizational Dynamics determinant.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.20 Pay/Incentive Systems

In Alpha there are employees with a fixed salary per month and in addition a variable part associated to incentivized objectives. In Epsilon the employees have a fixed salary, and they also receive yearly a variable part but with no agreed upon objectives; Epsilon is introducing incentivized objectives, and according to the degree of achievement of the

objectives, becoming those incentivized in the near future. The difference in the variable parts of the two companies is that in Alpha is paid quarterly and in Epsilon will be paid yearly. In Gamma it is similar even though not fully equal to Alpha: the salary is composed of two parts, one fixed and another one variable indexed to incentivized objectives. The objectives can be broad related to the financial performance of the company or individual related to each employee's work. In Delta, the evaluation is currently mainly performed by the scrum masters; the future system is under definition by a consultant company. Beta it is also similar to Alpha and Gamma with the particularity that the objectives are individual and related to each person's contribution to the company and to specific objectives associated to the projects, and that some of these are indexed to innovation goals which is relevant to innovation.

The pay and incentive systems in each company are defined and follow in a harmonized way what each HR has defined for each company following the Company Strategy. In general, the compensation is related to the performance which is also important for WI.

It is possible to observe interdependencies of this topic within its HR Management determinant and with two others Organizational Dynamics and IT Infrastructure.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.21 New Training Practices

Under this topic are considered subjects such as training on the job, online learning, harmonization of learning practices or shared learning. The five companies use all these mechanisms, some more than others, depending on the maturity and size of the company. For instance, if a company is in a growth stage it needs a structured training program for a big number of people in parallel, as for example Delta. If for a subject, there are already enough people trained (as for the case of design thinking in Alpha) then to reduce the costs, this trained people can either use shared learning with the other colleagues or training on the job. In case of companies with a relatively big size as Alpha and Gamma then when there are newcomers there is already a harmonization of learning practices, through prepared induction programs or through the academies that both companies have established. The academies are also used for additional trainings of existing employees.

All of the companies use open training academy platforms with different intensities in addition to traditional training. The new ways of training in a faster way support getting information at the workplace in a much faster way than the traditional training and allows for instance to overcome challenges that one employee can face while trying to establish new concepts and having knowledge difficulties with a certain subject, and the new online ways at the workplace disposal enable innovation.

Interdependencies were identified between the topics New Training practices and HR/ Work Practices, Competence Skill Development, Online Environment, and IT Usage, this reflects interdependencies between HR Management Determinant, Organizational Dynamics and IT infrastructure determinants.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.22 Information Flow

Alpha is a large company, where not all of the mechanisms needed to allow an efficient information flow are in place. The management at board level is aware of this, and wants to change it, and there are some initiatives ongoing; the tools exist already as support for the information, what is missing is the channel and the processes. This is currently a topic of high priority in the company, as it might affect the level of innovation and efficiency. The first step is given, and now they can ensure, for instance that no more than one offer is going to a customer, which is a problem they recently overcame.

Oppositely in Beta, people are continuously doing information sharing. The difference in size of the two companies needs to be taken into consideration. There is a proximity of all employees in Beta, and this is not possible in Alpha. Beta also has procedures defined and implemented according to IDI which support the information flow.

Gamma has several processes in place through its QM department to ensure that information flows and is kept written to flow when needed.

In Delta, people interact intensively in each team and additionally have regular meetings in the entire company, and all sit in the same floor, so currently there is a good flow of information. The Agile methodology used in the company supports the information sharing as well.

Epsilon also had some challenges with information flow; this was recognized as result of a survey performed, some measures were afterwards established, such as: some spaces were created with televisions, newsletters, a communication plan, and short events to share the launch of strategic products, so they are taking steps to hinder the previous bad perception and ensure that people are better informed and are able to understand what the company does, what are the weak points and how each employee can contribute to a better and more innovative company.

A support of Knowledge management systems is a help to ensure that the information flows and is stored for reuse.

In this topic there are interdependencies within HR Management determinant (HR / Work practices) but also with Organizational Dynamics (knowledge Management) and Collaboration determinants (knowledge share).

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.23 Culture (Country)

Alpha, Gamma and Epsilon have offices out of Portugal. Country Culture is something that HR departments know of, having offices in several countries, and mainly what was referred, in the interviews, was the legal and institutional laws of the country, which might be influenced by the culture, and this was referred as relevant to the companies in an innovation context. The boundary is hard to define because if one country gives incentives to innovate this can be considered that it has a culture which promotes innovation, as in Portugal. In Beta and Delta no relevance was observed. In Alpha and Gamma that have affiliates in several countries it is possible to see that there are foreigners working with them and in the offices in the other countries those specificities must as well be considered.

It is possible to observe interdependencies with the Corporate Strategy of the company (in Organizational Dynamics determinant) as well as with to HR practices in HR Management determinant.

This topic is classified as an intra-company topic, and an outside company topic as the country culture exists in the country and can be impacted by factors not directly under the company’s control, but which are associated with its relation to external entities or factors.

4.3.24 Management

This topic is related with the Leadership style and the relation type of the leaders with the employees.

In Epsilon the board level management has an open-door policy, meaning they want to be accessible to everyone. In Alpha, being a big organization, the employees' view of the Management is the one from the business division where they work. Alpha having 10 to 15 employees per line manager does not promote a heavy hierarchy, but the distance to the board, due to its dimension, is bigger than in any other company under study (Beta, Gamma, Delta, or Epsilon). In Gamma the large size is also a challenge in terms of proximity to the Management, but the management aims to be present in the several buildings, and to be accessible and participate in the events, so a close contact with the employees is promoted. In Delta, the leadership style is still difficult to define, as everything is being built, so currently, this company has a very flat organization that brings a close proximity of all employees to at least one member of the board always co-located. In Beta the top-level management meets every week with the employees, existing as such as close contact employees / board.

The different Management styles established are limited by the corporate strategy and HR but constrained to business needs and the reality of each company as just described.

It was possible to observe interdependencies between this topic within HR Management determinant (HR/ Work Practices) and with Organizational Dynamics determinant (Organizational Guidance).

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.25 Cooperation Actions

This topic covers internal co-operations as meetings among employees and external co-operations as partnerships.

In Alpha no inter-division, division or sub-division meetings are performed for best practice sharing, contrary to Epsilon where internally there are several initiatives promoted either by

the innovation sponsor or by other areas, for best practice sharing or for relevant communications. It must be noted that the sizes of the companies are very different, with Epsilon being 10 times smaller it is easier to do it even though in Alpha this could as well be organized to be performed in smaller teams. In Beta there is a good internal co-operation, there are meetings among employees supporting each other, there is a good cooperation between Management and employees. In Gamma there is a good internal collaboration triggered by the culture embedded in the company installed and by some mechanisms as the installed processes, the innovation lab, the quality systems, the innovation, and knowledge team and the defined KPIs. In Delta, being a recent established company, the main internal collaboration factors in the process which it is followed, Agile, the U-shape they use to sit in meetings, the existing spaces for networking and the openness to allow experiences to produce innovation. Several of these companies have different ways to support innovation.

Alpha, Beta, Gamma and Epsilon have external collaborations with universities. Alpha uses it to recruit talented people, to participate in co-funding projects or events or for consultancy. Epsilon uses it to explore new technologies or new processes or to participate in European or National funded programs. Alpha gets involved in other external collaborations like events which are related to innovation as for example the Web Summit in 2018 (entrepreneurship, innovation, and technology), IMSHARE (management and data analysis), and Hackathon (web, mobile and desktop platforms). Gamma participates in international research projects which are funded by European or National Programs (e.g. ESA, H2020, PT2020). Usually, the participation implies several partners and brings new knowledge and networking of new partners, that even after the project is finished are useful either for other international projects or for bilateral partnerships, receiving the support from the innovation and knowledge team. Epsilon in its transformation process, to achieve product differentiation through technological competitiveness, established additional co-operations to add competencies from other companies, as suppliers and other technological and strategic partners. There are also collaborations which are performed by the business; examples are, as in case of Alpha, an alliance with a Portuguese operator in the telecommunications market, to deliver a contract to a customer and in Epsilon, a strategic partnership in the United States of America with a consultancy company, to look for new customers and the right markets to target.

Beta has external collaborative partnerships to thrive as a global technology network, by celebrating partnerships with international R&D institutions, according to the strategy of the

company that aims to have a Global R&D Network, which could become a “technology arm” of the international business. This strategy is designed to explore the good connections existing in Europe, Brazil, Angola, Mozambique and China.

All of these companies, from Alpha to Epsilon, are listed as associates of the Community of Practice (CoP), COTEC, previously referred in the chapter 3. Beta belongs additionally to a CoP to ascertain standards in the Power sector, and in other CoPs of working/study groups in several countries in the Power sector. The participation in these CoPs is, on one side, a way to share knowledge in a context of WI – as many of the subjects which are under discussion in those workgroups require new protocols and new products to be developed – and, on the other side, a way to influence for instance standards – based on the innovations already produced by this company at the workplace. Externally Gamma partnerships with companies for a purpose, for instance during a certain period to execute a contract or collaboration protocols (e.g., with universities), or with entities from the national R&D and Scientific and Technological system or via participation in international or national projects, or even triggered by a subject, where a specific knowledge is needed to acquire. The collaborations may consist in the participation of the partners in the concept, development, and test of this company’s products in a joint work with its employees, enlarging the internal scientific and technological competences. One of the main objectives of the collaborations is to create an innovative engine continuously transferring know-how and technology knowledge from experienced technological external entities to the company, creating employees’ conditions to work in WI environments producing highly innovative technologies.

Internal Marketing activities were observed in Beta as described in section 4.2.2.3, and in Alpha this practice is not installed due to customer constraints.

It was possible to observe interdependencies of this topic from topics in the determinants Organizational Dynamics (Corporate Strategy), Collaboration (CoP, Internal Marketing, Interface Management, Knowledge share) and Other Facilitators (Funding Programs Usage).

This topic is classified as an intra-company topic, and an outside company topic as it can be impacted by factors not directly under the company’s control, but which are associated with its relation to external entities or factors (as in Funding Programs Usage).

4.3.26 Interfaces Management

Beta evaluates interface management with its partners, according to the assumptions and objectives internally determined. This is performed on a yearly base. Epsilon has a detailed process to evaluate if current partners are the appropriate ones. Epsilon has defined criteria and each year performs this assessment. Contrary to this good practice, Alpha does not have it. Gamma also has a process specified for interface Management; its QM team handles it, contrary to Beta and Epsilon where this is done by the innovation sponsor through the respective IDI processes, with support from other people from each company. In Delta, this process is adopted from its national parent company.

Under this topic can also fall the interface management between the team internally, and this is defined by the work teams based on the job descriptions. Except for the process Agile, it was not verified in a written way such an interface description.

This topic is interdependent from topic co-operation actions also in determinant Collaboration (co-operation actions) and from Corporate Strategy in Organizational Dynamics determinant.

This topic is classified as an intra-company topic, and an outside company topic as it can be impacted by factors not directly under the company's control, but which are associated with its relation to external entities or factors (as co-operations actions with their partners).

4.3.27 Knowledge Share

In Alpha, the Knowledge is stored in a systematic way only in the CRM system, corresponding to customer information, to ensure that this part of Knowledge is accessible and as such shared (this customer knowledge is relevant to WI). There are some teams which perform learning meetings, but this is not shared at a larger level, so most likely it is correct to express that the knowledge is shared at the granularity of the team and at most within the business division or for instance in case there is a lack of resources and one employee is moved from one team to another one. It is worth noting that Alpha has 2000 employees and if no process exists to determine a Knowledge Management System (KMS) basic principle then it is difficult to verify and observe which knowledge was in fact shared. In Beta and Epsilon, it is possible to verify the existing Knowledge Management processes, being common to the IDI processes to optimize the structure and being good sources of

information, which can be shared. It is also possible to see a knowledge bridge, overcoming theory and the practice gap through the laboratories usage in Beta, Delta and Epsilon and in some cases in Gamma; in Alpha it is not observed but the characteristics of this company are different as it mainly has Services and some software in IT systems, where this is not so relevant. In Epsilon there are additional team building activities organized at company level or by each team, where knowledge is shared. Epsilon also promotes internal marketing activities, such as innovation projects, the publishing of books with case studies, newsletters with best practices and project wins, and a communication plan is available to everyone; overall there are ongoing initiatives to promote knowledge share.

In summary it seems to exist good knowledge share potential in Beta, Gamma and Epsilon; in Delta it exists in the area of work based on the current adopted process and Alpha keeps the most relevant customer information stored, has several tools to store knowledge information but still lacks some articulation among all tools to guide people through them.

The existence of KMS supports the knowledge share.

Another possible way to share knowledge or gain knowledge is by having a process that potentiates it (that is the case of the R&D and Innovation certification, that some of the studied companies have) or by protecting the new ideas via Intellectual Property Rights (IPR) and then participate in congresses and workshops to share those.

All the companies with different degrees have knowledge share as a goal supporting WI with different levels of intensity.

In this topic we observed interdependencies to Organizational Dynamics, HR Management, Collaboration and IT infrastructure determinants.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.28 Teamwork

All of the companies handle the projects in a teamwork setup according to the customer needs. The best examples of self-managed teams are the ones that use the Agile process, namely Delta, Beta, and some teams in Gamma, and Epsilon (listed according to the Agile intensity usage observed and estimated). Alpha is mainly more services oriented and for

this reason it is harder to reach any conclusions; in Alpha there is a higher focus in operating profit; that sometimes might have a higher priority than innovation. Teamwork is a way of work where people must be very co-operative, led by influence, work as if it was one person aiming to achieve a result; this is a good environment for WI.

This topic has been described as well in the context of other topics as in work organization.

As a result of the observations, interdependencies were observed between Collaboration determinant and Organizational Dynamics (derived from topics informal power, job characteristics, job design or employee training) and IT infrastructures (derived from topics Computer based simulator usage, or IT usage) determinants.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.29 Community of Practice (CoP)

Alpha, Beta, Gamma, Delta, and Epsilon are associates of COTEC being part of the Community of Practice (CoP) (COTEC, previously referred in the chapter 3). Epsilon is also part of another CoP to determine standards in the mobility area, and a CoP of working groups at European level to create a mobility platform. The COTEC shares over the year the best innovative practices in the company, and it is also a forum where people can network and establish partnerships contributing to WI, and Innovative get-togethers in COTEC to share ideas and practices in a co-operative approach sharing knowledge.

The main interdependencies observed were within determinant Collaboration (with topics co-operations actions and knowledge share); however, this participation is also dependent from the Corporate Strategy of the company, so there is also an interdependency to the Organizational Dynamics determinant.

It is an intra-company and outside company topic as it can be impacted by factors not directly under the company's control, but which are associated with its relation to external entities or factors (as co-operations actions with their partners).

4.3.30 Internal Marketing

Internal Marketing in this context is mainly about sharing or presenting ideas in the company or delivered projects and getting feedback about those; as a result other people also put ideas together and might generate a chain of innovation and of interactions.

In Alpha there is a lack of practice share; this does not facilitate the information flow in the company, which could potentiate aggregation of ideas and more innovation to be generated, as it was recognized in the interviews. In Epsilon, internal marketing activities are promoted, such as innovation projects, the publishing of books with case studies, newsletters with best practices, project wins, and a communication plan available to everyone. In Beta, the projects' results are shared internally, via events called "innovation hours" where, besides the company's employees, the national parent company is invited to participate in these events, contributing by providing feedback. Gamma also has some best practice sharing organized by the QM department. Delta does it ad-hoc in the open space they have. Even though it is important for WI, it seems that the companies which are doing internal marketing in a more systematic way are the ones certified by IDI, namely Beta and Epsilon.

This topic shows interdependencies mainly with others from Collaboration determinant (co-operation actions and knowledge share). It also is impacted by the Corporate Strategy topic (Organizational Dynamics).

This topic is classified as an intra-company topic, and an outside company topic as it can be impacted by factors not directly under the company's control, but which are associated with its relation to external entities or factors (as co-operations actions with their partners), as for instance customer constraints.

4.3.31 Regional Innovation

These five companies are part of COTEC that has innovative companies from different regions of Portugal. The word "Regional" as described in the SLR, means a region of a country. Alpha, Beta, Gamma, Delta, and Epsilon did not show in the interviews to be part of any regional innovation system, although they have shown evidence to be part of an innovation community of practice at national level and belong to a ecosystem where innovation takes place. The topic Regional Innovation was not possible to validate. It can also be argued that in the country where this study is conducted, Portugal, it was not

possible to validate if in reality the regional innovation contributes to WI, or how WI interrelates with the ecosystem of innovation, as most likely it is not possible to identify a group of innovative companies co-located in one or more regions where this would be possible to validate in the timeframe of a PhD thesis.

It was also not possible to conclude how Regional Innovation and WI are interrelated. This topic is discussed in the chapter 5 and taken as limitation in chapter 6.

4.3.32 Information and Technology Usage

In all of the observed companies, from Alpha to Epsilon, Information and Technology (IT) infrastructures are used and play a crucial role in these technological companies, that rely on the IT infrastructures and tools to perform the daily business and develop, deliver or provide remote services to the customer. The companies also consider that it is essential to have a good IT support team when there is a problem. In some cases, as in Alpha, support from the IT shared services team is available 24/7, which is appropriate to the work needs of the company. If IT does not work this hinders the normal functioning of this company and of WI to a certain extent, as there is the need to have connectivity.

Beta has laboratory facilities equipped with testing tools that allow a co-simulation of power systems and communication networks. This enables the product test in the laboratory and via remote access at the workplace that is particularly important for WI as it allows a fast validation of an innovative idea. Gamma also has laboratories that rely on the proper functioning of IT. Delta has simulators also dependent from IT infrastructures. Epsilon has laboratories to test the hardware and software they develop, dependent from IT.

Although the technology is used in different ways, all companies have in common the fact that the usage of IT, namely the PCs usage (either desktop or laptops), and the IT infrastructures are considered critical for the business. Some companies, mainly Beta, Gamma, Delta, and Epsilon have laboratory facilities dependent from IT infrastructures or need IT services available 24/7 as in Alpha. This is aligned with the outcome of the WI SLR and the relevance of IT for WI. This way of working is avoiding time consumption of the employees, allowing them to focus on innovation activities and giving them a faster access to knowledge.

It is also used in several critical tools in the company from salary systems to 24/7 customer support systems.

This topic had interdependencies observed in the Organizational Dynamics (as seen in topics Employee training, Job Design, Job Characteristics or Corporate Strategy), HR Management (as seen in Pay and Incentive Systems, HR/ Work Practices or New Training Practices), Collaboration (as for topic Teamwork), and (within) IT infrastructures (as for topics online learning environment, computer-based simulator or integrated technology) determinants.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.33 Online Learning Environment

Alpha and Epsilon use online learning for planned training when possible or when needed to gain expertise for a project. For instance, Alpha considers that online training is one of the possible ways to optimize learning avoiding travels and minimizing costs, facilitating bringing the knowledge to the workplace in a fast way and supporting innovation and WI. Gamma and Delta use and promote continuous online training even if not planned.

This topic is mainly interdependent from an adequate IT usage, another topic in IT Infrastructure determinant and from the topic Corporate Strategy from Organizational Dynamics determinant.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.34 Computer-Based Simulations

Alpha, Beta, Gamma, Delta, and Epsilon use computer-based simulation tools in testing and development environments of their products; this usage is particularly important for workplace innovation as it allows a fast concept validation of an innovative idea, by testing it in conditions close to the real ones. Another perspective is that by using simulation tools the errors are detected at an early stage of product development, optimizing the resources spent to correct it and focusing the work on innovation at the workplace. Companies use it in different levels and having different sizes and different types of businesses, as R&D or

Service. It is difficult to understand the degree of usage in each, however it seems beneficial in all the observed cases.

There were observations in this area specially in Beta and Delta where this type of simulators is particularly needed due to the novelty and specificity of the products under development, namely new-generation power systems and future driving machines.

The interdependencies observed were mainly in Organizational Dynamics (as in topics employee training and Corporate Strategy), Collaboration (as in topics Teamwork and New Training Practices), and IT infrastructures (as in topic IT usage) determinants.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.35 Integrated Technology

Alpha and Epsilon do not have integrated technology systems to perform all the functions in the company. For instance, Alpha has a system for messaging, and then uses another one, an open source, for conference calls; there is not an integrated one. Epsilon uses different systems but has a similar situation. An integrated system for the entire was not observed in any of these companies.

On the contrary, it was observed a tendency from each company to look for what each considered the best open-source system from each type and adopt it, as for instance for messaging, for database, and for conference calls. It is an option even though these systems might have a time-limited usage permission. One of the reasons for this selection is certainly cost constraints and in some cases attitude as these companies work with others at an international level which use the same tools, as is the case of Gamma.

The interdependencies reside within the same determinant of the topic, as with topic IT usage from IT infrastructure determinant, and with Corporate Strategy from Organizational Dynamics determinant.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

4.3.36 Change Management

In Alpha, Beta, Gamma, Delta, and Epsilon there is no Change Management process defined. Alpha handles the changes as a project with an approach case by case. Alpha and Epsilon recognize that a Change Management process is needed and are working on elaborating one. Beta is relatively recent, the interviewees refer that there was no need to perform big changes, so this is not considered a priority, even though it is considered important.

In Gamma the change management responsible and the management of the communication have an owner, in case of a need for changes, that handles all the activities considered of relevant impact for the employees. Delta made changes very recently; the changes are the own growth of the company and it is running smoothly.

There is an interdependency of this topic with Corporate Governance from Organizational Dynamics determinant and with topic External factors within Other Facilitators determinant

It is considered an intra-company topic.

4.3.37 External Factors

The External factors topic is influencing all of the companies. Alpha, Gamma and Epsilon, due to its presence in several countries, are subject to contextual influences, environmental/ institutional and other structural factors. Epsilon is looking to adopt innovation if this brings faster time-to-market to cover market trends. Beta and Delta are influenced via the requests collected by the market trends received via each respective international parent company. Both companies might be impacted by environmental, institutional, and other structural factors, due to the functional areas where its businesses are inserted. As previously discussed and applicable to all the companies under study there is a national country specific tax reduction program applicable to all companies that have Research and Development activities; that is an incentive to Innovate, supporting WI.

Interdependencies were observed between this topic and Change Management within the same determinant, and with topic Corporate Strategy from Organizational Dynamics determinant.

It is considered as an outside company topic as it can be impacted by factors not directly under the company's control, but which are associated with its relation to external entities or factors.

4.3.38 WI Implementation Support

All the companies participating in the case studies are interested to get feedback about this research and have the possibility to use it as improvement for innovation in the companies. The companies are aware that there are other companies participating in the cases studies of this empirical study, as explained in chapter 3.

No interdependency was observed in this topic, except with Organizational Dynamics (mainly with topic Corporate Strategy, Culture (Organizational) and Organization type).

It is an intra-company topic as it is an internal decision at corporate strategy level to decide on getting a WI implementation support and an outside company topic as it can be impacted by factors not directly under the company's control, but which are associated with its relation to external entities or factors (as co-operations actions with their partners), namely if the expertise for such a support is available and affordable at reasonable costs.

4.3.39 Venture Capital

Alpha has a Business division that has venture capital, with the purpose to scan and look for innovation opportunities that can bring business possibilities to invest, intra-company or outside the company. These products can target markets different from the ones of interest for Alpha. This was not observed in any of the other four companies (Beta, Gamma, Delta, and Epsilon) under study.

Alpha's initiative already produced positive outcomes, as previously referred in Alpha's findings description. The venture capital business division has already invested in a startup that, besides being already a success case, has the potential to become a Unicorn.

Alpha's business objective is twofold; firstly, to get a return on the investment in a period, secondly to increase the company's innovation level. The innovation can derive from an employee's idea at his workplace or from a startup looking for an investment partner. This is a facilitator that enables innovation, turning new ideas into products; this levers workplace

innovation, giving the employees the possibility to have their ideas supported and transformed into products. This may act as employees' driver to innovate at the workplace.

This topic is adequate in the framework to determine Other Facilitators, as an enabler. An interdependency exists with Corporate Strategy from Organizational Dynamics determinant, the willingness to have this structure and risk level in the company.

It is considered an intra-company and an outside company topic as it is a Corporate Strategy decision to scan and look for innovation opportunities that can bring business possibilities to invest, intra-company or outside the and it can be impacted by factors not directly under the company's control, but which are associated with its relation to external entities or factors, namely the existence of startups fitting the strategy.

4.3.40 Funding Programs Usage (National or European or Other)

In Alpha, Beta, Gamma and Epsilon it was possible to verify the effect of the knowledge created through funding programs (National or International). The projects using funding programs are not always of the same type. Some funding programs support research, others support demonstration projects, others are for scientific and innovation initiatives or even for investment; each of them has its scope defined. All the projects supported by the funding programs usually have most of their activities covered by those programs, and the remaining part is at the company's expense.

There are projects which are funded for instance by ESA, H2020, PT2020, QREN or Artemis JU or by own country programs or even by other institutions. This knowledge is then reused in other projects or allows other innovations to be performed in the companies and can leverage WI. The participation in these projects allows the interdependency of different partners creating connections which otherwise would be difficult to achieve and allow either research in areas that usually are still under investigation, or the experimental usage of unknown environments or processes and this is value added for the companies and its partners that take part in those projects.

Delta is too recent, there is no accumulated evidence to allow drawing conclusions from this subject.

The aforementioned funding programs seem to contribute to WI.

It was possible to identify an interdependency of this topic to Organizational Dynamics (Knowledge Management and Corporate Strategy topics), to Collaboration (knowledge share and co-operation topic) and to Other Facilitators (topic Venture capital can use some of these funds).

This topic can be considered a candidate to be included in Determinant Other Facilitators.

It is considered an intra-company and an outside company topic as it is a Corporate Strategy decision to use funding programs and it can be impacted by factors not directly under the company's control, but which are associated with its relation to external entities or factors.

4.3.41 Protection of Intellectual Property Rights (IPR)

Alpha does not have patents registered and does not have that objective; intellectual property rights are protected, whenever applicable, through code components registration (software). Beta has three patent applications ongoing. Conversely, in Gamma the patents and code registrations are ways to protect the intellectual property but only if it is absolutely required, as it is not a goal from the company to produce these. In Delta, a recent company, no code, or patent registration exists, there is the goal to do it when applicable. Epsilon has a patent registered, and one pending; it has several source code (software) components and some models (hardware) registered in Europe and in the USA.

The fact that it was observed that, in some of the companies, there are patents, software, or other components registered does not allow to conclude that those registrations contribute to WI. The relevance of those observations is to point to the need of understanding how the innovations conducting to those registrations were generated, namely if this was the result of a previous planned proactive work.

In the case of Alpha and Gamma, from the observations, the registration of components is performed to protect the products delivered to the customers. There is no strategy defined to have patents. In these two companies no patents were observed; only the software is protected. Beta and Epsilon are the two companies which have, systematically, goals associated with the generation with IPRs or patents; this indicates that in these two cases there was a previous proactive work setting targets to achieve the innovative results, allowing those registrations. At least in these two companies it was possible to verify a relation between the focus on innovation and the obtained results in terms of intellectual

property protection, being possible to connect the topic protection of intellectual property with the innovation generated at the workplace.

In this topic it was identified an interdependency to Corporate Strategy in Organizational Dynamics determinants, Knowledge share in Collaboration determinant and R&D and Innovation Certification in Other facilitators.

This topic can be considered for other facilitators determinant.

This topic is classified as an intra-company topic, as in all the interviews conducted and all observations noted, it did not directly reveal to be affected from outside the company.

The action or intention to register is an intra-company topic, this is the angle under observation and its association with innovation at the workplace. If the consideration would be if the IPR would be accepted by external entities then it would be an outside-company topic, not in focus in this context.

4.3.42 R&D and Innovation Certification

Beta and Epsilon are certified according to the IDI Portuguese Standard NP 4457 (CT 169 - Atividades de Investigação Desenvolvimento e Inovação (IDI), 2007), which ensures that innovation goals are set for each year. Alpha, Gamma and Delta are not certified according to this standard and do not see currently as priority to go through this process, as customers do not request it.

Beta was from its beginning established with the strategic goal to be the innovation company of its parent companies. This company being challenged by its parent companies to design innovative solutions for emerging technological trends defined an innovation system to support the achievement of the defined strategic goal. The IDI system and its standards was used as guidance to build the innovation system. The IDI system defines a group of standards or rules which were implemented to achieve the correct setup to apply successfully to a certification.

In Epsilon the interviews confirm that the IDI implementation is a live system and not just a defined process; people refer that they are having brainstorming meetings to solve concrete issues aligned with the defined innovation goals, with enthusiasm, for instance. There is an innovation process defined. The principles expressed in the standard helped the company

to structure the innovation activities, even though many were in place before the certification, lacking process documentation, as expressed by the innovation sponsor, so the certification process brought benefits and structure.

The certification was achieved by both Beta and Epsilon. Some examples of standard rules which contribute to innovation are defining goals aligned with innovation and documentation. Each team has KPIs defined depending upon the projects. The KPIs are aligned with IDI goals for innovation. Having goals defined for instance for the number of innovations each employee or each team must achieve yearly, motivates contributing to innovation and incentivizing innovation at the workplace. The standard also implies the existence of documentation describing how the daily work is performed as well as project documentation. It is defined which documents must be produced in which form at which stage of the project and which processes must be defined and documented. It is a support to WI having documentation available, supporting knowledge share and projects and the work process flow understanding, as this is the base for new ideas generation with what exists already as a starting point and not wasting time with double work.

It was possible to identify an interdependency of this topic to Organizational Dynamics (topics: knowledge management, culture (organizational), creativity, organization type, work organization and Corporate Strategy topics), to Collaboration (knowledge share topic), to HR Management (information flow topic) and to Other Facilitators (IPR Protection topic) Determinants.

This topic settles the creation of new ways of working in the organization, it can be considered for Organizational Dynamics Determinant.

This topic is mainly classified as an intra-company topic, however an external entity is needed to be IDI certified; for this reason it is also classified as an outside-company topic as it can be impacted by factors not directly under the company's control.

4.3.43 Cross-Case Studies Overview

The topics overview per company is summarized is Table IX.

Table IX: Empirical Study: Topic overview per company

Topic	Category	Proposed Framework	Alpha	Beta	Gamma	Delta	Epsilon
Work Organization	Organizational Dynamics	X	Teamwork (non-hierarchical).	Teamwork (non-hierarchical).	Teamwork (non-hierarchical).	Teamwork (non-hierarchical).	Teamwork (non-hierarchical).
Autonomy/ Employee Empowerment	Organizational Dynamics	X	Employee autonomy. Optimization of operating profit accountability.	Employees work in an autonomous way through the planned deliverables, with supervision from time to time. The Agile way of work used leverages autonomy and Employee Empowerment.	Employee autonomy. Employees work in line with defined objectives. The Agile way of work used leverages autonomy and Employee Empowerment.	Employee autonomy and empowerment are part of Corporate Strategy. The Agile way of work used leverages autonomy and Employee Empowerment.	Autonomy geared to daily work in functional teams. Optimization of product innovation.
Leadership	Organizational Dynamics	X	Employees trained to be leaders since the induction phase. Leadership is considered important for teamwork.	The Agile way of work leverages the Leadership attitude in teamwork and its acceptance in rotating mode, from project to project.	The Agile way of work leverages the Leadership attitude in teamwork.	The Agile way of work leverages the Leadership attitude in teamwork.	Employees behave like leaders to be able to have influence in the team without hierarchy.
Employee Engagement	Organizational Dynamics	X	Autonomy brings Employee Engagement as a result.	There is a small team very engaged with the objectives of the company in a young multicultural company.	Employees are engaged with the company, and the company considers this essential to produce an innovative environment.	Employees are engaged with the company and are involved in teamwork since the recruitment process of new employees.	Autonomy brings Employee Engagement as a result. An engaged employee is committed to improve products and contributes to innovation in an active way.
Culture (Organizational)	Organizational Dynamics	X	Organizational culture reflected in its vision, mission, values. Part of Corporate Strategy.	Organizational culture reflected in its vision, mission, values. Part of Corporate Strategy.	Organizational culture reflected in its vision, mission, values. Part of Corporate Strategy.	Organizational culture of autonomy and strengthening of employees' strong points. Part of Corporate Strategy.	Organizational culture reflected in its vision, mission, values. Part of Corporate Strategy.
Organizational Guidance	Organizational Dynamics	X	ISO 9001 certification and a Quality Management System. Establishing measures to become a more attractive place to work and face the competition of startups.	The Organization has a high concern with employees. There is a Quality Management System based on the principles of NP 4457.	Organizational guidance comes from the board. In the company there is a common quality policy and objectives ensuring the delivery of high-quality projects and services as per the company corporate strategy and board guidance.	Organizational guidance is to have people working in a structured way, giving them the freedom, they need to achieve their goals. With this guidance the board expects to have and attract brilliant and innovative people.	Governance is defined at board level, through its functionally oriented organizational structure. Corporate Strategy and Governance of the company are the base for defining its Vision, Mission and Values.
Job Design	Organizational Dynamics	X	All jobs have descriptions.	All jobs have descriptions.	Employees are selected according to the skills needed for each job. There are job descriptions.	Employees are hired/selected according to the skills needed for each job role. There are job descriptions for each job role.	Job roles are designed. The main categories are Project managers, team leaders, employees.
Knowledge Management	Organizational Dynamics	X	There are tools for KM repository (Applicational Mushrooms). There is a CRM system in place. There is no explicit procedure for KM.	KM process defined.	KM process defined. The QM department ensures the KM mechanisms and repositories.	KM is based on networking and mixing experienced and new people. There is an application which "obliges" people to network, "Joy in Motion".	There are tools and processes for KM.

Topic	Category	Proposed Framework	Alpha	Beta	Gamma	Delta	Epsilon
Organization type	Organizational Dynamics	X	Competitive Multidivisional type organization.	Simple type organization.	Cooperative multidivisional type organization.	Simple type organization.	Functional type organization.
Creativity	Organizational Dynamics	X	Creativity workshops and Design Thinking workshops (conducted by Stanford University) to promote innovation (in the past). Currently internal trained people train other employees.	There are weekly meetings where brainstorming occurs. Team building initiatives take place where new ideas also occur.	There are mechanisms to promote creativity. From challenges raised by the company to employees to special spaces dedicated to innovation where people can go to discuss ideas.	Creativity workshops are performed via "meet-up" initiatives once a month. Employees are selected with the skill of creativity as a (wish) requirement.	The Innovation Sponsor promotes several practices such as regular brainstorming sessions, acting as creativity workshops.
Job Characteristics	Organizational Dynamics	X	Jobs are assigned in teamwork according to the skills the employees have for the work needs. Employees' capabilities are registered in a competence matrix.	Jobs are assigned depending on the skills and allocations needed.	Jobs are assigned in teamwork according to the skills the employees have for the work needs. Employees' capabilities are registered in a competence matrix.	Jobs are assigned depending on the skills needed.	Jobs are assigned according to the skills the employees have (which are registered in a competence matrix).
Corporate Strategy	Organizational Dynamics	X	Vision, Mission and Values are defined at corporate strategy level. Currently the company is under a rebranding phase to become more appealing. With its strategy, it has the goal to continue being recognized as an innovative company	The corporate strategy is defined, and its main components are stored in the Management System, where all guidelines for the organization are also stored. Mission, Vision and Values are part of the Corporate Strategy.	The corporate strategy is defined by the board. Vision, Mission and Values are deemed as a common quality policy and objectives ensuring the delivery of high-quality projects, and services are defined at corporate strategy level.	The corporate strategy is defined by the board. Basic principles are 100% based on the Agile working mode and there are no hierarchies. The team is responsible for results.	It has the strategy to look for internationalization, setting the pace for market trends in mobility, in being the Innovation and R&D of the parent company and its associates. Its strategy is to continue being recognized as an innovative company.
Employee and Supervisor co-operation	Organizational Dynamics	X	Good cooperation between employees and Supervisors or team leaders. In the case of co-operation between employees and the board of the company, it might be a challenge for people who are not located in the same building, especially due to the size of this company and the variety of affiliates.	Good cooperation between employees, head of R&D and co-located members of the board. All employees attend the weekly meetings (allowed by the size of the team).	Good co-operation between supervisors and employees.	The supervisor concept does not apply, except for the board, as no hierarchy is defined. There is good co-operation in the team.	It was mentioned that there is good cooperation between employees and team leaders. The board has an open-door policy and employees are open to contribute with ideas to the company's higher management.

Organizational Performance	Organizational Dynamics	X	There are KPIs defined to measure organizational performance aligned with the business.	It is measured. There are KPIs defined at project level, which are business oriented.	It is measured. There are KPIs defined by the Quality department and stored in the QMS. They are defined at Strategic, Departmental, Project and Process levels, and its follow up is performed using a balanced scorecard tool. Every project has a dashboard, which is assessed and discussed in project meetings at least once every month. These are reported to the board of the company as input for supporting its decisions and are accessible to all employees. This is relevant for the engagement of the employees with the company and to their motivation to innovate at the workplace, conducive to WI.	KPIs are not defined. The company is in a ramp up stage. The objective is for the teams to reach speed cruise.	There are KPIs defined to measure the business aligned organizational performance.
Informal Power	Organizational Dynamics	X	The project organization is usually performed in teamwork. Employees are empowered by the project organization, acting as project leaders, through informal power as often they are not the line managers.	The project organization is in teamwork, in scrum teams, and therefore people are able to lead teams using informal power.	The project organization is in teamwork, in scrum teams, and therefore people are able to lead teams using informal power.	The project organization is in teamwork, in scrum teams, and therefore people are able to lead teams using informal power.	Through their autonomy, employees take the lead in an organization where they do not have a direct management action, but they need to manage people and projects to succeed, so they must lead through informal power.
Employee responsibility with the customer	Organizational Dynamics	X	There is a high degree of accountability and employee responsibility with the customer. The operating profit is under the employee's responsibility, customer proximity and responsibility are very high.	There is a close contact and responsibility between employees and the two parent companies which are the two main customers.	Employees are accountable for the customer related KPIs. Implementation of the backlog of customer complaints (that are not errors) is a way to provide solutions tailored to customer needs.	Not applicable yet.	Employees feel responsible for everything they are producing for the customers. Employees are accountable for the customer related KPIs.
Employee Training	Organizational Dynamics	X	Planning of employee training is part of their skill development and career planning, in a joint work carried out between the line manager, human resources (HR) and the employee; additional training is performed if the projects need special skills. This company has established an Academy.	Employee training has two components, one mainly organized by the Portuguese parent company, for soft skills or communication, and another which is specific, for instance, for laboratory tools or more technical elements, this last component being organized by the head of R&D.	This company has established an Academy. There are three types of regular training: -on-board training for people who join the company -technical training specific for the work to be performed -and a third type common to all employees. Employees can also have a volume of external training, agreed with their manager, combining soft and technical skills.	Multidimensional daily training; Self-learning; learning over networking and formal training programs (Scrum); online training using tools such as Pluralsight, Udacity and Safari Books.	Planning of employee training is part of their skill development and career planning, in a joint work carried out between the line manager, human resources and the employee; additional training is performed if the projects need special skills.

Competence / Skill Development	Human Resources Management	X	There are Competence development plans for each employee. These are done after the evaluation periods performed every quarter, allowing a fast adjustment and establishment of measures in the plans.	There is a Matrix with all existing competences per person in the company. This is the base for Competence/ skill development planning.	The skills of each employee are listed in a competence matrix maintained by the HR department. This information is the base for project planning and for identifying missing competences of employees. Skill development is performed via regular training or training on the job.	Employees are hired according to the skills needed. People develop competences daily, as needed.	There are Competence development plans for each employee, prepared on a yearly basis after the performance evaluation. There is a competence matrix with employee's training registration and skills.
HR/ work Practices	Human Resources Management	X	There are some practices used such as the possibility to work remotely, all employees are entitled to an insurance health system, to the free use of a mobile phone, everyone has a laptop, and work under a flexible time schedule. Some people are entitled to use a company car or other benefits, but no practice which could be directly related to innovation was identified. Job rotation is not promoted.	HR is performed based on a SLA with the parent company. The good relationship that management has locally with employees, was mentioned as a relevant factor for motivation. The role of HR in this company is performed partially by the line manager. One example given as a work practice was a team off-site event taking place once a year.	There are practices such as giving fruit or small meals throughout the day to employees. There is the possibility to work remotely. There are possibilities for job rotation.	Some practices were mentioned, such as a MasterChef cooking soup, sandwiches and cakes in a separate room, available for free throughout the day. Overall, it was also stated that there is a concern with employees' wellbeing so that they would have the correct environment to be productive and innovate.	There are some practices used such as the possibility to work remotely, all employees are entitled to an insurance health system, to the free use of a mobile phone, to a laptop, and work under a flexible time schedule. Job rotation is not promoted.
Pay and incentive systems	Human Resources Management	X	There are employees with a fixed salary per month and, in addition, a variable part associated with incentivized objectives, which is paid quarterly.	The salary is composed of two parts, one which is fixed and another which is variable, indexed to incentivized objectives. There are individual objectives indexed to innovation goals, which is relevant to WI.	Employees' salary is composed of two parts, one which is fixed and another which is variable, indexed to incentivized objectives. The incentivized objectives can be global, related to the financial performance of the company, and individual, related to the employees' work. Global objectives are related to the company. Employees' individual objectives are pre-agreed between manager and employees.	Employees' salary is agreed and fixed.	There are employees with a fixed salary per month without any predefined variable part. There are no incentivized objectives. At the end of the year the employees have a fixed and a variable part in their pay system. Objectives with an associated incentive are also under consideration, and, according to the degree of achievement of objectives, translating it into a variable part of the salary to be paid yearly.
New Training Practices	Human Resources Management	X	Online and web accesses are used for training. Open training academy platforms are used. Induction programs are prepared for newcomers, using the own Academy.	The type of training, either on-site or online, has to do with the specificities of the training required. In this company, online or web-based training is preferred, when available.	The type of training, either on-site or online, has to do with the specificities of the training required. In this company, online or web-based training is preferred, when available. Induction programs are prepared for newcomers, using the own Academy.	Online and web accesses are used for training. Open training academy platforms are used. Daily training is in practice.	Online and web accesses are used for training. Open training academy platforms are used.

Information Flow	Human Resources Management	X	This is a big company lacking processes to ensure an efficient information flow. There are tools, but channels and processes are missing. This is a topic of high priority in the company, as it affects the level of innovation and efficiency.	Weekly meetings, as it is a small team, and a knowledge management system installed ensure a good information flow.	The QM department has several processes in place to ensure that information flows or is kept documented to be accessed and used when needed.	There is a good information flow. In each team people interact intensively, have regular meetings across the entire company and all sit in the same floor; visually, the employees see each other and sit using a layout that motivates information flow to occur (U-shape in each team)	There is a communication plan, events occur to present launched products, and best practices are shared in newsletters.
Culture (Country)	Human Resources Management	X	It has offices outside of Portugal. The HR department knows the Country Cultures, especially the legal and institutional laws of the country, that might be influenced by the culture. Some country cultures promote innovation, as in Portugal, through special programs. In Portugal tax reduction program benefits are used with high success rates.	Country Culture is embedded in the Corporate Strategy. innovation culture is supported by processes inspired by the national certification Innovation and R&D standard and compliant to the standard. The tax reduction program benefits existing in Portugal are applied with 100% success.	Country Culture is embedded in the Corporate Strategy. The QM Department promotes the associated values as II throughout the company. This company works for several countries and in different countries so HR must handle country specificities. The tax reduction program benefits existing in Portugal are applied with success.	Country Culture is embedded in the company, derived from the national parent company. The benefits that the country offers (such as tax reduction) are planned to be used.	Country Culture is embedded in the company, derived from the parent company. It has offices outside of Portugal. The benefits that the country offers (such as tax reduction) are used with success. It has offices outside of Portugal, in the USA, so the products must also comply with the rules applicable therein. The legal and institutional laws of the countries are also followed.
Management	Human Resources Management	X	The employees' view of Management is the one from the business division in which they work. It has 10 to 15 employees per line manager, which does not promote a heavy hierarchy. The direct Line Management might be in the team having the same responsibility as an employee in a project.	This company is in close contact with the head of R&D and innovation and the board. The size of the company is small.	Management aims to be present in several buildings, and be accessible and participate in events, so a close contact with employees is promoted. This is a large company, which tends to indicate an informal relationship between employee and top management.	This company has a very Lean Management, the board, and the employees. Employees manage the projects in teams according to the Agile mode of Operation.	The board level management has an open-door policy, they want to be accessible to all employees, regardless of hierarchical level.

Cooperation actions	Collaboration	X	There are no inter-division, division or sub-division meetings conducted for sharing best practices. It uses co-funding programs (by FEDER) such as Lisboa 2010, COMPETE (QREN) and COMPETE 2020 to invest in scientific and innovation initiatives. It has external collaborations with universities to recruit talented people or to get consultancy support for developing technologies. It gets involved in other external collaborations, for instance, in events which are related to innovation, taking place in 2018, namely Web Summit 2018 (entrepreneurship, innovation and technology), IMSHARE (management and data analysis), Hackathon (web, mobile and desktop platforms) or events organized by the CoP COTEC. This company is an affiliate of the CoP COTEC. There is a partnership with a Portuguese operator in the telecommunications market to jointly deliver a contract to a customer.	There are several internal and external initiatives. One of the parent companies is foreign and an important source of market innovation trends, there are also external partnerships with companies, universities and the use of applications as much as possible for funding from several programs. It is very active in conferences in the Power sector. Many of the networking events contributing to following innovation projects derive from these activities and acquired knowledge. This company is an affiliate of the CoP COTEC.	There are cooperation actions. There is an innovation laboratory in one of the universities. This allows innovation to happen among own employees' collaboration, but it is also open to students or to other people (teachers, researchers, …). The close contact with universities is a channel feeding scientific and emerging knowledge. Externally, it participates in international research projects which are European funded or funded by National Programs (e.g. ESA, H2020, PT2020). Usually, participation implies several partners, brings new knowledge and networking with new partners, which, even after the project is finished, are useful either for other international projects or for bilateral partnerships, and the company receives support from the innovation and knowledge team. This company is an affiliate of the CoP COTEC.	There are internal co-operations in the company, with networking among teams (supported by an application) and with the parent companies, at a national and international level. This company is an affiliate of the CoP COTEC	One of the important sources of innovation they have nowadays are the market trends coming from the USA customers and, therefore, the company has a local partnership in the USA. Additionally, there are other collaborations with universities and other companies to apply for European funded Programs, at a national and international level. This company is an affiliate of the CoP COTEC.
Interfaces Management	Collaboration	X	This company does not have an interface management process.	There is a process defined for interface management evaluation carried out on a yearly basis.	There is a process defined for interface Management, handled by the Quality department.	The International parent company is a good source to feed possible relevant interfaces.	It has a detailed Interface Management process to evaluate whether its current partners are the appropriate ones. The company has defined criteria and conducts this assessment each year (in line with IDI processes).

Knowledge share	Collaboration	X	There is knowledge share, supported by: Customer information stored in the CRM system. The KM related tools available (applicational mushrooms).	There is knowledge share, supported mainly by the existing Knowledge Management Process and by the weekly meetings.	There is knowledge share, through: Use of laboratories in a sharing mode with partners and internally, filling the theory /practice gap. Supported in KMS.	All the work performed by the employees is stored in IT Cloud systems, accessible to the employees. There are also Knowledge share moments, such as All Hands meetings.	There are team building activities organized at company level or by each team. Internal marketing activities are promoted, such as innovation projects, publishing of books with case studies, newsletters on best practices and project wins, and a communication plan is available to everyone, Overall, there is an ongoing initiative to promote knowledge share. This company also has a knowledge Management (KM) process and tools. There is an open-source platform available to store information.
Teamwork	Collaboration	X	The projects are structured in teamwork.	The projects are structured in teamwork. As Agile is the process used in development, they are called Scrum teams and each iteration is called a Sprint.	The projects are structured in teamwork.	The projects are structured in teamwork. The teams are autonomous and must deliver results. As Agile is the process used in development, they are called Scrum teams and each iteration is called a Sprint.	The projects are structured in teamwork.
Community of Practice (CoP)	Collaboration	X	Is part of the Community of Practice (CoP) COTEC.	Is part of: - the CoP COTEC, - a CoP to define standards in the Power sector, - other CoPs of working/study groups in several countries in the Power sector.	Is part of the Community of Practice (CoP) COTEC.	Is part of the Community of Practice (CoP), COTEC.	Is part of: - the CoP COTEC, - a CoP to define standards in the mobility sector, - a CoP of working groups at European level to create a mobility platform.
Internal "Marketing"	Collaboration	X	There is a lack of practice sharing, this does not facilitate information flow in the company, which could leverage aggregation of ideas and more innovation to be generated.	There are initiatives promoting the sharing of best practices internally (called "Innovation Hours"). This contributes to the knowledge share in the company, to the capability to innovate and to WI.	It has best practice sharing initiatives organized by the QM department.	No actions are performed, except for the projects shared in the All Hands meeting.	Internal marketing activities are promoted, such as innovation projects, publishing of books with case studies, newsletters on best practices, project wins.
Regional Innovation	Collaboration	X	-	-	-	-	-
Information and technology usage	IT Infrastructure	X	Information and Technology (IT) infrastructures play a crucial role in this technological company, which relies on the IT infrastructures to perform daily business and develop and deliver customer solutions. In this company, IT support is available 24/7, as this is a service request.	The use of IT infrastructures, in the development and testing of power systems by employees, is part of the way of achieving efficiency in the company. IT infrastructures are a critical resource to enable the business for the company.	Information and Technology (IT) infrastructures are used and play a crucial role to perform the daily business and develop, deliver or provide remote services to the customer. It is also very important for laboratories.	IT infrastructures are critical for the daily work in this company. This company works with Software and computers specifically appropriate for Software development, and the work produced is stored in cloud systems. This means that the tools and development environments are all IT-based.	IT infrastructures are critical for the daily work. This company considers that it is essential to have a good IT infrastructure to support the business and ensure a fast response from the support team when there is a problem. This company has laboratories to test SW and HW supported in IT.

Online learning environment	IT Infrastructure	X	Online learning is used for planned training when possible or when needed to gain expertise for a project.	Online learning is one of the preferred mechanisms for training.	Online learning is used and promoted.	Online learning is used daily.	Online learning is used for planned training when possible or when needed to gain expertise for a project.
Computer-based simulations	IT Infrastructure	X	Computer-based simulations are used for testing and development environments.	Tools based on IT environments enable employees to remotely access work, laboratories and collaborative activities. These tools simulate the real environment in the computer. This company has laboratory facilities equipped with testing tools, allowing a co-simulation of power systems and communication networks.	Computer-based simulations are used for testing and development environments.	Computer-based simulations are used to test the future driving systems under development.	Computer-based simulations are used for testing and development environments.
Integrated Technology	IT Infrastructure	X	There are no integrated technology systems (for instance, messaging and conference call).	There are no integrated technology systems.	Open-source systems are used. No integrated technology systems are used.	Open-source systems and modern channels are used. No integrated technology is used.	There are no integrated technology systems (for instance, messaging and conference call).
Change Management	Other Facilitators	X	There is no process available. Changes are handled on an Individual project basis.	There is no process. available. The need was not identified.	Change management responsibility and management of communication have an owner, in case there is the need for changes, which handles all activities of relevant impact for employees.	There is no process defined.	There is no process available. Changes are handled case by case.
External Factors	Other Facilitators	X	Due to its presence in several countries, this company is subject to contextual influences, as well as environmental, institutional and other structural factors.	The international parent company, with its challenges and technological expertise, and the market where it is located, are an innovation source important for WI in this company. The company actively participates in conferences and events, gaining knowledge from several sources, such as companies or universities. The type of existing collaborations are either as associated members (sector associations), via collaboration protocols (e.g. with universities), via participation in international projects, or triggered by a subject (e.g. with an international R&D institution).	This is an outside-in topic influencing the company; due to its presence in several countries it is subject to contextual influences, environmental/ institutional and other structural factors.	The international parent company is an innovation source important for WI in this company. Management wants to make a difference in this company by having the purpose to inspire people to work with an innovation mindset, focused on the future way of living and working.	Due to its presence in Portugal and the USA, this company is subject to contextual influences, environmental, institutional and other structural factors from each country. Additionally, it adopts innovation due to system integration needs in advanced markets as the USA.

WI implementation support	Other Facilitators	X	Does not have explicit support. It would be beneficial. It is interested in the conclusions of this study.	Does not have explicit support. Currently it is not a priority as there is a good setup. The company is always willing to learn more, so they do not discard the possibility to have that type of support. It is interested in the conclusions of this study.	Does not have explicit support. Considers positive to have WI implementation support as it aims at increasing innovation. It is interested in the conclusions of this study.	Does not have explicit support. Does not exist and currently it is not a concern. It is interested in the conclusions of this study.	Does not have explicit support. Considers positive to have WI implementation support as it aims at increasing innovation. The company would welcome support to implement WI, so that it could increase innovation. It is interested in the conclusions of this study.
Venture capital availability	Other Facilitators	-	This company has a Business division which is a Venture Capital, with the purpose to scan and look for innovations (in the company or externally) to bring business possibilities to invest.	This company does not have a Venture capital business division.	This company does not have a Venture capital business division.	This company does not have a Venture capital business division.	This company does not have a Venture capital business division. This company is owned in minority by a Venture Capital investor.
Funding Programs Usage (National or European or other)	Other Facilitators	-	This company uses co-funding programs (by FEDER) such as Lisboa 2010, COMPETE (QREN) and COMPETE 2020 to invest in scientific and innovation initiatives.	This company uses Funding programs. In 2018, 13 Applications were submitted to European and National funding programs.	This company uses Funding programs. Participates in international research projects funded by European or National Programs (e.g. ESA, H2020, PT2020, QREN or Artemis JU).	This company did not show evidence of using Funding programs. The company has the objective to apply to Funding programs.	This company uses Funding programs. At the time of this study the company participates in 3 consortiums, in European funded projects.
Protection of Intellectual Property Rights (IPR)	Other Facilitators	-	It does not have patents registered and does not have that objective. Intellectual property rights are protected, whenever applicable, through code components registration (software).	There are currently 3 ongoing patent applications (two international and one national)	Components are registered to protect the products delivered to customers. There is no strategy defined to have patents. No patents were identified, only the software is protected.	Not applicable yet. IPR will be used in the future, as needed.	It has one patent registered, and one pending. It has several source code (software) components and some designs (hardware) registered in Europe and in the USA.
R&D and Innovation Certification NP 4457	Organizational Dynamics	-	Not certified.	Certified by NP 4457 (IDI). The IDI certification and the way it is considered as a live process in the company supports WI, defining yearly innovation objectives. The innovation process is structured and documented.	Not certified.	Not certified.	Certified by NP 4457 (IDI). Each team has KPIs defined depending upon the projects, for innovation these are set by the IDI process.

4.4 Topics Interdependencies and Overview

This concludes the description of the results of the empirical work conducted and the subsequent analysis of the data gathered, namely the interdependencies among topics and determinants.

In the sequence of the descriptions in the previous section 4.3, an overview of the Interdependency between topics organized by the determinant they belong is represented in Table X.

Table X: Interdependency between topics – organized by determinants

	Organizational Dynamics	Human Resources Management	Collaboration	IT Infrastructure	Other Facilitators
Topics					
Work Organization	Autonomy/ Employee Empowerment. Leadership. Employee Engagement. Culture (Organizational). Organizational Guidance. Job Design. Knowledge Management. Organization type. Creativity. Job Characteristics. Corporate Strategy. Employee and Supervisors co-operation. Organizational Performance. Informal Power. Employee responsibility with the customer. Employee Training.	New Training Practices.	Teamwork. Knowledge Share.	Computer based Simulator. Information and Technology Usage.	Funding Programs Usage.

Autonomy/ Empowerment	Employee and Supervisor co-operation. Employee Engagement. Leadership. Informal Power. Work Organization. Organizational Type. Culture (Organizational). Corporate Strategy.				
Leadership	Autonomy/ Empowerment. Employee and Supervisor co-operation. Work Organization. Organizational Type. Culture (Organizational). Corporate Strategy.				
Employee Engagement	Employee Responsibility with the Customer. Work Organization. Organizational Type. Culture (Organizational). Corporate Strategy.				

Culture (Organizational).	Work Organization. Autonomy/ Employee Empowerment. Leadership Employee Engagement. Organizational Guidance. Job Design Knowledge Management. Organization type. Creativity. Job Characteristics. Corporate Strategy. Employee and Supervisors co-operation. Organizational Performance. Informal Power. Employee responsibility with the customer. Employee Training.				
Organizational Guidance	Organization Type. Job Characteristics. Work Organization. Organizational Type. Culture (Organizational). Corporate Strategy.	HR/ Work Practices. Management.			

Job Design	Job Characteristics. Informal power. Work Organization. Organizational Type. Culture (Organizational). Corporate Strategy.	HR/ Work Practices.	Teamwork.	IT Usage	
Knowledge Management	Employee Engagement. Creativity. Work Organization. Organizational Type. Culture (Organizational). Corporate Strategy.		Knowledge Share.		Protection of Intellectual Property Rights (IPR).

Organization Type	Work Organization. Autonomy/ Employee Empowerment. Leadership. Employee Engagement. Culture (Organizational). Organizational Guidance. Job Design Knowledge Management. Creativity. Job Characteristics. Corporate Strategy. Employee and Supervisors co-operation. Organizational Performance. Informal Power. Employee responsibility with the customer. Employee Training.				
Creativity	Knowledge Management. Work Organization. Organizational Type. Culture (Organizational). Corporate Strategy.	HR/ Work Practices.	Knowledge Share.		

Job Characteristics	Job Design. Informal Power. Organizational Guidance. Work Organization. Organizational Type. Culture (Organizational). Corporate Strategy	HR/ Work Practices.	Teamwork	IT Usage	
Corporate Strategy	All	All	All	All	All
Employee and Supervisors co-operation	Leadership. Autonomy/ Employee Empowerment. Work Organization. Organizational Type. Culture (Organizational). Corporate Strategy				
Organizational Performance	Employee Engagement. Work Organization. Organizational Type. Culture (Organizational). Corporate Strategy				

Informal Power	Autonomy/ Employee Empowerment. Job Design. Job Characteristics. Work Organization. Organizational Type. Culture (Organizational). Corporate Strategy		Teamwork.		
Employee responsibility with the customer	Employee Engagement. Work Organization. Organizational Type. Culture (Organizational). Corporate Strategy				
Employee Training	Work Organization. Organizational Type. Culture (Organizational). Corporate Strategy	HR/ Work Practices. New Training Practices. Competence/Skill Development.	Teamwork	IT Usage Online Training environment	
Competence / Skill Development	Employee Training. Corporate Strategy	HR/ Work Practices. New Training Practices.		Online learning Environment.	
HR/ Work Practices.	Creativity. Employee Training. Job Characteristics. Job Design. Organizational Guidance Corporate Strategy	Pay and Incentive Systems. New Training Practices. Information Flow. Culture (Country). Management.			

Pay and Incentive Systems	Corporate Strategy	HR/ Work Practices.		Information and Technology Usage.	
New Training Practices	Employee Training. Corporate Strategy	HR/ Work Practices. Competence/ Skill Development.		Online learning Environment. IT Usage	
Information Flow	Knowledge Management. Corporate Strategy. R&D and Innovation Certification (NP 4457	HR/ Work Practices.	Knowledge Share.		
Culture (Country)	Corporate Strategy	HR/ Work Practices.			
Management	Organizational Guidance Work Organization. Organizational Type. Culture (Organizational). Corporate Strategy.	HR/ Work Practices.			
Co-operation actions	Corporate Strategy.		CoP. Internal Marketing. Interfaces Management. Knowledge Share.		Funding Programs Usage.
Interfaces Management	Corporate Strategy.		Co-operation actions.		
Knowledge Share	Knowledge Management. Creativity. Corporate Strategy. R&D and Innovation Certification (NP 4457).	Information Flow.	Co-operation actions. CoP. Internal Marketing		Protection of Intellectual Property Rights (IPR).

Teamwork	Corporate Strategy. Informal Power. Job Characteristics. Job Design. Employee Training.			Computer based Simulator. Information and Technology Usage	
CoP	Corporate Strategy.		Co-operation actions. Knowledge Share.		
Internal Marketing	Corporate Strategy.		Co-operation actions. Knowledge Share.		
Information and Technology Usage	Employee Training. Job Design. Job Characteristics. Corporate Strategy.	Pay and Incentive Systems. HR/ Work Practices. New Training Practices.	Teamwork.	Online Learning Environment. Computer based Simulator. Integrated Technology.	
Online Learning Environment	Corporate Strategy. Employee Training	New Training Practices.		Information and Technology Usage.	
Computer based Simulator	Employee Training. Corporate Strategy.		Teamwork. New Training Practices.	Information and Technology Usage.	
Integrated Technology				Information and Technology Usage.	
Change Management					External Factors.
External Factors	Corporate Strategy.				Change Management.
WI Implementation Support	Corporate Strategy. Culture (Organizational)				

Venture Capital	Corporate Strategy.				Funding Programs Usage.
Funding Programs Usage	Knowledge Management. Corporate Strategy.		Co-operation actions. Knowledge share.		Venture Capital.
Protection of Intellectual Property Rights (IPR).	Corporate Strategy.		Knowledge Share.		
R&D and Innovation Certification (NP 4457)	Knowledge Management. Corporate Strategy. Culture (Organizational). Creativity. Work Organization. Organizational Type.	Information Flow	Knowledge Share.		Protection of Intellectual Property Rights (IPR).

A table showing the interdependency between each topic and the other topics is represented in Annex V.

After concluding the empirical work and carrying out the analysis, a new proposal of topics per determinant was prepared. The resulting topics underneath each determinant can be found in Annex VI.

The classification of Intra- / Outside-Company Topics is presented in Annex VII.

In Figures 3, 4, 5, 6, 7 and 8 there are diagrammatic representations of the interdependencies found among topics within each determinant and between determinants, as indicated in each of the Figures.

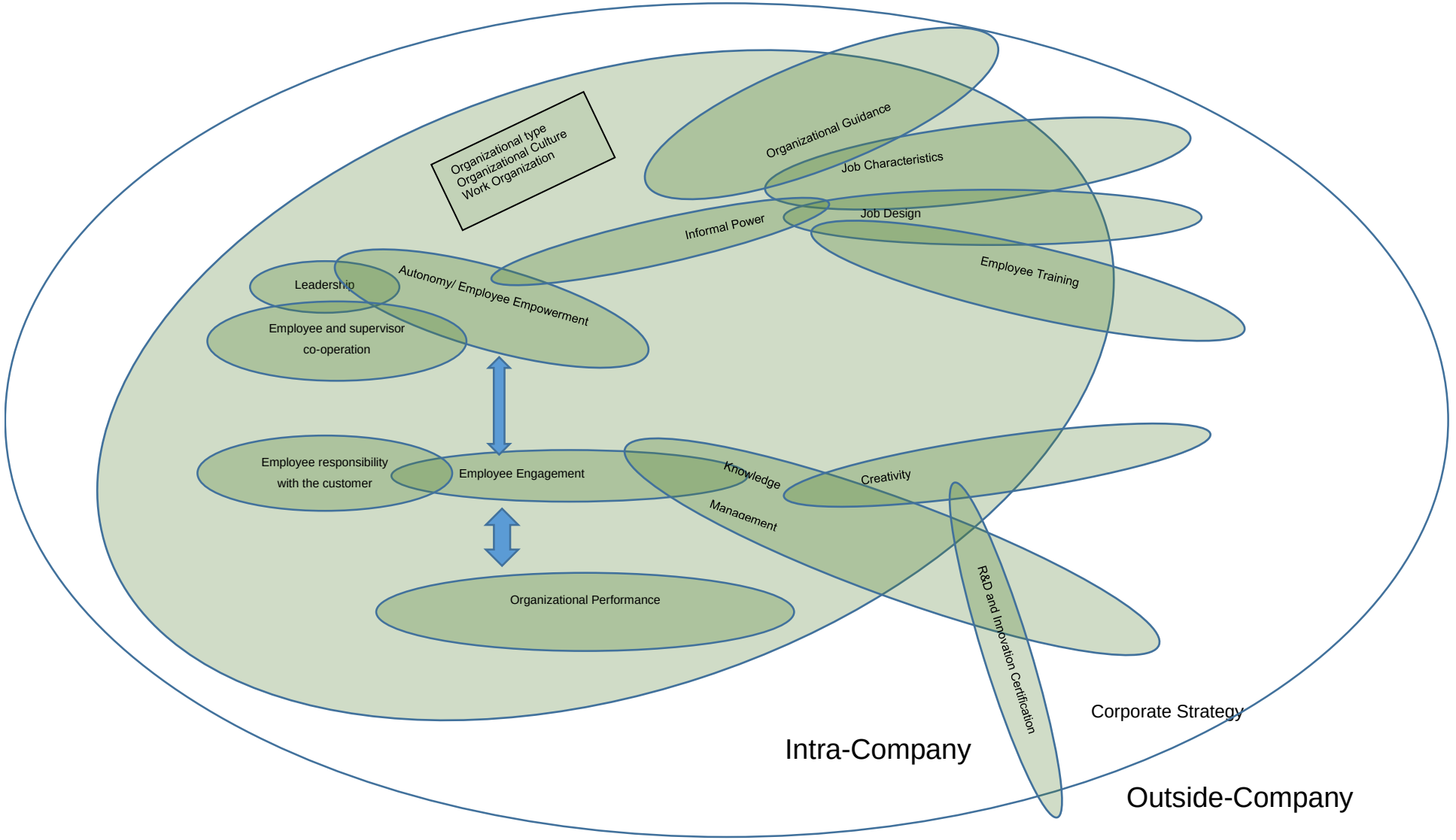

Figure 3: Determinant Organizational Dynamics - Interdependency between topics.

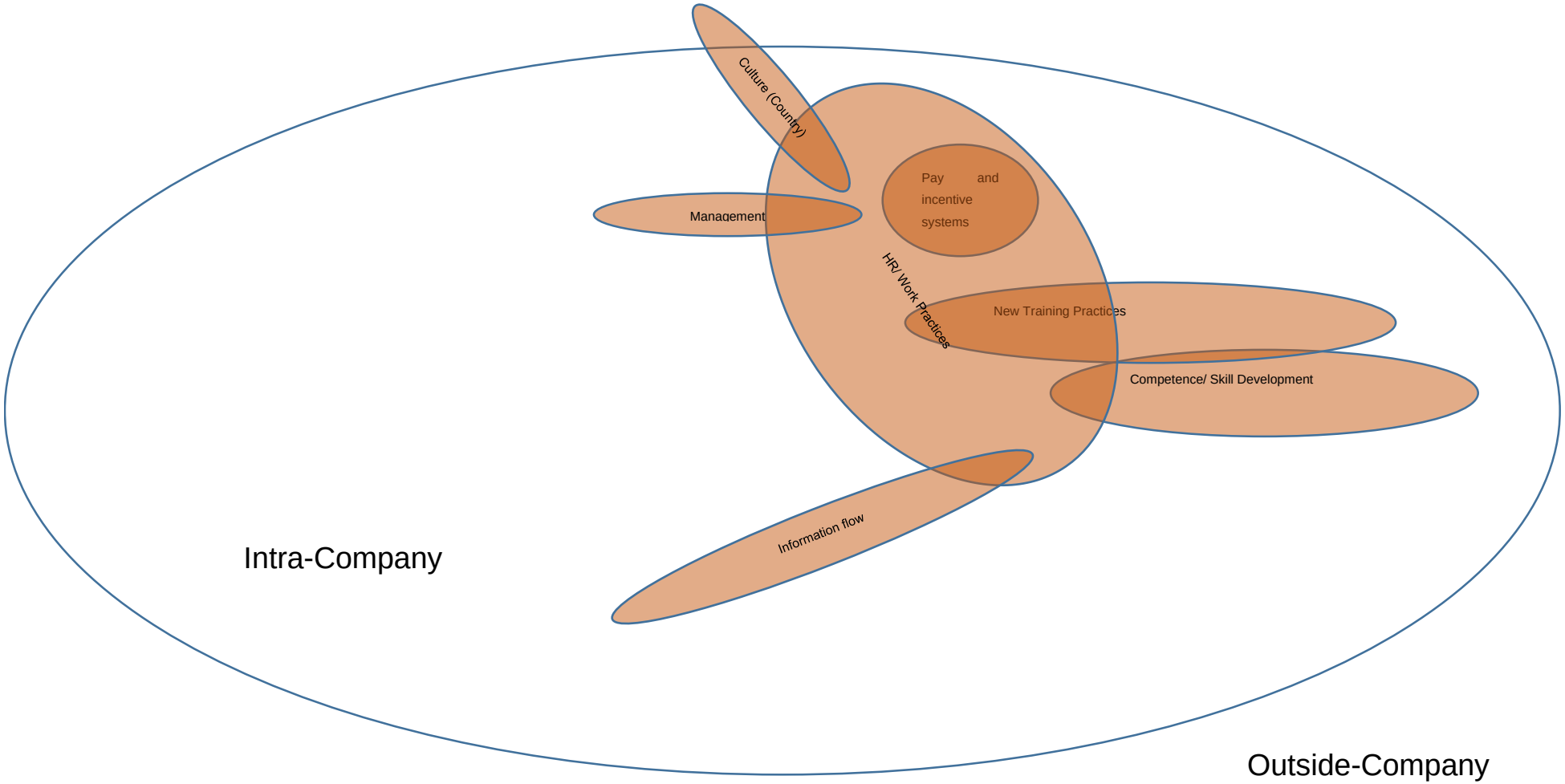

Figure 4: Determinant Human Resources Management - Interdependency between topics.

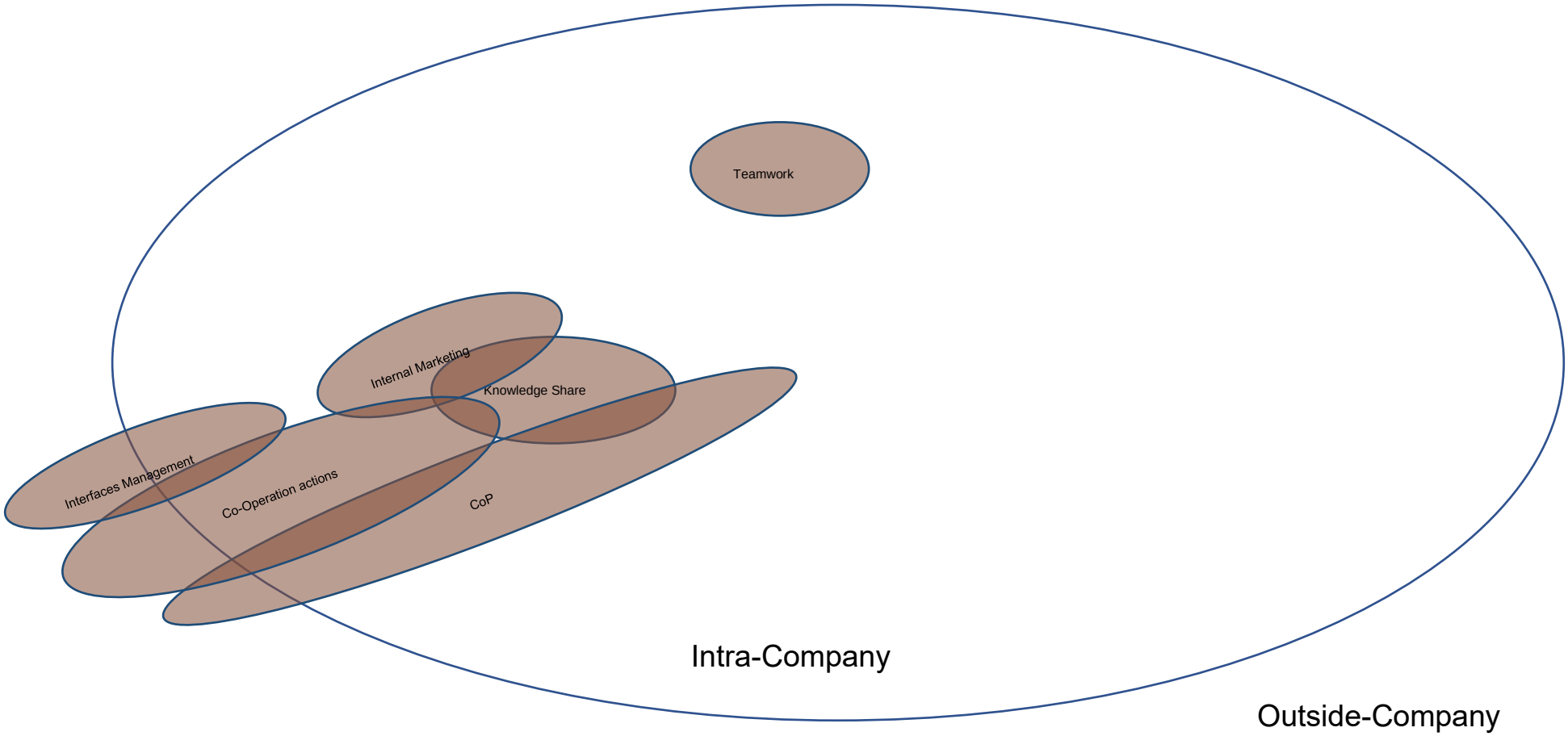

Figure 5: Determinant Collaboration - Interdependency between topics.

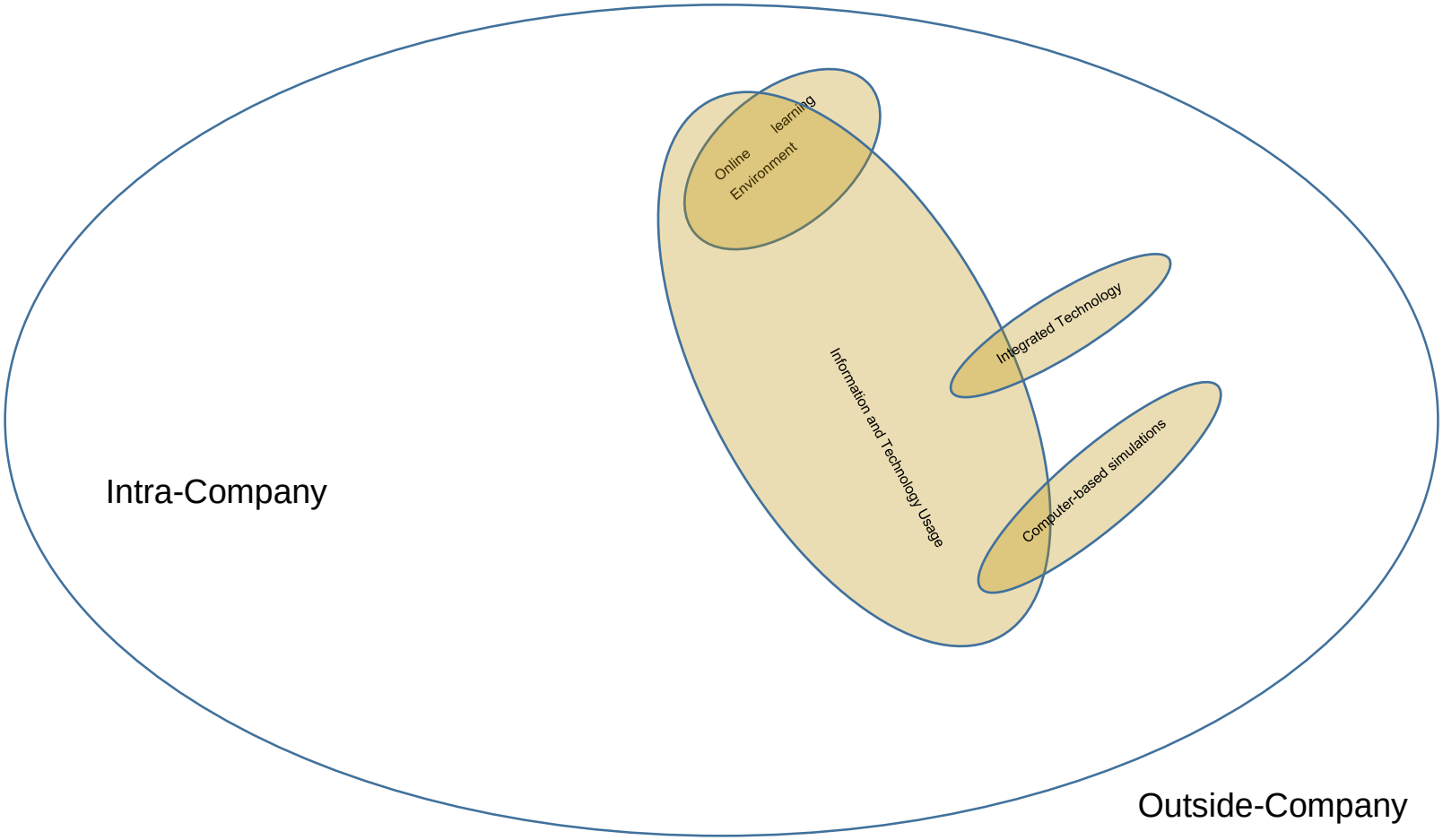

Figure 6: Determinant Information and Technology - Interdependency between topics.

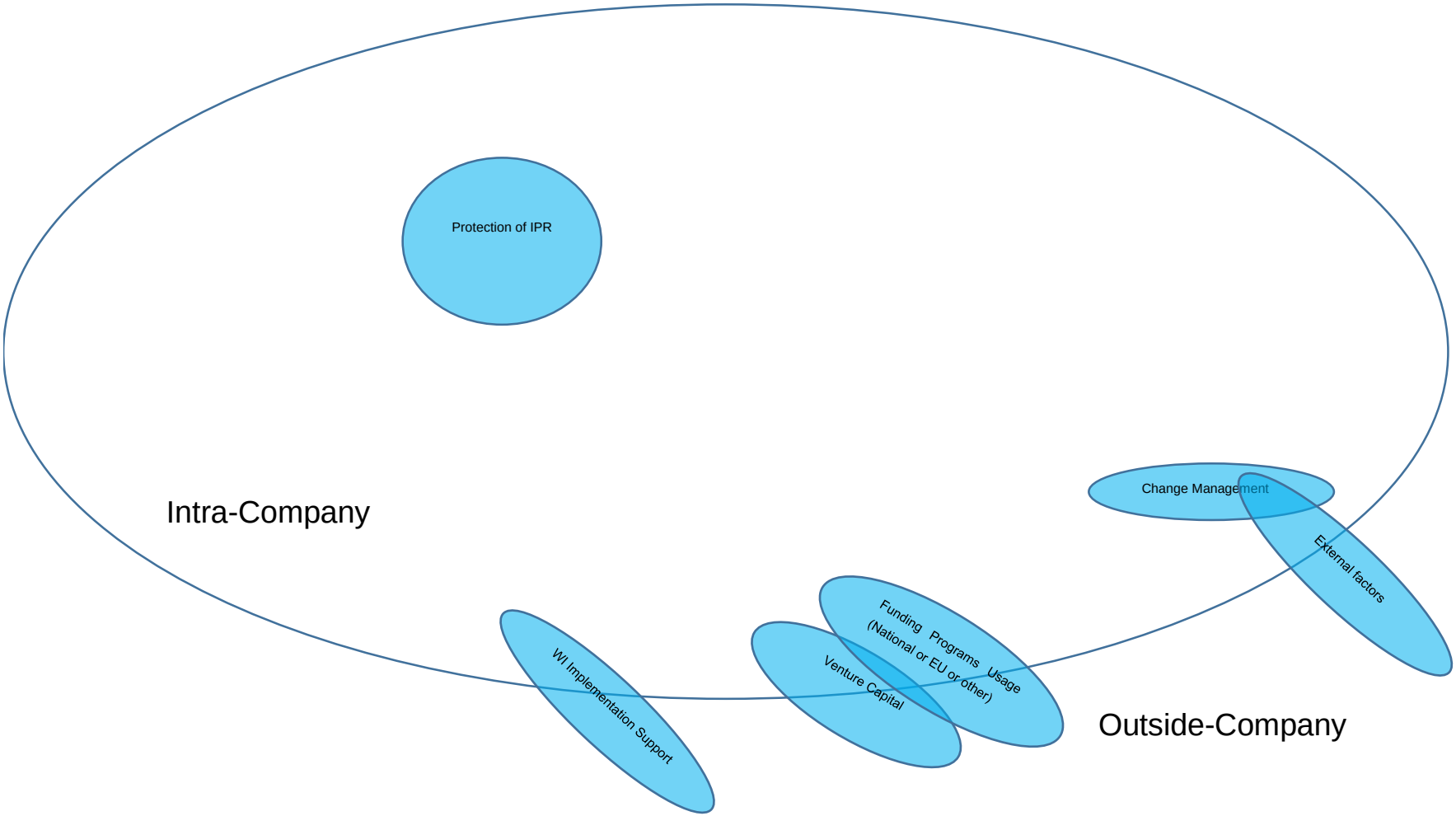

Figure 7: Determinant Other Facilitators - Interdependency between topics.

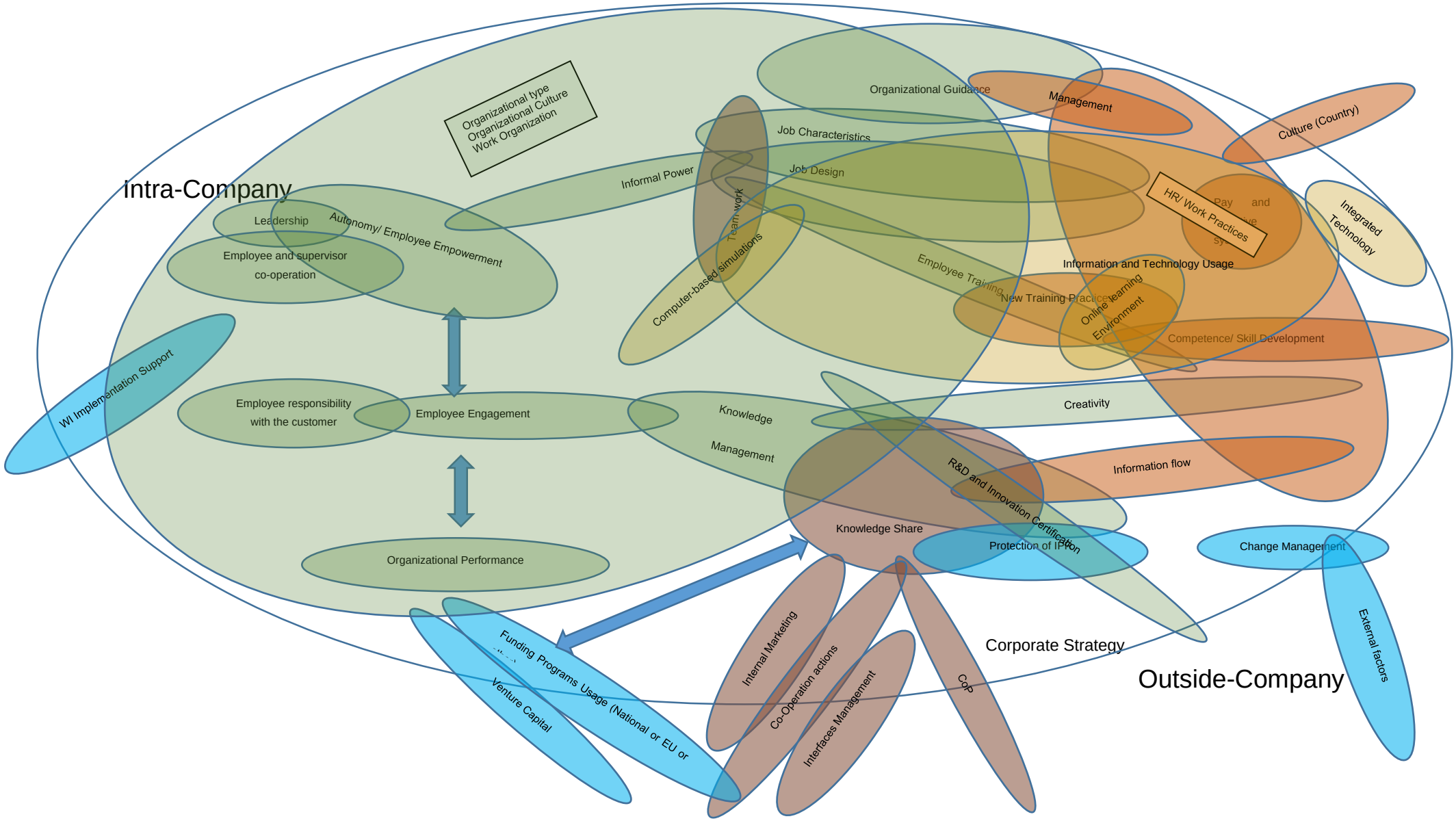

Figure 8: Interdependency between topics from all determinants.

CHAPTER 5 - Discussion

Chapter 5 - Discussion

The purpose of this chapter is to discuss the results of the empirical study and how can they enhance the initially proposed framework (Figure 1) of the main determinants of Workplace Innovation and their interdependencies, complementing existing knowledge. This chapter starts by discussing the topics resulting from the empirical study, i.e., the topics uncovered, and the validation of the topics initially proposed that emerged from the SLR and their interdependencies. Moreover, we wish to discuss and present how the results of the empirical study contribute to achieve a new enriched framework of main determinants of Workplace Innovation and their interdependencies. It proceeds with a discussion about the existing definitions and frameworks in comparison with the new enriched proposed framework. Finally, it ends with a proposal of a new WI definition.

As previously discussed, this study was composed of two main parts, the first part led to a proposed framework of the five determinants leveraging Workplace Innovation shown in Figure 1, at the end of chapter 2. This framework was the basis to prepare the second part, the empirical study, which, in brief, consisted of performing case studies in companies and the subsequent analysis of the data collected; this work is documented in chapter 4. The findings of the case studies performed in the companies are summarized in Table IX, in chapter 4, organized by topics.

5.1 Topics Uncovered by the Empirical Study

Based on the 38 topics that resulted from the Systematic Literature Review, the interview guide was used as the support for the interviews during the case studies During the interviews, in the companies analyzed, new topics were uncovered according to the individual reality of the companies and complementing the previous ones. The new topics are: Venture Capital; Funding Program Usage; Protection of Intellectual Property Rights (IPR); and R&D and Innovation Certification (NP 4457).

The new topics were not evenly present in all the companies. For some companies some of these topics were essential, for others they were not their focus.

Venture capital was an important topic only in one company, Alpha, and this was the way the company managed to have faster innovation in the market and benefit from it. In the

performed SLR there were other topics previously unveiled, that are common to Alpha relevant to WI, such as creativity and knowledge management and share, just to name a few. Alpha enabled the creativity topic as part of their employee training – another relevant topic – by performing Design thinking conferences, and the latter through availability of tools as knowledge mushrooms to incentivize knowledge management and knowledge share. However, Alpha went beyond those and by using venture capital introduced a new mechanism to leverage WI, not uncovered in previous research looking with a different approach internally in the company and externally performing an exhaustive analysis of the most innovative startups to add innovation and bring value to the company.

The use of Funding Programs was present in four companies. In the fifth company, Delta, there is an interest in using them, but it was not a priority at the time of the interview, due to specificities of Delta. All companies state that these funding programs are a source of innovation and a possibility to innovate at a lower cost by accessing partners and new subjects difficult to reach under other circumstances. There are topics previously considered before performing the empirical study as external factors (contextual influences, environmental/ institutional and other structural factors) and CoP (as COTEC, groups for standardization and others), as examples, that can partially led to WI results similar as when Funding Programs are used, such as: in any of the generated situations there is a contact with market tendencies or its development for the years to come (as these programs usually support development of new technologies, or sustainability, or a specific area of work of the Industry, dependent on the specificity of the Program) the possibility to get new knowledge and to establish new partnerships among companies. This is in fact a new topic bringing other possibilities, as for instance financial support, or a broader number of partners and contact to perform innovation activities.

The Protection of Intellectual Property Rights was adjusted to the business needs and positioning of each company. The protection of property rights was relevant in four out of the five companies. In the fifth company, Delta, it was not applicable due to the newness of the company; they will protect their intellectual property rights, as needed. It is to expect that in an innovation context new communication (or other type) protocols are developed, as a result of information flow in the knowledge share in the company, but even in the SLR studies where knowledge share was recognized as a relevant topic, it was not referred any concern with the protection of the generated knowledge, in the form of software elements or other. This topic can also be a source of competitiveness increase in a company as quite

often the companies have agreements to use the IPRs from each other or have to pay one company to use their IPRs.

R&D and Innovation certification was verified in two companies, Beta and Epsilon. In Beta, the guidelines defined by standard NP 4457 were the basis to establish the work procedures (process innovation related to WI) when the company was established. In Epsilon when the company decided to implement the norm NP 4457, as there was already an innovation process defined, the work consisted in adapting it to the norm's guidelines according to Epsilon's business needs. The implementation of such a norm requires resources as well as time of the employees and money, so either it is a new company and wants to use it as guideline, or there is a customer requirement to be certified or the companies use it as good practice, as it certifies that the best practices are followed. To the best knowledge of the researcher there are similar norms in Italy and in Spain, and this might be a reason why the SLR did not unveil such a relevant topic, as not so many studies are derived from those countries. For an employee is engaging having in its pay and incentive system (two relevant topics related) incentivized objectives related to innovation, as if they innovate their income increases; having innovation objectives is a good practice in a company certified with the standard NP 4457.

As explained in chapter 4 these four topics were unleashed during the analysis of case studies. They contribute to innovation in the companies where they apply. Having identified them in the case studies, within the context of our research, their inclusion provided the basis for an enhancement of the list of the previous 38 topics that emerged from the SLR.

Taking into account the specificities and communalities identified in the topics Venture Capital, Funding Program Usage, Protection of Intellectual Property Rights (IPR) in the realm of the five original determinants – Organizational Dynamics, Human Resources Management, Collaboration, IT infrastructures and Other facilitators –, it was decided to include them in the determinant of Other Facilitators. In the case of the topic R&D and Innovation Certification (NP 4457), as discussed in chapter 4, because of the communality and interaction with other topics addressed, it was decided to include it as part of the determinant Organizational Dynamics.

5.2 Topics Validated by the Empirical Study

From the 38 topics, that emerged from the SLR, proposed in the initial framework (Figure 1), it was possible to confirm the importance of 37 topics during the empirical work.

One topic was not confirmed in the reality of WI among the cases analyzed; this was Regional Innovation. In the SLR the topic Regional Innovation was referred to by Andersson (2013) and Svare (2016), as a means of obtaining knowledge, and consequently innovation, with different approaches, facilitating collaboration among several players. Looking in detail at those studies, Andersson (2013) challenges regional innovation in a context of workplace innovations that include local, regional, national and international actors within the same innovation network; however, our empirical study did not confirm or reject his theory. Although there were several companies in close contacts with international players, customers, and stakeholders, it was not possible to address any significant influence from the regional ecosystem. One aim of our study was to better understand whether the topic of Regional Innovation would be blurred in a context of WI, which we could not conclude. The second study was conducted as a qualitative, explorative case research of nine SMEs in a Norwegian region and among other conclusions, a positive one in favor of regional innovation systems (RIS) was that skilled work floor staff may contribute significantly to innovation processes, and measures should consequently be taken to promote RIS interaction (Svare, 2016). So even though there were two studies published about Regional Innovation, the aim was to establish a connection between WI and RIS was not achieved. In the case of our study, although we do not have a formal regional innovation environment, we did not find any interactions with the regional ecosystem – and the companies did not state to part of any – so we were unable to reach any conclusions about this topic. As such, it was decided not to consider this topic in the list of topics resulting from the empirical work. This will be referred as a limitation in chapter 6.

In summary 37 topics were confirmed and 4 new topics were added. This means that the new proposed list of topics from the empirical work consists of 41 topics. The topics underneath each determinant, after the empirical work are listed in Annex VI.

5.3 Intra-Company and Outside-Company Topics and Determinants Classification

There were few indications, when performing the SLR to classify all the topics in a systematic way as intra or outside-company topic. It was possible to perform for some of the topics their classification such as: for topic teamwork as an intra-company topic and for topic external factors as an outside-company topic, so at the time that classification was not performed for all the topics.

Throughout the observations performed during the case studies and the subsequent data analysis, each topic was classified as an intra-company topic and/or an outside-company topic. The classification as intra-company or outside-company topic was based on the analysis whether it was referred to only in the internal context of the company or whether it could be impacted on by factors not directly under the company's control, but which are associated with its relation to external entities or factors. Both classifications apply to some of the topics, as presented in chapter 4. This type of topic classification was not identified in the SLR shown in chapter 2 and it contributes to the enriched framework to be proposed. In Annex VII the classification of each topic is listed.

The classification of a topic as intra-company or outside-company creates the possibility of the determination of the classification of the determinants they belong to. Moreover, this means that the determinant IT infrastructures has an intra-company character and the determinants Organizational Dynamics, HR Management, Collaboration and Other facilitators an outside one.

This classification is relevant as it contributes to the elaboration of the enriched proposed framework of main determinants leveraging Workplace Innovation and their interdependencies.

5.4 Interdependencies among the Topics and Determinants

During the empirical study, interdependencies among the topics were identified, these are listed in Table X, represented in Figure 8 and in Annex V.

Figures 3, 4, 5, 6 and 7, in chapter 4, represent the interdependencies of topics within each determinant, respectively: Organizational Dynamics, Human Resources Management, Collaboration, IT infrastructure and Other Facilitators.

Topics from different determinants present interdependencies that induce interdependencies between the determinants they belong to. A clear example of this is when an employee wants to use new training practices such as online training, s/he needs such an environment to be available and will use IT. In this example it is possible to verify the interdependencies of the topics: employee training, new training practices, online training environment and IT usage. These interdependencies between these topics create interdependencies between the determinants of Organizational Dynamics, Human Resources Management, and IT Infrastructures.

An exhaustive description of the interdependencies is provided in chapter 4. These interdependencies between topics from all the determinants are also represented in Figure 8, in chapter 4.

In Figure 3, where the topics (colored green) aggregated in the determinant Organization Dynamics are included, it is possible to see that the topics have many interdependencies, and that some of them as organization type, work organization and culture (organizational) embrace many other topics aggregated in this determinant. These topics are mostly intra-company, with one topic exception (R&D and Innovation Certification). It is also visible that some topics here aggregated have interdependencies outside of the Organizational Dynamics level, meaning that other topics represented in Figures 4, 5, 6 and 7 have interdependencies with the topics of Figure 3, being all of those interdependencies ultimately represented in Figure 8.

In Figure 4 all the topics (colored orange) are intra-company except for one – country culture – and have interdependencies with HR/work practices and some among themselves. However, the majority of them have interdependencies with topics from other levels of aggregation out of Human Resources Management Determinant.

Figure 5 shows the interdependencies of topics (colored brown) with many interdependencies among them, which is to expect at a level of aggregation of collaboration topics. In this case we have intra and outside-company topics also showing interdependencies out of the aggregation level from Collaboration determinant, as it is to be expected for instance when there are partnerships or communities of practice.

Figure 6 represents topics (colored yellow) that are all internal to the company showing all interdependencies to the topic IT usage as well as out of their level of aggregation, the IT determinant.

In Figure 7 the topics (colored blue) do not have so many interdependencies among them. There are interdependencies, for instance, between external factors and change management. The topics aggregated at this level in the determinant of Other Facilitators are intra and outside-company and have interdependencies with topics belonging to other levels of aggregation.

Figure 8 shows the interdependencies among all topics. A code of colors was used to facilitate the interpretation and ease the recognition in which determinant each topic was aggregated. It is possible to see many interdependencies between topics from Organizational Dynamics, Human Resources Management, Collaboration, and IT determinants. The Topics belonging to determinant of Other facilitators show less interdependencies.

Figure 8 provides an overview of the interdependencies between the topics.

It will be indicated as a field for further research to perform a quantitative analysis of these interdependencies, that was not in the focus of this research.

5.5 Proposal of an Enriched Framework

In this section we start by enumerating the findings that are the basis for the proposal of a new enhanced framework.

The main findings derived from the empirical study contributing to our research and relating to the framework initially proposed are:

a) Five determinants were confirmed: Organizational Dynamics, Human Resources Management, Collaboration, Information Technology Infrastructure and Other facilitators.

b) The topics under the determinants of Human Resources Management and Information Technology Infrastructure remain the same as the ones proposed initially for each determinant.

c) One topic under the determinant of Collaboration was not possible to verify: Regional Innovation, for this reason the topic will be disregarded, and this will be taken as a limitation to our study.

d) One new topic is added to the determinant of Organizational Dynamics: R&D and Innovation Certification (NP 4457).

e) Three new topics have been added to the determinant of Other Facilitators, these are: Venture Capital, Funding Program Usage and Protection of Intellectual Property Rights (IPR).

f) There are interdependencies among topics.

g) It was verified that some topics are intra-company, others are outside company and others are intra and outside-company.

h) Corporate Strategy being uncovered in the SLR under the determinant of Organizational Dynamics embraces all the topics/determinants as it embodies the interests of the whole organization and the future strategy of the company.

i) It is possible to answer the research question, defined in chapter 1, by posing that the main determinants that leverage Workplace Innovation, based on the exploratory study grounded on the performed SLR and on the conducted empirical study are: Organizational Dynamics, Human Resources Management, Collaboration, Information Technology Infrastructures and Other Facilitators. These determinants as the topics underneath present interdependencies, as described in chapter 4 and represented in Figure 8. The topics defined under each determinant are listed in Annex VI.

An inductive perspective concerning the WI phenomenon was obtained by comparing the different results as previously explained in chapters 2 and 4. Based on the results obtained, our study proposes a new enriched WI framework composed of the five confirmed determinants, with a new updated list of underlying topics, derived from the empirical study performed, showing the interdependencies among the determinants, highlighting their classification as either being intra-company or outside-company. As previously discussed, the IT Infrastructures determinant is internal to the company. The determinants Organizational Dynamics, Human Resources Management, Collaboration, and Other Facilitators are both internal and external to the company.

Taking into consideration the previous discussion a proposal for an enriched framework of the main determinants leveraging Workplace Innovation and their interdependencies, now follows as in Figure 9. Further, the relevance intra and outside-company topics/Determinants is also indicated. Corporate Strategy is also represented in Figure 9,

embracing all the determinants, as this topic has to do with the strategy definition of the company and all the topics.

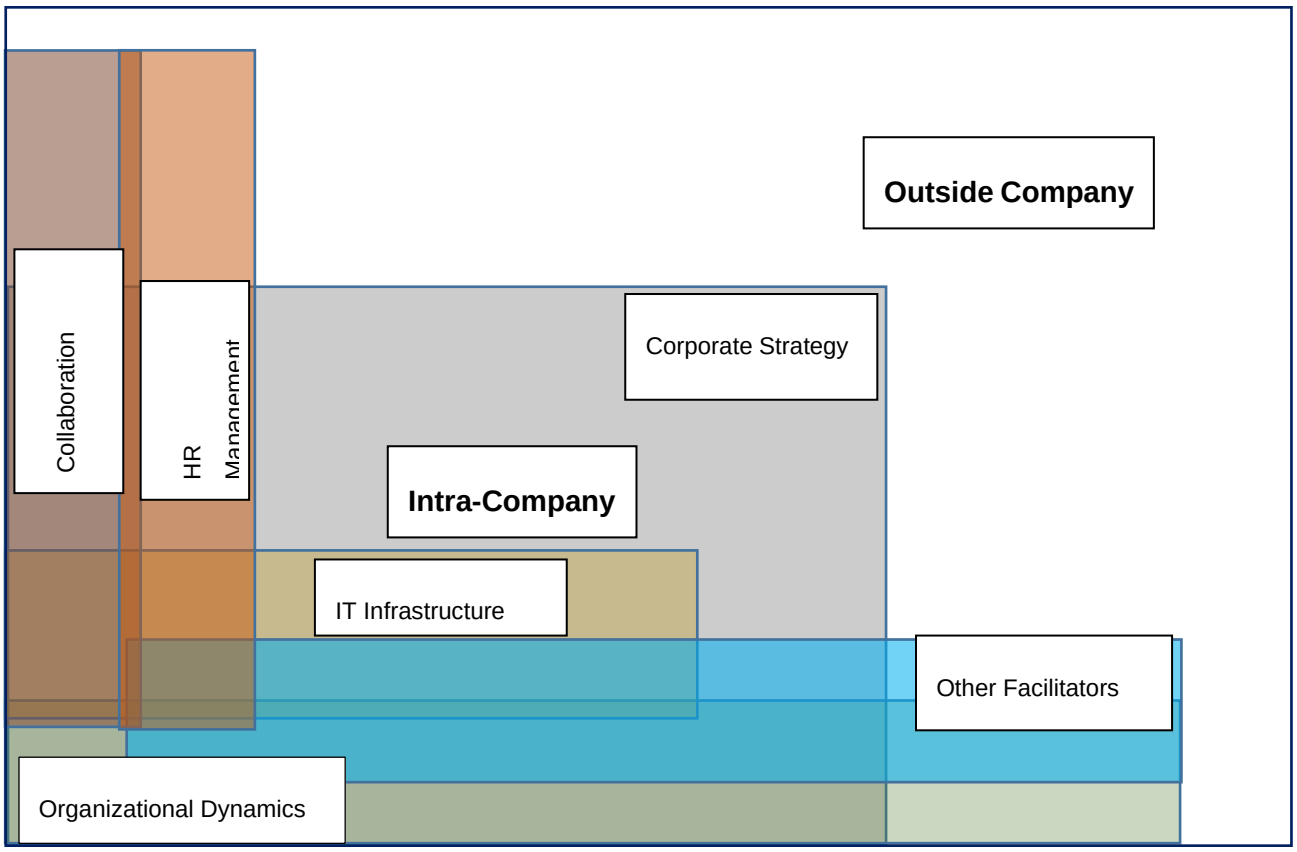

Figure 9: Main determinants of Workplace Innovation and their interdependencies: enriched proposed framework (own preparation).

5.6 Discussion and Comparison of Previous Definitions and Frameworks of WI with the Enriched Proposed Framework

It is important to discuss and compare the enriched framework proposed represented in Figure 9, with the interdependencies represented in Figure 8 and the topics listed in Annex 8, with the previous research.

At the end of chapter 2, we conducted a discussion summarized in Table VI comparing the initially proposed framework from Figure 1 with the frameworks and definitions identified in the context of Workplace Innovation, already presented in chapter 1.

The first conclusions presented in chapter 2 are still valid for the enriched model from Figure 9, meaning the focus on Organizational and HRM aspects of the three frameworks identified (Kim & Bae, 2005; Martins & Terblanche, 2003; Totterdill & Exton 2014b) and presented in chapter 1. Totterdill and Exton (2014b) were the only ones who referred to collaboration indirectly. None of the studies included IT Infrastructure, even though Martins and Terblanche (2003) refer to “structures” but do not directly discuss IT and as previously mentioned due to the elapsed time might not have the same meaning. The enriched framework combines several of the determinants partially identified in each framework and goes beyond them.

Comparing the enriched framework from Figure 9, that contains the results from the empirical study, with the previously proposed framework in Figure 1, the enriched one provides more information regarding the interdependencies among determinants and their classification as being either intra-company or outside-company, a holistic view we did not find in any other framework or definition. Moreover, as represented in Annex VI, the determinant of Other Facilitators is enriched by three topics the determinant of Organization Dynamics by one topic resulting from the empirical work and the determinant of Collaboration has one less topic, as previously explained in this chapter. It is also possible to verify that corporate strategy influences all the companies internally.

The enriched framework, just as the initial proposed framework also extends Pot (2011) definition, by introducing the determinants of Collaboration and Other Facilitators determinants, which are absent from Pot (2011) definition.

Prus et al. (2017) also studied WI, as discussed in chapter 1, they reach the conclusion in their literature review that there are eight dimensions, namely the: work system, workplace democracy, high-tech application, workplace boundaries, workspaces, people practices, workplace experience and workplace culture and that the concept of innovation within those dimensions has changed throughout the years. The main outcome of their work was the proposal of a new definition of WI as a process of renovation altering structural, cultural, organizational, and experiential characteristics of workplaces that create social value. It is not evident that their study provides a basis to identify the determinants that leverage WI. They did not define any framework, and did not perform any empirical work, so their work could be considered a support to the implementation of WI without a specific guideline. If we tried to map their eight dimensions onto the topics from our proposed enriched framework from Figure 9, we could perhaps fit: work system, workplace democracy, people practices, work experience and workplace boundaries, as topic work organization, and high-

tech application to IT usage, this would map onto topics from Organizational Dynamics and IT Infrastructures or maybe also Human Resources Management if people practices were mapped to HR/ Work Practices but this would only be a partial portion of the proposed enriched framework and would not contain any topic from Collaboration or Other Facilitators.

Having performed the comparison with previous research, it is possible to state that the enriched framework proposed in Figure 9 enhances any of the previous existing definitions or frameworks of WI.

In summary the enriched framework of the main determinants leveraging Workplace Innovation and their interdependencies from Figures 8 and 9, enlarges existing research and constructs new knowledge contributing to the academy and the industry as it will be presented in next chapter.

5.7 Workplace Innovation: New Definition

This study identified 41 topics (Annex VI), five determinants (Figure 9) and their interdependencies. Based on the acquired knowledge validated by the empirical study, it is possible to inductively derive and propose the construction of a new definition of Workplace Innovation as:

"*Workplace Innovation is the result achieved by implementing practices and their interdependencies in the areas of:*

(a) Knowledge, its management, share and creation, either via internal practices or partnerships,

(b) Human resources management mechanisms to incentivize employees and reward innovation, leverage and support the employee's carrier and competence development, and have adequate definition of jobs (design, characteristics, and skills),

(c) Organization, with the dynamics to frame a guidance able to: (1) generate an organizational culture, associated organizational type and work organization, where the employees without losing the business focus are empowered, autonomous and engaged with the ability to be creative, aggregate ideas, lead projects, generating

innovative products and services; and (2) accommodate a good cooperation with the employees, being these three areas enabled by

(d) information and technology tools that ensure efficiency and connectivity; and by

(e) corporate strategy."

This new Workplace Innovation definition complements all the existing frameworks and definitions previously identified in the SLR and contributes to the academy and the industry as it will be explained in the Conclusions chapter.

CHAPTER 6 - Conclusions and Contributions

Chapter 6 - Conclusions and Contributions

This chapter starts with a summary of the result of this study, from the initial research question and goal, until its findings. Afterwards the theoretical contributions this research brings for the academy and the industry, and the practical implications that can be a benefit for companies, their managers and their workplaces are emphasized. It also addresses some limitations of the research and suggests paths for further research in WI based on the achieved results under the existing constraints.

This research contributes to a better understanding of the phenomenon of Workplace Innovation through the proposal of an enriched framework of the main determinants of WI, including their interdependencies, shown in Figures 8 and 9 and to a new definition of Workplace Innovation. The results were achieved by performing an exploratory study, initiated with a systematic literature review complemented by an empirical qualitative work. The framework and the WI definition are the result of an inductive analysis of the obtained findings.

6.1 Research Question and Context

In this section we start by providing the initial research question, as defined in chapter one, followed by a summary of the work performed and how the objectives were achieved, the challenges faced, the lessons learned and the findings.

The research question addressed in this research is:

- What are the determinants leveraging Workplace Innovation and what are their interdependencies?

In order to address the formulated research question, objectives were defined, as presented in chapter 1. The first research objective was to perform a SLR on Workplace Innovation, underpinning the analysis of the main determinants and topics/themes addressed that support WI.

To perform the empirical study substantiating the knowledge and results concerning WI and to be able to conduct such a work in a context of a PhD thesis with limitations in terms of the time available, the balance achieved for the companies to be used in the case studies

was to select five innovation based Portuguese companies. These five companies have technological heterogeneity, and show diversity in the context, the age and the number of the employees.

In order to prepare the case studies in five companies, a date had to be defined for the analysis of the scientific papers to be considered, for the SLR, and this was set for the end of 2017 – as we knew already that the interview process would be long – as explained in chapter 2. In 2018 we conducted the first pilot interview in a company and throughout 2019 the interviews were performed in all companies. To be able to propose an enriched framework based on the predefined criteria, part one of this investigation started with the SLR results, this was the source for the preparation of part two, the empirical work. Afterwards data were gathered, analyzed and conclusions were drawn, this was in our view the most rigorous way to conduct the investigation.

From the SLR inductively emerged 38 topics that were aggregated in five determinants. The second research objective defined was, based on this SLR, to propose a framework of determinants leveraging Workplace Innovation and their interdependencies, that would underpin the empirical research. It was possible to derive, from the SLR, 38 WI topics and five determinants; it was not possible, based on the SLR, to identify interdependencies among topics or determinants. The topics and determinants identified allowed the construction of a proposal of a framework of main determinants leveraging Workplace Innovation as represented in Figure 1, in chapter 2, partially achieving the second research objective, as no interdependencies between topics were identified in the SLR. The proposed framework was the base for the elaboration of the case studies, where the empirical study was performed, as per the second objective. An interview guide, as shown in Annex IV, was based on the framework from Figure 1 and was used for the semi-structured interviews of the case studies, as described in chapter 3, in the preparation work for the case studies.

Planning, performing, and analyzing the data for a case study is a very time-consuming activity that is highly unpredictable in terms of how much time will be necessary as was confirmed by the researcher. Even knowing this beforehand, the time needed for the study was still underestimated. There were several constraints during the interviews. Firstly, the interviews were scheduled and for that it was needed the availability of the relevant interviewees. Secondly, quite often the scheduled interviews had to be rescheduled several times. Thirdly, when additional information was needed, after the interviews, there was a long time until the researcher got it, via email, or documentation. There were also constraints during the data gathering and its subsequent analysis. Firstly, the amount of

data was huge, it was hard, and it took a long time to write it down in the form of a report. Secondly, it was also difficult to de-scope, or not, any part of the gathered data that might not be obvious for a reader to be relevant for the research scope, but following the researcher interpretation was relevant in the scope of this research – this constraint has to do with the exploratory and interpretative nature of the study and is related to the challenge that the researcher has to ensure that everything that s/he interpreted during the interviews relevant for this research is written in the report, this means transforming tacit to explicit knowledge. Thirdly, it was a challenge to have the majority of the interviews recorded in Portuguese and writing down the report in English, as the way of thinking and writing are completely different, and this introduced additional time consumption in writing the report as well. Some of these facts, which were not overcome during the research, are indicated in the limitations section. Another fact that can be challenged is the number of selected companies used for the empirical study, this subject is highlighted and justified as well in the limitations.

The interviews started in 2018 and were concluded in 2019. There was a plan to conduct further interviews and check, if there were any relevant changes in 2020, in WI context, but the COVID-19 situation did not allow it. In the beginning of March 2020 because of the pandemic situation the employees went home and, unfortunately, this situation is not expected to change and come back to normality at least in a time frame of six to nine months, according to the COVID-19 vaccination plan, having this still a high level of uncertainty.

The empirical study, comprehending the analysis of several case studies enriched by the observation of the daily work in the companies was essential to assess the pertinence and usefulness of the topics/determinants proposed in the framework – this was the third objective we wanted to confirm – to learn the reality how WI is in the companies, to better understand the phenomenon Workplace Innovation and to credit and to provide us the capability to construct an enhanced framework of main determinants leveraging Workplace Innovation and their interdependencies, complementing previous frameworks assessed in the literature on WI.

The findings from the empirical work show that from the initially proposed 38 topics emerged from the SLR, 37 were verified and four new topics were uncovered, aggregating, and complementing previous research constructing knowledge in a systemic way. Relevant interdependencies were identified between topics and between determinants.

From the observations in the companies and from the descriptions in chapter 4 it is possible to claim that the 41 topics/ aggregated in five determinants are pertinent and useful for the companies and have interdependencies.

It is also possible to achieve the fourth objective of this research, based on the empirical work, to propose an enriched framework/model of main determinants leveraging Workplace Innovation and its interdependencies as represented in Figures 8 and 9, with the topics listed in Annex VI, and the topics interdependencies organized by determinants listed in Table X.

Finally, the fifth objective was as well achieved, a new WI definition is proposed, as presented in chapter 5.7, complementing previous research on WI. The contributions that the new WI definitions brings are presented in chapter 6.2.

6.2 Contributions

This research contributes to a better understanding of the phenomenon Workplace Innovation, through the induction of theory in the sequence of the performance of case studies and their cross-case analysis. As explained in chapter 3 the companies selected for the cases were based on Purposive sampling, to enable the researcher to discover in reality the subject of study, meaning that the results of the empirical study should be appropriate for theory building.

This research makes a contribution to the advance of the scientific knowledge, contributing to the academy through theory building, bringing a better understanding of the WI phenomenon, by proposing based on the 41 topics, listed in Annex VI and interdependencies represented in Figures 8 and 9 a new definition of Workplace Innovation (defined in chapter 5.7) contributing also to the industry and bringing as well practical implications for the Industry, as it will explained further on.

6.2.1 Contributions to the Academy

The new definition of Workplace Innovation is a contribution of theory building to the academy as it complements previous existing framework or definition identified in the performed SLR.

The new WI definition results from an inductive process after a cross-case study analysis. The results of the empirical study are documented in chapter 4, Table IX (Empirical Study: Topic Overview per Company), Table X (Interdependencies between topics -organized by determinants), Figure 8 (Representation of the Interdependency between topics from all determinants), Figure 9 (Main Determinants of Workplace Innovating including their interdependencies: enriched proposed framework), Annex V (Interdependency between topics) and Annex VI (Detailed topics for each Determinant in the enriched proposed framework for Workplace Innovation).

The new WI definition, presented in chapter 5.7, complements each of the existing models/frameworks or definitions emerged from the SLR.

As explained before the new WI definition is: "*the result achieved by implementing practices and their interdependencies in five areas"* (see chapter 5.7 for the complete definition*).*

It follows a description, area by area, how the new WI definition, complements previous research from the SLR, contributing to the creation of new knowledge.

To enable an easy reading, it is always indicated the area of the new WI definition and afterwards how it complements previous research.

The first area from the new WI definition is:

(a) "Knowledge, its management, share and creation, either via internal practices or partnerships"

This area complements:

Kim and Bae (2005), as in their framework no reference is performed to this area, in this study knowledge is derived from the HR initiatives to learn; Martins and Terblanche (2003), as in their framework they only consider cooperative teams and group interaction, with an internal focus and the new WI definition comprehends a broader meaning of knowledge with its management share and creation internally and with partnerships; Pot (2011), as this area is not present in his definition, and Prus et al. (2017) as in their definition it is also absent.

The second area from the new WI definition is:

(b) "Human resources management mechanisms to incentivize employees and reward innovation, leverage and support the employee's carrier and competence development, and have adequate definition of jobs (design, characteristics and skills"

This area complements:

Kim and Bae (2005) as in their framework they have HRM but this new definition complements their work with the need to have the jobs adequately defined (either through design or by specifically defining its characteristics and needed skills); Martins and Terblanche (2003), as they only cover in their framework reward and recognition and even this is not related to innovation; Prus et al. (2017), as in their definition it is also absent.

The third area from the new WI definition is:

(c) Organization, with the dynamics to frame a guidance able to: (1) generate an organizational culture, associated organizational type and work organization, where the employees without losing the business focus are empowered, autonomous and engaged with the ability to be creative, aggregate ideas, lead projects, generating innovative products and services; and (2) accommodate a good cooperation with the employees, being these three areas enabled by

This area complements:

Kim and Bae (2005), as their framework is focused on organizational design, and the new WI definition has a broader context determining also that the organization has to be conducive to the generation of conditions where the employees are empowered and autonomous with the ability to be creative, aggregate ideas, lead projects generating innovative products and services; Martins and Terblanche (2003) with the need to implement a good cooperation between manager and employee and to have an organization that allows engaged employees; Totterdill and Exton (2014b) by the recognition of the need to have a dynamics to frame a guidance able to generate organizational culture, associated organizational type and other factors; Pot (2011) definition and Prus et al. (2017) by all the area but the work organization as it is the only component present, being these three previous areas enabled by the area of

(d) "information and technology tools that ensure efficiency and connectivity"

This area complements:

Kim and Bae (2005) and Totterdill and Exton (2014b): as this area is absent; Martins and Terblanche (2003) as they only have a reference to IT resources in their study (twenty years old), with no reference to tools or connectivity; Pot (2011) as he refers to “supportive technologies”, so the new WI definition contains this component and is broader, as it has tools and connectivity and Prus et al. (2017) by IT tools and connectivity as in this area they only consider high-tech application.

and by

(e) corporate strategy.”

This area complements:

Kim and Bae (2005), Totterdill and Exton (2014b), Pot (2011) and Prus et al. (2017) as it is not referred in these studies. It partially complements Martins and Terblanche (2003) as it is referred only partially in this framework as “Strategy”.

Last contribution is that, with the exception of Pot (2011) that refers in his definition to “*combined interventions*”, no previous research from the SLR refers to the interdependencies part of the new WI definition.

It is possible to conclude that the new WI definition complements all previous research WI definitions and frameworks from the SLR, contributing to the construction of theory and to scientific advance of the academy.

6.2.2 Contributions to Industry

As discussed in the Introduction companies face nowadays a global business competition worldwide. The pressure to innovate, to bring differentiation in the portfolio, lower the costs and create value in the companies is huge. Workplace Innovation is a way to support innovation. Many companies have this challenge on a daily base and is a concern of the CEOs, as referred by O’reilly and Binns (2019) in a study performed by McKinsey, 70% of the senior executives surveyed listed innovation as a major concern. Big established companies also embrace innovation as a way to develop new growth businesses and in some cases even to avoid decline.

The companies try to find ways to innovate, some have knowledge management tools, others provide good training to the employees, other set goals and pay incentives and

associate to the goals for instance to the generation of innovations. Most of the times in the Industry these actions are either an own initiative of one Manager or HR manager or a HR consultant company.

The industry consults very seldom the Academy to be supported on the implementation on innovation at the workplace. One possible way to overcome this difficulty is to have partnerships Industry /Academy and have the support from the Academy to improve innovation in the companies by implementing the appropriate mechanisms that generate WI. This study has the possibility to be used to bridge two gaps, the lack of knowledge in the Industry and the few partnerships that exist in the Industry with the Academy, in the area of social sciences.

The result of this research can be used as guidelines for the industry to implement Workplace Innovation. The topics identified in this research can be used to produce a guideline and a diagnostic tool to support the Industry in WI implementation and the new WI definition points to specific areas of implementation.

This research can also generate consulting jobs to support the Industry.

This framework brings advantages for the industry either through training or consulting or collaboration with the academy, in this last case combining benefits for both Industry and academy.

6.3 Practical Implications

This research brings practical implications for industry as the framework can be used to shape guidelines to implement WI in companies. Figure 8 shows the complexity of the phenomenon WI, the topics underlying an implementation of WI, and the topics interdependencies.

Workplace Innovation can be successfully implemented in industry bringing innovation as benefit, though many levels must be involved, as there are implications for the companies, the managers, and the workplace levels. To understand the different implications, it is important to describe how the topics impact and are relevant at each of these levels.

6.3.1 Implications for Companies

The application of the results of this study to the companies has implication of several factors, in this section we will explain some we consider essential, the complete list of topics relevant for Workplace Innovation is available in Annex VI

Corporate Strategy, in a company is one of the topics considered in Organizational Dynamics determinant interacting with all the other topics of the framework. This topic determines the strategy in the company and influences factors such as the way the organization is designed, the way the work is organized, the vision, mission and values of the company, what market to address, what is the company positioning in the customers. When a company wants to implement Workplace Innovation then it is relevant that in their Corporate Strategy they define the appropriate organizational guidance to allow that other topics, part of our framework, are able to be implemented and those could be the Culture of the organization defined in such a way that the employees have autonomy and feel empowered and engaged, the organization type, or to define a pay and incentive system conducive to reward innovation, to promote the existence of appropriate leadership conducting to a good co-operative way of working between employee and supervisor. It is not our goal to state that Corporate Strategy is responsible for all the factors but by promoting the basic guidelines provides directions that allow a breakdown of those directions to be performed in the company by the managers and employees in the company and enables as an example that in the company could be performed a diagnostic of its current WI degree of implementation validation which of the topics from the proposed framework are present, through the usage of WI implementation support one topic of Other facilitators determinant.

At company level it is also important to define in which Communities of practice to belong as this supports WI, promotes Knowledge share, and other co-operation actions.

R&D and Innovation Certification (NP 4457), to have it or not, or at least even if not certified to use the norm to design the organization is a decision that has to be taken at company level as it requires the sponsorship from the CEO. This is a topic that requires attention at company level.

The companies face huge challenges in terms of competitiveness, as explained in chapter 1, Workplace Innovation can support innovation, the tradeoff of investing more money to produce innovation and generate more return for the shareholders is always present. The companies aim to have workplace innovation creating the appropriate mechanisms so that

people can innovate at their workplace, and the new WI definition and the topics listed in Annex VI and the interdependencies among topics from Figure 8 give companies the possibility to guide them how to do it, including or adapting to the needs of each company.

The country culture promoting innovation as in the case of Portugal and offering fiscal benefits for companies having activities of innovation and research is also a way to promote innovation at the workplace increasing organizational performance but that needs an organizational guidance at company level.

The company is formed of employees with different levels of responsibility, some of these responsibilities as corporate strategy are at board level, others are at other management levels or even employees without management responsibilities doing their work at their workplaces. The enhanced framework defined and the new WI definition embrace all of these different levels in the concept of Workplace Innovation.

6.3.2 Implications for Managers

Now we want to analyze what is the implication for a manager if s/he wants to implement WI based on the identified topics, their interdependencies and WI definition. Looking into Annex VI the manager needs to establish a good co-operation between the supervisor and the employee, have a good articulation between the Line Manager and the Human Resources Management to ensure a good Competence and skill development plan for the employee, has to understand the importance of having employees trained, using also new training practices at the workplace as online training and for that the connectivity through IT has to be ensured. Other ways of training are getting knowledge through the participation in Projects funded by National, European Community or other entities.

The managers need to understand that to have WI implemented need to provide some guidance to the employees but also to give them autonomy to allow them to develop their creativity, to organize partnerships with Universities or innovative companies, to open the company externally (out of the company) to acquire new knowledge, new technologies, new market trends.

It is also relevant in a context of WI implementation to protect either protocols, software or hardware elements using intellectual property rights, as per the findings translated in our framework. Figure 8 gives also a good overview of all the relevant topics and their

interdependencies; the managers can use it as base to apply it in the company and understand possible areas of action to improve the innovation capability at the workplace.

6.3.3 Implications for Workplace

Workplace applies to every employee in the company. Having Workplace Innovation is enabled among other topics by having knowledge Management appropriate mechanisms in place that facilitate access to explicit knowledge, means also that knowledge share through tacit-to-tacit exchange mechanisms exists in the company, that co-operation actions are in place to access to knowledge from outside and inside the company. It also means that at the workplace the employees have the adequate tools to access knowledge and be able to be efficient supported by IT and by an organization that recognized the importance of innovation and expects to get that contribution from their employees, supporting at the level of the Corporate Strategy.

It is possible to think of a workplace as an organic entity where a person virtually sits and is able to innovate based on the environment the company makes available for this entity, under certain conditions that in an ideal scenario correspond to the topics defined in Table VI and in Figure 8 resulting from the findings of this research and promoting Workplace Innovation.

The new WI definition indicates good paths for implementation of Workplace Innovation, namely considering the areas of Knowledge, Human Resources Management, Organization, IT tools and Corporate Governance.

6.4 Limitations and Future Research

When the SLR was performed we concluded that WI has a crosswise importance in business/economics, being published in 51 different journals and that studies deal with areas such as Healthcare, Medicine, Nursery, Municipal sector, and Business Schools. Also, especially when data used is secondary all type of companies and different levels of employees are involved.

It is understandable to accept the number of companies used for the case studies as a limitation and propose to use the findings of this research, enlarge the sample and add also

fields not covered by the technological endowments shown in the Case Studies Companies in Table IV. In this research we studied technology-based companies with applications in: Telecommunications, Financial Services, Public Sector, Mobility, Energy, Utilities, Power Systems, Aerospace, Defense, Next Generation Driving Machines and Mobility but are not empirically covered areas as Healthcare, this could lead to two fields for further research: enlarge the sample and cover industries with other technological endowments. The topics from Annex VI, the Figure 8 with the topics and their interdependencies, the enriched framework proposed in Figure 9 and the new WI definition from chapter 5.7 from this study could serve as the basis for the preparation of those case studies in future research on this topic.

The SLR stops in 2017. This can be taken as a limitation. This research has two parts a first one based on the SLR and a second one consisting of the empirical work based on the SLR. The first empirical work took more time than planned, the interviews started in 2018 and were concluded in 2019 and writing the report of the case studies is also a process that took more time than planned. The pandemic situation generated by COVID-19 since beginning of March 2020 hindered any possibility to perform in the companies any further empirical work. The plan we had to perform in 2020 interviews was not possible. We propose as further research to continue the SLR, following the same protocol as defined in chapter 2 over the following years in order to verify how could be enriched the findings of this research. If there were significant developments, new broadened empirical studies could then be conducted to verify the outcomes. The empirical work could also consider enlarging the sample and the technological endowments of the companies or at least covering Healthcare to complement the study of this research.

As expressed in chapter 5 there was one topic that was not possible to find in the companies where the case studies were performed – Regional Innovation systems. This will be taken as a limitation and is not considered in the enriched framework. This can be a field for further research to perform a case study using the framework from this research in a Region to understand the interrelation and relevance with WI. The interview guide related to this topic had an internal focus, which did not properly cover the Regional Innovation systems.

The SLR excluded some articles from the study related to trade unions, employee negotiations rights, gender, race, discrimination of workers, public policies, politics, government, non-for-profit organizations, social organizations, outsourcing, environment, psychology, facility management and workplace layout – did not pertain our WI research

study, as such they are listed in this section as limitations, even though they were not in focus of this research.

Another field for further research on the WI area is quantitative work on Workplace Innovation to determine the importance of each to the determinants and topics and their interdependencies resulting from this study.

References

Acaps. (2012). *Qualitative and Quantitative Research Techniques for Humanitarian Needs Assessment*. *12*(May), 14. Retrieved from http://reliefweb.int/report/world/qualitative-and-quantitative-research-techniques-humanitarian-needs-assessment

Addison, J. T. (2005). the Determinants of Firm Performance: Unions, Works Councils, and Employee Involvement/High-Performance Work Practices. *Scottish Journal of Political Economy*, *52*(3), 406–450. https://doi.org/10.1111/j.0036-9292.2005.00351.x

Alasoini, T. (2009). Strategies to Promote Workplace Innovation: A Comparative Analysis of Nine National and Regional Approaches. *Economic and Industrial Democracy*, *30*(4), 614–642. https://doi.org/10.1177/0143831X09336556

Alasoini, Tuomo, Ramstad, E., Heikkilä, A., & Ylöstalo, P. (2010). WORKPLACE INNOVATION IN FINLAND: TOWARDS SUSTAINABLE PRODUCTIVITY GROWTH?: *VEZETÉSTUDOMÁNY/ Budapest Management Review*, *41*(9), 2–16. Retrieved from http://eds.b.ebscohost.com/eds/detail/detail?vid=2&sid=3b67da11-bb7e-42aa-9ee6-e573df7b7902%40sessionmgr105&hid=117&bdata=JkF1dGhUeXBlPWlwLGNvb2tpZSxzaGliLHVpZCZsYW5nPXB0LWJyJnNpdGU9ZWRzLWxpdmUmc2NvcGU9c2l0ZQ%3D%3D#AN=53973962&db=a9h

Andersson, G. (2013). Rethinking Regional Innovation. *Systemic Practice & Action Research*, *26*(1), 99–110. https://doi.org/10.1007/s11213-012-9265-5

Ang, A. (2002). An eclectic review of the multidimensional perspectives of employee involvement. *The TQM Magazine*, *14*(3), 192–200. https://doi.org/10.1108/09544780210425856

Avgar, A. C., Givan, R. K., & Liu, M. (2011). Patient-centered but employee delivered: Patient care innovation, turnover, and organizational outcomes in hospitals. *Industrial and Labor Relations Review*, *64*(3), 423–440. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-79953854832&partnerID=tZOtx3y1

Badham, R., & Ehn, P. (2000). Tinkering with technology: Human factors, work redesign, and professionals in workplace innovation. *Human Factors and Ergonomics in Manufacturing*, *10*(1), 61–82. https://doi.org/10.1002/(SICI)1520-

6564(200024)10:1<61::AID-HFM4>3.0.CO;2-O

Bamber, G. J., Bartram, T., & Stanton, P. (2017). HRM and workplace innovations: formulating research questions. *Personnel Review*, *46*(7), 1216–1227. https://doi.org/10.1108/PR-10-2017-0292

Bartram, T. (2011). Employee management systems and organizational contexts: a population ecology approach. *Management Research Review*, *34*(6), 663–677. https://doi.org/10.1108/01409171111136194

Bayo-Moriones, A., & Galdon-Sanchez, J. E. (2010). Multinational companies and high-performance work practices in the Spanish manufacturing industry. *The International Journal of Human Resource Management*, *21*(8), 1248–1271. https://doi.org/10.1080/09585192.2010.483848

Beirne, M. (2013). Interpretations of management and modernisation at the UK Royal Mail: shifting boundaries and patterns of resistance? *New Technology, Work and Employment*, *28*(2), 116–129. https://doi.org/10.1111/ntwe.12009

Bernier, C. (1999). Transformation of work and New model of Qualification/Training. *Relations Industrielles / Industrial Relations*, *54*(1), 51–79. https://doi.org/10.7202/051220ar

Bjornali, E. S., & Anne Støren, L. (2012). Examining competence factors that encourage innovative behaviour by European higher education graduate professionals. *Journal of Small Business and Enterprise Development*, *19*(3), 402–423. https://doi.org/10.1108/14626001211250135

Black, S. E., & Lynch, L. M. (2004). What's driving the new economy?: the benefits of workplace innovation*. *The Economic Journal*, *114*(493), F97–F116. https://doi.org/10.1111/j.0013-0133.2004.00189.x

Borch, O. J., & Arthur, M. B. (1995). Strategic networks among small firms : Implications for strategy research methodology. *Journal of Management Studies*, *32*(4), 419–441. https://doi.org/10.1111/j.1467-6486.1995.tb00783.x

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology Using thematic analysis in psychology. *Qualitative Research in Psychology*, *0887*(January), 77–101. https://doi.org/10.1191/1478088706qp063oa

Brown, B. A., Harte, J., & Warnes, A. (2007). Developing the health care workforce: A comparison of two work-based learning models. *Education + Training*, *49*(3), 193–200. https://doi.org/10.1108/00400910710749323

Brown, J., & Dearnaley, J. (2016, August). Learning and teaching clinical communication in the clinical workplace. *The Clinical Teacher*, *13*, 283–286. https://doi.org/10.1111/tct.12441

Bryman, A., & Bell, E. (2011). *Business Research Methods* (3rd ed.). OUP Oxford.

Bryson, A., Forth, J., & Kirby, S. (2005). High-Involvement Management Practices, Trade Union Representation and Workplace Performance in Britain. *Scottish Journal of Political Economy*, *52*(3), 451–491. https://doi.org/10.1111/j.0036-9292.2005.00352.x

Camuffo, A., & Volpato, G. (1995). The labour relations heritage and lean manufacturing at Fiat. *The International Journal of Human Resource Management*, *6*(4), 795–824. https://doi.org/10.1080/09585199500000048

Carter, N., Bryant-Lukosius, D., Dicenso, A., Blythe, J., & Neville, A. J. (2014). The use of triangulation in qualitative research. *Oncology Nursing Forum*, *41*(5), 545–547. https://doi.org/10.1188/14.ONF.545-547

COTEC PORTUGAL. (2015). Retrieved September 1, 2015, from web site website: http://www.cotecportugal.pt/index.php?lang=pt

Creswell, J.W. (2003). *Chapter One, A Framework for Design. Research design: Qualitative, quantitative, and mixed methods approaches.* Thousand Oaks, CA: Sage Publications.

Creswell, JW & Clark, V. (2017). *Designing and conducting mixed methods research*. SAGE Publications.

CT 169 - Atividades de Investigação Desenvolvimento e Inovação (IDI). (2007). Gestão da Investigação Desenvolvimento e Inovação (IDI) - Requisitos do sistema de gestão da IDI. *NP 4457:2007*. Retrieved from https://catalogonormas.ipq.pt/catalogoipq/public/catalogoIPQ

Denyer, D., & Tranfield, D. (2009). Producing a systematic review. *In D. A. Buchanan & A. Bryman (Eds.), The Sage Handbook of Organizational Research Methods.*, 671–689.

Dhondt, S, & Hootegem, G. Van. (2015). Reshaping workplaces: workplace innovation as designed by scientists and practitioners. *European Journal of Workplace Innovation*, *1*(1), 17–24.

Dhondt, Steven, Pot, F. D., & Kraan, K. O. (2014). The importance of organizational level decision latitude for well-being and organizational commitment. *Team Performance Management*, *20*(7/8), 307–327. https://doi.org/10.1108/TPM-03-2014-0025

Dokko, G., Kane, A. A., & Tortoriello, M. (2013). One of Us or One of My Friends: How Social Identity and Tie Strength Shape the Creative Generativity of Boundary-Spanning Ties. *Organization Studies*, *35*(5), 703–726. https://doi.org/10.1177/0170840613508397

Drucker, P. (1985). The discipline of innovation. *Harvard Business Review*, *63*(3), 67–72.

Eeckelaert, L., Dhondt, S., Oeij, P., Pot, F. D., Nicolescu, G. I., Webster, J., & Elsler, D. (2012). Review of workplace innovation and its relation with occupational safety and health. In *EU-OSHA*. https://doi.org/http://dx.doi.org/10.2802/50497

Erickson, C. L., & Jacoby, S. M. (2003). The Effect of Employer Networks on Workplace Innovation and Training. *Industrial and Labor Relations Review*, *56*(2), 203–223. https://doi.org/10.2307/3590935

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of Convenience Sampling and Purposive Sampling. *American Journal of Theoretical and Applied Statistics*, *5*(January 2016), 1–4. https://doi.org/10.11648/j.ajtas.20160501.11

Findlay, P., Lindsay, C., McQuarrie, J., Bennie, M., Corcoran, E. D., & Van Der Meer, R. (2017). Employer Choice and Job Quality: Workplace Innovation, Work Redesign, and Employee Perceptions of Job Quality in a Complex Health-Care Setting. *Work and Occupations*, *44*(1), 113–136. https://doi.org/10.1177/0730888416678038

Finegold, D., & Wagner, K. (1998). The Search for Flexibility: Skills and Workplace Innovation in the German Pump Industry. *British Journal of Industrial Relations*, *36*(3), 469–487. https://doi.org/10.1111/1467-8543.00103

Friedrich, A., Sjöberg, A., & Friedrich, P. (2016). Leaned teamwork fattens workplace innovation: the relationship between task complexity, team learning and team proactivity. *European Journal of Work and Organizational Psychology*, *25*(4), 561–569.

https://doi.org/10.1080/1359432X.2016.1183649

Furmańska-Maruszak, A., & Sudolska, A. (2016). Social Innovations in Companies and in Social Economy Enterprises. *Comparative Economic Research*, *19*(3), 169–191. https://doi.org/10.1515/cer-2016-0026

Geary, J. F. (1999). The new workplace: Change at work in Ireland. *The International Journal of Human Resource Management*, *10*(5), 870–890. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0003089084&partnerID=tZOtx3y1

Ghosh, K. (2014). Creativity in Business Schools: Towards a Need Based Developmental Approach. *Global Journal of Flexible Systems Management*, *15*(2), 169–178. https://doi.org/10.1007/s40171-013-0049-2

Ghosh, K. (2015). Developing organizational creativity and innovation. *Management Research Review*, *38*(11), 1126–1148. https://doi.org/10.1108/MRR-01-2014-0017

Guarte, J. M., & Barrios, E. B. (2006). Estimation under purposive sampling. *Communications in Statistics: Simulation and Computation*, *35*(2), 277–284. https://doi.org/10.1080/03610910600591610

Guba, E. G., & Lincoln, Y. S. (1994). 10-guba_lincoln_94 competing paradigms in qualitqtive methods.pdf. In *Handbook of qualitative research* (In T. Oaks, pp. 105–117). Sage.

Hammond, M. M., Neff, N. L., Farr, J. L., Schwall, A. R., & Zhao, X. (2011). Predictors of individual-level innovation at work: A meta-analysis. *Psychology of Aesthetics, Creativity, and the Arts*, *5*(1), 90–105. https://doi.org/10.1037/a0018556

Howaldt, J., Oeij, P. R. A., Dhondt, S., & Fruytier, B. (2016). Workplace innovation and social innovation: an introduction. *World Review of Entrepreneurship, Management and Sustainable Development*, *12*(1), 1–12. https://doi.org/10.1504/WREMSD.2016.073433

Høyrup, S., Bonnafous-Boucher, M., Hasse, C., Lotz, M., & Møller, K. (2012). *Employee-Driven Innovation: A New Approach*. Palgrave Macmillan UK.

Humphreys, P., McAdam, R., & Leckey, J. (2005). Longitudinal evaluation of innovation implementation in SMEs. *European Journal of Innovation Management*, *8*(3), 283–

304. https://doi.org/10.1108/14601060510610162

Isa, K., & Tsuru, T. (2002). Cell Production and Workplace Innovation in Japan: Toward a New Model for Japanese Manufacturing? *Industrial Relations: A Journal of Economy and Society*, *41*(4), 548–578. https://doi.org/10.1111/1468-232X.00264

Jilcha, K., & Kitaw, D. (2017). Industrial occupational safety and health innovation for sustainable development. *Engineering Science and Technology, an International Journal*, *20*, 372–380. https://doi.org/10.1016/j.jestch.2016.10.011

Jilcha, K., Kitaw, D., & Beshah, B. (2016). Workplace innovation influence on occupational safety and health. *African Journal of Science, Technology, Innovation and Development*, *8*(1), 33–42. https://doi.org/10.1080/20421338.2015.1128044

Johansson, B., & Lööf, H. (2014). Productivity, networks and knowledge flows. *Economics of Innovation and New Technology*, *24*(1–2), 1–4. https://doi.org/10.1080/10438599.2014.897862

Jones, M. V., Coviello, N., & Tang, Y. K. (2011). International Entrepreneurship research (1989-2009): A domain ontology and thematic analysis. *Journal of Business Venturing*, *26*(6), 632–659. https://doi.org/10.1016/j.jbusvent.2011.04.001

Kalmi, P., & Kauhanen, A. (2008). Workplace Innovations and Employee Outcomes: Evidence from Finland. *Industrial Relations*, *47*(3), 430–459. https://doi.org/10.1111/j.1468-232X.2008.00528.x

Khan, S., & Mohiya, M. (2020). Determinants of SMEs employees' creativity and their impact on innovation at workplace. *Management Science Letters*, *10*(16), 3865–3872. https://doi.org/10.5267/j.msl.2020.7.025

Kim, D.-O., & Bae, J. (2005). Workplace innovation, employment relations and HRM: two electronics companies in South Korea. *The International Journal of Human Resource Management*, *16*(7), 1277–1302. https://doi.org/10.1080/09585190500144228

Klein, H. K., & Myers, M. D. (1999). A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly: Management Information Systems*, *23*(1), 67–94. https://doi.org/10.2307/249410

Koski, P., & Jarvensivu, A. (2010). The innovation diffusion paradox in the light of "shop-floor games" and micro-politics. *Economic and Industrial Democracy*, *31*(3), 345–363.

https://doi.org/10.1177/0143831X09351216

Lapointe, P., & Cucumel, G. (2016). An alternative typology for teamwork. *World Review of Entrepreneurship, Management and Sustainable Development*, *12*(1), 50–73. https://doi.org/10.1504/WREMSD.2016.073431

Lee, B.-H., & Kang, H.-Y. (2012). Hybridisation of employment relations in the era of globalisation? A comparative case study of the automotive and banking industries in South Korea. *The International Journal of Human Resource Management*, *23*(10), 2034–2050. https://doi.org/10.1080/09585192.2012.668362

Lee, T.-T. (2004). Nurses' adoption of technology: Application of Rogers' innovation-diffusion model. *Applied Nursing Research*, *17*(4), 231–238. https://doi.org/10.1016/j.apnr.2004.09.001

Long, R. J. (1989). Patterns of workplace innovation in Canada. *Relations Industrielles/Industrial Relations*, *44*(4), 805–826. https://doi.org/10.7202/050535ar

Lorenz, E. (2015). Work Organisation, Forms of Employee Learning and Labour Market Structure: Accounting for International Differences in Workplace Innovation. *Journal of the Knowledge Economy*, *6*(2), 437–466. https://doi.org/10.1007/s13132-014-0233-4

Macpherson, A., & Antonacopoulou, E. (2013). Translating strategy into practice: the role of communities of practice. *Journal of Strategy and Management*, *6*(3), 265–285. https://doi.org/10.1108/JSMA-11-2012-0061

Marks, A., Findlay, P., Hine, J., Thompson, P., & McKinlay, A. H. (1997). Handmaid's tale or midwives of change? HR managers and organizational innovation. *Strategic Change*, *6*(8), 469–480. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&site=eds-live&db=bth&AN=17073295

Martins, E. C., & Terblanche, F. (2003). Building organisational culture that stimulates creativity and innovation. *European Journal of Innovation Management*, *6*(1), 64–74. https://doi.org/10.1108/14601060310456337

Martins, E., & Terblance, F. (2000). The influence of organizational culture on creativity and innovation in a university library. *Mlnf Dissertation, University of South Africa, Pretoria*. Retrieved from http://scholar.google.com/scholar?hl=pt-

BR&q=The+influence+of+organisational+culture+on+creativity+and+innovation+in+a+university+librar.&btnG=&lr=#0

McCartney, John; Teague, P. (1997). WORKPLACE INNOVATIONS IN THE REPUBLIC OF IRELAND. *The Economic and Social Review*, *28*(4), 381–399. https://doi.org/10.7202/051220ar

McCartney, J., & Teague, P. (2004a). The diffusion of high performance employment practices in the Republic of Ireland. *International Journal of Manpower*, *25*(7), 598–617. https://doi.org/10.1108/01437720410563962

McCartney, J., & Teague, P. (2004b). The use of workplace innovations in Ireland: a review of the evidence. *Personnel Review*, *33*(1), 81–109. https://doi.org/10.1108/00483480410510633

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

Muenjohn, N, & McMurray, A. (2016). The impact of leadership on workplace innovation in Thai and Vietnamese SMES. *The Journal of Developing Areas*, *50*(5), 479–486. https://doi.org/10.1353/jda.2016.0045

Muenjohn, Nuttawuth, & McMurray, A. (2017). Design leadership, work values ethic and workplace innovation: an investigation of SMEs in Thailand and Vietnam. *Asia Pacific Business Review*, *23*(2), 192–204. https://doi.org/10.1080/13602381.2017.1281642

Neumann, W. (1997). Social Research Methods: Qualitative and Quantitative Approachese. In *Allen & Bacon, United States of America*.

Nonaka, I., Toyama, R., & Konno, N. (2000). SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation. *Long Range Planning*, *33*(1), 5–34. https://doi.org/10.1016/S0024-6301(99)00115-6

O'reilly, C., & Binns, A. J. M. (2019). The three stages of disruptive innovation: Idea generation, incubation, and scaling. *California Management Review*, *61*(3), 49–71. https://doi.org/10.1177/0008125619841878

OECD, & Eurostat. (2005). Oslo Manual. *Guidelines for Collecting and Interpreting Innovation Data, 3rd Edition*, 162. https://doi.org/10.1787/9789264013100-en

OECD, & EUROSTAT. (2018). *The Measurement of Scientific, Technological and Innovation Activities Oslo Manual 2018 GUIDELINES FOR COLLECTING, REPORTING AND USING DATA ON INNOVATION 4TH EDITION*. https://doi.org/10.1787/9789264304604-en

Oeij, P., de Vroome, E., Bolland, A., Gründemann, R., & van Teeffelen, L. (2014). Investing in Workplace Innovation Pays Off for SMEs: A Regional Innovation Initiative from the Netherlands. *International Journal of Social Quality*, *4*(2), 86–106. https://doi.org/10.3167/IJSQ.2014.040206

Oeij, P. R. A., Dhondt, S., & Korver, T. (2011). Workplace Innovation, Social Innovation, and Social Quality. *International Journal of Social Quality*, *1*(2), 31–49. https://doi.org/10.3167/IJSQ.2011.010204

Oeij, P. R. A., & Vaas, F. (2016). Effect of workplace innovation on organisational performance and sickness absence. *World Review of Entrepreneurship, Management and Sustainable Development*, *12*(1), 101–129. https://doi.org/10.1504/WREMSD.2016.073425

Ozman, M. (2009). Inter-firm networks and innovation: a survey of literature. *Economics of Innovation and New Technology*, *18*(1), 39–67. https://doi.org/10.1080/10438590701660095

Pålshaugen, Ø. (2015). Why a European Journal of Workplace Innovation? *European Journal of Workplace Innovation*, *1*(1), 5–12.

Payne, J. (2004). Re-Evaluating the Finnish Workplace Development Programme: Evidence from Two Projects in the Municipal Sector. *Economic and Industrial Democracy*, *25*(4), 485–524. https://doi.org/10.1177/0143831X04047157

Payne, Jonathan. (2017). Towards a broad-based innovation policy in the UK: Can design help? *Economic and Industrial Democracy*, *38*(3), 535–555. https://doi.org/10.1177/0143831X15579289

Perry, C., R., & Brown, L. (1999). REALISM'S ROLE AMONG SCIENTIFIC PARADIGMS IN MARKETING RESEARCH. *Irish Marketing Review*, *12*(2), 16–23.

Pettine, S. B., Cojanu, K. A., & Walters, K. (2011). Pedagogy and praxis: simulations and skill sets. *On the Horizon*, *19*(3), 156–164.

https://doi.org/10.1108/10748121111163869

Plijter, E., J.M. van der Voordt, T., & Rocco, R. (2014). Managing the workplace in a globalized world: The role of national culture in workplace management. *Facilities*, *32*(13/14), 744–760. https://doi.org/10.1108/F-11-2012-0093

Podsakoff, P. M., MacKenzie, S. B., Bachrach, D. G., & Podsakoff, N. P. (2005). The influence of management journals in the 1980s and 1990s. *Strategic Management Journal*, *26*(5), 473–488. https://doi.org/10.1002/smj.454

Ponelis, S. R. (2015). Using Interpretive Qualitative Case Studies for Exploratory Research in Doctoral Studies : A Case of Information Systems Research in Small and Medium Enterprises. *International Journal of Doctoral Studies*, *10*, 535–550.

Pot, F., Totterdill, P., & Dhondt, S. (2016). Workplace innovation: European policy and theoretical foundation. *World Review of Entrepreneurship, Management and Sustainable Development*, *12*(1), 13–32. https://doi.org/10.1504/WREMSD.2016.073428

Pot, Frank. (2011). Workplace innovation for better jobs and performance. *International Journal of Productivity and Performance Management*, *60*(4), 404–415. https://doi.org/10.1108/17410401111123562

Preenen, P., Oeij, P., Dhondt, S., Kraan, K. O., & Jansen, E. (2016). Why job autonomy matters for young companies' performance: company maturity as a moderator between job autonomy and company performance. *World Review of Entrepreneurship, Management and Sustainable Development*, *12*(1), 74–100. Retrieved from http://www.inderscienceonline.com/doi/abs/10.1504/WREMSD.2016.073425

Prus, I., Nacamulli, R., & Lazazzara, A. (2017). Disentangling workplace innovation: a systematic literature review. *Emerald Insight*, *46*(7), 1254–1279. https://doi.org/http://dx.doi.org/10.1108/MRR-09-2015-0216

Rees, C. (2001). Worker responses to quality organisation: Discourse and materiality in organisational change. *Work, Employment and Society*, *15*(4), 743–761. https://doi.org/10.1177/095001701400438189

Sanders, K. (2011). A RESOURCE FOR BEST PRACTICE. *Nursing Standard*, *25*(25), 70–71. Retrieved from http://eds.a.ebscohost.com/eds/detail/detail?sid=c0710532-45f1-

4ad7-b1b0-959029b90996%40sessionmgr4007&vid=19&hid=4110&bdata=Jmxhbmc9cHQtYnImc2l0ZT1lZHMtbGl2ZQ%3D%3D#AN=59304988&db=a9h

Schot, J., & Steinmueller, W. E. (2018). Three frames for innovation policy: R&D, systems of innovation and transformative change. *Research Policy*, *47*(9), 1554–1567. https://doi.org/10.1016/j.respol.2018.08.011

Schumpeter, J. A. (1934). *The Theory of Economic Development: An Inquiry Into Profits, Capital, Credit, Interest, and the Business Cycle*. Transaction Books.

Senge, P. M., & Carstedt, G. (2001). Innovating our way to the next industrial revolution. *MIT Sloan Management Review*, *42*(2), 24–38.

Sharma, G. (2017). Pros and cons of different sampling techniques. *International Journal of Applied Research*, *3*(7), 749–752. Retrieved from www.allresearchjournal.com

Sobh, R., & Perry, C. (2006). Research design and data analysis in realism research. *European Journal of Marketing*, *40*(11/12), 1194–1209. https://doi.org/10.1108/03090560610702777

Srivastava, A., & Thomson, S. B. (2009). Framework Analysis: A Qualitative Methodology for. *Applied Policy Research. JOAAG*, *4*(2), 72–79. https://doi.org/10.7748/nr2011.01.18.2.52.c8284

Starman, A. (2013). The case study as a type of qualitative research. *Journal of Contemporary Educational Studies*, *1*(2013), 28–43.

Subramaniam, I. D., & Moslehi, M. M. (2013). Does Workforce Innovation Mediate the Relationship between Internal Factors and Performance in Malaysian Entrepreneurial SMEs? *Asian Social Science*, *9*(9), 45. https://doi.org/10.5539/ass.v9n9p45

Svare, H. (2016). User-Producer Dialogue, Workplace Innovation, and Knowledge in a Regional Innovation System. *Journal of the Knowledge Economy*, *7*(2), 565–586. https://doi.org/10.1007/s13132-014-0229-0

Teague, P. (2005). What is Enterprise Partnership? *Organization*, *12*(4), 567–589. https://doi.org/10.1177/1350508405052759

Thurmond, V. A. (2001). The point of triangulation. *Journal of Nursing Scholarship*, *33*(3),

253–258. https://doi.org/10.1111/j.1547-5069.2001.00253.x

Totterdill, P, & Exton, O. (2009). Workplace innovation policies in European countries. *UKWON, Nottingham*.

Totterdill, Peter, & Exton, R. (2014a). Closing the gap: There is a gap and it is not going away. *Strategic Direction*, *30*(9), 9–11. https://doi.org/10.1108/SD-09-2014-0111

Totterdill, Peter, & Exton, R. (2014b). Defining workplace innovation: The Fifth Element. *Strategic Direction*, *30*(9), 12–16. https://doi.org/10.1108/SD-09-2014-0112

Totterdill, Peter, & Exton, R. (2014c). Interactive Theatre. *Strategic Direction*, *30*(9), 35–37. https://doi.org/10.1108/SD-09-2014-0120

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. *British Journal of Management*, *14*(3), 207–222. https://doi.org/10.1111/1467-8551.00375

Truss, C., Shantz, A., Soane, E., Alfes, K., & Delbridge, R. (2013). Employee engagement, organisational performance and individual well-being: Exploring the evidence, developing the theory. *International Journal of Human Resource Management*, *24*(14), 2657–2669. https://doi.org/10.1080/09585192.2013.798921

Tushman, M. (1997). Winning through innovation. *Strategy & Leadership*. Retrieved from http://www.emeraldinsight.com/doi/pdfplus/10.1108/eb054591

Urbach, T., Fay, D., & Lauche, K. (2016). Who will be on my side? The role of peers' achievement motivation in the evaluation of innovative ideas. *European Journal of Work and Organizational Psychology*, *25*(4), 540–560. https://doi.org/10.1080/1359432X.2016.1176558

Von Treuer, K., & McMurray, A. J. (2012). The role of organisational climate factors in facilitating workplace innovation. *International Journal of Entrepreneurship and Innovation Management*, *15*(4), 292–309. https://doi.org/10.1504/12.48078

Walsworth, S., & Verma, A. (2007). Globalization, Human Resource Practices and Innovation: Recent Evidence from the Canadian Workplace and Employee Survey. *Industrial Relations: A Journal of Economy and Society*, *46*(2), 222–240. https://doi.org/10.1111/j.1468-232X.2007.00466.x

Williams, J., & LaBrie, R. C. (2015). Unified communications as an enabler of workplace redesign. *Measuring Business Excellence*, *19*(1), 81–91. https://doi.org/10.1108/MBE-11-2014-0044

Wipulanusat, W., Panuwatwanich, K., & Stewart, R. A. (2017). Workplace Innovation: Exploratory and Confirmatory Factor Analysis for Construct Validation. *Management and Production Engineering Review*, *8*(2), 57–68. https://doi.org/10.1515/mper-2017-0018

Womack, J., & Jones, D. (1996). Beyond Toyota: how to root out waste and pursue perfection. *Harvard Business Review*, *75*(5), 140–158.

Wynarczyk, P., Piperopoulos, P., & McAdam, M. (2013). Open innovation in small and medium-sized enterprises: An overview. *International Small Business Journal*, *31*(3), 240–255. https://doi.org/10.1177/0266242612472214

Xerri, M. J., Nelson, S. A., Brunetto, Y., & Reid, S. R. M. (2015). NPM and change management in asset management organisations. *Journal of Organizational Change Management*, *28*(4), 641–655. https://doi.org/10.1108/JOCM-11-2013-0222

Yalabik, Z. Y., Popaitoon, P., Chowne, J. A., & Rayton, B. A. (2013). Worker Engagemet As a Mediator Btween Yee Attitude and Outcomes. *The International Journal of Human Resource Management*, *24*(14), 2799–2823. https://doi.org/http://dx.doi.org/10.1080/09585192.2013.763844

Yeh-Yun Lin, C., & Liu, F. (2012). A cross-level analysis of organizational creativity climate and perceived innovation. *European Journal of Innovation Management*, *15*(1), 55–76. https://doi.org/10.1108/14601061211192834

Yin, R. K. (2014). *Case Study Research: Design and Methods* (5th ed.). California: SAGE Publications Inc.

Zheng, C., Hyland, P., & Soosay, C. (2007). Training practices of multinational companies in Asia. *Journal of European Industrial Training*, *31*(6), 472–494. https://doi.org/10.1108/03090590710772659

Zwanikken, P. A. C., Alexander, L., & Scherpbier, A. (2016). Impact of MPH programs: contributing to health system strengthening in low- and middle-income countries? *Human Resources for Health*, *14*(1), 52. https://doi.org/10.1186/s12960-016-0150-7

Annexes

Annex I: Articles Analyzed in the SLR

Article Reference	Topic	Topic	Determinants					Method				Context					
			OR	HRM	C	I	OT	Eqt	CS	Eql	Conc	SME	Data	R&D	Serv	Ind	Ot
(Alasoini, 2009)	WI implementation support	1					X			X			X				
(Alasoini et al., 2010)								X								X	
	Interfaces Management	2			X												
	Work Organization	3	X														
	Competence/Skill Development	4		X													
(Andersson, 2013)											X		X				
	Knowledge Share	5			X												
	Regional Innovation	6			X												
(Ang, 2002)	Employee Engagement	7	X								X		X				
(Avgar et al., 2011).	Information and technology usage	8				X		X									X
(Badham and Ehn, 2000)											X		X				
	HR/ Work Practices	9		X													
	WI implementation support	1					X										
	Job Design	10	X														
	Change Management	11					X										
	Information and technology usage	8				X											

(Bamber et al., 2017)									X			X
	Corporate Strategy	33										
	HR/ Work Practices	9	X	X								
	Change Management	11				X						
	Competence/ Skills Development	4		X								
(Bartram, 2011)	HR/ Work Practices	9		X					X	X		
(Bayo-Moriones and Galdon-Sanchez, 2010)							X				X	
	Pay and Incentive Systems	12		X								
	Competence/Skill Development	4		X								
(Beirne, 2013)								X				X
	Autonomy/ Employee Empowerment	16	X									
	HR/ Work Practices	9		X								
(Bernier, 1999)	Competence/Skill Development	4		X					X	X		
(Bjornali and Støren, 2012)							X			X		
	Competence/Skill Development	4		X								
	External Factors	24				X						
	Organization type	13	X									
(Black and Lynch, 2004)							X				X	
	Information and technology usage	8			X							
	Employee Engagement	7	X									
	Pay and Incentive Systems	12		X								

(Brown and Dearnaley, 2016)				X	X
	Knowledge Management	25	X		
	Co-operation actions	20	X		
	Knowledge Share	5	X		
(Brown et al., 2007)	New Training Practices	14	X	X	X
(Camuffo and Volpato, 1995)				X	X
	Informal Power	31	X		
	Competence/Skill Development	4	X		
(Curington et al., 1986)	Pay and Incentive Systems	12	X	X	X
(Dhondt et al., 2014)				X	X
	Job Characteristics	15	X		
	Autonomy/ Employee Empowerment	16	X		
	Leadership	17	X		
	Organizational Guidance	18	X		
(Dokko et al., 2013)				X	X
	Knowledge Share	5	X		
	Information Flow	19	X		
	Co-operation actions	20	X		
(Erickson and Jacoby, 2003)				X	X
	Change Management	11	X		
	WI implementation support	1	X		

(Findlay et al., 2017)				X	X
	Information and technology usage	8	X		
	Job Design	10	X		
(Finegold and Wagner, 1998)	Competence/Skill Development	4	X	X	X
(Furmańska-Maruszak and Sudolska, 2016)				X	X
	HR/ Work Practices	9	X		
	Competence/Skill Development	4	X		
	Culture (Organizational and Corporate)	21	X		
	Organizational Performance	22	X		
	Leadership	17	X		
	Employee and supervisor's co-operation	23	X		
(Friedrich et al., 2016)				X	X
	Work Organization	3	X		
	Job Characteristics	15	X		
	Competence/Skill Development	4	X		
(Geary, 1999)				X	X
	Work Organization	3	X		
	Autonomy/ Employee Empowerment	16	X		
	Job Design	10	X		
(Ghosh, 2014)	External Factors	24	X	X	X
(Ghosh, 2015)	Autonomy/ Employee Empowerment	16	X	X	X

(Hammond et al., 2011)								X						X
	Job Characteristics	15	X											
	HR/ Work Practices	9		X										
	Change Management	11					X							
	External Factors	24					X							
(Howaldt et al., 2016)										X		X		
	Work Organization	3	X											
	Organization type	13	X											
	Knowledge Management	25	X											
	Interfaces Management	2			X									
	HR/ Work Practices	9		X										
	Culture (Organizational and Corporate)	21	X											
(Humphreys et al., 2005)									X		X			
	Leadership	17	X											
	Autonomy/ Employee Empowerment	16	X											
	Culture (Organizational)	21	X											
	Information and technology usage	8				X								
	Competence/Skill Development	4		X										
	Organization type	13	X											
(Isa and Tsuru, 2002)								X	X				X	
	Employee responsibility with the customer	27	X											
	Pay and Incentive Systems	12		X										

(Jilcha, Kitaw and Beshah, 2016)					X	X
	Employee Engagement	7	X			
	Competence/Skill Development	4		X		
	Employee Training	28	X			
(Jilcha and Kitaw, 2017)	External Factors	24		X	X	X
(Kalmi and Kauhanen, 2008)					X	X
	Work Organization	3	X			
	Information Flow	19		X		
	Teamwork	30		X		
	Competence/Skill Development	4		X		
	Employee Engagement	7	X			
(Kim and Bae, 2005)	Change Management	11		X	X	X
(Koski and Jarvensivu, 2010)					X	X
	Change Management	11		X		
	Informal Power	31	X			
	Information Flow	19		X		

(Lapointe and Cucumel, 2016)							X				X
	Autonomy/ Employee Empowerment	16	X								
	Work Organization	3	X								
	External Factors	24				X					
	Corporate Strategy	33	X								
	External Factors	24				X					
(Lee and Kang, 2012)	HR/ Work Practices	9		X			X				X
(Lee, 2004)								X			X
	Information and technology usage	8			X						
	External Factors	24				X					
	Competence/Skill Development	4		X							
(Long, 1989)	Autonomy/ Employee Empowerment	16	X				X				X
(Lorenz, 2015)	Work Organization	3	X				X		X		
(Marks et al., 1997)	Change Management	11				X		X			X
(Macpherson and Antonacopoulou, 2013)							X			X	
	CoP	34			X						
	Culture (Organizational)	21	X								
	Leadership	17	X								
	Organizational Guidance	18	X								

(McCartney and Teague, 1997)				X	X
	Work Organization	3	X		
	Pay and Incentive Systems	12	X		
	Organizational Guidance	18	X		
	HR/ Work Practices	9	X		
	Competence/Skill Development	4	X		
(McCartney and Teague, 2004a)	HR/ Work Practices	9	X	X	X
(McCartney and Teague, 2004b)				X	X
	Teamwork	30	X		
	HR/ Work Practices	9	X		
(Muenjohn and McMurray, 2016)				X	X
	Leadership	17	X		
	Management	26	X		
	New Training Practices	14	X		
	Culture (Country)	35	X		
(Muenjohn and McMurray, 2017)	Leadership	17	X	X	X
(Oeij et al., 2011)	HR/ Work Practices	9	X	X X	X

(Oeij and Vaas, 2016)								X					X		
	Information and technology usage	8				X									
	Organizational Performance	22	X												
	Work Organization	3	X												
	Job Design	10	X												
	Competence/Skill Development	4		X											
(Oeij et al., 2014)								X				X			
	Work Organization	3	X												
	HR/ Work Practices	9		X											
(Payne, 2004)	Work Organization	3	X						X	X					X
(Payne, 2017)	WI implementation support	1					X				X				X
(Pettine et al., 2011)								X					X		
	New Training Practices	14		X											
	Online learning environment	32				X									
	Computer-based simulations	29				X									
	Co-operation actions	20			X										
(Plijter et al., 2014)	Culture (Country)	35		X					X	X	X			X	
(Pot, 2011)											X		X		
	HR/ Work Practices	9		X											
	Pay and Incentive Systems	12		X											
	Co-operation actions	20			X										
	Knowledge Management	25	X												
	Competence/Skill Development	4		X											

(Pot et al., 2016)											X		X	
	Work Organization	3	X											
	Organization type	13	X											
	Knowledge Management	25	X											
	Interfaces Management	2			X									
	Information and technology usage	8				X								
(Preenen et al., 2016)								X					X	
	Autonomy/ Employee Empowerment	16	X											
	HR/ Work Practices	9		X										
(Prus et al.,2017)	WI implementation support	1					X		X	X	X			X
(Subramaniam and Moslehi, 2013)	Autonomy/ Employee Empowerment	16	X					X				X		
(Svare, 2016)									X			X		
	Interfaces Management	2			X									
	Knowledge Share	5			X									
	Employee Engagement	7	X											
(Teague, 2005)											X		X	
	Teamwork	30			X									
	HR/ Work Practices	9		X										
	Change Management	11					X							

(Totterdill and Exton, 2014c)				X	X
	Creativity	36	X		
	Knowledge Share	5	X		
	HR/ Work Practices	9	X		
	Co-operation actions	20	X		
(Totterdill and Exton, 2014a)	Work Organization	3	X	X	X
(Totterdill and Exton, 2014b)				X	X
	Autonomy/ Employee Empowerment	16	X		
	Teamwork	30	X		
	HR/ Work Practices	9	X		
	Employee Engagement	7	X		
	Culture (Organizational)	21	X		
	New Training Practices	14	X		
	Co-operation actions	20	X		
(Urbach, Fay and Lauche, 2016)				X	X
	Work Organization	3	X		
	Internal "Marketing"	37	X		
(Von Treuer and McMurray, 2012)	Autonomy/ Employee Empowerment	16	X	X	X

(Walsworth and Verma, 2007)				X	X
	Pay and Incentive Systems	12	X		
	Competence/Skill Development	4	X		
	WI implementation support	1	X		
(Williams and LaBrie, 2015)	Integrated Technology	38	X	X	X
(Wipulanusat et al., 2017)				X	X
	Creativity	36	X		
	Team work	30	X		
(Rees, 2001)				X	X X
	HR/ Work Practices	9	X		
	Organizational Guidance	18	X		
(Yeh-Yun and Liu, 2012)	Creativity	36	X	X	X
(Xerri et al., 2015)				X	X
	Employee and supervisors co-operation	23	X		
	Autonomy/ Employee Empowerment	16	X		
	Information Flow	19	X		
(Zheng et al., 2007)				X	X
	Competence/Skill Development	4	X		
	New Training Practices	14	X		

(Zwanikken et al., 2016)										X								X
	Interfaces Management	2			X													
	External Factors	24					X											
	Co-operation actions	20			X													
	Leadership	17	X															
	Competence/Skill Development	4		X														
	Articles Method/ Context types Sum								39	13	10	20	6	21	1	2	26	20
	Articles Method/ Context types Weight %								48	16	12	24	8	28	1	3	34	26
	Topics Sum	38	17	7	7	4	3											
	Weight % (Non repeated topics: 38)		45	18	18	11	8											
	Topics Addressed overall Research	191	76	57	25	11	22											
	Weight % (191)		40	30	13	6	12											

Abbreviations used in Annex I:

Determinants:

OR: Organizational Dynamics,

HRM: Human Resources Management,

C: Collaboration,

I: IT Infrastructures,

OT: Others

Method:

Eqt: Empirical Quantitative,

Eql: Empirical Qualitative,

CS:Case Study,

Conc: Conceptual

Context:

SME: Small and Medium-sized Enterprise,

Data: Secondary database,

R&D: Research and Development,

Ser: Service,

Ind: Industry,

Ot: Other

Annex II: Detailed Topics for each Determinant in the Proposed Framework for Workplace Innovation

Organizational Dynamics

-Work Organization

-Autonomy/ Employee Empowerment

-Leadership

-Employee Engagement/

-Culture (Organizational)

-Organizational Guidance

-Job Design

-Knowledge Management

-Organization type

-Creativity

-Job Characteristics

-Corporate Strategy

-Employee and Supervisors co-operation

-Organizational Performance

-Informal Power

-Employee responsibility with the customer

-Employee Training

Human Resources Management

-Competence / Skill Development

-HR/ work Practices

-Pay and incentive systems

-New Training Practices

-Information Flow

-Culture (Country)

-Management

Collaboration

-Co-operation actions

-Interfaces Management

-Knowledge Share

-Teamwork

-CoP

-Internal "Marketing"

-Regional Innovation

IT Infrastructures

-Information and technology usage

-Online learning environment

-Computer-based simulations

-Integrated Technology

Other Facilitators

-Change Management

-External Factors

-WI implementation support

Annex III: Numbering of the Proposed Framework Elements for the Mapping in the Interview Guide

Topics	Numbering of the topics
Work Organization	1
Autonomy/ Employee Empowerment	2
Leadership	3
Employee Engagement/	4
Culture (Organizational)	5
Organizational Guidance	6
Job Design	7
Knowledge Management	8
Organization type	9
Creativity	10
Job Characteristics	11
Corporate Strategy	12
Employee and Supervisors co-operation	13
Organizational Performance	14
Informal Power	15
Employee responsibility with the customer	16
Employee Training	17
Competence/ Skill Development	18
HR/ work Practices	19
Pay and incentive systems	20
New Training Practices	21
Information Flow	22
Culture (Country)	23
Management	24
Co-operation actions	25
Interfaces Management	26
Knowledge Share	27
Teamwork	28
CoP	29
Internal Marketing	30
Regional Innovation	31
Information and technology usage	32
Online learning environment	33
Computer-based simulations	34
Integrated Technology	35
Change Management	36
External Factors	37
WI implementation support	38

Annex IV: Interview Guide

Interview Guide item nº	Link to the Numbering of the topics (as in Annex III)
Company Characterization (Field of activity, size, age, sales volume, …)	all
1. Strategic level understanding: Corporate, breakdown to the employees, connection between those and Innovation.	12, 6, 20
2. Organizational or Country Culture impacting Innovation. Mechanisms used to leverage Creativity.	5, 23, 10, 37
3. Employees' Autonomy individually and in teamwork. Relationship Line manager/ employee. Innovation related activities in daily work	2, 28, 13, 24, 3, 9, 16
4. Organizational Culture in the Company. Type if existing.	5
5. Type of Organization / Leadership style.	9, 3, 13
6. Change Management Process or case by case.	36
7. Job Allocation and effort calculation / under pressure.	11
8. Knowledge Management / Knowledge share / Internal Marketing / Best Practice Share.	8, 27, 30
9. Job description in the projects and in the leadership positions.	7, 19, 11, 3
10. Organizational Performance. Defined KPI. Evolution along the time.	14
11. Allocation of work to each employee. Competence skills matrix per employee. Requirements for each project defined. Teamwork setup. Methodologies used in the Projects.	1, 2, 18, 28, 11, 4, 15, 16, 32, 22
12. Employees' competence development HR / LM joint work. Type of training: Online or web-based training used. Other?	21, 33, 17
13. Communication share in the Company: How?	27, 8, 22, 6
14. Employees performance evaluation, Pay, incentive and evaluation methods. Work practices contributing to innovation?	16,19,17
15. Type of Collaborations existing in the company (employees' meeting, partnerships, focus groups for problem solving part of any CoP, Innovation Cluster or specific Innovation Region, internal/external?)	25, 26, 29, 31
16. Interface with other companies: how and why those?	25, 26, 29, 31
17. Importance of the technology at the workplace. Environments used.	34, 35, 32
18. External factors which contribute to leverage Innovation. Any other subject not discussed or covered in this conversation?	37
19. Your Vision: how can a workplace be more innovative?	3, 12, 6, 17, 18, 19, 37
20. Check if useful to have an external structure as consultancy to support the implementation of WI in the company.	38

Annex V: Interdependency Between Topics

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
1		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X						X	X			X		X						X		
2	X		X	X	X				X			X	X		X																										
3	X	X			X				X			X	X																												
4	X				X				X			X				X																									
5	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X																								
6	X				X				X		X	X							X					X																
7	X				X				X		X	X		X					X									X			X									
8	X			X	X				X	X		X														X													X	
9	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X																								
10	X				X			X	X			X							X							X														
11	X				X	X	X		X			X			X				X								X			X										
12	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
13	X	X	X		X				X			X																												
14	X			X	X				X			X																												
15	X	X			X		X		X		X	X																X												
16	X			X	X				X			X																												
17	X				X				X			X						X	X		X							X			X	X								
18												X					X		X		X											X								
19						X	X		X	X		X					X			X	X	X	X	X																
20												X							X										X											

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
21												X					X	X	X											X	X									
22								X				X							X								X													X
23												X							X																					
24	X				X	X			X			X							X																					
25												X														X	X		X	X									X		
26												X													X																
27								X		X		X										X			X				X	X									X	X
28							X				X	X			X		X														X		X							
29												X													X		X														
30												X													X		X														
31							X				X	X					X		X	X	X							X				X	X	X							
32												X					X		X											X										
33												X					X				X						X			X											
34																														X											
35																																			X						
36												X																							X						
37					X							X																													
38												X																											X		
39								X				X													X		X											X		
40												X															X														
41	X				X			X	X	X		X										X				X													X	

Numbering used in Annex V:

1. Work Organization
2. Autonomy/ Employee Empowerment
3. Leadership
4. Employee Engagement
5. Culture (Organizational)
6. Organizational Guidance
7. Job Design
8. Knowledge Management
9. Organization type
10. Creativity
11. Job Characteristics
12. Corporate Strategy
13. Employee and Supervisors co-operation
14. Organizational Performance
15. Informal Power
16. Employee responsibility with the customer
17. Employee Training
18. Competence / Skill Development
19. HR/ work Practices
20. Pay and incentive systems
21. New Training Practices
22. Information Flow
23. Culture (Country)
24. Management
25. Co-operation actions
26. Interfaces Management
27. Knowledge Share
28. Teamwork
29. CoP
30. Internal Marketing
31. Information and technology usage
32. Online learning environment
33. Computer-based simulations
34. Integrated Technology
35. Change Management
36. External Factors
37. WI implementation support
38. Venture Capital Availability
39. Funding Programs Usage (National, EU, Other)
40. Protection of Intellectual Property Rights (IPR)
41. R&D and Innovation Certification (NP 4457)

Annex VI: Detailed Topics for Each Determinant In The Enriched Proposed Framework for Workplace Innovation (After the Empirical Work)

Organizational Dynamics

-Work Organization

-Autonomy/ Employee Empowerment

-Leadership

-Employee Engagement/

-Culture (Organizational)

-Organizational Guidance

-Job Design

-Knowledge Management

-Organization type

-Creativity

-Job Characteristics

-Corporate Strategy

-Employee and Supervisors co-operation

-Organizational Performance

-Informal Power

-Employee responsibility with the customer

-Employee Training

- R&D and Innovation Certification (NP 4457)

Human Resources Management

-Competence / Skill Development

-HR/ work Practices

-Pay and incentive systems

-New Training Practices

-Information Flow

-Culture (Country)

-Management

Collaboration

-Co-operation actions

-Interfaces Management

-Knowledge Share

-Teamwork

-CoP

-Internal "Marketing"

IT Infrastructures

-Information and technology usage

-Online learning environment

-Computer-based simulations

-Integrated Technology

Other Facilitators

-Change Management

-External Factors

-WI implementation support

-Venture Capital Availability

-Funding Programs Usage (National, EU, Other)

-Protection of Intellectual Property Rights (IPR)

Annex VII: Intra-Company/ Outside-Company Topics classification (data analysis)

	Classification	
	Intra-Company	Outside-Company
Topics		
Work Organization	X	
Autonomy/ Empowerment	X	
Leadership	X	
Employee Engagement	X	
Culture (Organizational).	X	
Organizational Guidance	X	
Job Design	X	
Knowledge Management	X	.
Organization Type	X	
Creativity	X	
Job Characteristics	X	
Corporate Strategy	X	
Employee and Supervisors co-operation	X	
Organizational Performance	X	
Informal Power	X	
Employee responsibility with the customer	X	
Employee Training	X	
Competence / Skill Development	X	
HR/ Work Practices.	X	
Pay and Incentive Systems	X	
New Training Practices	X	
Information Flow	X	
Culture (Country)	X	X
Management	X	
Co-operation actions	X	X
Interfaces Management	X	X
Knowledge Share	X	
Teamwork	X	
CoP	X	X
Internal Marketing	X	X
Information and Technology Usage	X	
Online Learning Environment	X	
Computer based Simulator	X	
Integrated Technology	X	
Change Management	X	
External Factors		X
WI Implementation Support	X	X
Venture Capital	X	X
Funding Programs Usage	X	X
Protection of Intellectual Property Rights (IPR).	X	
R&D and Innovation Certification (NP 4457)	X	X