

Creativity and Innovation Management at the Interface of Higher Education and Business – A quantitative analysis for the purpose of obtaining the academic degree Master of Arts Adult Education/ Continuing Education –

Transversal competences regarding creativity and innovation are of increasing importance for European citizens in the 21<sup>st</sup> century. This is why the European Union is eager to encourage their promotion in various educational settings. In the scope of the Erasmus+ project *CIM*, the present work aims at contributing to conclude to what extent creativity and innovation related competences are perceived and promoted in European Member states and how the management of creativity and innovation within European higher education institutions and businesses is related to the success of fostering of these competences. The results of the conducted analyses can provide a basis for educational practices in Europe, as well as for further research in the field, to equip Europeans with the competences they require to face future challenges



Fenna Henicz

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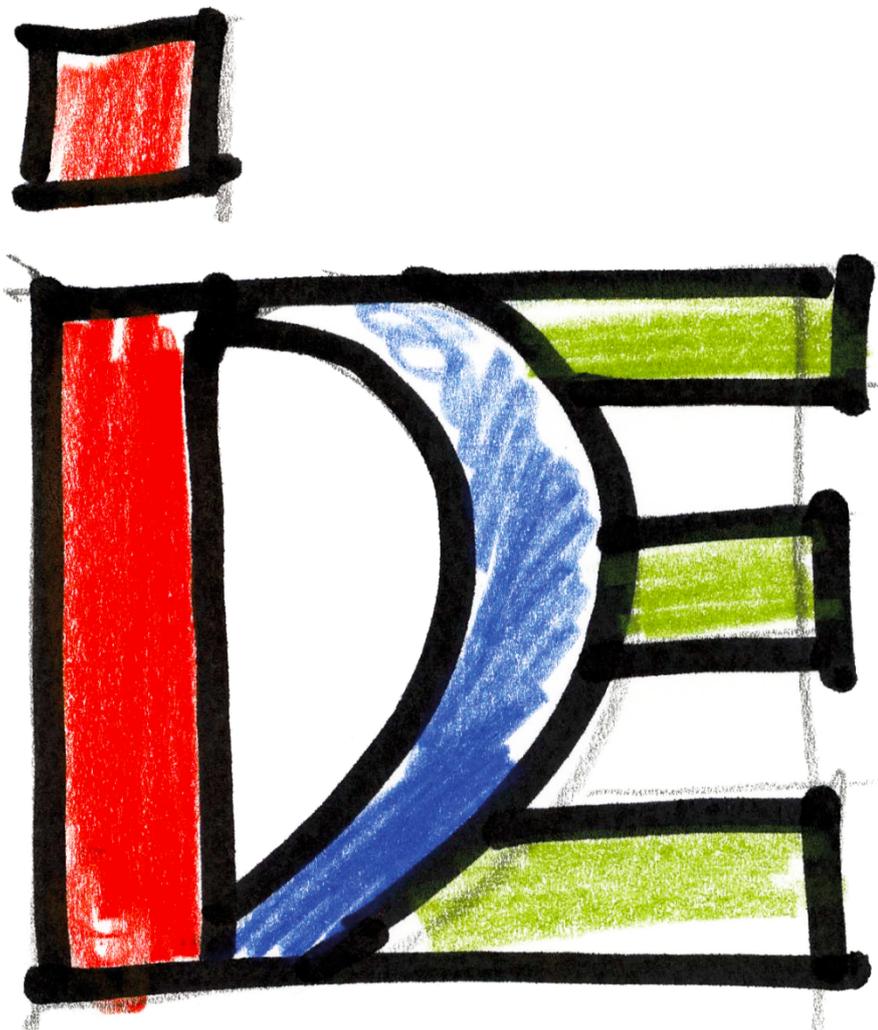
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IDE – Kompetenzzentrum für Innovation und Unternehmensgründung

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## Geleitwort

Die Idee zu einer IDE-Schriftenreihe stammt noch aus der Zeit, in der wir lediglich das Projekt small business management (sbm) an der Universität Duisburg-Essen (UDE), Campus Duisburg, betrieben haben, um Studierende und Mitarbeitende der UDE frühzeitig für die Alternative einer beruflichen Selbstständigkeit zu sensibilisieren und damit deren Interesse an unternehmerischem Denken zu wecken bzw. zu erhöhen. sbm gibt es seit 1999 (<https://www.sbm-duisburg.de>). Heute ist das Angebot deutlich umfassender; die Gründungsaktivitäten an der UDE sind im IDE (Kompetenzzentrum für Innovation und Unternehmensgründung, (<https://www.uni-due.de/IDE>) gebündelt und Studierende können im Studiengang „Master of Arts in Innopreneurship“ der Mercator School of Management (<https://www.innopreneurship.de>) gezielt entrepreneuriale Kompetenzen erwerben und sich auf eine Gründung vorbereiten. Zudem steht das IDE für weitere Unterstützungsangebote (EXIST-Stipendien, Kontakte zu Kapitalgebern usw.), einer Innovationsfabrik, in der Ideen aus dem Kopf in die Zwei- oder Dreidimensionalität gelangen, und Netzwerkaktivitäten – insbesondere „Currywurst und Bier“ (siehe „Start up!, Events, Netzwerke“ auf der IDE-Homepage).

Die Aktivitäten des IDE leisten einen wichtigen Beitrag zur Weiterentwicklung des Strukturwandels im Ruhrgebiet. Das Potenzial gründungswilliger HochschulabsolventInnen stellt eine Chance dar, gut ausgebildete junge Entrepreneure an den Standorten Duisburg oder Essen zu halten und in das örtliche Gründungsgeschehen einzubinden. Durch die Kompetenzvermittlung, durch Netzbildung sowie durch die Bereitstellung von Infrastrukturen leistet das IDE einen erheblichen Beitrag zur Belebung der Gründungslandschaft im Ruhrgebiet durch qualitativ hochwertige Gründungen im Bereich KMU und der Schaffung von neuen Arbeitsplätzen. Bisher nahmen an sbm mehr als 2.000 Studierende, Mitarbeitende der Universität Duisburg-Essen und externe Interessenten teil. Im direkten Zusammenhang mit der Teilnahme an den Seminarangeboten von sbm haben sich mehr als 250 ehemalige sbm-Teilnehmer selbstständig gemacht (vgl. die „Wall of Fame“ unter [https://www.uni-due.de/innovationhub/wall\\_of\\_fame.php](https://www.uni-due.de/innovationhub/wall_of_fame.php)). Dadurch konnten mehr als 800 Arbeitsplätze für die strukturschwache Region entstehen oder auch gesichert werden.<sup>1</sup> Im Master of Arts in Innopreneurship studieren derzeit etwa 62 Studierende, wobei die erste Kohorte ihr Studium bereits erfolgreich absolviert hat.

Die Schriftenreihe ist ein Forum für wissenschaftliche Beiträge, die gründungsspezifische Themen aufgreifen und aus unterschiedlichen Perspektiven bearbeiten. Ihr Ziel ist es, methodisch fundierte wissenschaftliche Arbeiten zu veröffentlichen und damit den wissenschaftlichen Fortschritt im Bereich Entrepreneurship zu fördern. Die Reihe richtet sich an Personen mit unternehmerischem Denken und

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<sup>1</sup> Diese Gründer haben ihre Unternehmensgründungen den Mitarbeitern des sbm-Büros mitgeteilt. Es muss allerdings darauf hingewiesen werden, dass es wahrscheinlich eine Vielzahl von weiteren Gründungen gibt, die den Mitarbeitern trotz intensiver Recherche nicht bekannt sind. Daher sind die genannten Zahlen als Untergrenze zu interpretieren.

Handeln, sei es als Entre- oder Intrapreneure. Die Schriftenreihe und das IDE-Büro dienen als Schnittstelle für den Austausch zwischen Praxis und Hochschule.

Im vorliegenden Band 21 der Schriftenreihe werden Fragen aufgeworfen und wissenschaftlich analysiert, die in einem engen Bezug zur Förderung der entrepreneurialen Praxis stehen: Wie lassen sich Kreativitäts- und Innovationskompetenzen an der Schnittstelle von Einrichtungen der Hochschulbildung und Unternehmen vermitteln und validieren? Können über Blended Learning hierfür hilfreiche Instrumente und Methodiken zu Verfügung gestellt und didaktisch so verarbeitet werden, dass der Transfer auf praktische Handlungsfelder gelingen kann? Eine Beantwortung dieser Fragen ist dringlich. Nach wie vor zeigt sich eine unzureichende Implementierung von Innovationsmanagement in der Praxis von Hochschulen und Unternehmen. Auf Basis einer Fragebogenstudie werden Einschätzungen von internationalen Akteuren aus Hochschulen und Unternehmen präsentiert, die einen Einblick in den Status Quo des Kreativitäts- und Innovationsmanagements einerseits sowie die Ableitung von Bedingungen für gelingende Innovationsprozesse andererseits erlauben.

Duisburg im September 2020 – für das IDE-Team –

Prof. Dr. Esther Winther

Prof. Dr. Volker Breithecker

## Preface

As part of the 21<sup>st</sup> century skills, creativity and innovation are becoming increasingly important for the workforce. Employers' demands for staff's or applicants' competences regarding creativity, innovation and entrepreneurship are high, whilst formal education institutions yet offer little to promote these competences in students apart from related subjects. This is why the European Union is eager to foster initiatives that aim to close this gap. The Erasmus+ Knowledge Alliance Higher Education Project *Promoting Creativity and Innovation Management in an innovative blended learning and validation programme at the interface between higher education (HE) and business (CIM)* aims at building a bridge between the demands of the labour market for creativity and innovation related competences and the promotion of these competences in higher education contexts.

Within the frame of the *CIM* project this work presents the results of a quantitative analysis regarding creativity and innovation management in higher education institutions and businesses in Europe. The main focus was to conclude to what extent creativity and innovation related competences are promoted in European Member states and how the management of creativity and innovation within European higher education institutions and businesses is related to the successful promotion of these competences.

The results of the conducted analyses can provide a basis for improving educational practice in Europe in order to equip European citizens with the necessary and relevant competences to face future challenges.

I would like to take this opportunity to thank all those who contributed to this work or who accompanied me during the process. Firstly, I would like to thank Prof. Dr. Esther Winther for always making time, as well as sharing her knowledge and experience with me. The work with her has inspired me on many levels, also, beyond this thesis. Special thanks also go to Dr. Tim Scholze for his support and confidence in me, and for providing the opportunity to be part of the project in the first place. In addition, I would also like to thank the project consortium for their efforts and cooperation during the research period.

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## 1 Introduction

“Innovation is an essential means by which organizations survive and thrive. As a result, innovation must be managed, but before it can be managed it needs to be understood.” (Dodgson, Gann, & Phillips, 2014, p. 3)

Within the scope of the Erasmus+ Knowledge Alliance Higher Education Project *Promoting Creativity and Innovation Management in an innovative blended learning and validation programme at the interface between higher education (HE) and business (CIM)*, this thesis will present the results of a quantitative analysis regarding creativity and innovation management in higher education institutions and businesses in Europe. In order to do so, an outline of the project will be given in this chapter to provide a comprehensive framework for the research conducted. Furthermore, the purpose of this research will be legitimised in this chapter, as well as the research objectives that have been pursued.

The theoretical background will be provided in the second chapter, regarding the definition of terminology as well as what role competence development plays. An overview of the status quo of implementation of creativity and innovation management will be provided, which will be linked to the formulation of research hypotheses.

After the methodological approach of the research will have been described and its adequacy will have been justified in chapter four, the data that have been gathered will be presented in chapter five to then be analysed and interpreted in chapter six.

Lastly, the significance of the results for the further development of the CIM project will be taken into consideration in chapter seven and an outlook on the further procedure will be provided.

### 1.1 The CIM project as a framework

As mentioned above, the framework of this research is provided by the CIM project. An outline of the project will be given in the following to embed the conducted research into an overall framework. As stated in the project proposal, the project “aims at developing innovative teaching and learning approaches to include Creativity and Innovation Management (CIM) in HE and in practice. This will be achieved with the help of an innovative, self-directed learning approach at the interface of higher education and business” (Erasmus+, 2018, p. 4), which is expected to strategically equip higher education students of different faculties and courses in traineeships or

mobility and also employees in continuing professional development with competences regarding creativity and innovation. This is intended to follow four learning steps:

(1) Fostering the perception of (entrepreneurial) opportunities (opportunities that include the potential for value creation); (2) Teaching methods for generating an innovative idea to solve a perceived problem; (3) Stimulating skills to evaluate the innovative ideas regarding usefulness, desirability, feasibility, legality, ethical-moral aspects, etc.; (4) Supporting the implementation of new ideas. (Erasmus+, 2018, p.10)

Therefore, learning environments in higher education institutions and enterprises that foster competences linked to creativity, innovation and entrepreneurship need to be created. In the context of the CIM project, these learning environments, as well as a validation system for the assessment of the competences mentioned above, will be developed.

The consortium of the project consists of six universities, one public institution, three small and medium enterprises (SME), one EU network, one Non-Governmental Organisation (NGO), three educational providers and one national research centre from nine different EU Member States, each of which will be taking on responsibilities for an entire or part of one of the work packages (WP) according to their expertise:

<b>WP1</b>	Stocktaking - Identifying CIM approaches in European study programmes
<b>WP2</b>	Developing the validation system for the Creativity and Innovation Management competences
<b>WP3</b>	Developing a competence oriented, open learning approach (CBL)
<b>WP4</b>	Developing training and counselling units for educational personnel
<b>WP5</b>	Piloting the open learning approach in accompanied traineeships and work teams
<b>WP6</b>	Validation of competence developments, accreditation, and certification
<b>WP7</b>	Evaluation
<b>WP8</b>	Dissemination
<b>WP9</b>	Valorisation
<b>WP10</b>	Quality assurance
<b>WP11</b>	Project management

**Table 1:** Work packages of the CIM project

The present thesis is to be seen within the research framework which is embedded in the stock-taking phase in WP1. This WP consists of three qualitative and quantitative research phases in order to provide needs analyses for each of the participating countries, which are the basis for

the development of the validation system and the open learning approach regarding creativity and innovation related competences.

The desk research, which was conducted by each of the partners for their countries, builds the first part of the research phase. The aim of this phase was to provide an overview about the importance and implementation of innovation and creativity within the higher education and enterprise landscapes within all of the partner countries, the integration of online learning technologies, as well as to detect existing approaches of developing and validating competences related to creativity and innovation in order to provide a framework for the following research phases. Also, the desk research was to be used to identify potential respondents for the conduction of the online questionnaire.

The second phase is the present research, which will then be followed by the conduction of expert interviews with stakeholders working in higher education institutions and businesses by each partner. The aim of the interviews will be to gain an in-depth understanding of creativity and innovation management practices within enterprises and higher educational institutions. The guiding questions for this WP will be which competences regarding creativity and innovation should be assessed on the cognitive, affective and activity related level and how these learning outcomes can be evidenced in a way that the demands of individual learners in different fields, learning environments and stages, and those stakeholders who are potentially interested in their competences can be satisfied (Erasmus+, 2018).

## **1.2 Purpose of research**

In 2006, the European Union proposed eight key competences for Lifelong Learning, which every European citizen should have in order to achieve “personal development, social inclusion, active citizenship and employment” (Bacigalupo, Kampylis, Punie, & Van den Brande, 2016, p.2), one of which was a “sense of initiative and entrepreneurship” (ibid.).

Considering that European economies and societies have been changing significantly and quickly, people must adapt and therefore require certain competences. In addition to basic skills such as literacy and numeracy that every person should possess, transversal competences such as problem-solving, creativity and critical thinking are of increasing importance. As entrepreneurial skills, knowledge, and attitudes can be learned, European educational systems must find ways to provide learners with these competences (European Commission, 2018). Yet in many of the Member States these competences are not regarded in formal educational contexts, even though the

demand is high on the employers' side. (European Commission, 2016). The Entrepreneurship Framework (EntreComp) was published in 2016 by the Joint Research Centre of the European Commission to support the development of entrepreneurship competence in various educational contexts. It "aims to establish a bridge between the worlds of education and work and to be taken as a reference de facto by any initiative which aims to foster entrepreneurial learning" (Bacigalupo et al., 2016, p.5). EntreComp provides a rather broad definition of entrepreneurship, not only focusing on the economic aspect, but also taking into consideration entrepreneurship as a means to personal, social and cultural development. Different types of entrepreneurship such as intrapreneurship, which relates to an entrepreneurial mindset and competences that are applied by employees to promote innovation within a company, social entrepreneurship and green entrepreneurship are therefore included (Bacigalupo et al., 2016).

Entrepreneurship competence is understood as the "ability to transform ideas and opportunities into action by mobilizing resources" (Bacigalupo et al., 2016, p.10). The EntreComp framework suggests 15 sub-competences that are needed to acquire the overall entrepreneurship competence. As creativity, innovation and entrepreneurship are interrelated, or as Peter Drucker puts it "Innovation is the specific function of entrepreneurship" (Drucker, 2002, p.5), they need to be considered as important and therefore be regarded in educational contexts, too. However, there seems to be a lack of efforts to systematically integrate the development and assessment of these competences in (extra-)curricular courses in higher education institutions and businesses. According to a number of Erasmus+ project descriptions like CIM, PROMOTE (Promoting and validating key competences in mobility and traineeship in Europe), EDUCKATE (Education Cultural and Creative Knowledge Alliance for Tomorrow's Entrepreneurs) and REBUS (Ready for Business - Integrating and validating practical entrepreneurship skills in engineering and ICT studies), these competences are best acquired in informal and non-formal environments. Yet the validation of informally and non-formally acquired competences are barely implemented in Europe (Erasmus+, 2018; Erasmus+, 2014a; Erasmus+, 2014b; Erasmus+, 2013)

The desk research reports of the projects mentioned above showed similar findings. The examples given show that there is a need to promote the acquisition and assessment of the competences mentioned above and that the demand for these competences on the labour market is high. Also, the European Union's goal is "the free movement of people in Europe" and so the European Qualification Framework (EQF) was developed "to make national qualifications more readable in order to promote workers' and learners' mobility, facilitating their lifelong learning

and occupational mobility across Europe” (European Commission, 2019). Thus, the comparison of qualifications and the cross-border recognition will be facilitated. A European wide validation system linked to the EQF particularly for informally or non-formally acquired competences related to creativity and innovation would therefore meet the European Union’s goals to promote entrepreneurial education, mobility and validation of informal and non-formal learning.

In order to develop this validation system in the scope of the CIM project, data about the demands and resources of the higher education institutions and businesses in practice are required. Once the results of this research and the expert interviews have been analysed, a European wide customized open learning approach with a validation system can be developed, suiting the demands of academia and practice. In order to do so, there are multiple objectives to this research, that will be introduced in the following sub-chapter.

### **1.3 Research objectives**

The outcome of this research will be the basis for a repository of tools, so therefore this research aims to provide a foundation to determine how creativity and innovation can be managed, how effective informal and non-formal learning environments can be developed, and the learning outcomes accordingly evidenced. Data about the relevant competences on the cognitive, affective and activity related level must firstly be collected, in order to describe how these competences can be assessed and evidenced in a way that meets the demands of the learners as well as those of the stakeholders who are interested in their competences. This includes the thorough identification, analysis, and in-depth description of available approaches in European study programmes and IT-supported validation, assessment and evidencing solutions for competences related to creativity and innovation, as well as the accurate comparison of the perspective partner countries’ capabilities towards creativity and innovation management. The goal of this research is to provide a basis for the further development of the project and therefore gather high quality data, in order to satisfy the needs of all stakeholders. Based on the needs for the acquisition of certain competences that have been stated, the following research question presents itself and therefore suggests research objectives for the present thesis.

*To what extent are creativity and innovation related competences, as well as their validation perceived and promoted in European Member states and how is the management of creativity and innovation within European higher education institutions and businesses related to it?*

In order to answering this question, the following objectives are presented:

- To determine the importance that relevant stakeholders attribute to creativity and innovation
- To determine and compare the differences of implementation between higher education institutions and businesses regarding competence development, validation and management of creativity and innovation
- To determine and compare the differences of implementation between the European Member states regarding competence development, validation and management of creativity and innovation
- Identify relations between creativity and innovation management and related competence development and validation

As to how this will be achieved will be stated in chapter 3 after the research has been embedded into a theoretical context.

## 2 Theoretical background

The following chapter will be regarding the terminology that will be frequently used in this paper in order to provide a precise understanding of the subject of creativity and innovation management. Definitions for the terms *innovation* and *creativity* will be provided in order to differentiate the two. Furthermore, the chapter will also present the current state of implementation of creativity and innovation management in order to provide a broader framework for this topic. Finally, the role of creativity and innovation related competence development, as well as validation, and its link to creativity and innovation management will be regarded.

### 2.1 Innovation

“Innovation is both an outcome and a process, a fact and an act” (Dodgson, Gann, & Phillips, 2014, p.5). To understand the nature and the dynamics of innovation, the definition of the term *innovation* will be regarded in the following sub-chapter in order to elaborate a thorough understanding of what is meant by the term *creativity and innovation management*. Therefore, a definition of *creativity* as part of innovation will also be provided, as well as possible sources of innovation, how types of innovation can be differentiated and under which conditions and contextual influences innovation thrives.

#### 2.1.1 The relationship between creativity and innovation

To fully understand the complexity of innovation, creativity as part of the innovation process must be examined and defined too. Often, the terms are used synonymously, however a differentiation of these terms is crucial, because firstly they require different ways of thinking and secondly, they occur on different levels and therefore cannot be used interchangeably. According to Teresa Amabile (1988), creativity occurs on the individual level, whereas innovation occurs on the organisational level. Both systems are closely interlinked and in order to achieve an innovative process, they may only be sufficient in combination, but not by themselves. Amabile refers to individual creativity as the “most crucial element of organizational innovation” (Amabile, 1988, p.125). Therefore, both parts are equally important.

One of the traits that distinguishes the human species from other mammals is the ability to think creatively and to imagine environments that do not yet exist. The modern world has been shaped mainly because humans have always invented new ways of living due to their brains being able to generate ideas of more convenient and efficient tools and even lifestyles, without their

presence to the senses (Manzini, 2015), and implementing them. There are nearly unlimited ways for the human brain to process information, which yields the prerequisites for creativity. The more manifold and broader the stimulation of the brain, the more advanced the information network can become to generate creative ideas. Thus, a diverse environment yields the precondition for creativity (Oliver, Heracleous, & Jacobs, 2014). Creativity can thrive if the potential and actual occurrence of errors is tolerated, as stagnation of the creative process can lead to rethinking the idea and therefore generating the solution to a problem. The avoidance of potential failure can therefore restrict the brain from reaching its creative potential (Eagleman, 2019). Chapter 2.2 will outline the effects of external circumstances on creativity further.

Creativity is often exclusively associated with artistic talents. However, creativity generally “involves a number of cognitions and behaviors that are more likely to result in creative outcomes. These can include challenging assumptions, broadly scanning the environment, recombining ideas from different areas, tolerating ambiguity, and making novel connections” (Shalley, Hitt, & Zhou, 2015, p.3). Accordingly, creativity can potentially be applied in any possible field. Advancing science for instance only succeeds by applying the behaviours mentioned above by scientists and is therefore highly creative (Khine, e.g. Eagleman, 2019).

From a point of view, that focuses on products as an outcome of creativity, Amabile (1988) defines creativity as “the production of novel and useful ideas by an individual or small group of individuals working together” (Amabile, 1988, p.126). For generating novel ideas, the human brain mostly requires divergent thinking. Divergent thinking generates different potentially unusual or unexpected answers to a mental task (Cropley, 2006), whereas convergent thinking, on the other hand, “is oriented towards deriving the single best (or correct) answer to a clearly defined question” (Cropley, 2006, p.3), which applies to implementing an idea with the aim of innovation.

“Finke, Ward, and Smith (1992) distinguished between two broad processes in the production of effective novelty: on the one hand generating novelty and, on the other, exploring this novelty, once it has been generated.” (Cropley, 2006, p.16) Generating novelty, in the understanding of creativity and innovation in this thesis, is linked to divergent thinking and therefore to the creative process. According to Cropley (2006), however, exploring the novelty is also part of the creative process. Hughes, Lee, Tian, Newman, & Legwood (2018) argue that “[workplace] creativity concerns the cognitive and behavioral processes applied when attempting to generate novel ideas. [Workplace] innovation concerns the processes applied when attempting to implement

new ideas.” (Hughes et al., 2018, p.9) In regard to how innovation is perceived in this paper, the exploration of novelty will be understood as part of the innovation process. The difficulty of agreeing on one understanding of creativity and innovation becomes apparent, due to the various definitions of the terms. It is the subject of many researchers whether or not convergent thinking is part of the creative process (Cropley & Cropley, 2008), or whether this form of thinking applies when the creation of a novel idea has already ended. It is for instance argued that convergent thinking is required for creativity, because knowledge is part of creativity, and for arranging existing and acquiring new knowledge in order to be creative, convergent thinking is required. The allocation to one of the two most certainly depends on the underlying definition of creativity, and whether it is seen as an isolated process or embedded in the innovation process. For the present thesis, based on the definitions that have been provided, divergent thinking is mostly associated with creativity and convergent thinking with innovation, although both may be part of either side to a certain extent, as the two cannot be viewed as rigid constructs, but must be seen as iterative and complementary processes.

It has been mentioned that an expanding information network in the brain and certain cognitive actions are the prerequisite for creativity. This highlights the importance of knowledge in generating novel ideas. In fact, creative productivity is rather unlikely without sufficient knowledge about the regarded domain. “[...] it is interesting to note that, since knowledge in a domain changes with the passage of time (usually by increasing), whether or not novelty is judged to be effective-and thus creative-may change with time. Indeed, once incorporated into existing knowledge, novelty of necessity ceases to be novel [...].” (Cropley, 2006, p.13) This implies that creativity is an agile process, that is also bound to the current time.

According to Amabile (1988), knowledge and expertise in the relevant domain are the basis for generating ideas. All possible pathways that lead to generating a novel idea are determined by the available domain specific knowledge and skills in the individual (Amabile, 1988). Individuals that do not possess those skills are not able to “combine ideas, make unexpected associations between pieces of knowledge, or synthesize apparently unrelated facts” (Cropley, 2006, p.11), or in other words: be creative. However, domain related skills alone do not necessarily result in creativity. For that to happen, it also requires creativity related skills and intrinsic motivation as Amabile (1988) suggests.

Also, does creativity not necessarily result in innovation, but innovation cannot exist without creativity. When regarding workplace creativity and innovation, it needs to be considered that in

addition to the mentioned individual traits and behaviours that facilitate creativity and organisational innovation, external factors, for instance the workplace environment, including the management, also influence the employee's creativity and innovation related capabilities. This will be regarded in chapter 2.2

“When confronted with new problems, human beings tend to use their innate creativity and design capacity to invent and realize something new: they innovate.” (Manzini, 2015, p.9) The term *innovation* is omnipresent, and relevant literature provides multiple definitions of the term. According to Baregheh, Rowley and Sambrook (2009), there is a lack of a common definition, even though many of the existing definitions overlap in certain aspects. In fact, many authors provide the same elements of what innovation means in their definitions, which will be regarded in the following paragraphs.

By firstly considering the etymology of the word *innovation* part of the definition is already provided: The term *innovation* derives from the Latin word *novus*, meaning *new* (Duden, 2018). The Latin word *innovatio* however, expands *new* to *renewal*. The linguistic trace of what *innovation* means may serve to distinguish it from the term *invention*. Both terms are often used interchangeably, although they describe different processes or outcomes. The Latin root of *invent* is *invenire*, meaning *to find* or *to discover*, concluding that inventions are the process or outcomes that have been discovered or created for the first time (Cambridge University Press, 2019). Innovation on the other hand does not describe the act of discovering but the implementation of something new to a society or an organisation. Inventions do not necessarily turn into innovations for instance if the invention is ahead of its time and the need does not exist or is not sufficient (yet), or the circumstances of a particular time do not allow the implementation due to a lack of resources (Fagerberg, 2005), however an invention was at some point the precursor for innovations or else: “Innovation is the continual upgrade of inventions.” (Worstell, 2014)

However, one could say that innovations are micro-inventions, as they create something that is new to an organisation, a market, or a society, and even though it is created by using existing resources it is nonetheless new in its use, its appearance or in its meaning.

Even though innovation seems to have gained more importance during the last decades from an economic and societal point of view, it has always existed and shaped the world's appearance and human lives. Academic research on innovation has only recently been conducted from disciplines outside of economics (Fagerberg, 2005). One definition that quite accurately portrays the inheritance of the main aspects of innovation as quoted in many of the existing definitions is one by

Peter Drucker who describes innovation as “a change that creates a new dimension of performance” (Garcia, 2010, p.89). Even though this definition is rather broad, it is as well as an expanded version of Schumpeter’s interpretation of innovation (“new combination of resources”) by Mörhle (“new combination of resources *and purposes*”) (Mörhle, e.g. Universität Bremen, 2016) well suited, because it gives room for expansion of the economic understanding. The common understanding of innovation is increasingly broadened, as the exclusively economic perspective on innovation is no longer sufficient at this stage. That is one of the reasons the Federal Ministry of Education and Research in Germany expands the conventional concept of innovation and focuses not only on technological innovations, but also on new organisational solutions as well as service and social innovations: “Being innovative requires more: sustainable consumption habits and behaviour patterns are becoming increasingly important. Social changes, such as resource-optimized forms of production and lifestyles, are increasingly shaping innovation processes.” (BMBF, 2018, p.103)

A modern definition of innovation should not be limited to “qualitative alterations of the company with the intention of improving their own economic success on the market” (Gerpott, e.g. Universität Bremen, 2016), but also be open to consider aspects of sustainable development. This includes social innovation, a form of innovation that differs from the usually profit-oriented perspective. Social innovations aim to create the above-mentioned *new dimension of performance* with the goal of meeting social needs. They can be considered as solutions to seemingly unsolvable problems “that break the traditional economic models and propose new ones, operating on the basis of a multiplicity of actors’ motivations and expectations” (Manzini, 2015, p.12).

The Entrepreneurship Competence Framework (EntreComp) also includes ethical, social, cultural and sustainability aspects and the associated costs to innovation and entrepreneurship (Bacigalupo et al., 2016).

A similar understanding is promoted by Jungmann, Baur & Ametowobla (2015), who describe innovation as something beyond scientific, technological or economic contexts, that is not limited to economic growth and that should be seen as a form of social change (Jungmann et al., 2015). Thus, in this paper innovation will be understood as 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)” (OECD/Eurostat, 2018, p.20), and that may also aim to meet social needs and not only profits.

As stated in the introduction of this chapter, innovation is always embedded within a process. Innovation literature suggests many different models of the innovation process. Even if, according to different authors, the phases, or steps that the process consists of are named differently and the number of steps vary, they all inherit a common underlying logic. The main basic parts of the innovation process are *identifying a problem or opportunity*, *generation of ideas* and *implementation of ideas*. Of course, this is an oversimplification and it is necessary to differentiate further, however these three phases are the fundamentals to most of the models.

One approach that illustrates these stages in an iterative process is the Design Thinking method established by the Hasso Plattner Institute of Design at Stanford. This method portrays the importance of creativity in the innovation process on the one hand, and the logic of the innovation process as such on the other hand. It also describes the intersection and alternation of creativity and innovation and therefore the use of divergent and convergent thinking. Design Thinking proposes five steps of generating ideas, which are situated before the implementation of one final idea with the aim of innovation (Plattner Institute of Design at Stanford, 2010). These steps can again be differentiated into sub-stages, but more importantly they follow the above-mentioned logic: *Emphasise* is the first stage of the process, meaning the full understanding of the context in which a problem is to be solved. People's needs are to be understood and identified in this stage in order to define the problem in the next stage. It includes observation of the relevant context. The purpose is to develop a point-of-view (POV) in the *Define* stage, which serves as the perspective from which the problem and its potential solution are to be viewed. In this phase, the problem is addressed explicitly in order to then begin the generation of ideas. Here, the emphasis shifts from identifying the problem to creating solutions. The purpose of the *Ideation* phase is not to develop one solution but multiple potentially suitable solutions. Determination of the most appropriate idea is part of the *Prototyping* and the *Test* stage. The iteration between all stages, but also within the stages is crucial to generate a sufficient outcome in order to implement the created innovation into people's lives. This approach also shows the shifts that have to be made in ways of thinking, and that it depends if creativity is seen as present in the problem-identifying stage or not, to determine whether convergent thinking is part of creativity or not.

Another example for illustrating the process of innovation according to the mentioned phases is one by Amabile. She also proposes five stages of the innovation process, in which she integrates the above-presented model of individual creativity. According to Amabile (1988), the first two stages serve to determine objectives, explore the context, and define the problem that is to be

solved. The generation of ideas follows in the third stage, which is where the model of individual creativity attaches (Amabile, 1988). Similarities with the Design Thinking approach become apparent, mainly the sequence of the three mentioned phases, although a main difference compared to the Design Thinking approach is the potential end of the process in stage five. If the outcome is assessed to be a clear success or failure, according to Amabile (1988) the process ends. If it requires further progression, stage two is repeated and the process continues. Amabile (1988) merely presents a partial iteration within the innovation process; the model is more linear than the Design Thinking process, which may be due to the fact that it was developed in 1988 and the importance of iteration has been discovered rather recently. It becomes apparent that in order to innovate the three mentioned general steps of an innovation process are essential, however they can be carried out in different ways. Presenting these two innovation process approaches portrays in what way creativity and innovation relate to each other. Having illustrated both creativity and innovation and their interrelations, the following sub-chapter will address potential typologies of innovation.

### **2.1.2 Types of innovation**

Innovation researchers provide various categorisation systems for different types of innovations. Depending on the perspective from which innovation is viewed, certain typologies are better suited than others. As with definitions there is no one correct typology, although there are several categories that are suggested more frequently in relevant literature. Since it would be beyond the capacity of this thesis to address all approaches, the most common ones are presented here. One commonly used approach is the distinction between product/service innovations as opposed to process innovations (Garcia, 2010). Even though product and service innovations also differ from each other, they are commonly combined into one category, as both focus on an enhanced outcome for the end users. Process innovation on the other hand is the new level of performance for operational processes within an organisation and can for instance result in reduced costs or increased efficiency or productivity. Process innovation therefore only indirectly affects consumers, when for example increased productivity and efficiency of the organisation result in improved outcomes for the end-users. According to Fagerberg (2005) product innovation (including service innovation) and process innovations result in different economic and social impacts, which is one of the reasons the distinction between the two is considered important in relevant literature. However, he also stresses that whilst a rather clear differentiation between

the two on an organisational level is possible, it may be rather difficult to remain as clear on the level of a whole economy, because products of one industry may be used within a process of another to produce goods or services or vice versa. Regardless which of the mentioned types of innovation is aimed to be achieved, the degree of novelty can be used to classify innovations too. A commonly used dichotomy is the one of radical and incremental innovations. Incremental innovations are the most common kind, as they require the smallest amount of renewal of the existing product or process. A new version of a product that inherits several enhanced features to facilitate the use of the product for the consumer would be an incremental innovation. Radical innovations on the other hand supply drastic improvements to the outcome, which can lead to transforming existing markets or even creating new markets. The product, service or process is significantly new in comparison to its previous outcome and offers radically new benefits to end-users (Fagerberg, 2005). However, labelling an innovation incremental or radical depends on the perspective, as a radical innovation for one firm may only be incremental on the market or vice versa. There is no standard degree at which an innovation is considered radical and it is always as innovative as it is perceived by a market or society. Interestingly, even though radical innovations are the less common kind, social innovations are often rather radical than incremental, as they usually address problems that require dramatic change. As stated above, the radicality can only be determined by and within the context and the market in which the innovation is occurring. A solution to a social problem in one country or area might not be de facto novel in general, but within that specific system it may create a breakthrough discontinuity (Manzini, 2015).

Even though it can be defined in a relatively precise manner what innovation means and what it takes to create it, some organisations are more successful in innovating than others. As innovation processes usually do not occur in isolated laboratory situations and with the work of multiple individuals and settings, different influences act upon their generation and implementation. There are contexts that are more innovation-friendly than others, and it is also possible to create contexts in which innovation is highly unlikely to occur. Therefore, finding these factors that determine more or less beneficial conditions for innovation can promote their success and is thus crucial, especially when aiming at managing these processes. Kristof remarks however, that creating these beneficial conditions should not be mistaken for the actual management of innovation, which takes the additional realisation of the innovation potentials (Kristof, 2010).

Considering that certain ways of thinking foster creativity and innovativeness, it seems apparent to assume that certain conditions in the working environment facilitate these processes. The

working environment includes and is influenced by the way the organisation is managed, which will be explored in the following.

## **2.2 Management**

This sub-chapter will aim to define the term management as to provide an overall understanding of what impact the management can have on the innovativeness of an organisation on the one hand, and on the other hand, of how innovation can be managed. In order to do so it must be distinguished from the term leadership as the two terms are often used interchangeably. Therefore, the following will elaborate on how the two constructs relate and in what way they may affect innovation. Eventually, this will lead to working out an understanding of what creativity and innovation management includes and what it should inherit to be successful in the next sub-chapter.

### **2.2.1 Management and Leadership**

For the purpose of clarification, and because leadership and management may be of importance regarding the subject of innovation (management), a brief definition of the two will be provided in the following.

“The manager is the dynamic, life-giving element in every business. Without his leadership ‘the resources of production’ remain resources and never become production<sup>2</sup>.” (Drucker, 2007, p.3)

This quote by Peter Drucker stresses the importance of the management in organisations and how crucial it is to their success. Also, it indicates that management includes leadership in order to be successful. The question how management and leadership relate to each other, however, remains unanswered.

Generally, management is regarded as the executive position(s) in an organisation that coordinate all activities within the organisation towards a particular goal and define and monitor operational objectives systematically. Management activities are not limited to the managing director of the organisation but include management of divisions and departments within the organisation. Based on the definition of the OSLO Manual 2018, managerial capabilities are seen as a “specific subset of organisational capabilities that relate to the ability of managers to organise change”. (OECD/Eurostat, 2018, p.108)

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<sup>2</sup> Production will be understood in the broader sense in the present paper and be treated as the productive outcome an organisation aims to achieve rather than actual products.

John Kotter (1990) points out that the aim, therefore, is to supply consistency and order within the organisation as to keep up with and increase the quality and productivity of the organisation (Kotter, 1990). Drucker describes management as an “organized body of knowledge” (Drucker, 2011, p.7) which aims at “controlling man’s livelihood through systematic organization of economic resources.” (Drucker, 2007, p.4).

The main tasks that are involved in management are therefore planning and budgeting, organising, and staffing, and controlling (Kotter, 1990). This implies that management involves how an organisation develops the full potential of all employees on the individual level, the team level, and the organisational level with the resources that have been and can be acquired in the future in order to achieve the organisation’s goals.

While management is understood as to be linked to some kind of organisation, leadership can be thought within the workplace context or outside of it<sup>3</sup> and it is characterised by movement or change. He points out that effective leadership is achieved through establishing direction, aligning people and motivating and inspiring them (Kotter, 1990). While leadership sets a long-term direction and therefore a vision, and what changes are required to achieve that vision, the function of management is to plan and allocate resources in order to work towards that vision. Leadership focuses on the empowerment and commitment of employees to achieve a common goal whereas management focuses on containment and predictability in order to achieve that goal. Considering a smaller scale in an organisation, leaders can be present within smaller workgroups, without being involved with management.

Examining management closer, it is important to note what characteristics effective management should include. In order to clarify this, Helfat & Martin (2015) propose the Concept of Dynamic Managerial Capabilities which suggests a concept that describes managers’ capacities that impact the sufficiency of the management. According to Helfat & Winter (2011), a capability is “the capacity to perform a particular activity in a reliable and at least minimally satisfactory manner” (Helfat & Winter, 2011, p.1244, e.g. Helfat & Martin, 2015, p.1285). The concept builds on the grounds that the possession of dynamic capabilities in managers promotes successful change within their organisation. These are characterised as the ability of a manager to organise the interaction with and reaction to internal and external challenges. Dynamic managerial capabilities comprise of three “managerial resources” (Helfat & Martin, 2015, p. 1285) namely,

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<sup>3</sup> In the present thesis leadership outside of organisations will not be regarded.

managerial cognition, managerial social capital, and managerial human capital, that provide the foundation for a managerial habitus that carries out organisational tasks with an intended purpose and creates recognisable outcomes. Managerial cognition is understood to comprise of knowledge, mental processes such as paying attention and perceiving things, reasoning and problem solving, language and communication, and emotions that impact a manager's activities within the organisation. Managerial social capital regards the ability to create and maintain relationships with others and to use them for the sake of the organisation's success. Managerial human capital relates to specific and generic competences and personality traits of the manager that have been acquired in formal, and informal contexts, that promote the organisation's success (Helfat & Martin, 2015). The three interact with each other and affect one another, so that for instance, as managerial cognition develops, managerial human capital also develops, as knowledge accumulates and therefore the repertoire of the persons's competences grows. The same applies to an increasing managerial social capital affecting the development of managerial human capital; the competence repertoire grows from experiences a person gains through social relationships. Of course, the development of these dynamic managerial capabilities can differ in managers. Therefore, a manager with superior dynamic managerial capabilities will presumably be more successful in carrying out organisation-related activities than managers with little or no dynamic managerial capabilities, which results in advantages or disadvantages for firms whilst competing with each other (Helfat & Martin, 2015). Besides dynamic managerial capabilities, a sufficient level of what Helfat & Martin refer to as "managerial operational capabilities" characterises effective management (Helfat & Martin, 2015, p. 1285). These capabilities can also be seen as competences applying the understanding of a competence by the EntreComp framework, which suggests a competence to be a "set of knowledge, skills and attitudes" (Bacigalupo et al., 2016, p.20). The understanding of a competence in this thesis will be based on this definition. Based on these underpinning capabilities or competences, managements can differ in many aspects, for instance in how learning from experience and using new knowledge to achieve goals and finding new solutions to certain problems are implemented within the organisation, or the degree of openness regarding collaboration with new partners or high-risk activities (OECD/Eurostat, 2018).

It can be said that management and leadership do overlap in terms of their goal, to run a successful organisation, however, differ in the way they carry out what is aiming to achieve the goal. Regardless of their differences, it becomes apparent that both are essential for organisations,

albeit with different functions. Therefore, if management does not lead effectively, it may impact employees' empowerment and motivation negatively to work towards the organisations' goals. On the other hand, if the management is not sufficient, employees might be highly motivated, however, they might be unaware of the goals they are pursuing and how to pursue them (Kotter, 1990). As conclusion, it can be said that one without the other is unlikely to achieve the success that would be achieved with a combination of strong management and strong leadership.

### **2.2.2 Impact of management and leadership on creativity and innovation**

The fact that the management of an organisation and therefore the organisational environment that is created around it have an impact on the innovative behaviour of employees has been widely accepted to be empirically proven (Dunegan, Tierney, & Duchon, 1992, Helfat & Martin, 2015). The management, including the chosen leadership style<sup>4</sup>, influences the organisational culture and climate, and therefore working environments, which again contribute to the outcome of employee's work (Amabile, 1988).

According to a study conducted by Gyskiewicz & Amabile (1987), there are certain factors that promote employees' creativity which therefore impacts organisational innovation and certain factors that inhibit it. They reveal that the most important factor seems to be the employees' autonomy in regard to how to accomplish their work, followed by good project management, that provides directions, allocates tasks according to employee's skills and interests, and serves as a positive and enthusiastic role model. Other aspects mentioned by the respondents were encouragement and recognition, and organisational aspects, such as a working environment that is characterised by cooperation and collaboration, and in which failure is not punished (Amabile, 1988). These results support what has been mentioned about the conditions that are required in order to facilitate divergent thinking in chapter 2.1.1. These findings also indicate the importance of managerial practices and the impact they have on the likelihood of creativity and innovation. Ellen Greenberg (1994) specifically examined the interrelation between an individual's autonomy when accomplishing tasks and individual creativity, in the field of fashion design. Like Amabile, Greenberg defines creativity as the individual prerequisite for organisational innovation. She concludes that participants that were given a higher degree of autonomy in choosing and

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<sup>4</sup> For the sake of simplicity, the term management will be used in the present thesis from now on, assuming that leadership is inherent therein.

accomplishing their tasks, according to an expert jury that examined the results, provided outcomes of higher quality (Greenberg, 1994).

The autonomy and empowerment that are given to employees do depend on the way managers lead their employees. Empowering leadership is a leadership style that aims to ensure this autonomy. It follows five guiding principles, which according to Kim (2019) are “leading by example, participative decision-making, coaching, informing, and showing concern/interacting with the team” (Kim, 2019, p. 231) It is characterised by aiming to share power with employees by encouraging employees’ autonomous decision-making, expression of appreciation of employees’ performances and achievements, and the provision of conditions that foster employees’ participation.

Walumbwa, Wang, Wang, Schaubroeck, & Avolio (2010) found that another leadership style, namely authentic leadership, is linked to promoting employee empowerment and trust, and fostering work engagement in employees. Authentic leadership

represents the extent to which a leader is aware of and exhibits pattern of openness and clarity in his/her behavior toward others by sharing the information needed to make decisions, accepting others' inputs, and disclosing his/her personal values, motives, and sentiments in a manner that enables followers to more accurately assess the competence and morality of the leader's actions. (Walumbwa et al., 2010, p. 901)

Černe, Jaklič, & Škerlavaj (2013) found in their study that when team members perceived their leaders as authentic, individual creativity and team innovation was directly influenced. It is important to note that this does not apply when team leaders describe themselves as authentic, yet members did not perceive them as such. These findings show how impactful the leadership can be when it comes to creativity and innovation, and that trust, honest encouragement and appreciation, and autonomy seem to be the underlying aspects that managers need to provide in order to enable employees to be creative and innovative.

This is also supported by the findings of a cross-sectional field study conducted by Barsh, Capozzi, & Davidson (2008). Accordingly, the two main driving forces for the innovativeness of employees are effective leaders that encourage the above-mentioned behaviour, and executives that promote and manage innovation. Their findings show that the respondents who rated their organisation’s ability to innovate as high compared to other organisations in the same field, also rated their leadership as rather strong. On the other hand, those who rated their organisation’s

innovativeness as rather low also rated their leadership capabilities as significantly lower (Barsh et al., 2008). A management that is perceived by employees in a positive, encouraging way, that provides directions, yet also allows individual autonomy, and that supports a collaborative working environment seems to foster the likelihood of employee's creativeness and innovativeness the most. Also, Dunegan et al. (1992) found that a higher quality exchange between executives and subordinates is, among divisional affiliation and workgroup interaction, significantly linked to employee's positive perception of the work climate, which on the other hand promotes motivation and willingness for innovative behaviour.

The above-mentioned findings show that managers who practice certain styles of leadership can provide working environments that promote creative thinking and behaviour more sufficiently than close monitoring managers who are more likely to put pressure on employees and to work in pre-determined ways, that hinder creative thinking.

In addition to what has been stated, Shipton, Fay, West, Patterson, & Birdi (2005) emphasise the importance of human resource management (HRM), and suggest that HRM systems and their approaches for recruiting and selecting new employees, and providing effective induction and training can be an indicator of the innovativeness of the organisation. Their study shows that innovation is fostered, where supportive learning environments are provided for employees, that allow explorative learning, and thus accept the potential occurrence of errors (Shipton, et al., 2005). This shows that the previously mentioned capacities or competences of the management determine which and how competences are fostered in employees, and thus to what extent employees are prepared and able to carry out creative and innovative performances.

### **2.3 Understanding of the term Creativity and Innovation Management**

Having stated how managerial practices and the effects of it can impact employees' creativity and innovativeness, the following will elaborate on how this knowledge can be used for the management of creativity and innovation.

The term creativity and innovation management was chosen by the authors of the project proposal to underline the equal importance of creativity and innovation related competences that should be fostered. However, in the relevant literature, creativity as such is rarely explicitly regarded when it comes to the management of innovation (and creativity), as creativity is understood to be inherent in the innovation process. Therefore, the term *innovation management* will be adopted in this chapter.

Generally, innovation management capabilities are closely connected to general management capabilities but focus on activities in respect to innovation. This involves the management of tasks that are not routinised, but new and sometimes unexpected, which leads to uncertainty and complexity for the task of managing these processes. Tidd (2002) suggests that organisations that have created conditions which enable them to react to and act upon the uncertainty and complexity of the environment coherently, have a more sufficient innovation management performance, than those who do not. Yet this is still rather broad and especially creativity seems rather unmanageable considering its features and the thinking processes that are required to be creative. Indeed, it seems to be a challenging task for managers to contribute to a climate that fosters organisational creativity (Oliver et al., 2014). The goal of creativity and innovation management is to provide systematic planning of innovation within an organisation, so innovation is not left to random occurrence and so the innovativeness is increased. This includes internal and external resources for innovation, and how these resources are allocated in order to effectively innovate, as well as learn from experiences for future innovations (OECD/Eurostat, 2018). The OSLO Manual 2018 also stresses that this includes “activities for establishing policies, strategies, objectives, processes, structures, roles and responsibilities to deal with innovation in the firm, as well as mechanisms to assess and review them.” (OECD/Eurostat, 2018, p.91)

As can be seen, managing innovation is a complex and challenging, yet important task, which is also highlighted by Adams, Bessant, & Phelps, (2006) too. They suggest a framework so managers can monitor and assess their innovation processes, that includes seven categories into the innovation management process, which they underline with for the innovation process empirically significant factors, such as: *inputs management*, which includes managing human resources, physical or financial resources; *knowledge management*, which refers to managing implicit and explicit knowledge the organisation obtains, the exchange and acquisition of information required for innovation processes, and the generation of ideas; *innovation strategy*, which is described as an internally consistent allocation of resources and strategic leadership; *organisation and culture*, which relates to the organisational culture and structures, including the way staff are grouped to carry out tasks; *portfolio management*, which focuses on managing strategic, technological and resource choices in order to select or terminate projects for achieving the organisation’s optimal project portfolio; *project management*, which is concerned with the transformation of the above-mentioned inputs into innovations; and *commercialisation*, which means the implementation phase of innovation. The framework’s purpose is to enable practitioners of

innovation management to evaluate their activities, identify deficiencies, and improvement potential which they can then pursue (Adams et al., 2006).

The overall aim of innovation management is efficiency, and thus, not to spend resources on processes that do not have a value to the organisation. Therefore, creativity and innovation management should provide the organisation with outcomes that enable it to gain knowledge about how to successfully innovate (of course this includes creativity as the first step of the process), and thus, what competences are crucial in order to do so. These competences and how they can be facilitated and measured will be the subject of chapter 2.4. According to the OSLO Manual 2018, capabilities that innovation management must cover, and that provide an idea for the competences mentioned are for instance identifying, generating, assessing and pursuing ideas for innovation, organising innovation activities within the firm (i.e. aligning different innovation activities), implementing external knowledge and other external inputs into a firm's innovation activities, as well as monitoring the results of innovation activities and learning from experience. Lastly, exploiting innovations and other knowledge that has been generated as part of an organisation's innovation activities are crucial features of innovation management. The degree of formality and complexity of the innovation management may differ between organisations, depending on the type of organisation and the type of innovation it aims to achieve (OECD/Eurostat, 2018). Besides these two factors, Damanpour (1991) identified two more aspects in a meta-analysis about the relationship between organisational innovation and potential determinants, that organisations differ in, and that impact the innovation management of the organisation: The stage of innovation and the scope of innovation. Tidd (2002) points out that the generalisability of innovation management is a great obstacle due to not specifying the degree and type of innovation. Because organisations and their innovations can differ tremendously in these aspects, he argues that it is rather challenging to find a one-size-fits-all definition of a sufficient innovation management. Also, he notes that comprehensive frameworks for guiding innovation research and managerial practice are lacking, due to the diversity of research disciplines that regard innovation management that result in different definitions, methods, and samples of the subject. Drejer (2002) identifies five managerial activities that innovation management comprises of, regardless of the differences of organisations: *Technological integration*, meaning that the technology used in an organisation to produce an outcome needs to develop as well the actual product needs to constantly develop in order to satisfy customers/users; *the process of innovation*, which refers to seeing the process of innovation as a collaboration of the different departments of an

organisation; *strategic technological planning* relates to maintaining the organisation's signature competences and technologies by planning projects that help achieving this; *organisational change*, taking into account that innovations always affect an organisation in regards to changing needs of for instance new competences or knowledge and therefore, that innovation managers have to respond to these changes induced by innovations; which also applies to *business development*, meaning that innovations are means and end to business development, which should always be considered by innovation managers (Drejer, 2002). Drejer, like Tidd, highlights that these activities will be carried out very differently according to the structures of the organisation.

Succeeding with the task of providing openness for creativity and innovation to thrive yet on the other hand providing systematic planning and controlling of the two can be based on the level of development of the dynamic managerial capabilities that have been mentioned in the previous chapter. The degree of responsiveness to external opportunities and challenges, the way learning from experiences and dealing with new knowledge is regarded, the ability to generate solutions to challenges and the allocation of resources determine how successful an innovation management is.

As can be seen, creativity and innovation management is a complex task, and it appears that even though there are definitions for innovation management in relevant literature, there is no common understanding of what exactly defines it. This may be due to the complexity and uncertainty of the matter, and that it has evolved rather recently. But especially because it is so complex, it seems like there should be an appropriate amount of attention paid to the extent it is put into practice in organisations. What has been mentioned in this sub-chapter however, suggests that the success of innovation management is based on the competences that innovation managers possess in different fields and how they are used to promote innovation, as well as on the competences that are needed to carry out innovation related tasks specifically by all members of an organisation. If Drucker's description of management is applied to innovation management, innovation managers are the "life-giving element" of innovation which is needed to transform resources into innovation.

## **2.4 Creativity and innovation related competences**

As previously mentioned, competence development in employees is crucial in all fields in order to carry out different tasks, of course also including creativity and innovation. Successful innovations of an organisation result from the creative and innovative workforce in that organisation

(Cerinšek & Dolinšek, 2009). With new challenges come new needs for knowledge and competences. Although it may seem difficult at first to pinpoint specific competences that are related to creativity and innovation, there are certain competences that are believed to have an effect on the likelihood of the two.

As mentioned above, divergent, and convergent thinking are different cognitive behaviours that are applied when either creating novel ideas or filtering out which one to pursue and implement. Educational offers can address both types of thinking with different methods, and thus support creative and innovative thinking. Approaches like Design Thinking addresses both types of thinking in different stages of the process and can be applied in any kind of learning context.

Birdi (2005) evaluated the effect creativity training attendance had on employees' creativity knowledge, attitudes, workplace idea generation, and idea implementation. The effects of three different creativity trainings were examined, and it was anticipated that the trainings would have a stronger impact on individual creativity, than on innovativeness (idea implementation), as the former is a rather internal process that is more likely to be enhanced by personal competence development initiated by creativity training, than the idea implementation, which usually requires approval and involvement from other members of the organisation and allocation of resources. Moreover, the study compared the effect of the trainings with the organisational and managerial support in regard to idea generation and idea implementation that was provided. It was found that participants reported moderate but significant improvement of the four aspects mentioned above. However, what was also found was that the three different creativity trainings addressed different aspects of competences (knowledge, skills, or attitudes), which resulted in different improvements in participants. The ones who attended all three trainings improved in all four aspects, whereas others who only attended one training improved more in either motivational aspects or knowledge aspects (Birdi, 2005). These findings imply firstly, that creativity trainings can have a positive effect on employees' competences, and secondly, that depending on the training, different aspects of a competence, as well as competences per se can be fostered more than others. As has been discussed previously, knowledge, skills and attitudes are equally important for carrying out tasks, suggesting that when offering creativity trainings, the emphasis should be on all three aspects to facilitate competence development. The study also confirmed however, that idea implementation is more dependent on the working environment, thus managerial support and the divisional climate regarding innovation. Therefore, the effects of improvements that creativity trainings can initiate are limited if no supportive environment that

is receptive to new ideas is provided (Birdi, 2005; Birdi, 2007). As there are different steps of the innovation process, the competences that are required for each step differ as well. These results do suggest ways of enhancing knowledge, skills, and attitudes regarding creativity, however it is not specified which competences should be developed in order to gain creativity competence and innovation competence. Firstly, it should be noted, that it seems challenging to identify innovation competence that individuals can develop, as innovation is usually viewed on an organisational level. A model that describes individual innovation competence is still lacking, as researchers define innovation competence as an organisational trait. Broken down to its components however, this organisational innovation competence comprises of the competences of the workforce. Models that describe creativity competence are not sufficient to explain innovation competence, as they only describe the idea generation phase of the innovation process (Hardt, 2011). It should be apparent now that creativity competence and innovation competence comprise of several competences, that the following will elaborate on. Based on the innovation process that has been described in chapter 2.1.1, it will be shown, what competences are required to carry out the tasks in the specific phases. During the phase of problem identification, a person has to firstly perceive the problem as such and assess it as an opportunity for change. In order to take action, the person must also assess her or himself to be capable of changing the situation or at least contributing to the change. Idea generation requires the creation of original ideas that could potentially contribute to a solution of the problem. Before an idea can be implemented, the ideas must be assessed according to their usefulness, feasibility, and whether they will solve the problem. Also, potential benefits, costs and consequences must be determined in this phase in order to choose the most preferable idea. The implementation phase requires evaluation of and if necessary, establishing new technical and organisational preconditions. Hardt (2011) also notes that this phase is characterised by resistance as the status quo is to be questioned and changed. This is why it is important to be able to collaborate with and mobilise others, and to convince potential stakeholders.

The EntreComp framework suggests an entrepreneurship competence which includes creativity and innovation in order to approach the challenges that are currently faced in Europe. Their conclusion is, that an entrepreneurial mindset is not only necessary for entrepreneurs, but also for any other citizen in order to facilitate creativity and innovation in organisations, and also in personal lives (Bacigalupo et al., 2016). As has been stated in chapter 1.2, entrepreneurship and innovation are interrelated, and according to Drucker, innovation can be understood to be the

vehicle to achieve entrepreneurship. Cerinšek & Dolinšek (2009) portray innovation as the overlapping segment of creativity and entrepreneurship, explaining that proactive entrepreneurial action is required to make innovative use of creativity. Therefore, it can be said that entrepreneurship can be the outcome of innovation, also including the above mentioned intrapreneurship, meaning “autonomous strategic employee behaviour in order to exploit a given business opportunity.” (Cerinšek & Dolinšek, 2009, p.168) Based on this understanding, the EntreComp framework has been chosen to be suitable for describing competences regarding innovation, including creativity. The framework proposes transversal competences under the umbrella term of entrepreneurship competence, that are meant to be unspecific in terms of domains as well as in terms of the degree of formality of learning. Besides the three competence areas *Ideas and opportunities*, *Resources*, and *Into action* that are split into 18 competences with a connected progression model, 442 potential learning outcomes have been developed by the Joint Research Centre (JRC) of the European Commission.

The occupational content model (O\*NET, 2019) describes specific workforce characteristics, that are important for innovation and clusters these in three categories: *Enduring attributes of workforce members that influence performance*, *workforce capacities that facilitate performance of activities that occur across different jobs*, and *work values and styles* (National Center for O\*NET Development, 2019; OECD/Eurostat, 2018). The following tables show the competences and characteristics identified by EntreComp and O\*NET. As can be seen, even though the competences are clustered into different categories, similar competences have been identified by both.

EntreComp	
Ideas and opportunities	<ul style="list-style-type: none"> <li>• Spotting opportunities</li> <li>• Creativity</li> <li>• Vision</li> <li>• Valuing ideas</li> <li>• Ethical and sustainable thinking</li> </ul>
Resources	<ul style="list-style-type: none"> <li>• Self-awareness and self-efficacy</li> <li>• Motivation and perseverance</li> <li>• Mobilising resources</li> <li>• Financial and economic literacy</li> <li>• Mobilising others</li> </ul>
Into action	<ul style="list-style-type: none"> <li>• Taking the initiative</li> <li>• Planning and management</li> <li>• Coping with uncertainty, ambiguity and risk</li> <li>• Working with others</li> <li>• Learning through experience</li> </ul>

**Table 2:** Entrepreneurship competences described by the EntreComp

O*NET	
Enduring attributes of workforce members that influence performance	<ul style="list-style-type: none"> <li>• Cognitive abilities (in particular idea generation and reasoning abilities)</li> <li>• Adaptability and flexibility towards change</li> </ul>
Workforce capacities that facilitate performance of activities that occur across different jobs	<ul style="list-style-type: none"> <li>• Social skills, to work with people to achieve goals</li> <li>• Complex problem-solving skills, to solve novel, ill-defined problems in complex, real-world settings</li> <li>• Technical skills, to design, set up, operate, and correct malfunctions involving machines or technological systems</li> <li>• Systems skills, to understand, monitor, and improve sociotechnical systems</li> </ul>
Work values and styles	<ul style="list-style-type: none"> <li>• Work values and styles, such as those related to <ul style="list-style-type: none"> <li>▪ entrepreneurialism</li> <li>▪ teamwork</li> <li>▪ creativity</li> <li>▪ and autonomy</li> </ul> </li> </ul>

**Table 3:** Workforce characteristics described by the O\*NET

The EntreComp framework explicitly regards creativity as a competence, which according to the authors includes developing several ideas and opportunities to create value, including better solutions to existing and new challenges, exploring and experiment with innovative approaches, and combining knowledge and resources to achieve valuable effects. The essence of the other competences identified in the EntreComp framework comprises of recognising the potential of ideas, decision-making, cooperation and communication, adaptability and flexibility, risk-taking, identifying needs and challenges, developing visions and plans, defining goals and priorities, being resilient and persistent, being aware of and assessing consequences and costs, and acquiring, managing and allocating resources (Bacigalupo et al., 2016). These competences support what have been identified as tasks according to the different innovation phases above.

The EntreComp Progression Model and the learning outcomes that are also provided by the framework facilitate the monitoring of competence development in learners. This is crucial for validating these competences. Validation comprises of four phases that can be applied to the required individual learning situation: Identification, documentation, assessment and certification of learning outcomes. According to the Cedefop (2015) validation is “about making visible the diverse and rich learning of individuals [...]” and “[...] about attributing value to the learning of individuals, irrespective of the context in which this learning took place.” (Cedefop, 2015, p. 14)

As creativity and innovation related competences are likely to be acquired in non-formal or informal contexts, for instance at the work place, at work related trainings, or during leisure time, they are, unlike in formal education, not necessarily evidenced or assessed.

To increase employability and also for personal development, it can be beneficial to identify and document competences, and depending on the contexts to assess and/or certify them. In order to facilitate identification, the EntreComp Progression Model comprises of four proficiency stages (Foundation, Intermediate, Advanced and Expert), that are divided into two levels each, resulting in eight proficiency levels in total. With increased proficiency, the degree of external support that is needed by the learner decreases. Descriptors of the learning outcomes indicate the level of proficiency on each of the levels and for each of the 15 competences (Bacigalupo et al., 2016). According to Cedefop (2015), the proficiency level identified for a person can for instance be documented in portfolios, or in external documentation reports, that do or do not include the person's Curriculum Vitae and previous working experience, as well as samples of work or other media that proves the acquired competences. An example for a documentation tool would be the Europass format, that provides a Europe-wide documentation possibility to facilitate comparability and transparency of competences regarding creativity and innovation. Even though validation of non-formal and informal learning is still mostly linked to education and training, it is important to note that it is not limited to these fields. The business and voluntary sector, as well as the higher education sector should not be disregarded, in order to promote holistic lifelong learning (Cedefop, 2015). In companies, validation can aid to increase motivation and it can also help coordinate continuing professional development more efficiently. As validation of non-formal and informal learning is not a completely standardised procedure, it may be challenging to achieve credibility for validated competences, which is why the EntreComp's Progression Model can provide a source of reference on what to assess in learner's achievements. Different tools or approaches can be used to collect evidence over the competences acquired, including tests and examinations, conversational ways, self-assessment methods (with verification by assessor), observations, simulations or evidence extraction from specific work situations. When certifying, the Cedefop (2015) strongly emphasises the point that the validation should be linked or integrated into a national qualifications system like for instance the European Qualification Framework (or the National Qualification Frameworks based on the EQF) that has previously been mentioned in this thesis, to ensure high quality and equality of certificates nationally and internationally (Cedefop, 2015).

## 2.5 State of implementation of creativity and innovation management in Europe

As it has been discussed in chapter 2.3, the management of innovation is important to actively promote the occurrence of innovations. It has also been mentioned that this task can be challenging due to the traits of creativity and innovation. This sub-chapter will explore the status quo of implementation of creativity and innovation management in different organisations in European countries, with a focus on the countries of the consortium partners. Furthermore, the implementation of competence development and validation of creativity and innovation related competences in different types of organisations of above-mentioned countries will be explored. The findings presented in this sub-chapter will lead to the development of hypotheses that will be tested within the conducted research. These will be integrated in this sub-chapter. As the hypotheses are closely linked to the project, a change in terminology will be carried out when regarding the hypothesis, using the term creativity and innovation management to refer to what has been described as innovation management. Also, the working hypotheses will be named H1<sub>x</sub> in this chapter, with the according number of each hypothesis and the corresponding null hypotheses that will be tested in chapter 4 will be named H0<sub>x</sub>.

First of all, it should be noted that innovation management measurement appears to have received very little attention in empirical research. The empirical studies that have been conducted on this matter show that measurement of innovation management is realised rather infrequently, which according to Adams et al., (2006) results in not reaching the full potentials innovation management could achieve. The fact that innovation management practises do not reach their full potential is also supported by Barsh et al. (2008). They conducted an international survey of executives on leadership and innovation, of which one third of senior executives stated to manage innovation only when necessary, and another third stated innovation management practice to be part of the senior leadership's activities. Only 27% of respondents from the sample stated that innovation is part of their organisational strategy, even though most of them assessed innovation as important.

Horizon 2020 is the largest research and innovation programme funded by the European Commission, with about 80 billion Euros spent from 2014-2020. Its aim is to promote economic growth within Europe. According to the Horizon 2020 Framework Programme for Research and Innovation, the European Union is eager to enhance its innovation performance due to increasing competition, even though the EU is one of the global leaders. Many projects regarding the

support for innovation management in Europe have been granted, which suggests, that there are attempts to close the gap of lacking implementation across Europe. Even though there is not much evidence regarding the implementation of innovation management itself, taking into consideration the innovativeness of countries might still be useful to identify differences between countries regarding innovation management. According to the Global Innovation Index (GII) 2019 by the World Intellectual Property Organization (WIPO), which annually ranks countries worldwide according to their innovativeness, most European countries rank within the top 50 economies (out of 129), with 12 of them in the top 20. Innovation is measured by research and development (R&D) and patents. Differences between European countries can be detected however, and focusing on the countries included in the sample of this research the results of the GI 2019 show that they range between rank 9 and rank 41<sup>5</sup> (Cornell University; INSEAD, and WIPO, 2019). Considering the input and output ratio of different economies, it is interesting to see that comparable innovation outputs achieved by economies differ from the invested innovation inputs (expenditures for R&D for instance). This might suggest that the economies with a lower-input-higher-output ratio manage innovation more sufficiently than the ones with higher inputs but similar outputs, assuming that successful innovation management is not the only predictor for innovativeness. This would mean that within groups of economies with similar innovation input values, which in the GI 2019 are measured in several aspects of knowledge and technology outputs (which includes the sub-categories knowledge creation, knowledge impact, and knowledge diffusion) and creative outputs (which includes the sub-categories intangible assets, creative goods and services, and online creativity), the ones that show higher innovation output whilst investing less innovation inputs, which are measured in several aspects of institutions, human capital and research, infrastructure, market sophistication, and business sophistication, manage their innovation activities more sufficiently than the ones with a higher innovation input value. The group with innovation input values that accumulate around a score of 50 comprises of Bulgaria, Lithuania, and Greece. The second group where innovation input values accumulate around a score of 55 includes Portugal and Italy, and the third group consists of Belgium, Austria, Ireland, and Germany, whose values appear between 60 and just above 65. Examining their innovation outputs, it shows that for instance Ireland and Germany show scores above 50, whereas Belgium and Austria show scores under 40 even though they have comparable

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inputs. The fact that innovation management still seems to be lacking in many places across Europe, and that countries differ in their innovation outputs, as well as inputs, lead to the presumption that

*H1<sub>1</sub>: Countries differ in terms of their understanding of creativity and innovation*

As it has been stated before, organisations that implement creativity and innovation management increase their chances of successful innovations. Therefore, it is also presumed that

*H1<sub>2</sub>: There is a difference between groups of countries in terms of the implementation of creativity and innovation management in organisations*

Regarding the organisations that mainly drive innovation, the European Union encourages close cooperations between businesses and higher education institutions in order to promote the exchange of knowledge and to drive innovation, entrepreneurship and creativity. This can be for instance seen in the CIM project. The business sector and the higher education sector both contribute to innovation immensely, with higher education conducting research in order to innovate and create, disseminate and transfer new knowledge, but also providing skilled human capital, whilst small and medium enterprises for instance are considered the key factor for economic growth and innovation by the European Commission, as they represent 99% of all businesses in the EU (European Commission, n.d.). However, higher education institutions usually inherit different governance structures to businesses that impact innovation capacities. Also according to Brennan et al. (2014), university managers are usually not being trained to manage innovations as they are usually promoted academics. These differences between higher education institutions and businesses leads to the presumption that

*H1<sub>3</sub>: There is a difference between higher education institutions and businesses in terms of their understanding, implementation, and management of creativity and innovation*

As the management of creativity and innovation also involves the management of related competences, it can be said that competence development is a crucial part of creativity and innovation management. As it has been mentioned before, creativity and innovation related competences are mostly acquired through informal and non-formal learning. Higher education institutions are generally rather formally oriented, whereas vocational education can be viewed as more diverse in formality. This can result in different competence development approaches between organisations, especially between higher education institutions and businesses, as different levels of formality of competences are emphasised. Moreover, they obtain different

goals and objectives generally, as well as in terms of innovation, as has been stated previously, hence their aim of achieving creativity and innovation competence development in their learners will presumably differ.

The promotion of creativity and innovation competences/entrepreneurship competence as a transversal competence for all citizens has only recently come into focus in the European Union, as has been mentioned before. With businesses clearly being linked to creating innovations, higher education institutions are likely to be still in early stages of the adaptation process to integrate development approaches of the mentioned competences into study programmes outside of specific creativity or innovation related courses, if any. Traditionally, higher education institutions focus on explicitly regarding innovation only when innovation is the subject of the course, rather than considering these competences transversal, or acknowledging them as informal or non-formal learning. Efforts have been made however during the last decades, to increase effectiveness of higher education regarding innovation by implementing policies and reforms, (van Vught, 2009). Still, due to these differences the presumption is made that

*H1<sub>4</sub>: There is a difference between higher education institutions and businesses in regard to creativity and innovation related competence development*

Competence development in formal education generally aims at accumulating a sufficient amount of competences in learners, in order to determine their degree of qualification. Formal qualifications also play an important role for businesses, however the other important aspect in this sector is the experience in the work field, and also other fields (Cedefop, 2015). The reason there is high demand for experience are the competences acquired during that time of experience, which will to a high degree be informal and non-formal learning, and which will indicate whether a potential employee is capable of the position in question. While formal education and training systems emphasise on formally acquired qualifications and certificates, the business sector is increasingly adopting validation methods for informal and non-formal learning in order to recruit staff. Otero, McCoshan, & Junge (2005) found that private sector organisations practise this very differently across Europe. As creativity and innovation related competences can be and mostly are acquired informally and non-formally, and as higher education institutions and businesses differ in emphases on the degree of formality, it is hence presumed that

*H1<sub>5</sub>: There is a difference between higher education institutions and businesses in regard to the implementation of validating creativity and innovation related competences*

On a European level, even though there is increased activity of the validation of informal and non-formal learning generally within European Member States, approaches, and systems for validating these competences are yet very diverse. Otero et al., (2005) argue in favour of the importance of coherency in the European lifelong learning system, and the fact that this is still lacking. There are a heterogeneous variety of methodologies that have been developed, and partially still are in experimental stages, to validate informal and non-formal learning in different national education and training contexts in recent years across Europe. Colardyn & Bjornavold (2004) support this finding, as they underline the presence of different stages of validation policy formulation and implementation across Europe. Hence, Otero et al., (2005) highlight the fact that differences in quality or success of validation of previously mentioned competences exist in Europe. Also, they found that the degree of acceptance of the validation of informal and non-formal learning varies between different countries in Europe. Therefore, it is presumed, that

*H1<sub>6</sub>: Countries differ in regard to the implementation of validation of staffs' creativity and innovation related competences*

A relationship was identified by Nielsen (2006) between innovation, education, and organisational learning in Denmark. The results show that the most innovative organisations had the lowest job turnover, presenting a relation between innovation and organisational policies regarding competence acquisition. This might indicate that the more innovative an organisation is the more staffs' competences that contributed to the innovativeness in the first place are valued, and the more competence development to maintain or increase the organisation's innovativeness is fostered. Furthermore, it was shown that businesses with learning organisation features, such as for instance job rotations and professionals' work groups had increased chances of being part of innovations (Nielsen, 2006).

These findings do not present any relationships to innovation management, however, based on what has been stated previously, it can be said that creativity and innovation management aims at managing all creativity and innovation related resources, including competences. Therefore, it is presumed that organisations that have a creativity and innovation management manage and develop their staffs' creativity and innovation related competences differently, than those who do not operate a creativity and innovation management, which leads to the following hypothesis

*H1<sub>7</sub>: The presence of creativity and innovation management in an organisation is related to the extent to which organisations promote creativity and innovation related competences*

As validation of these competences can also help to detect deficits and therefore facilitate purposeful further competence development, it is also presumed that

*H1<sub>8</sub>: Organisations with creativity and innovation management differ from those without creativity and innovation management in terms of validating their staffs' creativity and innovation related competences*

Although empirical findings of the contents presented in this sub-chapter are still lacking widely, an attempt has been made to outline the status quo regarding creativity and innovation management, the of development of creativity and innovation competences, and the validation of these competences in European organisations. The hypotheses that have been formulated in this context will be tested in the following.

### **3 Methodological approach**

The following chapter will elaborate on the methodological decisions taken to address the research question and to test the hypotheses. In order to do so the research design and the sampling process of the study will be described, as well as the data collection instrument, procedures and the analysis methods.

#### **3.1 Research design**

The following sub-chapter will describe the characteristics of the present study, which are described in the research design, to provide a transparent overview of this empirical quantitative research. The present research measured, as well as statistically analysed characteristics of different variables, which makes it a primary study.

The data that was worked with in the research was collected with an online questionnaire (see chapter 3.2) in order to represent a sample of the population of higher education institutions and businesses and to therefore analyse a large number of cases regarding the topic of creativity and innovation (management).

For the present research to be an explanatory, and non-experimental study, along with the just mentioned characteristics of quantitative research, another characteristic which was to test hypotheses derived from relevant theory (Bortz & Döring, 2016), was applied in the research, which was described before in the paper. The null hypotheses derived from the alternative hypotheses previously presented, were therefore tested. The aim of the project, and therefore of the research as well, will be to further develop the theory of creativity and innovation management in order to explore new approaches of educational practice, on the basis of the collected data. In order to ensure that the relevant population was examined, specific samples of interest were chosen, which results in a non-randomisation of the study.

Considering the whole of the CIM project, this research is embedded in a mixed methods approach, as it will be followed by qualitative interviews. However, this will not be addressed further in this thesis. The aim of this research is to gain insights into the field of creativity and innovation management in different samples, so that the educational practice can be improved, which leads to classifying it in the field of applied research as opposed to basic research (Bortz & Döring, 2016). The study was conducted once exclusively and in the natural environment of the test subjects, therefore it is a field study without a repeated measurement.

### 3.2 Instrumentation

In order to collect the data for the present research, a written survey was chosen as the appropriate method. The method was implemented in the form of an online research questionnaire, which was self-administered. This type of survey is best suited because it can document subjective attitudes that cannot be observed and it is more efficient than interviews, for instance, because a large number of participants can be reached with low time expenditure. The anonymity of the online questionnaire and the low expenditure of time can lead to a higher willingness of the respondents to provide information about themselves and to more honest answers, since no judgement is to be expected, that might directly affect participants. Also, since interviews are to be conducted afterwards, another advantage of the questionnaire is that potential interviewees can be acquired at the same time. The fact that difficulties in understanding and queries regarding items in the questionnaire cannot be answered, and that this could influence the response rate, was accepted because of the above-mentioned advantages that were predominate.

The instrument is a standardised questionnaire with predominantly closed questions, but with open questions where necessary.

The questionnaire comprises of 37 items, which were divided into a total of five thematically related blocks, in addition to one part for the introduction and the demographical background of respondents, and one part for further information about the project. Care was taken to ensure that the items were articulated as precisely and unambiguously as possible and that there was little room for subjective interpretation. Also, with regard to cognitive processes, the order of the blocks and also the items itself were determined in a logical manner, from rather non-specific to specific items to facilitate the answering of the items and to ensure as little losses of respondents due to confusion or excessive demands as possible.

As it could not be assumed that the respondents in all partner countries understood and spoke English sufficiently to carry out the questionnaire, translations of the instrument were provided in the respective languages. The possible loss of precision and accuracy of the questions due to translating was deliberately accepted, as without translations the response rate would have been likely to be lower.

Throughout the questionnaire mostly multi-point scales with up to five points were used when possible, to provide options of differentiation, yet not to overwhelm participants with too many

options. Whenever a multi-point scale was used, it was chosen to provide an odd number of response options, to avoid the tendency to agree (Bortz & Döring, 2016) in respondents.

The first section in the questionnaire (Introduction and statistical background data) gathered information about the age, gender, the country of the workplace, the type of organisation and department, and the position within the organisation.

In the second section (Understanding creativity and innovation) a concept scale was used which was based on the EntreComp framework in order to detect the attitudes and the understanding of the respondents towards the concepts of creativity and innovation, which were phrased as follows: "In your opinion which of the above-mentioned are the three most important for being innovative/creative?" The multiple response options that were provided for the participants were as follows:

- Constantly develop new ideas
- Develop better solutions to existing and new challenges
- Experiment with innovative approaches that are new to me
- Think visionary to turn ideas into action
- Identify needs and challenges that need to be met
- Assess the consequences and costs of my ideas
- Manage all resources to turn ideas into action
- Make the most of limited resources
- Inspire and enthuse relevant stakeholders
- Work together and co-operate with others to develop ideas and turn them into action
- Adapt to unforeseen changes

Additionally, respondents were asked to rate the importance of the above-mentioned aspects for their own work, which was measured in a five-point scale from 1 = 'Not Important at all' to 5 = 'Very important'. The scale comprised of 11 items (Cronbach's  $\alpha=.882$ ).

Part 3 (Creativity and innovation related competences) aimed at understanding which competences respondents allocate to the constructs of innovation and creativity and how they evaluate the importance of these competences for different formal/non-formal or informal contexts. Firstly, they were asked to rate the provided competences that were based on the EntreComp framework ("Which aspects and competences related to creativity and innovation do you consider most important?") on a five-point scale from 1 = 'Not Important at all' to 5 = 'Very

important'. This was carried out separately for both, creativity (Cronbach's  $\alpha=.829$ ) and innovation (Cronbach's  $\alpha=.820$ ). The options provided were as follows:

- Taking initiative
- Entrepreneurial mindset
- Ethical and sustainable thinking
- Networking
- Flexibility/adaptability
- Communication
- Problem-solving
- Financial and economic literacy
- Leadership
- Decision Making

Secondly, respondents were asked to rate the importance of the above-mentioned competences for personal development, success in formal education, success in non-formal or informal education, employability, and further career development on a three-point scale from 1 = 'Not important at all' to 3 = 'Very important'.

Moreover, this part of the questionnaire aimed at gathering information about existing creativity and innovation management within the organisations. Here, participants were asked whether they do or do not have a department or a position that is responsible for managing creativity and/or innovation of staff, and if they do whether it is a dedicated position or part of a staff members' responsibilities.

Part 4 (Acquisition and development of creativity and innovation related competences) comprised of two items, namely "To what degree would you say does your department/faculty/organisation promote the acquisition and development of competences related to creativity and innovation in students/trainees/employees?", which was measured in a five-point scale from 1 = 'Not at all' to 5 = 'Very strong', and "Does your department/faculty/organisation use any the following to achieve this?", where respondents were to agree or disagree with whether any of the following options are used within their organisation:

- Internal career development (such as training modules for students/trainees/employees)
- Training from external providers

- Bachelor's degrees related to creativity and innovation (or other undergraduate courses)
- Master's degrees related to creativity and innovation (or other graduate courses)
- Placements/Traineeships within businesses
- Job shadowing in other companies

The fifth part of the questionnaire (Assessment and recognition of creativity and innovation related competences) aimed to understand whether organisations validate their employees' competences in regard to creativity and innovation, and in case they do, what approaches are being used in order to do so, and also whether any frameworks are used as a reference system.

The respondents were asked to rate the importance they personally allocate to the validation of creativity and innovation related competences on a five-point scale from 1 = 'Not important at all' to 5 = 'Very important', and whether their organisation implements validation of the mentioned competences and their development. When asked whether competence frameworks were implemented in the organisations' validation system, five options of European competence frameworks (Key Competence Framework for Lifelong Learning, ESCO – The European Skills, Competences, Qualifications and Occupations, Digital Competence Framework, EntreComp Framework, and European Qualifications Framework) were provided, and respondents were asked to indicate on a binary 'yes'/'no' scale whether they had heard of them and/or used them. Moreover, respondents were asked to indicate on a five-point scale from 1 = 'Never' to 5 = 'Always' whether or not any of the provided ways of validating above-mentioned competences were used in their organisation. The provided options were as follows:

- Self-assessment by the students/employees themselves
- Peer-to-peer-assessments
- Observation of facilitators/mentors
- Interactive methods (simulation, role plays...)
- Online tools

Part 6 (Digital learning) aimed to examine the use of digital learning tools (such as for instance learning management systems) that do or do not connect to validation tools. Respondents were asked to provide information about the frequency of use of above-mentioned learning environments on a five-point scale from 1 = 'Never' to 5 = 'Always'. Part 7 (Further information) is insignificant for the statistical analysis of this thesis, and asked respondents whether they would be

interested in receiving further information about the project, and whether they would be willing to be interviewed in the scope of the qualitative analysis following the present research.

### 3.3 Sample

For the tested sample to be as accurately representative as possible, the sampling method is of great importance. Each partner took responsibility for acquiring approximately 30 respondents in order to achieve representation for the population. Firstly, a database was established by distributing the online questionnaire to potentially suitable respondents of the target groups, which had been detected by all partners prior to the present study. This can additionally lead to snowball sampling, which is also encouraged in participants, meaning that the participants themselves distribute the questionnaire within their networks in order to acquire a greater number of participants. Snowball sampling on its own is not sufficient for scientific research, however on the basis of the therewith collected data, a random selection of the sub-samples can be applied (stratified random sampling) to improve the accuracy of parameter estimates. According to specific characteristics, sub-samples were created by dividing the overall sample.

The present research required respondents from different European countries, to determine the differences and potentials of the creativity and innovation management in European higher education institutions and businesses, as this was the objective of the thesis. Therefore, it was firstly aimed to acquire participants who are working in the two main fields of interest, higher education institutions on the one hand, and companies, on the other hand. The focus here was to target people in leading positions of all age groups, which includes teaching and training, as this is still considered as leading a group of people. Secondly, staff working in other adult/ further education organisations, public entities or Non-Governmental/Civil Society Organisations were invited to participate in order to have additional categories for comparison in the analysis.

The sample of the present research is composed of  $N=347$  participants. Considering the number of potential respondents that received an invitation to participate in the study directly from one of the project partners, which was approximately  $N=536$ , the response rate is 65%. However, in addition to the direct distribution of each project partner, potential participants were also contacted through the launch of the online questionnaire on websites, in newsletters, mailing lists, and on social media platforms by most project partners and through the further distribution of the questionnaire within the participants' networks. Therefore, the exact response rate cannot

be determined. Also, it has to be noted that not all respondents completed the questionnaire, which results in varying sample sizes for different analyses.

As it has been stated, higher education institutions and businesses are the organisations of main interest, however other organisations were also invited to participate. Therefore, the sample includes  $n=258$  respondents from different organisations, of which  $n=92$  worked in higher education, and  $n=75$  worked in companies. The other organisations were represented with  $n=91$ , including training providing organisations ( $n=17$ ), public entities ( $n=48$ ), and NGOs/CSOs ( $n=26$ ). For analysis, all organisations besides higher education institutions and companies were grouped and named “other organisation”.

Given the fact that the project aims to study and compare the countries of the partner organisations in regard to their creativity and innovation management, these countries are the ones of higher interest. Therefore, even though there are some responses from other countries as well, the countries of the project partner organisations are the ones with the highest prevalence. Out of the whole sample, the highest number of responses were received from Germany ( $n=64$ ) and Belgium ( $n=49$ ), followed by Lithuania ( $n=36$ ), Italy ( $n=34$ ) and Portugal ( $n=33$ ).  $n=20$  responses were received from Austria, and  $n=12$  responses each were received from Greece, Bulgaria, and Ireland. Figure 1 shows the percentage of respondents each country reached.

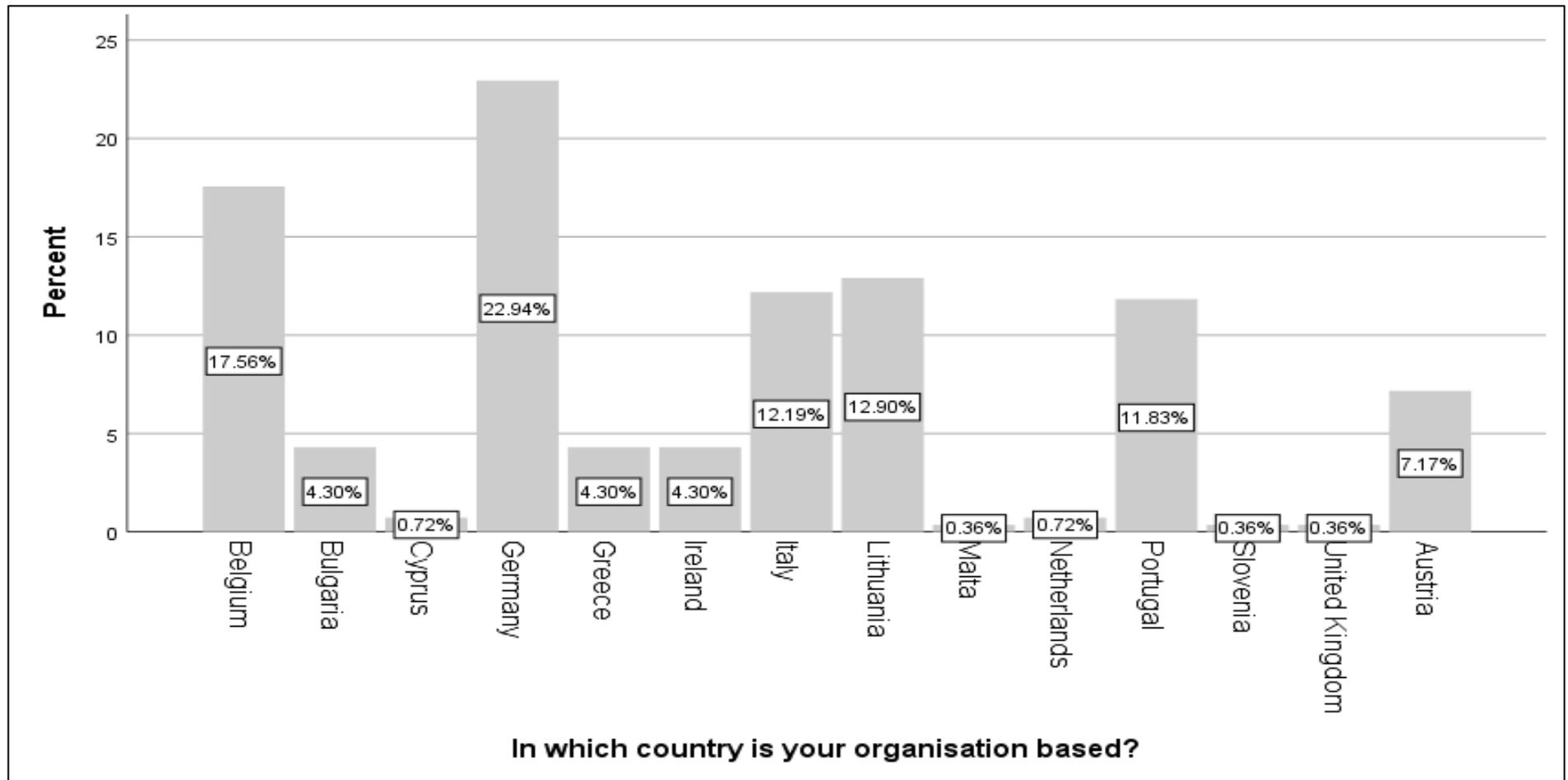
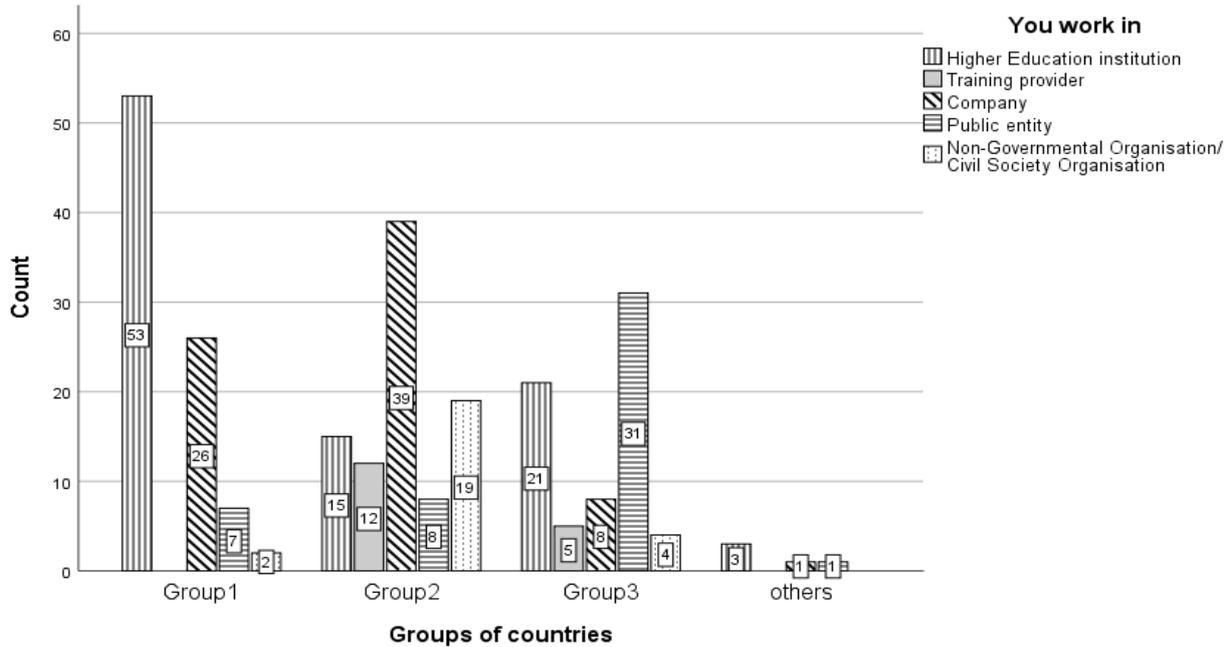


Figure 1: Represented countries (%)

The distribution of the types of organisation within the different countries shows that the highest prevalence of responses from participants working in Higher Education institutions was found in Portugal ( $n=24$ ), the highest prevalence of responses from participants working in organisations that provide training was found in Austria ( $n=7$ ), the highest prevalence of participants working in companies was found in Belgium ( $n=22$ ), the highest prevalence of participants working in public organisations was found in Germany ( $n=29$ ), and the highest prevalence of responses from participants working in NGOs/CSOs was found in Belgium ( $n=14$ ). These numbers do not represent the actual prevalence of types of organisation within the above-mentioned countries, but is most likely due to the project partner's types of organisations and therefore which kinds of organisations their networks inherit and therefore sent the invitations to the online questionnaire to. Due to the fact that some countries did not reach a sufficient number of respondents that allowed further statistical testing, the countries were clustered into groups. Therefore, based on the GII 2019 that was mentioned in chapter 2.5 countries were clustered according to their innovation outputs in 2019 to ensure reasonable and comparable groupings. Group 1 ( $n=93$ ) clusters Bulgaria, Lithuania, Greece, and Portugal, Group 2 ( $n=103$ ) includes Italy, Belgium, and Austria, and Group 3 ( $n=76$ ) includes Ireland and Germany. These groups will be used throughout the present research when aiming to compare countries, instead of using each single country as a variable. For describing the sample, however, the single countries will still be used.

In order to show the distribution of organisations per group of countries, the bar chart below (figure 2) compares the prevalence of the types of organisations per country group, which shows a high prevalence of higher education institutions ( $n=53$ ) in Group 1, compared to the other types of organisation, as well as compared to the prevalence of higher education institutions in the other groups. The highest prevalence of companies is found in Group 2, again compared to the other types of organisations, as well as compared to the other groups. Group 3 has the highest prevalence of public entities ( $n=31$ ), also compared to the other organisations, and the other groups.



**Figure 2:** Organisations per country

Also, participants were asked to provide information about their position within the organisation they work in. Because this was an open question in the questionnaire, the responses had to be clustered into the following four categories: *Executives*, *Management*, *Employees*, and *Others*, so differences in terms of the understanding of and attitudes towards creativity and innovation between the groups can be detected. The *Others* category ( $n=15$ ) includes responses that could not be allocated to either of the other three categories. The sample of  $n=233$  shows that 62,7% of respondents work in management positions, of which 16,7% are executive positions. The remaining 30,9% of respondents are employees. Taking into account the organisations in which the positions occur ( $n=211$ ), the table below shows the distribution of positions in the three groups of organisations. As can be seen the number of executives is rather low in higher education, compared to the other groups, as well as the number of employees is rather low in companies. The category of *others* will not be regarded, as it is of no relevance for this thesis.

		Position				Total
		Execu- tive	Manage- ment	Employee	Others	
Groups of or- ganisations	Higher Education	2	39	33	7	81
	Company	14	34	7	4	59
	Other Organisa- tion	16	28	24	3	71
Total		32	101	64	14	211

**Table 4:** Positions per groups of organisations

The gender distribution within the sample appears as follows: 45,5% of the sample are female ( $n=158$ ) and 35,4% are male ( $n=123$ ). The remaining 19% ( $n=65$ ) did not state their gender. Looking at the distribution of gender in the different types of organisations in the sample ( $n=258$ ), the results show that the prevalence of females working in higher education institutions is higher than the prevalence of males. Also, it is higher compared to companies, that on the other hand have a higher prevalence in males, compared to females. Other organisations show a higher prevalence in females, compared to males, and compared to companies and higher education both numbers are in between the two.

		Your gender:			Total
		Female	Male	Prefer not to say	
Groups of organisations	Higher Education	64	27	1	92
	Company	28	47	0	75
	Other Organisation	53	38	0	91
Total		145	112	1	258

**Table 5:** Gender distribution in organisations

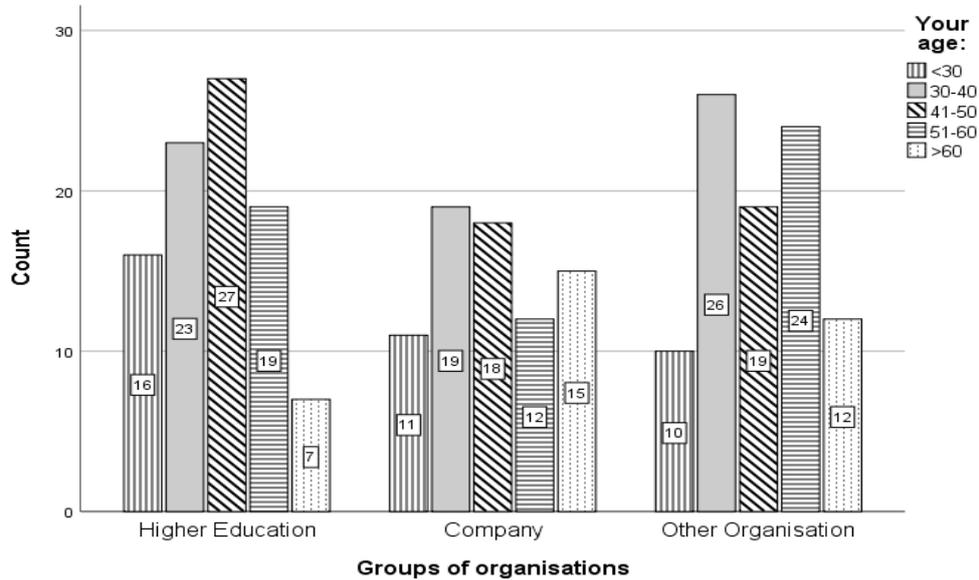
The gender distribution between the different types of positions within organisations ( $n=233$ ), shows a high prevalence in male executives, whereas employee positions show a high prevalence in females. Management positions show close to equal distribution between males ( $n=49$ ) and females ( $n=57$ ).

		Your gender:			Total
		Female	Male	Prefer not to say	
Positions	Executive	8	31	0	39
	Management	57	49	1	107
	Employee	54	18	0	72
	Others	9	6	0	15
Total		128	104	1	233

**Table 6:** Gender distribution per group of position

Taking into account the distribution of the age groups in the sample, it is shown that the majority of respondents ( $n=282$ ) are between the age of 30 and 50 (42,3%), ( $M=1,95$ ,  $SD=1.24$ ). The age distribution within the different types of organisations ( $n=258$ ) shows the highest prevalence in

the age group of 30-40 years working in companies and public entities, and the highest prevalence in the age group of 41-50 years working in higher education institutions.



**Figure 3:** Age distribution in organisations

Conducting of the study to appear in a clear and concise manner. The choice of language was given on the very first page but was still visible throughout the questionnaire in case participants needed to switch to a different language. The progress bar at the top of the page provided a visualisation of the respondents' progress in the questionnaire at all times during the process in order to avoid early termination of the questionnaire due to the unknown length of the questionnaire. Also, for that purpose, after the brief introduction that was provided on the initial page, an additional overview of the six parts the questionnaire consists of, and the number of items (37) was provided, as well as an estimate of the duration of the procedure (approximately 15 minutes). The platform also allows participants to resume the questionnaire at a later time, in case they did not have the time to complete it in one go. The launch of the questionnaire was carried out on the 10<sup>th</sup> of July 2019 and continued for 6 weeks. Originally it was meant to stay active for 3 weeks, however due to the time of the launch of the questionnaire during the summer, many potential respondents were unable to participate during that time as they were on their summer breaks. The development of the questionnaire required close cooperation between the project partner organisations, as the questionnaire needed to meet the standards of both academic research and the project itself. Also, to provide an array of languages in order to enable

as many respondents as possible to complete the questionnaire, translations of the questionnaire in the target languages had to be provided by the partner organisations. Thus, the questionnaire was first developed in English, which is the communication language within the consortium, and then translated into the target languages by the partner organisations, which were Bulgarian, Dutch, German, Greek, Italian and Portuguese. The questionnaire was therefore developed in a file that was easily distributable within the consortium as to then implement it on the LimeSurvey platform.

The consortium partners served as experts to provide feedback on the quality of the questionnaire as a pre-test. The feedback was afterwards incorporated in the revision of the questionnaire. Regular weekly updates about the number of respondents were provided to the consortium by the author of this thesis who was responsible for the questionnaire, so the partner organisations were able to send out reminders to their potential respondents. Because the consortium partners were responsible for addressing potential respondents in their countries, the partners' existing networks could be used to distribute the questionnaire in order to reach sufficient numbers of all countries, which lead to operating more efficiently. On the other hand, these networks might have been limited to an array of organisations that each partner organisation usually operates with, instead of contacting businesses and higher education institutions to equal parts.

The data was analysed using the software IBM SPSS Statistics. The methods that were used include descriptive ways, such as computing the mean values as measures of central tendency, as well as the standard deviation and variance as measures of dispersion. Crosstabulations and bar charts were used for portraying frequency distributions in the sample, and the Chi<sup>2</sup> Test according to Pearson was used when looking for statistically significant relations between nominal variables. For differences between two groups with variables of a measurement scale of metric level, the independent-samples *t*-test according to Student was used. When testing and comparing more than two groups within the sample, a one-way Analysis of Variance (ANOVA) was carried out. The methods of analysis that were used will be stated when presenting the results.

#### 4 Presentation of results

The following chapter will present the results that were found through the study to then interpret them in the next chapter. Firstly, descriptive statistics will be presented, to then describe inferential statistical results. The hypotheses developed in the previous chapter may be discussed in a slightly different order in the following. In order to give an overview on the prevalence of creativity and innovation related competence development in organisations in Europe, as well as validation and the use of digital learning, measures of central tendency were computed to summarise the data for several variables. Measures of dispersion were computed to understand the variability of scores for those variables. The following will present the results of this analysis. In regard to the promotion of creativity and innovation related competence development in organisations, results of the analysis including all organisations and all countries ( $n=205$ ) show a mean value of  $M=2.39$ , with a standard deviation of  $SD=1.10$ . Respondents were also asked to rate the importance of these competences for different aspects of professional and personal life. The results show relatively similar mean values and standard deviations as can be seen in table 7.

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
[Personal development]	222	0	2	<b>1.19</b>	<b>.415</b>	.172
[Success in formal education]	220	0	2	<b>1.39</b>	<b>.783</b>	.613
[Success in non-formal or informal education]	221	0	2	<b>1.45</b>	<b>.575</b>	.331
[Employability]	222	0	2	<b>1.35</b>	<b>.565</b>	.319
[Further Career development]	222	0	2	<b>1.28</b>	<b>.481</b>	.231
Valid N (listwise)	220					

**Table 7:** Importance of creativity and innovation related competences

The importance for validation of these competences assessed by respondents ( $n=208$ ) shows a mean value of  $M=2.92$ , with a standard deviation of  $SD=.97$ . Results about the implementation in European organisations ( $n=215$ ) show a mean value of  $M=1.42$ , with a standard deviation of  $SD=.66$ . Concerning the use of validation methods, it can be seen in table 8 that all options range between mean values of one and two, with self-assessment methods being the most prevalent

method used ( $M=1.71$ ,  $SD=1.34$ ), which indicates that on average this aspect received the highest agreement.

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
[Self-assessment by the students/employees themselves]	209	0	4	<b>1.71</b>	<b>1.336</b>	1.785
[Peer-to-peer-assessments]	209	0	4	<b>1.55</b>	<b>1.333</b>	1.778
[Observation of facilitators/mentors]	209	0	4	<b>1.46</b>	<b>1.297</b>	1.682
[Interactive methods (simulation, role plays..)]	209	0	4	<b>1.31</b>	<b>1.313</b>	1.725
[Online tools]	207	0	4	<b>1.23</b>	<b>1.278</b>	1.633
Valid N (listwise)	205					

**Table 8:** Use of validation methods

Comparing respondents working in higher education institutions with the ones working in companies, it can be seen that the mean values for higher education are slightly higher for all methods.

Additionally, respondents were asked to state whether they use any online learning tools in their organisation. The results show that the online learning tool *learning management systems* such as Moodle had the highest mean value ( $M=2.36$ ,  $SD=1.42$ ) out of all as can be seen in table 9 below.

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
[Learning management systems (e.g. Moodle)]	132	0	4	<b>2.36</b>	<b>1.421</b>	2.019
[E-Portfolios]	127	0	4	<b>1.39</b>	<b>1.316</b>	1.731
[Blogs]	129	0	4	<b>1.53</b>	<b>1.311</b>	1.720
[Wikis]	130	0	4	<b>1.35</b>	<b>1.322</b>	1.747
[MOOCs]	128	0	4	<b>1.14</b>	<b>1.221</b>	1.492
Valid N (listwise)	124					

**Table 9:** Online learning

The results of comparing means of respondents working in higher education institutions to the ones working in companies show higher mean values for *Learning management systems* ( $M=3.26$ ,  $SD=.964$ ), *E-portfolios* ( $M=1.6$ ,  $SD=1.41$ ), and *MOOCs* ( $M=1.4$ ,  $SD=1.24$ ) from higher education, whereas higher mean values were found for *Blogs* ( $M=1.94$ ,  $SD=1.39$ ) and *Wikis* ( $M=1.33$ ,  $SD=1.41$ ).

In respect to the importance that respondents allocated to creativity and innovation aspects it can be seen that for both, creativity and innovation, the highest mean value was found for “Problem-solving” (creativity:  $M=3.36$ ,  $SD=.88$ ; innovation:  $M=3.51$ ,  $SD=.76$ ).

The multiple response analysis that was used to present the frequencies of the dichotomous items of the concept scales previously mentioned in chapter 3.2, shows the top three selections of all respondents ( $n=242$ ), which can be seen in table 10 below.

	<u>Creativity</u>	<u>Innovation</u>
1.	Constantly develop new ideas (n=107)	Develop better solutions to existing and new challenges (n=121)
2.	Experiment with innovative approaches that are new to me (n=103)	Think visionary to turn ideas into action (n=91)
3.	Think visionary to turn ideas into action (n=91)	Inspire and enthuse relevant stakeholders (n=85)

**Table 10:** Top three aspects for creativity and innovation (whole sample)

Also, the top three of businesses and higher education institutions for both creativity and innovation can be seen in table 11 and 12. The results show that the three most important aspects for creativity that were selected by the majority of respondents from all organisations were the same aspects that were selected by the majority of higher education institutions, whereas businesses' selections had fewer conformities with the selection of all organisations. Regarding the most important aspects for creativity, it can be seen that higher education institutions correspond with the selection of the aspects of all organisations, and even though businesses' selections also show similarities to the selections of all organisations, again there were fewer conformities shown.

Businesses (n=70)	Higher Education (n=78)
Creativity	
Constantly develop new ideas (n=28)/ Think visionary to turn ideas into action (n=28)	1. Constantly develop new ideas (n=36)
Work together and co-operate with others (n=27)	2. Experiment with innovative approaches that are new to me (n=31)
Develop better solutions to existing and new challenges (n=25)	3. Think visionary to turn ideas into action (n=30)

**Table 11:** Top three aspects by businesses and higher education institutions for creativity

Businesses (n=70)	Higher Education (n=78)
Innovation	
Think visionary to turn ideas into action (n=34)	1. Develop better solutions to existing and new challenges (n=44)
Develop better solutions to existing and new challenges (n=31)	2. Work together and co-operate with others (n=35)
Constantly develop new ideas (n=29)	3. Think visionary to turn ideas into action (n=26)

**Table 12:** Top three aspects by businesses and higher education institutions for innovation

In addition, participants were asked which of the above-mentioned tasks are the most relevant for their own work to understand how creative and innovative they perceive their work. This will be tested in the scope of H1<sub>3</sub> (*There is a difference between higher education institutions and businesses in terms of their understanding, implementation, and management of creativity and innovation*) in regard to whether higher education institutions and businesses differ in terms of how creative and innovative respondents perceived their work. In order to test H0<sub>3</sub> (*There is no difference between higher education institutions and businesses in terms of their understanding,*

*implementation, and management of creativity and innovation*), a one-way ANOVA was conducted in which higher education institutions, businesses and other organisations were included. Firstly, however, in order to obtain comprehensible information, a factor analysis was conducted, in which all items were included. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy  $KMO = 0.89$  ("meritorious", according to Field (2018)). Two factors were identified, in which five items loaded on factor 1, and six items loaded on factor 2. In combination, they explain 56.4% of the variance. Table 13 shows the factor loadings after rotation. The items that load on each factor suggest that factor 1 represents creativity related tasks, and factor 2 represents management related tasks. This means a high correlation between certain items occurred, which indicates that these items can be clustered into one category.

	Factor	
	1	2
[Constantly develop new ideas] Please rate the importance of the following aspects for your work	<b>.780</b>	.168
[Develop better solutions to existing and new challenges] Please rate the importance of the following aspects for your work	<b>.829</b>	.214
[Experiment with innovative approaches that are new to me] Please rate the importance of the following aspects for your work	<b>.749</b>	.237
[Think visionary to turn ideas into action] Please rate the importance of the following aspects for your work	<b>.693</b>	.423
[Identify needs and challenges that need to be met] Please rate the importance of the following aspects for your work	<b>.614</b>	.342
[Assess the consequences and costs of my ideas] Please rate the importance of the following aspects for your work	.380	<b>.582</b>
[Manage all resources to turn ideas into action] Please rate the importance of the following aspects for your work	.421	<b>.599</b>
[Make the most of limited resources] Please rate the importance of the following aspects for your work	.016	<b>.773</b>
[Inspire and enthuse relevant stakeholders] Please rate the importance of the following aspects for your work	.312	<b>.576</b>
[Work together and co-operate with others to develop ideas and turn them into action] Please rate the importance of the following aspects for your work	.304	<b>.612</b>
[Adapt to unforeseen changes] Please rate the importance of the following aspects for your work	.260	<b>.694</b>

**Table 13:** Rotated Factor Matrix: Creativity and management related tasks at workplace

This allows to detect differences between organisations or countries in regard to whether or not respondents carry out creativity and/or management related tasks. Both factors were ranked into three percentiles each in order to create groups that obtain information about respondents' perception of whether they do or do not carry out creativity related tasks or innovation related tasks at their workplace.

The above-mentioned one-way ANOVA that was carried out with a significance threshold of  $\alpha < .05$  ( $* = p < .05$ ); which will apply for all tests in this thesis, showed that there is a significant difference (table 14) between organisations regarding creativity related tasks [ $F(2,209)=6.4$ ,  $p=.002$ ]. However, it was also found that there is no significant difference regarding management related tasks [ $F(2,209)=.505$ ,  $p=.604$ ].

		Sum of Squares	df	Mean Square	F	Sig.
Creativity related tasks at workplace	Between Groups	8.136	2	4.068	6.400	<b>.002*</b>
	Within Groups	132.859	209	.636		
	Total	140.995	211			
Management related tasks at workplace	Between Groups	.678	2	.339	.505	<b>.604</b>
	Within Groups	140.317	209	.671		
	Total	140.995	211			

**Table 14:** ANOVA: Creativity and management related tasks

The post hoc comparisons using the Bonferroni test regarding creativity related tasks shows a significant difference ( $p=.001$ ) between higher education institutions ( $M=2.25$ ,  $SD=.80$ ) and other organisations ( $M=1.78$ ,  $SD=.73$ ) but no significant difference ( $p=.092$ ) between higher education institutions and companies ( $M=1.96$ ,  $SD=.86$ ), or companies and other organisations ( $p=.592$ ). The value of the difference between higher education and business, even though it is not significant, shows a tendency of difference. Also regarding H1<sub>3</sub>, it will be tested in the following whether there is a significant difference between higher education institutions and companies regarding their understanding of creativity and innovation and what competences are required for both. Therefore, another factor analysis was carried out for both, creativity and innovation, in order to detect manifest variables that underlie the total number of items. Firstly, the factor analysis in regard to creativity competences was conducted, in which all items were included in

the analysis. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy  $KMO = 0.81$  (“meritorious”, according to Field (2018)). Three factors were identified, five items loaded on factor 1, three items loaded on factor 2, and two items loaded on factor 3. In combination, they explain 62.52% of the variance. Table 15 shows the factor loading after rotation. The items that load on each factor suggest that factor 1 represents “importance of leadership competences for creativity”, and factor 2 represents “importance of communication competences for creativity” and factor 3 represents “importance of initiative competences for creativity”.

	Factor		
	1	2	3
[Taking initiative] [Scale 1] Which aspects and competences related to creativity and innovation do you consider most important?	.144	.058	<b>.799</b>
[Entrepreneurial mindset] [Scale 1] Which aspects and competences related to creativity and innovation do you consider most important?	.324	.032	<b>.765</b>
[Ethical and sustainable thinking] [Scale 1] Which aspects and competences related to creativity and innovation do you consider most important?	.029	<b>.593</b>	.502
[Networking] [Scale 1] Which aspects and competences related to creativity and innovation do you consider most important?	.113	<b>.828</b>	.121
[Flexibility/adaptability] [Scale 1] Which aspects and competences related to creativity and innovation do you consider most important?	<b>.427</b>	.386	.186
[Communication] [Scale 1] Which aspects and competences related to creativity and innovation do you consider most important?	.281	<b>.785</b>	-.117
[Problem-solving] [Scale 1] Which aspects and competences related to creativity and innovation do you consider most important?	<b>.687</b>	.084	.087
[Financial and economic literacy] [Scale 1] Which aspects and competences related to creativity and innovation do you consider most important?	<b>.605</b>	.275	.455
[Leadership] [Scale 1] Which aspects and competences related to creativity and innovation do you consider most important?	<b>.714</b>	.294	.301
[Decision Making] [Scale 1] Which aspects and competences related to creativity and innovation do you consider most important?	<b>.815</b>	.071	.121

**Table 15:** Rotated Factor Matrix: Creativity

All factors were ranked into three percentiles each in order to create groups that obtain information about respondents’ degree of agreement on whether the above-mentioned

competences are important for creativity. As H1<sub>3</sub> is stating that there is a difference to be expected between higher education and businesses, H0<sub>3</sub> therefore expects no difference between the two regarding the importance of above-mentioned competences for creativity. To test H0<sub>3</sub>, a one-way ANOVA was carried out. As can be seen in table 16, the results show that there is no significant difference between the groups regarding any of the three competences (importance of leadership competences [ $F(2,184)=1.73, p=.180$ ]; importance of communication competences [ $F(2,184)=.801, p=.450$ ]; importance of initiative competences [ $F(2,184)=.499, p=.608$ ]) for creativity.

		Sum of Squares	df	Mean Square	F	Sig.
Importance of leadership competences creativity	Between Groups	2.289	2	1.144	1.730	<b>.180</b>
	Within Groups	121.690	184	.661		
	Total	123.979	186			
Importance of communication competences for creativity	Between Groups	1.062	2	.531	.801	<b>.450</b>
	Within Groups	121.933	184	.663		
	Total	122.995	186			
Importance of initiative competences for creativity	Between Groups	.669	2	.334	.499	<b>.608</b>
	Within Groups	123.331	184	.670		
	Total	124.000	186			

**Table 16:** ANOVA: importance of competences for creativity

To test whether there is a difference between the organisations in regard to the importance respondents gave to innovation competences, the same procedure of a factor analysis followed by a one-way ANOVA was applied again. The KMO measure also verified the sampling adequacy KMO = 0.85 for the second factor analysis for innovation. Three factors were identified, five items loaded on factor 1, three items loaded on factor 2, and two items loaded on factor 3. In combination, they explain 59.86% of the variance. Table 1 shows the factor loading after rotation. The items that load on each factor suggest that factor 1 represents “importance of flexibility/adaptability” “competences for innovation”, factor 2 represents “importance of leadership for

innovation” and factor 3 represents “importance of an ethical entrepreneurial mindset for innovation”, which can be seen in table 17 below.

	Factor		
	1	2	3
[Taking initiative] [Scale 2] Which aspects and competences related to creativity and innovation do you consider most important?	<b>.504</b>	.301	.235
[Entrepreneurial mindset] [Scale 2] Which aspects and competences related to creativity and innovation do you consider most important?	-.024	.349	<b>.665</b>
[Ethical and sustainable thinking] [Scale 2] Which aspects and competences related to creativity and innovation do you consider most important?	.229	.007	<b>.811</b>
[Networking] [Scale 2] Which aspects and competences related to creativity and innovation do you consider most important?	<b>.714</b>	.082	.271
[Flexibility/adaptability] [Scale 2] Which aspects and competences related to creativity and innovation do you consider most important?	<b>.751</b>	.091	.029
[Communication] [Scale 2] Which aspects and competences related to creativity and innovation do you consider most important?	<b>.678</b>	.390	.078
[Problem-solving] [Scale 2] Which aspects and competences related to creativity and innovation do you consider most important?	<b>.603</b>	.345	-.081
[Financial and economic literacy] [Scale 2] Which aspects and competences related to creativity and innovation do you consider most important?	.226	<b>.785</b>	.124
[Leadership] [Scale 2] Which aspects and competences related to creativity and innovation do you consider most important?	.177	<b>.802</b>	.233
[Decision Making] [Scale 2] Which aspects and competences related to creativity and innovation do you consider most important?	.299	<b>.732</b>	.064

**Table 17:** Rotated Factor Matrix: Innovation competences

The results of the ANOVA show that again, there was no significant difference between the types of organisations in regard to the importance of adaptability competences [ $F(2,179)=1.54$ ,

$p=.218$ ], leadership competences [ $F(2,179)=.19$ ,  $p=.157$ ], and ethical entrepreneurial mindset [ $F(2,179)=.21$ ,  $p=.813$ ] for innovation. The results can be seen in table 18 below.

		Sum of Squares	df	Mean Square	F	Sig.
Importance of adaptability Competences for innovation	Between Groups	2.041	2	1.020	1.536	<b>.218</b>
	Within Groups	118.910	179	.664		
	Total	120.951	181			
Importance of leadership Competences for innovation	Between Groups	2.473	2	1.236	1.868	<b>.157</b>
	Within Groups	118.478	179	.662		
	Total	120.951	181			
Importance of ethical entrepreneurial mindset for innovation	Between Groups	.280	2	.140	.208	<b>.813</b>
	Within Groups	120.671	179	.674		
	Total	120.951	181			

**Table 18:** ANOVA: importance of competences for innovation

H<sub>13</sub> also anticipates that different types of organisations will differ in terms of their creativity and innovation management, so consequently H<sub>03</sub> expects no differences between the two will be found. In order to test H<sub>03</sub>, a Chi-Square Test was carried out, which tested the dependence of the two variables type of organisation and whether a creativity and innovation management is implemented. First of all, table 19 below shows the predominant negation to the question of whether a creativity and innovation management is present in an organisation throughout all types of organisation.

		Is there a position or department within your organisation that is responsible for managing creativity and/or innovation of staff?			Total
		No	Yes	Uncertain	
Groups of organisations	Higher Education	30	18	21	69
	Company	34	22	9	65
	Other Organisation	46	14	12	72
Total		110	54	42	206

**Table 19:** Creativity and innovation management per organisation

Chi-Square Testing according to Pearson with all three groups of organisations showed a dependence [ $X^2(4, N=206)= 10.74, p=.030, V=.161$ ]. As the effect size value is  $V < .30$ , it is according to Cohen (1988) a low effect size. The Chi-Square Test, only including higher education institutions and businesses shows that the implementation of creativity and innovation management is independent of the type of organisation [ $X^2(2, N=134)= 5.335, p=.069$ ], which indicates that there might be a tendency of difference that is not significant. The results can be seen in table 20 below

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.335	2	<b>.069</b>
Likelihood Ratio	5.468	2	.065
Linear-by-Linear Association	3.369	1	.066
N of Valid Cases	134		

**Table 20:** Chi-Square Test: Organisations and creativity and innovation management

When participants were asked to rate the degree to which the organisation promotes the acquisition and development of creativity and innovation related competences (H1<sub>4</sub>: *There is a difference between higher education institutions and businesses in regard to creativity and innovation related competence development*), out of all that responded ( $n=205; M=2.39, SD=1.104$ ), 14.1% of respondents stated to perceive the competence acquisition and development as “very strong”, 39% as “rather strong”, and 23.9% as “moderate”, followed by 17.1% that stated “barely”, and 5.9% that stated “not at all”. Focusing on the distribution of ratings within the groups of organisations, it can be seen that all three groups show similar response patterns. To test whether a

significant difference can be identified in the promotion of creativity and innovation related competences within different organisations, a one-way ANOVA was carried out to test  $H_{04}$  (*There is no difference between higher education institutions and businesses in regard to creativity and innovation related competence development*), including higher education ( $M=2.51, SD=.98$ ), businesses ( $M=2.53, SD=1.07$ ) and other organisations ( $M=2.15, SD=1.16$ ). The results in table 21 show that the perception of the degree of promoting creativity and innovation related competences within organisations is not significantly different between organisations [ $F(2,186)=2.58, p=0.78$ ], although it can still be said that there is a tendency.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.865	2	2.932	2.580	<b>.078</b>
Within Groups	211.373	186	1.136		
Total	217.238	188			

**Table 21:** ANOVA: Creativity and innovation related competences development

Bearing in mind, that this analysis included other organisations as well as higher education institutions and businesses, an independent-samples t-test was conducted as well, to test the difference between only higher education and businesses. The results of the t-test analysis show no significant difference [ $t(125)=-.14, p=.89$ ] between the two.

In order to identify whether there are differences between higher education institutions and businesses, regarding the validation of creativity and innovation related competences ( $H_{15}$ : *There is a difference between higher education institutions and businesses in regard the implementation of validating creativity and innovation related competences*), firstly an independent-samples t-test was conducted that tested  $H_{05}$  (*There is no difference between higher education institutions and businesses in regard the implementation of validating creativity and innovation related competences*), including higher education ( $M=2.10, SD=.81$ ) and business ( $M=2.73, SD=1.06$ ), regarding how important they evaluate the validation of competences personally. The results show in table 33 (see Appendix 1) that a significant difference between the two groups was found [ $t(114.19)=2.26, p=.026$ ].

Also, a Chi-Square Test was carried out to find whether the implementation of validation practices and the type of organisation are dependent, including higher education, business, as well as other organisations. The results of the test show that the validation of creativity and

innovation related competences is independent from the type of organisation [ $\chi^2(4, N=201)=3.81, p=.433$ ].

As not only differences between organisations regarding the understanding and implementation of creativity and innovation related competences, as well as their management and validation were anticipated, but also differences between different countries (H1<sub>1</sub> and H1<sub>2</sub>), the following will present the results regarding these hypotheses.

The same aspects that were tested as part of H1<sub>3</sub> (see results in table 14) are according to H1<sub>1</sub> (*Countries differ in terms of their understanding of creativity and innovation*) expected to differ between different countries. Thus, a one-way ANOVA was carried out again to test H0<sub>1</sub> (*Countries do not differ in terms of their understanding of creativity and innovation*) regarding creativity and management related tasks at the workplace, which included Groups 1 ( $M=2.17, SD=.82$ ), 2 ( $M=2.03, SD=.81$ ) and 3 ( $M=1.77, SD=.79$ ), and management related tasks, also including Groups 1 ( $M=1.97, SD=.86$ ), 2 ( $M=2.04, SD=.82$ ) and 3 ( $M=1.96, SD=.74$ ). The results (see table 22 below) show that there is a significant difference between the groups of countries regarding creativity related tasks [ $F(3,223)=2.66, p=.049$ ], but no significant difference regarding management related tasks [ $F(3,223)=.426, p=.735$ ].

		Sum of Squares	df	Mean Square	F	Sig.
Creativity related tasks at workplace	Between Groups	5.219	3	1.740	2.662	<b>.049*</b>
	Within Groups	145.741	223	.654		
	Total	150.960	226			
Management related tasks at workplace	Between Groups	.855	3	.285	.426	.735
	Within Groups	149.128	223	.669		
	Total	149.982	226			

**Table 22:** ANOVA: Creativity and management related tasks at the workplace

The post hoc comparisons using Bonferroni testing regarding creativity related tasks shows a significant difference ( $p=.037$ ) between Group 1 (Greece, Bulgaria, Lithuania, and Portugal) and Group 3 (Germany and Ireland), and no significant difference ( $p=1$ ) between Group 1 and Group 2 (Belgium, Austria, and Italy), or between Group 2 and Group 3 ( $p=.328$ ).

Regarding the importance that respondents from different countries allocate competences related to creativity and innovation, as part of H1<sub>1</sub> it is expected that differences between the groups of countries will be identified. H0<sub>1</sub> therefore does not anticipate differences in the importance that countries give to creativity related competences (communication competences, leadership competence, and initiative competences), and innovation related competences (adaptability competences, leadership competences, and ethical entrepreneurial mindset). To test H0<sub>1</sub>, a one-way ANOVA was conducted, including Group 1, Group 2, and Group 3 (for mean and standard deviation values see table 35 in Appendix 1), which showed no significant differences regarding the importance of competences related to creativity and innovation between the three, apart from the importance of “initiative competences” for creativity [ $F(3,195)=7.55$ ,  $p<.000$ ]. The results can be seen in the table below (table 23). The post hoc comparison using Bonferroni testing regarding the importance of initiative competences given by the countries shows a significant difference between Group 1 and Group 3 ( $p=.005$ ) and between Group 2 and Group 3 ( $p=.000$ ), and no significant difference between Group 1 and Group 2 ( $p=1$ ).

		Sum of Squares	df	Mean Square	F	Sig.
Importance of adaptability competences for innovation	Between Groups	.270	3	.090	.133	.940
	Within Groups	127.730	189	.676		
	Total	128.000	192			
Importance of leadership competences for innovation	Between Groups	4.107	3	1.369	2.106	.101
	Within Groups	122.846	189	.650		
	Total	126.953	192			
Importance of ethical entrepreneurial mindset for innovation	Between Groups	1.351	3	.450	.672	.570
	Within Groups	126.628	189	.670		
	Total	127.979	192			
Importance of leadership competences for creativity	Between Groups	4.115	3	1.372	2.092	.103
	Within Groups	127.885	195	.656		
	Total	132.000	198			
Importance of communication competences for creativity	Between Groups	.775	3	.258	.387	.763
	Within Groups	130.220	195	.668		
	Total	130.995	198			
Importance of initiative competences for creativity	Between Groups	13.734	3	4.578	7.549	.000*
	Within Groups	118.246	195	.606		
	Total	131.980	198			

**Table 23:** ANOVA: Importance of creativity and innovation competences

As part of H1<sub>1</sub>, H0<sub>1</sub> anticipates no significant differences between the three groups of countries regarding the promotion of above-mentioned competences. To test this, a one-way ANOVA was carried out, including all three groups of countries. The results show a significant difference [ $F(3,199)=5.05$ ,  $p=.002$ ] between the groups of countries as can be seen in table 24 below. Specifically, post hoc comparison using Bonferroni testing shows a significance value of ( $p=.002$ ) between Group 2 ( $M=2.63$ ,  $SD= 1.02$ ) and Group 3 ( $M=1.92$ ,  $SD=1.23$ ). No significant values were found between Group 1 and Group 2 ( $p=1$ ) or Group 1 ( $M= 2.39$ ,  $SD= 1.02$ ) and Group 3 ( $p=.116$ ).

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	17.560	3	5.853	5.054	<b>.002*</b>
Within Groups	230.469	199	1.158		
Total	248.030	202			

**Table 24:** ANOVA: Competence development

H<sub>12</sub> (*There is a difference between countries in terms of the implementation of creativity and innovation management in organisations*) anticipates differences between the groups of countries regarding the management of creativity and innovation. In order to test H<sub>02</sub> (*There is no difference between countries in terms of the implementation of creativity and innovation management in organisations*), a Chi-Square Test was carried out to test for dependence of the variables. The results show a significance value of  $X^2(6, N=220)=13.81, p=.032, V=.177$  (see table 25 and 26), which shows that the implementation of creativity and innovation management is dependent on the groups of countries. However, because  $V < .30$ , the effect size is small.

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.813	6	<b>.032*</b>
Likelihood Ratio	15.035	6	.020
Linear-by-Linear Association	.402	1	.526
N of Valid Cases	220		

**Table 25:** Chi-Square: Relation of countries and CIM

		Value	Approximate Significance
Nominal by Nominal	Phi	.251	.032
	Cramer's V	<b>.177</b>	.032
N of Valid Cases		220	

**Table 26:** Effect size: Relation of countries and CIM

In order to test which combinations of the variables showed statistical significance, a post-hoc test with correction for alpha inflation (Bonferroni style) with a corrected significance threshold of  $\alpha < .006$  was carried out as well, which shows a significant value for the combination of Group 2 and the confirmation that there is a creativity and innovation management ( $p=.001$ ).

Regarding the validation practices in different countries, H1<sub>6</sub> (*Countries differ in regard to the implementation of validation of staffs' creativity and innovation related competences*) expects a difference between the groups of countries, which consequently leads to H0 (*Countries do not differ in regard to the implementation of validation of staffs' creativity and innovation related competences*) anticipating no difference. To test H0<sub>6</sub>, a one-way ANOVA was carried out, including Group 1 ( $M=2.99$ ,  $SD=.92$ ), Group 2 ( $M=2.95$ ,  $SD=1.01$ ), and Group 3 ( $M=2.72$ ,  $SD=1.01$ ) to find whether there are differences between the groups in terms of how important respondents assess the validation of competences personally, which shows no significant difference [ $F(3,201)=1.65$ ,  $p=.179$ ]. In addition, a Chi-Square Test was carried out to find whether the implementation of validation practices and the country of employment are dependent on each other. The results of the test show that the validation of creativity and innovation related competences is independent from the group of country [ $\chi^2(6, N=212)=10.10$ ,  $p=.121$ ]. Lastly, H1<sub>7</sub> and H1<sub>8</sub> anticipated a relationship between the implementation of creativity and innovation management and the promotion of competence development regarding creativity and innovation (H1<sub>7</sub>), as well as the validation of these competences (H1<sub>8</sub>). In order to test whether the promotion of above-mentioned competences is dependent on whether there is a creativity and innovation management (H1<sub>7</sub>: *The presence of creativity and innovation management in an organisation is related to the extent to which organisations promote creativity and innovation related competences*), which H0<sub>7</sub> (*The presence of creativity and innovation management in an organisation is not related to the extent to which organisations promote creativity and innovation related competences*) anticipates it is not, a one-way ANOVA was conducted. As can be seen in table 27, the results show that there is a significant difference between the groups [CIM: yes ( $M=2.92$ ,  $SD=.853$ ), CIM: no ( $M=2.14$ ,  $SD=1.16$ ), and CIM: uncertain ( $M=2.40$ ,  $SD=1.03$ )] and the promotion of above-mentioned competences [ $F(2;200)=9.31$ ,  $p<.000$ ].

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	21.116	2	10.558	9.306	.000*
Within Groups	226.914	200	1.135		
Total	248.030	202			

**Table 27:** ANOVA: Promotion of creativity and innovation related competences

The post hoc comparisons using Bonferroni testing shows a significant difference between the groups that confirmed to have creativity and innovation management ("Yes") and the group that

stated not to have a creativity and innovation management (“No”) ( $p < .000$ ). No significant difference was found between “No” and “Uncertain” ( $p = .534$ ). A tendency of difference was found between “Yes” and “Uncertain” ( $p = .056$ ).

Also, in the scope of H1<sub>7</sub> it was tested whether there is a dependency of creativity and innovation management and how respondents perceive creative and management related tasks at their own workplace, using a Chi-Square Test. The test was carried out both separately, starting with the previous. The testing results for a dependency of creativity related tasks and creativity and innovation management show that there was no independence found [ $\chi^2(4, N=217)=15.17, p=.004, V=.187$ ]. The effect size of the relation is low, as  $V < .3$ . The results can be seen in the tables 28 and 29 below. Regarding management related tasks, the results show that there was an independence found [ $\chi^2(4, N=217)=1.47, p=.831$ ].

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	15.174	4	<b>.004*</b>
Likelihood Ratio	15.874	4	.003
Linear-by-Linear Association	9.246	1	.002
N of Valid Cases	217		

**Table 28:** Chi-Square: Relation of CIM and creativity related tasks

		Value	Approximate Significance
Nominal by Nominal	Phi	.264	.004
	Cramer's V	<b>.187</b>	.004
N of Valid Cases		217	

**Table 29:** Effect size: Relation of CIM and creativity related tasks

To test whether there are significant differences between organisations that have a creativity and innovation management (“Yes”,  $M=3.17, SD=.81$ ) and those that do not (“No”,  $M=2.81, SD=.95$ ) in regard to the personal assessment of the importance of validation of creativity and innovation related competences of respondents in the scope of H1<sub>8</sub> (*Organisations with creativity and innovation management differ from those without creativity and innovation management*

<sup>6</sup> Production will be understood in the broader sense in the present paper and be treated as the productive outcome an organisation aims to achieve rather than actual products.

in terms of validating their staffs' creativity and innovation related competences), the independent-samples *t*-test according to Student was used.  $H_{08}$  (Organisations with creativity and innovation management do not differ from those without creativity and innovation management in terms of validating their staffs' creativity and innovation related competences) anticipates no differences between the two. As can be seen in table 34 (see Appendix 1), the results show that there is a significant difference between organisations that manage creativity and innovation and those that do not regarding the importance of validation of related competences [ $t(164)=-2.41$ ,  $p=.017$ ].

Also, in the scope of  $H_{18}$ , it was tested for dependency regarding the validation practice in organisations and organisations that manage creativity and innovation and those that do not. In order to do so, a Chi-Square test was conducted, which showed a significant dependence with a medium effect size of the validation and creativity and innovation management in organisations, as can be seen in table 30 and 31 [ $\chi^2(2, N=171)=23.06$ ,  $p<.000$ ,  $V=.367$ ].

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	23.055	2	<b>.000*</b>
Likelihood Ratio	23.422	2	.000
Linear-by-Linear Association	22.470	1	.000
N of Valid Cases	171		

**Table 30:** Chi-Square: Relation of validation and CIM in organisations

		Value	Approximate Significance
Nominal by Nominal	Phi	.367	.000
	Cramer's V	<b>.367</b>	.000
N of Valid Cases		171	

**Table 31:** Effect size: Relation of validation and CIM in organisations

In order to test which combinations of the variables show statistical significance, a post-hoc test with correction for alpha inflation (Bonferroni style) with a significance threshold of  $\alpha < .008$  (\*\*

<sup>7</sup> In the present thesis leadership outside of organisations will not be regarded.

=  $p < .008$ ) was carried out, which shows significant values for all combinations, as can be seen in table 32.

		Does your organisation validate (assess and evidence) the creativity and innovation competence development of your students/trainees/employees?				Total
		No, never	Yes, always	Yes, some-times		
Is there a creativity and innovation management?	No	Count	8	36	75	119
		Expected Count	13.9	43.8	61.2	119.0
		% within Is there a creativity and innovation management?	6.7%	30.3%	63.0%	100.0%
		Adjusted Residual	-3.1	-2.7	46	
			<b>0.0022**</b>	<b>0.0069**</b>	<b>0.0000**</b>	
	Yes	Count	12	27	13	52
		Expected Count	6,1	19,2	26,8	52,0
		% within Is there a creativity and innovation management?	23.1%	51.9%	25.0%	100.0%
		Adjusted Residual	3.1	2.7	-4.6	
			<b>0.0022**</b>	<b>0.0069**</b>	<b>0.0000**</b>	
Total		Count	20	63	88	171
		Expected Count	20.0	63.0	88.0	171.0
		% within Is there a creativity and innovation management?	11.7%	36.8%	51.5%	100.0%

**Table 32:** Post-hoc: Relation of validation and CIM in organisations

Having presented the results of the analyses conducted in the scope of this research, the interpretation and discussion of the results will follow in the next chapter.

## 5 Interpretation of results

The present research is to make a contribution in answering questions regarding differences between higher education institutions and businesses in European Member States, and to what extent competences regarding creativity and innovation are fostered and validated, as well as to what extent creativity and innovation management is part of the practice and whether or not that has an impact on competence development and validation in organisations. The following chapter will interpret and discuss the findings of the analyses that were conducted in the previous chapter, following the order of hypotheses that was used in the that chapter.

The results in respect to the promotion of creativity and innovation related competence development in organisations showed a relatively low mean value of agreement that creativity and innovation related competences are promoted in respondents' organisations, reflecting a collective opinion of "rather unimportant" according to the five-point scale that was used in the questionnaire. The standard deviation value shows that most responses accumulate around the mean, which indicates that organisations do not seem to put much emphasis on the competence development of the mentioned competences, which confirms the lack of implementation of competence development approaches regarding creativity and innovation across Europe that has been mentioned in several Erasmus+ project proposals (see chapter 2.1.1). As a consequence, for the CIM project, this could mean that organisations have not established approaches to foster these competences in employees yet, which could provide a suitable opportunity for the competence-oriented blended-learning approach to be implemented in organisations to bridge the current lack. As innovation is deemed important by European economies and as employers seem to value these competences in employees, it could be assumed that creativity and innovation related competence development should be in the interest of European organisations. On the other hand, this could also mean that difficulties could arise during implementation, if organisations are not sufficiently prepared for external competence development approaches, which might result in resistance. The importance that respondents rated in regard to creativity and innovation related competences for the personal and professional lives of people (table 7), showed relatively low mean values for all five aspects, which reflect "not important at all" for all, as well as relatively low standard deviation values, which again shows, that the average importance allocated to the aspects is rather low. This does not considerably differ between higher education and businesses. This might show that respondents do not see much value in creativity and innovation related competences on an individual level. Since the questionnaire did not gather

information of alternative levels that respondents might value these competences for, a conclusion cannot be made at this point and further research would be required. This might suggest, that when introducing the blended-learning approach, much emphasis should be put on providing sufficient information on the relevance of these competences for learners' personal and professional lives, or motivation levels could be rather low to acquire those competences.

The importance of validation showed a mean value which reflects "moderately important" on the five-point scale that was used in the questionnaire. The mean for the actual implementation of validation was considerably lower which shows that the validation of creativity and innovation related competences does not seem to be very prevalent in organisations within the sample (yet), even though respondents consider the validation moderately important on average. The relatively low mean values for the validation approaches seem to support this, unless there are other approaches, that the questionnaire did not collect information on. As respondents had the chance to express other methods in the scope of an open question, and its results did not show anything alike, this seems unlikely, however. If these results are taken representative for the population of higher education institutions and businesses, as well as other organisations in Europe, the validation of creativity and innovation related competences seems to be still lacking to a large extent. Considering the fact that generally, validation approaches for informal and non-formal learning across Europe are quite diverse and still in their infancy, these findings are not surprising.

The above-mentioned validation methods did show differences in mean values between higher education and companies, suggesting that higher education institutions use these methods to a larger extent than companies. Differences in mean values between the two were also found regarding online learning tools, such as learning management systems, which was the tool with the highest mean value. This suggests that learning management systems are the most prevalent online learning tools used by organisations. This does not allow any conclusions about the purpose that organisations use this tool for, which might vary from the mere distribution of materials to extensive e-learning courses. The mean values suggest that learning management systems, e-portfolios, and MOOCs are used more within higher education institutions compared to companies, whereas blogs and wikis seem to find more use in companies. This could indicate a difference of formality of online tools, as blogs and wikis are tools usually used in rather informal every-

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<sup>8</sup> For the sake of simplicity, the term management will be used in the present thesis from now on, assuming that leadership is inherent therein.

day live situations, whereas LMSs, e-portfolios and MOOCs usually have an educational purpose. The most important aspects of creativity and innovation that were presented in table 10, 11, and 12, might show a tendency of different priorities of businesses and higher education institutions, compared to the overall top three aspects regarding creativity and innovation that included all respondents in the sample. The number of respondents for the groups of business and higher education were rather small in order to base a conclusion on these results, however even though the groups show slightly deviating results, it can still be said that both groups seem to emphasise aspects for both, creativity and innovation that can be subsumed under the definitions of the terms in chapter 2. According to the EntreComp framework, creativity comprises of developing several ideas and opportunities to create value, including the development of better solutions to existing and new challenges, exploring and experimenting with innovative approaches, and combining knowledge and resources to achieve valuable effects, amongst others. Most of the selected items for creativity and innovation included these aspects. “Think visionary to turn ideas into action” according to the EntreComp framework is not explicitly part of creativity as a competence but was clustered as such in the factor analysis that was conducted regarding “creativity related tasks” (table 13) at the workplace. All aspects that were subsumed under “creativity related tasks”, can also be understood as inherent in innovation when viewed on a larger scale, just like “work together and co-operate with others to develop ideas and put them into action” can be seen as part of creativity or innovation. This highlights again that the differentiation between the two depends on the point of perspective, as mentioned in chapter 2.1.1. This could also explain, why the top three aspects that were selected for innovation by all organisations mostly contained aspects that according to the definitions that have been the base of the thesis, are allocated to creativity. The aspects that were subsumed under “management related tasks”, were also adopted from the EntreComp competences, however outside the context of innovation and entrepreneurship they can be seen as general management activities required in any organisation, regardless of innovation. This again suggests the importance of the management for the innovation capabilities of that organisation. It also shows the complexity of innovation and that it must be contextualised. In regard to the differences between the top three aspects for creativity and innovation, it should be noted that as it has been mentioned before, both organisation types operate in different ways, which might explain the differences in priorities. The following will elaborate on the results of the tests that have been conducted in the scope of H1<sub>3</sub> (*There is*

*a difference between higher education institutions and businesses in terms of their understanding, implementation, and management of creativity and innovation).*

The one-way ANOVA that was conducted in the scope of H1<sub>3</sub> showed significant differences between organisations regarding “creativity related tasks”, a variable that was obtained using the factor analysis (table 13). It was shown that furthermore, the significant differences were found between higher education institutions and “other organisations”, but not between higher education institutions and businesses, although there was a tendency of difference detected between the two. This indicates that respondents working in higher education institutions may differ in terms of how creative they perceive the tasks that they carry out at their workplace from organisations, such as public entities, NGOs/CSOs, or training providing organisations. As mentioned above however, respondents did not clearly differentiate between creativity and innovation in respect to the aspects that are important for both, which may suggest that “creativity related tasks” might have to be expanded to “creativity and innovation related tasks” as it cannot be clearly differentiated. In respect to the identified tendency of difference between higher education and businesses, it is suggested that further research with a larger sample size could provide a more conclusive result in regard to differences between the two. A tendency might indicate that a relatively high percentage of respondents from higher education and businesses differed in how creative/innovative they perceive tasks at their workplace, but a fair number of respondents had similar perceptions across both types of organisations. “Management related tasks” on the other hand did not significantly differ between any of the organisations that were tested. These aspects were also tested between the groups of countries, which showed similar results; between these groups “creativity related tasks” did show a significant difference between Group 1 and Group 3, which suggests that a difference between these groups is not incidental, which on the other hand implies that there is a high probability that the group of country and the importance of creativity/innovation related tasks for the job are related in this case, whereas “management related tasks” did not differ between any of the groups. The findings from the analysis do not allow a conclusion about any causalities, but the differences between the organisations may be explained by the degree of generality of the tasks that were included in the factor analysis. The items that loaded on factor 1 might be more specific tasks, that do not necessarily occur at all workplaces, whereas the items that loaded on factor 2 are more generic, and therefore more likely to be part of any workplace activities. In regard to the groups of countries, a possible explanation based on the GII 2019 could be that people working in countries from

Group 1 (Bulgaria, Greece, Lithuania, and Portugal) perceive their workplace activities as less creative or innovative than the people working in countries from Group 3 (Germany and Ireland), whereas people working in countries from Group 2 (Austria, Belgium, and Italy) might share perceptions with both of the two groups. This has not been proven by the analysis however and requires further research. As it has been mentioned, the importance of “management related tasks” for respondents, did not differ significantly between the groups of countries, which indicates that potential differences between the groups are incidental, and not linked to specific groups of countries.

The results of the second ANOVA in the scope of H1<sub>3</sub> showed no significant difference between higher education institutions, businesses or other organisations regarding the importance of leadership competences, communication competences and initiative competences for creativity. These results do not show any affirmation or disaffirmation by the organisations towards the importance of the above-mentioned competences, nor do they prove that there are no differences at all. Because there was no significant difference found, it has to be assumed that potential differences are incidental, rather than statistically determinable. The ANOVA that was carried out to test for significant differences between higher education and business (and other organisations) in regard to the importance of adaptability competences, leadership competences, and ethical entrepreneurial mindset for innovation, did not show any significance values either, which leads to the conclusion that higher education institutions and businesses might have relatively similar views on what competences are important for creativity and innovation.

To test for significant differences between organisations in regard to managing creativity and innovation (H1<sub>3</sub>), the Chi-Square Test that included all three groups of organisations showed a significant dependence of the organisation and the implementation of creativity and innovation management. The rather low effect size, however, indicates that the dependence is not very strong, which lead to conducting the test a second time only including higher education institutions and businesses this time, to find whether the result would still show a significant dependence when excluding “other organisations”. This was not the case, rather it was shown that there was merely a tendency found, that the type of organisation and implementation of creativity and innovation management are dependent. This might suggest that the accuracy of the test results might have been impaired during the second conduction due to the fewer number of respondents that stated to manage creativity and innovation ( $n=40$ ) in their organisation. A conduction of this test with a higher number of participants in the future could provide a more accurate

result whether or not the type of organisation and the implementation of creativity and innovation management are dependent, as the number of respondents that stated that their organisation manages creativity and innovation was rather low in the present research. For the progression of the project, this result should be considered when addressing the two organisations. It should be anticipated that there will most likely be differences of some kind regarding the implementation of creativity and innovation management, which will not necessarily be the result of the type of organisation, however. This might mean that it is important to differentiate not between types of organisations, but between whether or not organisations have a creativity and innovation management (how creativity and innovation management and the promotion and validation of creativity and innovation related competences relate will be elaborated on further down in this chapter), when implementing the blended-learning approach.

The result of the analyses that have been conducted in the scope of H1<sub>3</sub> show that higher education institutions and businesses do not seem to differ as much as anticipated. No significant differences were found between the organisations regarding the importance of specific competences for creativity and innovation. The relevance of creativity and innovation related tasks for respondents' own work showed a tendency of difference between the two organisation types, as did the implementation of creativity and innovation management. No differences were found between the two regarding management related tasks for respondents' own work. These findings suggest that H0<sub>3</sub> must be maintained, as the individual analyses do not provide clear conclusive results. It is therefore suggested to conduct further research to test whether significant results can be obtained with a larger sample size.

It was also presumed that there are differences between higher education institutions and businesses regarding the extent to which the promotion of creativity and innovation related competences are perceived (H1<sub>4</sub>: *There is a difference between higher education institutions and businesses in regard to creativity and innovation competence development*). The results of the one-way ANOVA showed no significant difference; however, a tendency of difference was identified, which implies that potential differences might not necessarily be incidental, but there is still a certain probability that the type of organisation and the perception of the promotion of previously mentioned competences within that organisation are related. However, because in this analysis the third group of organisations (other organisations) was included, and the following t-test showed no significant differences between only higher education and business, it can be concluded, that potential differences between the two types of organisations are incidental. This

suggests that other organisations might differ to higher education institutions and businesses in the extent to which creativity and innovation related competences are promoted, but that higher education institutions and businesses promote these competences to similar extents.  $H_{04}$  can therefore not be rejected and must be maintained. Regarding the development and implementation of a competence-oriented blended-learning approach in higher education institutions and businesses, this could mean that there do not have to be any major differentiations made between the types of organisation, but only between overall differences in practice in all organisations.

It was also anticipated that there would be differences between higher education institutions and businesses in validation practices ( $H_{15}$ : *There is a difference between higher education institutions and businesses in regard to the implementation of validating creativity and innovation related competences*). The findings of the *t*-test testing for differences in personal perception of the importance of validation of these competences between higher education and businesses showed a significant difference between the two. These results suggest that the importance respondents allocate to validation of creativity and innovation related competences is related to the type of organisation participants work in. Whether the degree of actual implementation of validation practices depends on the type of organisation, was tested with the Chi-Square Test, which showed no significant value. Even though respondents working in higher education institutions and companies do seem to differ regarding the importance of validating creativity and innovation related competences,  $H_{05}$  cannot be rejected, because the implementation practice of the validation does not depend on the type of organisation. Therefore,  $H_{05}$  must be maintained.

This could mean that different validation approaches are rather randomly distributed between different types of organisations. This seems to support the findings that were mentioned in this thesis before, which stated that validation practises are rather unsystematically applied in different European organisations. This could mean that a number of organisations are more experienced with validation practices of creativity and innovation related competences in general than others, or specifically that some obtain experience with certain validation approaches, but not with others that are used by other organisations. For the CIM project this implies that some organisations might be familiar with the type of validation approach that will be used in the scope of the project, while others will not be, which does not relate to a certain type of organisation though. The general validation landscape in European organisations seems to be quite diverse,

which bears an important task for the project to accomplish, as the introduction of the validation approach in the different types of organisations will be confronted with many different backgrounds of experience. In order to establish a uniform validation approach across Europe, it should be ensured that the implementation of the validation approach is understood and carried out in comparable ways by all organisations.

The differences between countries in respect to the importance of creativity and innovation related tasks for the workplace have been mentioned previously, which were regarded in the scope of H<sub>11</sub> (*Countries differ in terms of their understanding and implementation of creativity and innovation related competence development*), which will be further explored in the following. It was anticipated that groups of countries would differ in terms of the importance they give to creativity related competences (communication competences, leadership competences, and initiative competences), and innovation related competences (adaptability competences, leadership competences, and ethical entrepreneurial mindset). The results of the one-way ANOVA regarding creativity related competences showed significant differences for the importance of “initiative competences”, which indicates that countries might differ in how important they assess these competences for being creative. The post hoc testing results showed that these differences occurred between Group 1 and 3, as well as between Group 2 and 3. This shows that differences between these groups regarding the importance of initiative competences for creativity, are unlikely to be incidental, but statistically determinable. Therefore, this suggests that some countries might value the importance of initiative competences and leadership competences rather high in regard to creativity, and others might rate their importance as rather low in this aspect. Regarding communication competences and leadership competences, there do not seem to occur different views between the groups of countries. The results of the one-way ANOVA regarding innovation related competences showed no significant differences between the groups of countries towards innovation related competences. Overall it can be said that there are some differences between groups of countries in regard to creativity related competences, which are rather minor, however. They should still be considered when developing the competence-oriented blended-learning module in the scope of the CIM project, as they the countries seem to put different emphases on which competences are needed.

While the previous addressed the mere understanding of creativity and innovation related competences, the following emphasises on the competence development in organisations, and the differences that exist between different countries (H<sub>11</sub>). A significant difference was found

between the groups of countries regarding the promotion of above-mentioned competences in respondents' own organisation between Groups 2 and 3. This shows that there seem to be differences between these groups in terms of how they perceive the promotion of competences related to creativity and innovation in their organisations, which could indicate that different groups of countries practice the acquisition and development of creativity and innovation related competences to different extents. This would confirm that some countries emphasise more on creativity and innovation related competence development than others. This might mean that different levels and potentially different ways of competence development regarding these competences should be expected and considered when developing the blended-learning approach in the CIM project. It is noticeable that Group 2 and 3 seem to show differences regarding the importance of competences for creativity and innovation, as well as the promotion of these competences in organisations. This might indicate that there is a relation, which should be taken into consideration when progressing with the development of the blended-learning module. However, further research is required to conclude whether there is a significant link between these aspects or not. Due to the results that have been obtained through the analyses, it can be said that  $H_{01}$  can and must be rejected, because there seem to be differences between some countries regarding creativity and innovation related competences.

In the scope of  $H_{12}$  (*There is a difference between groups of countries in terms of the implementation of creativity and innovation management in organisations*), the results of the conducted Chi-Square Test show a significant value for the dependency of creativity and innovation management and the groups of countries. Cramer's V showed a relatively low value, which indicates that the dependency is of low effect. The post hoc testing was also conducted, and the results showed a significant value for Group 2 only, which might indicate that there could be an outlier in the group. Even though,  $H_{02}$  can be rejected due to the significant dependency, it might be necessary to conduct further testing with a larger sample size in order to determine which country is responsible for the significant results of Group 2. As a consequence, for the CIM project, it can be said that due to the relatively low dependency, the countries can be treated equally regarding their creativity and innovation management.

Moreover, it was anticipated that countries also differ in regard to validation practices of the competences related to creativity and innovation. The findings of the one-way ANOVA, that was conducted in the scope of  $H_{16}$  (*Countries differ in regard to the implementation of validation of staffs' creativity and innovation related competences*) found no significant difference in terms of

how important respondents from different groups of countries assessed the importance of validating above mentioned competences. This shows that the degree of importance that respondents gave to validation occurred regardless of their country of employment. It was also shown with the Chi-Square Test that the actual validation practices are independent from the country. This might mean that, like it has been discussed before regarding the different types of organisations, different validation approaches cannot be traced back to different countries, but more to the general heterogeneity of practices and approaches. Again, it is highlighted that it should be expected to see many different backgrounds of experience regarding approaches and extents of validation of creativity and innovation related competences across the countries, when implementing the validation approach of the CIM project. These differences are unlikely to be related to specific countries, which results in maintaining  $H_{06}$ .

Having regarded differences between the partner countries and the organisations of interest, the following will address the relationship of the implementation of a creativity and innovation management and the promotion of acquisition of creativity and innovation related competences ( $H_{17}$ ), as well as their validation ( $H_{18}$ ). It was anticipated that organisations that have a creativity and innovation management differ from those who do not in terms of the extend of promotion of development of above-mentioned competences ( $H_{17}$ ). The results of the one-way ANOVA showed that there is a significant difference between organisations that manage creativity and innovation and those that do not in respect to the promotion of competences. This means that there seems to be a relation between two, especially, because the post hoc testing showed a significant difference between the group that has creativity and innovation management and the one that does not. These findings do not allow any conclusion about causalities, however based on what has been stated from relevant literature, it could be assumed that the presence of creativity and innovation management has an impact on the promotion of creativity innovation related competences. Additional research is required, however, in order to test that further. Another result that seems to confirm that the creativity and innovation management impacts the competence development, though, is the finding that showed a dependence of creativity and innovation management and how creative/innovative respondents perceived tasks at their own workplace. This suggests that organisations with a creativity and innovation management create environments in which creativity and innovation related competences are required and therefore also fostered. Interestingly, it was also found that "management related tasks" showed no dependency with creativity and innovation management. Again, as is has been before, it can be

argued that management related tasks are immanent in many professions and positions in organisations, whereas creativity/innovation related tasks do not necessarily have to be inherent in professions or positions that are not explicitly related to creativity, and that they therefore vary in respondents. This supports the findings that have been presented in chapter 2.1.1, which showed that creativity trainings had an impact on knowledge and skills of participants. It can be said that  $H0_7$  can and must be rejected.

With regard to the differences between organisations with or without creativity and innovation management and the validation of creativity and innovation related competences ( $H1_8$ ), the results of the Chi-Square Test showed that there is a dependency of the management of creativity and innovation and the implementation of validation of related competences. Moreover, the results of the independent-samples t-test showed that there is a significant difference between the group that manages creativity and innovation and the group that does not in regard to the personal assessment of the importance of validation of creativity and innovation related competences. As with the relation to competence development that was described above, the results suggest that the implementation of creativity and innovation management impacts the validation practice of creativity and innovation related competences. The relation between the personal assessment of the importance of validation and creativity and innovation management might be due to an increased exposure of staff to validation practices in organisations that also manage creativity and innovation, which may lead to an increased perception of importance of validation, or due to personal attitudes of people towards the importance of validation that lead to choosing a workplace that manages creativity and innovation, and also validates related competences, but in order to statistically test these assumptions further research is necessary. Regardless of the causalities, the results show that  $H0_8$  must be rejected, as there seems to be a relation between creativity and innovation management and the validation of related competences. With regard to the CIM project this could mean that organisations that explicitly manage creativity and innovation, also more often validate related competences. Again, this cannot merely be assumed from the results of the conducted analyses, as they are two-sided, rather than stating which of the variables impacts the other. But it could be assumed based on the relevant literature that has been reviewed, and also on the results of the post hoc test which showed relations between the affirmation of validation and affirmation of creativity and innovation management. This might mean that it is important to differentiate not between types of

organisations or countries, but between whether or not organisations have a creativity and innovation management when regarding differences of competence development or validation.

Overall the results of the analyses show that promotion of creativity and innovation related competence development, as well as their validation seem to be lacking in a range of European organisations. Moreover, it was found that different types of organisations do not seem to differ from each other as much as it was anticipated prior to the research conducted. Several tests showed no significant differences between higher education institutions and businesses regarding their understanding of creativity and innovation, competence development or validation of related competences, or the implementation of creativity and innovation management. These findings do not confirm what was anticipated in the alternative hypotheses, however it provides indications for the CIM project, which suggest that there are no uniform approaches for either businesses or higher education institutions. As there exists a common understanding that learning outcomes, especially those acquired in informal and non-formal contexts, should be comparable across Europe, the CIM project could be an opportunity for distributing its approach on competence-oriented blended-learning, as well as validation, and strive to become the uniform approach that has been lacking in Europe so far. Also, with providing the learning and validation approach for creativity and innovation related competences and implementing them in organisations across Europe, first steps towards managing creativity and innovation would be achieved. This would work in favour of the European Union's efforts to support the implementation of creativity and innovation management, which, as the analyses in this thesis showed, seems to be related to the way competences are fostered and validated in organisations.

Regarding differences between the countries it could be shown that there seem to be slightly different understandings of which competences are needed for creativity and innovation, as well as different extents of practices for competence development between some of the groups examined. Only Group 2 (Belgium, Austria, and Italy) showed a significant relation with a creativity and innovation management. Therefore, this should be explored further in order to see whether this group does differ from the other groups, or whether there is an outlier found.

As a consequence for the project, the development of a blended-learning module for both types of organisation does not seem to have to focus on the differences between the countries or the organisations per se, but rather, it may be important to consider that any organisation with a creativity and innovation management might be show a different level in competence development and validation approaches, than organisations that do not manage creativity and

innovation. Also, as it was shown, the practice of systematic developing and validating creativity and innovation related competences seems to be poorly developed. However, some of the competences will be present already in many people from previous formal, non-formal or informal learning experiences. Therefore, a variety of competence levels should still be expected.

It has been stated before that further research including a more comprehensive sample size would be desirable in order to achieve more appropriate representation of the populations. The sample size in the conducted research was sufficient in total, however countries had to be grouped due to varying numbers of respondents, as well as some countries not having reached a sufficient number of respondents (only five out of nine countries reached a number of 30 respondents to represent approximation). The clustering of the countries facilitated the conduction of the analysis in this thesis, however it would be desirable to examine the countries individually, as the clustering occurred on the basis of one criterion, which is not sufficient to infer to the whole population. This can still provide an insight into the topic of interest, yet the results are of course not as accurate, as they would have been if all countries were explicitly regarded. As has been mentioned before, this is explained with the time of the launch of the online questionnaire, which was not ideal, as well as the decentralised distribution of the questionnaire.

Also, some countries consisted of up to four partners, which provides more manpower to acquire respondents than countries that only consisted of one partner. Also, for future research outside of the project boundaries, more respondents from additional countries could be aimed to acquire to ensure a more complete representation of Europe. Even though the sufficient number was reached for the organisation types of interest namely higher education and businesses, the number of subsamples in relation to specific variables decreased immensely making it challenging to obtain conclusive results, which supports the demand for a larger sample size. Also, it is suggested to invest time in a pre-test including the target group in order to detect ambiguities at an early stage. A conventional pre-test was not conducted with people from the target group, due to the regulations of the project, before launching the questionnaire. Results of a pre-test allow a revision of the questionnaire according to issues test persons point out, such as for instance clarity of items, appropriate of length and potential difficulties that respondents might face (Bortz & Döring, 2016).

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<sup>9</sup> Ranks of innovativeness according to WIPO (2019): Germany (9), Ireland (12), Austria (21), Belgium (23), Italy (30), Portugal (32), Lithuania (38), Bulgaria (40), Greece (41)

Another aspect that should be considered is the understanding of *creativity and innovation management*. As it has been mentioned in chapter 2, creativity is seldomly regarded explicitly when addressing innovation management, which could have potentially led to responses that are faulty. For instance, respondents could have stated not to have a creativity and innovation management, because the organisation does not explicitly regard creativity. Or the term could have led to confusion in respondents, resulting in stating to be uncertain. This could potentially be detected with the implementation of the above-mentioned pre-test.

## 6 Conclusion and outlook

The purpose of the research was to provide insights into the creativity and innovation management practices, as well as the development and the validation of relevant competences in European higher education institutions and businesses. The literature review provided a base of relevant terminology in order to work out an understanding of the term creativity and innovation management, and that it is important to manage the two, even though it was highlighted that it is a highly complex task. Also, relevant competences were outlined, of which the promotion and validation are some of the core tasks in creativity and innovation management, in order to foster innovativeness of the workforce within organisations, as this is the driving force behind innovation. There is a clear demand for more empirical research on the topic, which was indicated by the lack of current research that was apparent during the literature review, and which was also supported by relevant literature. Therefore, the present research has aimed to contribute to closing this gap and to encourage further research to deepen the findings and elaborate on multiple aspects.

As anticipated, the findings of the research conducted supported the lack of promoting creativity and innovation related competences in Europe, as well as their validation in the organisations of interest in Europe. These competences are promoted by the European Union to be crucial for European citizens for their personal and professional development, which shows the relevance of the CIM project and its potential impact for European organisations. Respondents did not seem to support the importance of these competences however, which indicates a potential challenge for the implementation of the previously mentioned blended-learning module. Therefore, it is crucial to raise awareness of the importance of these competences, or European citizens might not see the need of acquiring them in this systematic manner. Also, stakeholders within the CIM project as well as other related projects hold responsibility for acknowledging and including the diversity of approaches of general competence development and validation that exist already, and that could be used for creativity and innovation related competences, when developing the competence-oriented-blended learning and validation approach, to not just add to the heterogeneity with just another approach.

Although, not all tests showed the results that were anticipated, the research still provides valuable information for the CIM project. Consequences for the project have been mentioned whenever suitable in this thesis, so actions taken within the scope of the project can consider the

results of the research. A finding that was unexpected is that respondents seem to attribute similar aspects to both creativity and innovation, rather than differentiating them more rigorously. The latter was anticipated due to the findings of the literature review. These findings were not obtained from statistical testing however, which would be interesting see as a subject of further research. They did highlight the fact that generally, people might have different understandings of the terms according to their contexts, which might differ from academic definitions in the relevant literature. This should be taken into consideration when targeting creativity and innovation related competences.

With the implementation of the approach developed in the scope of the CIM project, the management of creativity and innovation will be encouraged in European organisation. On the base of this research, the CIM approach can be customised to the needs of Europe's organisations, in order to achieve the European Union's aims to foster creativity, innovation, and entrepreneurship.

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## Appendix

### Appendix 1: Tables

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
How important do you consider the validation (assessing and evidencing) of creativity and innovation related competences?	Equal variances assumed	8.548	.004	2.290	128	.024	.377	.165	.051	.703
	Equal variances not assumed			2.262	114.190	<b>.026*</b>	.377	.167	.047	.707

**Table 33:** T-test: Relation between importance of validation and organisation

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
How important do you consider the validation of creativity and innovation competences?	Equal variances assumed	.824	.365	-2.409	164	<b>.017*</b>	-.366	.152	-.666	-.066
	Equal variances not assumed			-2.556	114.607	.012	-.366	.143	-.650	-.082

**Table 34:** T-test: Relation CIM and creativity and innovation related competence validation

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Adaptability Competence for innovation	Group1	60	<b>2.02</b>	<b>.813</b>	.105	1.81	2.23	1	3
	Group2	81	<b>2.00</b>	<b>.837</b>	.093	1.81	2.19	1	3
	Group3	46	<b>1.96</b>	<b>.815</b>	.120	1.71	2.20	1	3
	others	6	<b>2.17</b>	<b>.753</b>	.307	1.38	2.96	1	3
	Total	193	<b>2.00</b>	<b>.816</b>	.059	1.88	2.12	1	3
Leadership Competence for innovation	Group1	60	<b>2.20</b>	<b>.777</b>	.100	2.00	2.40	1	3
	Group2	81	<b>1.89</b>	<b>.758</b>	.084	1.72	2.06	1	3
	Group3	46	<b>1.96</b>	<b>.918</b>	.135	1.68	2.23	1	3
	others	6	<b>2.33</b>	<b>.816</b>	.333	1.48	3.19	1	3
	Total	193	<b>2.02</b>	<b>.813</b>	.059	1.90	2.13	1	3
Ethical & Entrepreneurial mindset for innovation	Group1	60	<b>1.90</b>	<b>.817</b>	.105	1.69	2.11	1	3
	Group2	81	<b>2.09</b>	<b>.840</b>	.093	1.90	2.27	1	3
	Group3	46	<b>2.00</b>	<b>.789</b>	.116	1.77	2.23	1	3
	others	6	<b>2.17</b>	<b>.753</b>	.307	1.38	2.96	1	3
	Total	193	<b>2.01</b>	<b>.816</b>	.059	1.89	2.13	1	3
Leadership Competence creativity	Group1	62	<b>2.15</b>	<b>.807</b>	.102	1.94	2.35	1	3
	Group2	85	<b>2.01</b>	<b>.779</b>	.085	1.84	2.18	1	3
	Group3	46	<b>1.76</b>	<b>.848</b>	.125	1.51	2.01	1	3
	others	6	<b>2.17</b>	<b>.983</b>	.401	1.13	3.20	1	3
	Total	199	<b>2.00</b>	<b>.816</b>	.058	1.89	2.11	1	3
Communication Competence for creativity	Group1	62	<b>2.08</b>	<b>.775</b>	.098	1.88	2.28	1	3
	Group2	85	<b>1.95</b>	<b>.830</b>	.090	1.77	2.13	1	3
	Group3	46	<b>2.02</b>	<b>.856</b>	.126	1.77	2.28	1	3
	others	6	<b>1.83</b>	<b>.753</b>	.307	1.04	2.62	1	3
	Total	199	<b>2.01</b>	<b>.813</b>	.058	1.89	2.12	1	3
Initiative Competence for creativity	Group1	62	<b>2.08</b>	<b>.775</b>	.098	1.88	2.28	1	3
	Group2	85	<b>2.15</b>	<b>.824</b>	.089	1.98	2.33	1	3
	Group3	46	<b>1.57</b>	<b>.720</b>	.106	1.35	1.78	1	3
	others	6	<b>2.67</b>	<b>.516</b>	.211	2.12	3.21	2	3
	Total	199	<b>2.01</b>	<b>.816</b>	.058	1.90	2.12	1	3

**Table 35:** Descriptive statistics creativity and innovation related competences

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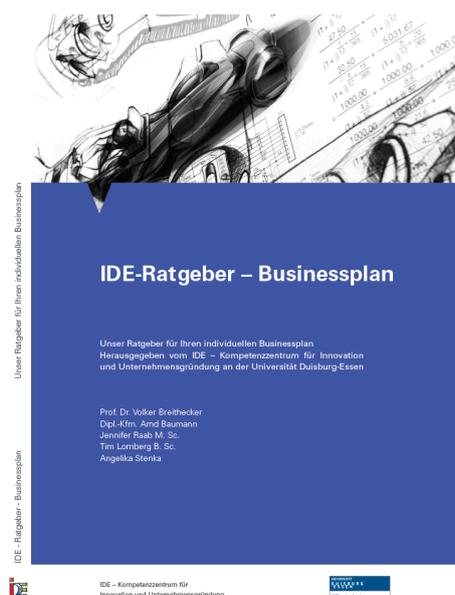
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Duisburg 2018

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