Unlocking Innovation Through Corporate Entrepreneurship

Exploring new tools, methods and approaches for identifying and enhancing intrapreneurial competencies

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BY
KRISTIAN BRØNDUM KRISTIANSEN

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DENMARK

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CV

Kristian Brøndum is PhD Fellow at the Aalborg University Business School in Denmark. His PhD project is within the field of corporate entrepreneurship, especially focusing on unlocking the innovation capacity in firms by developing new tools, methods, and approaches for identifying and enhancing intrapreneurial competencies. In addition, he is interested in enhancing knowledge and entrepreneurial potential in business development processes through creative methods and techniques. Before entering the PhD programme, Kristian worked with the development and innovation of business models ranging from startups and public institutions to large global groups as a Project Manager and Consultant. See project and publication portfolio at: www.vbn.aau.dk/en/persons/125767.

ENGLISH SUMMARY

This research aims to strengthen the theoretical and practical basis within the field of corporate entrepreneurship by proposing ways to identify corporate entrepreneurs (intrapreneurs) as well as enhance their competencies. Thus, the main contribution circles around enhancing and identifying corporate entrepreneurs (intrapreneurs). Firstly, a new tool was developed to spot intrapreneurial potential in individuals, which can be used to assess the hidden or untapped inherent capabilities that certain people might possess. Secondly, this dissertation also offers a new approach to generate highly novel business ideas as well as a method to include horizontal knowledge for the further development and test of novel ideas. Thirdly, this thesis presents new insights into corporate entrepreneurship training from an online perspective. Although more research is needed in the future, this dissertation represents a significant milestone as it offers several proposals to practical problems in the field of corporate entrepreneurship; something which benefits both scholars and practitioners in search of unlocking innovation capabilities and increasing the returns of innovation in organisations.

The first article, *New Insights on Innovative Individuals: Uncovering the Characteristics of Corporate Entrepreneurs*, accounts for the initial steps of this thesis by providing a rigorous examination of the historical research done within the area of corporate entrepreneurship from a human-centred approach. By conducting a systematic literature review, 19 intrapreneurial characteristics are identified and described in detail, comprising a more holistic definition of the concept. While these characteristics constitute a foundational element and a point of reference in the following sections in this dissertation, the paper itself imparts an immediate contribution to theory and practice, as it further advances the theorisation of who the corporate entrepreneur (intrapreneur) is and thus, what to look for in organisational and/or educational settings.

The second article, *Assessment and Corporate Entrepreneurship: Exploring a Promising New Approach for Identifying Intrapreneurial Potential*, seeks to understand how intrapreneurial potential in individuals can be discovered. With a starting point in the existing tools and methods used to spot corporate entrepreneurial (intrapreneurial) candidates, the article investigates the possibilities of designing a tool that can identify intrapreneurial potential by assessing differences in levels of specific intrapreneurial characteristics between individuals. The paper presents examples of how to design and use qualitative intrapreneurial tasks to spot such differences in individuals by employing an expert panel of evaluators, resulting in more in-depth insights of the individuals. As such, it contributes to the existing knowledge within this field and opens new avenues for scholars to further investigate.

For practitioners, the article provides an exciting new approach to identifying who has corporate entrepreneurial (intrapreneurial) potential.

The third article, *Booster Cards: A Practical Tool for Unlocking Business Model Innovation*, investigates the implications of novel idea generation in business model innovation processes; something which is of high importance in corporate entrepreneurial activities. It does so by providing a new tool – the Booster Cards (so-called stimulus cards) – developed for novel idea production in the field of business models. While other similar cards exist, this article also offers "best practice" knowledge for how to train practitioners in using them in practice. The Booster Cards are one of the first logically structured approaches (technique plus process) to develop new business model ideas. It thereby contributes to practitioners (educators and consultants) lacking an appropriate structured process to develop novel business model ideas and thus, strengthen their training processes and enhance trainee motivation. The article also contributes to the business model innovation literature by providing a practitioner-oriented tool that can support managers in this endeavour.

The fourth article, *Business Model Creativity: A Horizontal Insight Model*, explores the implications of using non-domain experts (horizontal knowledge) in the further development and test highly novel ideas that diverge from domain logic and industry causality. This is important, as these ideas have huge potential but typically are neglected by companies because they are complex to understand, difficult to evaluate and have a high degree of uncertainty. The article provides a new perspective on how to work with such highly novel ideas from a practitioner's point of view. It does so by providing a five-step approach for involving non-domain experts and horizontal knowledge in the further development and testing of highly novel ideas, which extends the existing knowledge and approaches found in the literature to move beyond from relying on simply users, customers and domain experts in this process. Thus, it contributes with a structured process for practitioners (managers, educators, consultants, and corporate entrepreneurs) to follow and opens up a new avenue for scholars to further enrich by developing more tools for the further development and test of ideas that diverge from domain logic and industry causality.

The fifth article, *Testing the Effects of Digital Gamified Creativity Training*, investigates the use of the deliberate practice of creative abilities in online environments. This field has been somewhat ignored in existing corporate entrepreneurship training programs. This is important, as idea generation is one of the main activities in the corporate entrepreneurship process and practising it online opens up great opportunities both for companies and trainees. The article offers insights into the completely unexplored area of online embodied creativity training – training solely focused on the 'doing part' of creativity. Based on an experimental research design with more than 100 trainees involved, it contributes with new knowledge about the positive effects of online embodied creativity training in terms of trainee learning achievements as well as knowledge transfers into trainees' own

profession. Besides contributing to the existing knowledge within the creativity training literature, it also gives practitioners (educators, consultants, and managers) an online tool to include in their training programs with proven effects.

The sixth article, *Online Gamified Training for Business Innovation: Examining an Embodied Gamified E-learning Module on Creativity*, explores the effect of using game-like elements as extrinsic reinforcements to stimulate (intrinsic) trainee motivation and engagement in an online creativity training program. This is important, as trainee motivation is an ongoing concern with online training, which is only magnified if the training is mandatory. The article confirms some of the fundamental principles in the gamification literature by demonstrating that extrinsic game-like reinforcements can increase trainee motivation. However, it does so in a completely new context: online embodied creativity training in an educational setting. Furthermore, it provides "best practice" knowledge for how to implement online embodied creativity training, which is especially useful for teachers, educators, and consultants. As such, it extends the knowledge related to applied creativity training and contributes to the creative training literature with new insights on the possibilities of using gamification in online training.

DANSK RESUME

Formålet med denne afhandling er at styrke det teoretiske og praktiske grundlag indenfor Corporate Entrepreneurship (entreprenørskab i virksomheder) ved at foreslå nye måder at identificere samt forbedre intraprenørielle kompetencer. Således kredser hovedbidraget af denne afhandling omkring forbedring og identifikation af intraprenørielle kompetencer. For det første fremsætter denne afhandling et nyt værktøj til at spotte intraprenørielt potentiale i individer, som kan bruges til at vurdere de skjulte eller uudnyttede evner, som visse mennesker besidder. For det andet tilbyder denne afhandling også en ny tilgang til at generere meget nye originale forretningsidéer samt en metode til, hvordan man kan inkludere horisontal viden til videreudvikling og test af nye originale ideer. For det tredje præsenterer denne afhandling ny indsigt i Corporate Entrepreneurship træning fra et online perspektiv. Selvom der er behov for mere forskning i fremtiden, repræsenterer denne afhandling en vigtig milepæl, da den tilbyder flere forslag til praktiske problemer inden for Corporate Entrepreneurship; noget der gavner både forksere og praktikere i søgen efter at forløse innovationsmuligheder og øge afkastet af innovation i organisationer.

Den første artikel, *New Insights on Innovative Individuals: Uncovering the Characteristics of Corporate Entrepreneurs*, redegør for de indledende trin i denne afhandling ved at give en grundig undersøgelse af den historiske forskning, der er udført inden for Corporate Entrepreneurship ud fra en individbaseret tilgang. Ved at gennemføre en systematisk litteraturgennemgang identificeres og beskrives 19 intrapreneurielle egenskaber i detaljer som derved omfatter en mere holistisk definition af begrebet. Mens disse egenskaber udgør et grundlæggende element og et referencepunkt i de følgende afsnit i denne afhandling, giver selve artiklen et bidrag til både teori og praksis, da det yderligere fremmer teoretiseringen af, hvordan en intraprenøren ser ud og dermed, hvad man skal kigge efter i organisatoriske- og uddannelsesmiljøer.

Den anden artikel, *Assessment and Corporate Entrepreneurship: Exploring a Promising New Approach for Identifying Intrapreneurial Potential*, søger at forstå, hvordan intraprenørielt potentiale hos individer kan spores. Med udgangspunkt i de eksisterende værktøjer og metoder, der bruges til at spotte virksomheders intraprenørielle kandidater, undersøger artiklen mulighederne for at designe et nyt værktøj, der kan identificere intraprenørielt potentiale ved at vurdere niveauforskelle af specifikke intraprenørielle egenskaber imellem individer. Artiklen præsenterer eksempler på, hvordan man designer og bruger kvalitative intraprenørielle opgaver til at få identificere sådanne forskelle hos individer ved at benytte et ekspertpanel med evaluatorer. Dette resulterer i mere dybtgående indsigt af individerne. Som

sådan bidrager denne forskning til den eksisterende viden inden for feltet og åbner derved op for nye forskningsområder, som andre forksere kan undersøge yderligere. For praktikere giver artiklen en spændende ny tilgang til at identificere, hvem der har intraprenørielt potentiale.

Den tredje artikel, *Booster Cards: A Practical Tool for Unlocking Business Model Innovation*, undersøger implikationerne af idégenerering i forretningsmodel innovationsprocesser; noget der er meget centralt i Corporate Entrepreneurship aktiviteter. Artiklen præsenterer et nyt værktøj, Booster Cards (i form for stimulikort), udviklet til skabe nye originale forretningsmodelidéer. Selvom der findes andre lignende stimulikort, tilbyder denne artikel også ”best practice” viden om, hvordan man træner praktikere i at bruge sådanne kort i praksis. Disse Booster Cards er en af de første logisk strukturerede metoder (værktøj plus proces) til at udvikle nye originale forretningsmodelidéer. Den bidrager hermed til praktikere (undervisere og konsulenter) der mangler en struktureret proces til at udvikle nye forretningsmodelidéer, som i sidste ende både styrker undervisningsprocessen og forbedre motivationen hos kursister (studerende og/eller medarbejdere). Artiklen bidrager til forretningsmodelinnovationslitteraturen ved at tilbyde et værktøj, der kan støtte ledere i bestræbelsen om at innovere en (eller flere) forretningsmodel(ler).

Den fjerde artikel, *Business Model Creativity: A Horizontal Insight Model*, udforsker implikationerne ved at bruge ikke-domæneeksperter (horisontal viden) i den videre udvikling og test af meget originale ideer, som afviger fra faglogik og kausalitet i branchen. Dette er vigtigt, da denne type ideer har et stort potentiale, men typisk bliver fravalgt i virksomheder, fordi de er komplekse at forstå, vanskelige at evaluere og har en høj grad af usikkerhed. Artiklen giver et nyt perspektiv på, hvordan man arbejder med sådanne originale ideer ud fra et praksisorienteret perspektiv. Dette gøres ved at fremsætte en fem-trins metode for involvering af ikke-domæne eksperter og horisontal viden i den videre udvikling og test af meget originale ideer. Metoden udvider herved den eksisterende viden og de fremgangsmåder der findes i litteraturen, til at gå ud over blot at benytte brugere, kunder og andre domæneeksperter i sådanne proceser. Således bidrager artiklen med en struktureret proces som praktikere (ledere, undervisere, konsulenter og intraprenører) kan følge. Samtidigt åbnes nye døre for forskere til yderligere berigelse af området, således der kan udvikles flere værktøjer til videreudvikling og test af originale ideer, der afviger fra faglogik og kausalitet i branchen.

Den femte artikel, *Testing the Effects of Digital Gamified Creativity Training*, undersøger brugen af bevidst erfaringstræning af kreative kompetencer i online-miljøer. Dette felt er blevet ignoreret i eksisterende træningsprogrammer inden for Corporate Entrepreneurship men er centralt, da idégenerering er en af hovedaktiviteterne i Corporate Entrepreneurship processer. Det, at kunne træne den egenlige udførelse online (learning-by-doing), åbner store muligheder for både virksomheder og praktikere. Artiklen giver indsigt i et helt uudforsket område

indenfor online kreativitetstræning, nemlig træning der udelukkende er fokuseret på udførelsen af kreativitet. Baseret på et eksperimentelt forskningsdesign med mere end 100 kursister involveret, bidrager denne artikel med ny viden om de positive effekter af online learning-by-doing kreativitetstræning med hensyn til indlæringspræstationer hos kursister såvel som videnoverførsel til kursisternes egen profession. Udover at bidrage til den eksisterende viden inden for kreativitetstræningslitteraturen, giver det også praktikere (undervisere, konsulenter og ledere) et onlineværktøj med dokumenterede effekter, som de bruge i deres træningsprogrammer, undervisning og/eller eftervidereuddannelse.

Den sjette artikel, *Online Gamified Training for Business Innovation: Examining an Embodied Gamified E-learning Module on Creativity*, undersøger effekten af at bruge spillignende elementer (ekstrinsisk belønning) til at stimulere indre motivation og engagement hos kursister i et online kretivitetstræningsprogram. Dette er vigtigt, da demotivation blandt kursister er et voksende problem i forhold til online træning, hvilket kun forøges, hvis træningen er obligatorisk. Artiklen bekræfter nogle af de grundlæggende principper i gamificationlitteraturen ved at demonstrere, at brugen af gamification som ekstrinsiske belønninger kan øge den indre motivation hos kursister. Dette gøres dog i en helt ny kontekst, nemlig online learning-by-doing kreativitetstræning i en uddannelsesmæssig kontekst. Desuden gives der i artiklen ”best practice” viden om, hvordan man implementerer online learning-by-doing kreativitetstræning, hvilket er særligt nyttigt for lærere, undervisere og konsulenter. Som sådan udvider artiklen den viden, som er relateret til anvendt kreativitetstræning og bidrager til den kreativetræningslitteratur med ny indsigt i mulighederne for at bruge gamification i online træning.

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This dissertation was written in the Department of Business and Management, now the Aalborg University Business School, during the period from August 2017 until the end of November 2020 (the PhD period was extended for 17 weeks in total due to two parental leaves). My contribution was to explore new tools, methods and approaches for companies to enhance their corporate entrepreneurial capabilities. I am very grateful that I had this opportunity, even though my mind has been troubled regularly since day one.

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1. FOREWORD

As advised in several methodological PhD courses, one should dare to write about how ideas have been generated – and what one has done to create them. Hence, this section describes how I became interested in the topics covered in this dissertation, starting with the introduction of the investment years in my evolving path towards becoming a business management researcher. This section, thereby, shows some of the fundamental assumptions behind my PhD studies.

For the past 30 years, academics have developed and designed the governing ideas for the old industrial economy. These ideas turned into conceptual models, tools and frameworks that I was taught during my time as a Bachelor and Master's student at Aalborg University, from 2007 to 2012. Back then, I had no idea that the world had changed. Not until my last year as a Master's student in Innovation Management and Entrepreneurship, where I won a nation-wide entrepreneurship contest. The prize was a month's stay in Silicon Valley. During this month, I visited some of the top research institutions in the world (Stanford and Berkeley), numerous interesting startups (e.g. YouNoodl) and innovative established companies like Google. I participated in springboard sessions with experienced venture capitalists as well as several supporting organisations working in the famous Silicon Valley eco-system. Everywhere I went, they talked about the Lean Startup movement and how it was changing the old ways of seeing the world as somewhat stable.

The truth is that the world is not stable anymore. The digital revolution and the rise of the Internet have changed the world as we once knew it. Today, we live in a globalised world with ever-increasing competition and where change happens overnight. Industries have vanished. Well-known business models are disrupted in ways we thought were impossible thanks to the new possibilities of digital technologies. Companies fight intensively to stay relevant and new in these highly uncertain environments. They face incredibly complex problems daily; problems that cannot be solved in the way they used to. Slow and rigid (formal) processes; organisational structures focused on hierarchy, functions and departments; goal-based reward and performance systems that can be objectively assessed; work well when you manage what you know. But building a world-class execution engine will not cut it when you have to manage what you do not know. Managing what you do not know is a different thing from the execution engine and calls for experimenting, failing and learning to shape new ideas and tackle complex problems. Companies should know how to manage in the presence of uncertainty.

As I learned during my stay in Silicon Valley, the governing principle behind the Lean Startup Methodology is to eliminate uncertainty based on agile development and validated learning. It was developed to better manage the process of building a

sustainable business as an entrepreneur. Nevertheless, the principles also work in other institutions, such as small and medium-sized enterprises, large corporations and public organisations. This is a good thing as not all people want to become entrepreneurs. Other types of professions also need to learn to manage what they do not know so they can run innovative projects in organisations and enhance the probability of success by decreasing uncertainty and risks. This calls for processes that are emergent, the informal organisation of autonomous teams with decision-making power, venture capital-style investments in a portfolio of new initiatives, and visionary novelty-seeking individuals.

My dissertation revolves around identifying and enhancing intrapreneurial competencies in the context of Corporate Entrepreneurship. Corporate entrepreneurship (CE) can be defined as entrepreneurial activities performed by a person or team inside an organisation to benefit the organisation. The initial inspiration was fostered during my stay in Silicon Valley, as well as my previous positions at the Department of Business and Management at Aalborg University (AAU). The Lean Startup Methodology came to me as a guide on how we could teach entrepreneurship in a new way, both in the classroom but also in companies.

So, as a movement against the governing ideas for the old industrial economy that I was taught in school, I found myself in a position to make a change. I got heavily involved in the development of a new entrepreneurship course, eventually named 'New Venture Creation' (NVC; www.nvc.aau.dk). Instead of developing yet another traditional reflective course focusing on understanding entrepreneurship as a phenomenon and teaching students how to write a business plan, I managed to somewhat steer the course development into incorporating the principles of the Lean Startup Methodology, greatly inspired by the work of Steve Blank and the Lean LaunchPad. The NVC became a multidisciplinary action-based course where students learned the doing part of entrepreneurship, manifested in the search for a sustainable business model.

I quickly learned that only some of the students following the course actually wanted to become entrepreneurs. In fact, most of them wanted to innovate companies. I, therefore, got the idea of developing a similar course where students – instead of searching for a sustainable business model for their own startup – worked as an autonomous entrepreneurial team inside a corporation, trying to solve a problem or unmet customer need by creating a new viable and sustainable business model for a host organisation. Eventually, the course was named "Corporate Entrepreneurship" (www.ce.aau.dk). Another title might be more appropriate, as CE is typically used to describe the entrepreneurial activities performed by one or more employees within their employing organisation. The setup I proposed was a CE 'hack' or workaround. Nevertheless, the program became quite popular – both for students and the host companies that have participated over the years.

As a co-founder, coordinator, supervisor and teacher of these two Master's level electives, I quickly got curious about how to build, enhance and nurture competencies of trainees. Furthermore, I encountered numerous organisations asking for exactly these competencies; either they talked about recruiting new prospects possessing these skills, or they wanted to develop the skills of their current employees further. This was a critical aspect to me as I wanted to make something that practitioners found meaningful and highly appreciated. In this case, the practitioners are both the trainees and the companies that wanted to make a new turn in their talent management practices by either recruiting new prospects with these skills or engaging in training activities for their current employees. Most employees and companies want to get better at this in a systematic, empirically-grounded way, which is what I am interested in and investigating in this dissertation.

Taking the helicopter view, I was (and still am) motivated to understand how we can build better businesses, starting with the individual. To the best of my knowledge, it is the collective of individuals that make the change. It is the individuals who break the pattern. It is the individuals that drive innovations forward. Nevertheless, special attention needs to be devoted to managers in firms. They are part of the equation as well, as they have the mandate to stimulate behaviour in certain ways.

However, it is not only the individuals (employees and managers) in small, medium and large organisations who interest me. It is also the young aspirants at various educational institutions waiting to enter the job market. If we can build, enhance and nurture corporate entrepreneurial (intrapreneurial) skills and mindsets, and provide the appropriate tools for managers up front, I believe we would see far more innovative and entrepreneurial behaviour happen in the world. And this is highly needed. The current COVID-19 pandemic is a good example. Companies have now witnessed that the world is not stable and that they need to make big moves fast and be willing to rethink entire portfolios by investing in new, transformative growth areas. Failure is inevitable in this process. But despite what most companies think, failure is not a loss. Instead, companies should embrace experimenting, failing and learning to shape new ideas – and turn them into profitable business models for the future in a more agile and lean way.

Looking back at my time as a PhD Fellow and before that, my previous positions at Aalborg University, I see a pattern where I have freely engaged myself in several different projects characterised by action and change. "Action" in the sense of initiating something new. "Change" in the sense that it should be somewhat different from existing (social) practices. "Project-based" in the sense that different people were involved. "Freely" in the sense that I have focused on what interested me. Also, I have been guided, in my professional and academic life, to produce governing ideas and knowledge products (e.g. models, tools and frameworks) that are useful and meaningful for practitioners. As such, I define myself as a "pragmatic experimental researcher". Not to be confused with experimental research, but experimental in the

sense that what drives me is to discover the unknown and develop and test new ideas, concepts, tools and processes.

The joy of creating new things and wanting to change existing practices is tough and exhausting. Coming up with new ideas is not the hard part. It is the actual development, refinement and execution that is draining, especially as a PhD Fellow, where you also have teaching requirements and courses to complete concurrently. Nevertheless, I feel this is my obligation as a scholar within the social sciences.

This dissertation was completed during the first and second wave of the COVID-19 pandemic. The pandemic had a massive impact on my work, especially the first wave, as several activities with companies and externals were planned for the Spring-Summer 2020. Denmark was one of the first countries to introduce a nation-wide lockdown, starting from March 13, 2020, where private employees were sent home and public institutions, such as universities, schools and day-cares, were shut down. People were asked to stay at home and not socialise. Doing experiments with companies was not an option, as the few companies that were still operating did not allow externals to enter the premises due to the danger of spreading the virus. Setting up psychical meetings, for example, expert panels, was almost impossible, as people were afraid of getting infected by the coronavirus. As an experimental researcher focusing on developing new ideas and concepts for practitioners and thus relying on conducting experiments with companies, this was a hard blow. Even though Denmark slowly started to open up again from April 15, 2020, most companies had suffered a huge economic loss. They were, therefore, only focusing on recovering and getting fully operational again. They did not have the energy to participate in experimental projects, such as allowing me to try out a new qualitative production-based test or run focus group interviews with twenty employees for a total of two hours. I had to accept this new situation, and I made the necessary pivotal changes in my project planning for the last eight months of my PhD period. The result is, however, that I did not get as far as I wanted in some of my projects. On the other hand, this offers an opportunity for me to pursue some of these things after my PhD period has come to an end.

The structure of this dissertation is as follows. In section 2, the phenomenon under study, research aim and research questions are presented. Section 3 is an integrated state-of-the-art section that describes the current knowledge about the studied matter and identifies theoretical gaps, which are later discussed in more detail in the substantive research objectives and su-conclusions are drawn. In section 4, the research design and philosophy of science is presented in an integrative way. This section also includes a discussion of the different strategies of inquiry employed in this dissertation as well as the specific methods. Section 5 concludes this dissertation. Finally, the appendices present the scientic papers (Articles I to VI) that are the foundation of this thesis

2. INTRODUCTION

My research interest was outlined in section 1. In this section, I present a short theoretical introduction, followed by an introduction to the phenomenon under study as well as the overall research aim. Furthermore, the research question and objectives will be introduced before I present the general research approach, I employed in this dissertation.

2.1. THEORETICAL INTRODUCTION

It all starts with innovation. ‘Innovation is the umbrella under which intrapreneurs operate within an organization’ (Miller & Bauer, 2017, p. 3–4).

Even though entrepreneurship within the boundaries of existing organisations has different definitions, all of them share one common aspect: innovation. The term ‘innovation’ has become a buzzword during the last decades, accompanied by significant ambiguity (Garcia & Calantone, 2002). As a result, no single definition of innovation exists (e.g. Adams et al., 2006). Nonetheless, there seems to be a consensus on the fact that innovation should be seen as a process of turning opportunities into new ideas and getting these ideas adopted (Tidd & Bessant, 2009). Numerous process models have been proposed suggesting that the innovative process consists of several phases, such as idea generation, research design and development, prototype production, manufacturing, marketing and sales (Dooley & O’Sullivan, 2001; Knox, 2002; Poolton & Ismail, 2000). Creativity is thereby an inherent part of innovation, which is described by several scholars (e.g. Sarooghi et al., 2015).

Depending on the source, innovation can take many different forms. Hamel (2006) suggests four major classifications of innovation: operational innovation, product innovation, strategic innovation and management innovation. Others use Doblin’s innovation taxonomy, which encompasses ten innovation types divided into three categories: configuration (profit model, network, structure, process); offering (product performance, product system); and experience (service, channel, brand, customer engagement) (e.g. Keeley et al., 2013). According to McFadzean et al. (2005), the most important factors to originate from the innovation literature focus on the product, that is, new ideas and the possibility for improvement through change. Innovations can be placed on a continuum of novelty (e.g. Freeman et al., 1982). The least risky and novel form of innovation is the incremental improvement of, for example, a product, which is rather predictable and unlikely to have a huge effect on the market (e.g. Heany, 1983). On the other end of the continuum are radical (major) innovations, which are riskier, novel and unpredictable in the sense that they can completely disrupt markets and industries and create new ones (Heany, 1983; Tidd & Bessant, 2009). Garcia and Calatone (2002) argue for including a third option in between incremental and radical innovation labelled “really new”. The scholars argue

that on a macro level, incremental innovation does not disrupt the market nor technology continuity, while radical innovation disrupts both. “Really new” innovation disrupts one of the two (Garcia & Calantone, 2002).

On a micro level, innovation is found to be crucial for organisations to remain competitive in today’s globalising world (Chesbrough, 2003). Researchers have shown that a company’s ability to innovate strongly correlates with its performance (Tidd & Bessant, 2009). Likewise, innovation is a necessity for public organisations. By coming up with new ideas, approaches and processes, public organisations can answer the challenges of tomorrow and response to the ever-increasing expectations of the public (Bloch & Bugge, 2013). On a macro level, innovation is crucial for the advancement of society; it should solve social problems and enhance society’s capacity to act. Some would even argue that the future economic wellbeing of European societies is strongly dependent on our ability to innovate. As such, innovation is on the agenda for policymakers, government institutions, public organisations and industry stakeholders.

It is, therefore, important to ask: who is performing the act of innovation? The simple answer is *people*. Individually and in teams. If an organisation is defined as highly innovative by the public or by researchers, it is, in fact, individuals within that organisation who are innovative, entrepreneurial and creative. It might be the top management, middle-level management or the operational-level employees. In most cases, it is all of these groups. Top management sets the vision and direction, and their attitudes towards innovations are found to strongly influence the adoption of innovation in organisations (e.g. Damanpour & Schneider, 2006). Middle managers play an important strategic role in the formulation, implementation and realisation of strategic change (e.g. Rouleau & Balogun, 2011). Some say they might have an even greater impact in this endeavour that top managers (Huy, 2001). Operational employees are generally considered as the implementors of innovation (e.g. Sebora et al., 1994) and thus play a crucial role. As such, research on the innovative individuals or entrepreneurial-thinking employees (middle managers and operational-level employees) is evolving. Several streams and focuses have emerged, e.g. corporate entrepreneurship, intrapreneurship, corporate innovation and corporate venturing.

According to Ferreira et al. (2018), corporate entrepreneurship (CE) is the term that has gained the most attention by scholars. CE is generally believed to refer to the development of new ideas and opportunities within large or established businesses, directly leading to the improvement of organisational profitability (Kuratko, 2017). Furthermore, CE has a strong focus on stimulating entrepreneurial-thinking employees to act from within the organisation and can result in either corporate venturing (the creation of new businesses) or the renewal of an existing organisation. As such, CE should be seen as one method of achieving innovation (Kuratko, 2017) – or an effort of promoting innovative initiative from employees leading to

innovation (Åmo & Kolvereid, 2005). In comparison, innovation is the process that adds value and novelty to the organisation. Nonetheless, it is within the process of innovation that the individuals – the corporate entrepreneurs (or intrapreneurs) of the world – operate (McFadzean, 2005). In the same vein, Shaw et al. (2005) established the following relationship between CE and innovation: 'Corporate entrepreneurship can be defined as the effort of promoting innovation in an uncertain environment. Innovation is the process that provides added value and novelty to the organization and its suppliers and customers through the development of new procedures, solutions, products and services as well as new methods of commercialization. Within this process the principal roles of the corporate entrepreneur are to challenge bureaucracy, to assess new opportunities, to align and exploit resources and to move the innovation process forward. The corporate entrepreneur's management of the innovation process will lead to greater benefits for the organization.' (p. 394). Contemporary research has demonstrated that CE plays an important role in stimulating innovation, renewing the organisation, enhancing productivity, and ultimately creating superior competitive advantage in the market (e.g. Zahra, 2015; Karimi & Walter 2016).

Even though other related terminologies are sometimes used, CE is still found to be the main construct used by scholars (e.g. Sakhdari, 2016; Kuretko, 2017). The primary theoretical focus of this PhD project is, therefore, corporate entrepreneurship from a human-oriented perspective, focusing on individuals, specifically, middle managers and operational-level employees.

2.2. PHENOMENON UNDER STUDY

Studying individuals within the process of CE is an important research topic (e.g. Corbett et al., 2014), mainly due to the significant role these individuals play. Lampe et al. (2020) found that this human capital and behavioural perspective on individuals within the context of CE is grounded in the human resources and psychology disciplines. Several scholars have advocated for the importance of identifying intrapreneurial individuals, both in relation to current employees as well as new aspirants (e.g. Hornsby et al., 1993). In the same vein, Åmo and Kolvereid (2005) explicitly advise organisations to '[…] put a corporate entrepreneurship strategy in place, to recruit individuals with intrapreneurial personalities or train their current employees in innovation and entrepreneurship' (p. 17). Most of the previous research has focused on the first part, namely, to unfold the concept of a corporate entrepreneurship strategy, which includes studies on the conceptualisation and scope of CE (e.g. Sakhdari, 2016). Nevertheless, there is a lack of consensus in the literature on how we should understand and define intrapreneurs (or corporate entrepreneurs) (e.g. Blanka, 2018), as well as the appropriate tools, methods and instruments to help managers spot intrapreneurial potential in individuals (e.g. Davis, 1999; Kuratko & Goldsby, 2004; Åmo & Kolvereid, 2005). Prior research has, according to Byrne et al. (2016), identified several individual characteristics of entrepreneurs, but these are

not adequate as '[…] corporate entrepreneurs face specific organizational and external environments. The corporate entrepreneur's environment thus implies a very different set of challenges, constraints and opportunities to the entrepreneur' (p. 480). Also, while extant research acknowledges the importance of training and developing individual intrapreneurial competencies (e.g. Hayton & Kelley, 2006; Schmelter et al., 2010), there is a lack of research addressing just how these competencies may be nurtured (Heinonen, 2007). Fundamental research is needed to push this area further, allowing for new methods to be developed.

As CE is referring to the development of new ideas and opportunities within existing companies, the actual creation of new ideas and business models that are novel is a crucial activity that deviates from the usual way of doing business and is valuable to the firm (e.g. Hayton & Kelley, 2006; Goodale et al., 2011). Developing novel ideas is, however, a challenging task mainly due to people's dominant logic (e.g. Bettis & Prahalad, 1995; Chesbrough, 2003) as well as their (limited) capabilities, especially the ability to see new ideas (e.g. Pisano, 2006). Likewise, scholars stress that designing new (and novel) business models is a complex and complicated task (e.g. Teece, 2007). Further research is thus necessary within this area, especially to develop new tools, methods or processes for facilitating the development of new and novel ideas and business models.

2.3. RESEARCH AIM AND MAIN RESEARCH QUESTION

This dissertation aims to explore potential new tools, methods and approaches for identifying and enhancing intrapreneurial competencies. The main research question (RQ) of this dissertation is:

> How can we identify and enhance intrapreneurial competencies in the context of corporate entrepreneurship?

Even though the concept of CE is rather broad, and scholars disagree about its definition, in this dissertation, CE is defined in the following way:

> Corporate Entrepreneurship is a process by which an individual or team of individuals inside an established organisation undertake entrepreneurial activities and pursue new opportunities and novel ideas that departs from traditional practice and routines for the benefit of that organisation as well as its promotion.[1]

I could have used *corporate entrepreneurial* instead of *intrapreneurial*, as most scholars seem to agree that the actors performing the entrepreneurial activities inside the existing organisations, the corporate entrepreneurs and intrapreneurs of the world,

[1] This definition will be further elaborated in section 3.1.1.

represent the same thing at the individual level. Numerous authors use the two terms interchangeably (e.g. Pinchot, 1985; Hayton & Kelley, 2006; Ireland et al., 2009, Lau et al., 2012; Byrne et al., 2016), which might be caused by the fact that Pinchot's term *intrapreneur* was proposed as shorthand for intra-corporate entrepreneur (Pinchot, 1985). Nevertheless, while CE is typically studied at the firm level, intrapreneurship is mostly associated with the individual level (e.g. Blanka, 2018). For this reason, I use the term *corporate entrepreneurship* for firm-level variables (for example, the managerial aspects of stimulating entrepreneurial activities in firms) and *intrapreneurial* for individual-level variables (such as individual competencies), a distinction also proposed by Twomey and Harris (2000).

Following Byrne et al. (2016), I use the term *intrapreneurial competencies*[2] to describe the entrepreneurial attitudes, attributes, skills and knowledge of individuals. The perspective is based on the premise that we can improve human capital by, for example, training and education, but it can also be facilitated by the use of new methods, tools and processes.

In its wording, several scholars claim that CE is an oxymoron, as the words 'corporate' and 'entrepreneurship' do not go hand in hand (Stevenson & Jarillo, 1990). In fact, Vesper (1985) finds that entrepreneurship is quite the opposite of corporate management. The control-related structures, processes and policies typically associated with large corporates are, according to Goodale et al. (2011), restraining the autonomy needed to successfully promote entrepreneurial activities in established organisations, as they are put in place to '[…] counteract the adverse effects of uncertainty on the organizational system, ensure conformity to established routines, correct deviations from expected behaviors, and promote efficiency and exploitative learning within the confines of established operations' (p. 117). I completely acknowledge this fact and find the term quite contradictory. Yet, due to its heavy expansion over the last two decades (e.g. Ferreira et al., 2018) and the fact that CE is the term that has gained the most attention by scholars – thereby making it the main construct describing the phenomenon of entrepreneurial activities within established companies (e.g. Sakhdari, 2016) – as well as its consolidation into a research stream with several sub-categories or branches attached to it (e.g. Kuratko, 2017), I have chosen CE as the overall anchoring term in my main RQ.

2.4. RESEARCH OBJECTIVES

My main RQ is relatively broad, pointing to a theoretically rich phenomenon (or even phenomena) that is difficult, if not impossible, to fully analyse in a single study or within the boundaries of a single research design. For this reason, I provide an answer

[2] I use the term *intrapreneurial characteristics* in Article I, as the research agenda is to describe features or qualities belonging to an individual. This is picked up again in Article II. Nevertheless, this term should be seen as a synonym for *intrapreneurial competencies*.

to the guiding research question of this dissertation by unpacking the phenomena across three related areas of inquiry or 'angles' (Project A, B and C), which again were divided into several substantive research objectives (see Figure 1 for a graphical overview).

Project A was initiated with a focus on the identification and assessment of intrapreneurial competencies in the context of CE. I investigated this topic through four research objectives:

- RO1 (phenomenon-based): To investigate the conceptual foundation for understanding the phenomenon of corporate entrepreneurship historically, contextually and cross disciplinarily.

- RO2 (substantive): To understand the (holistic) characteristics of an intrapreneur (corporate entrepreneur).

- RO3 (phenomenon-based): To understand how companies can assess intrapreneurial (corporate entrepreneurial) potential.

- RO4 (substantive): To explore the extent to which qualitative production-based tests can contribute to an in-depth assessment of intrapreneurial (corporate entrepreneurial) potential.

Project B was initiated with a focus on novel idea creation in corporate settings. I investigated this topic through three research objectives:

- RO5 (phenomenon-based): To understand how novel ideas are created and supported in corporate settings.

- RO6 (substantive): To understand how to nurture the process of novel idea generation in the context of business model innovation.

- RO7 (substantive): To understand how non-domain expertise can help to nurture the process of further developing and testing highly novel ideas.

Project C was initiated with a focus on CE training and intrapreneurial competencies. I investigated this topic through three research objectives. These are as follows:

- RO8 (phenomenon-based): To explore corporate entrepreneurship training programs as well as their relationship with intrapreneurial competencies.

- RO9 (substantive): To understand the impact of online embodied creativity training.

- RO10 (substantive): To explore how gamification can enhance trainee motivation in online creativity training.

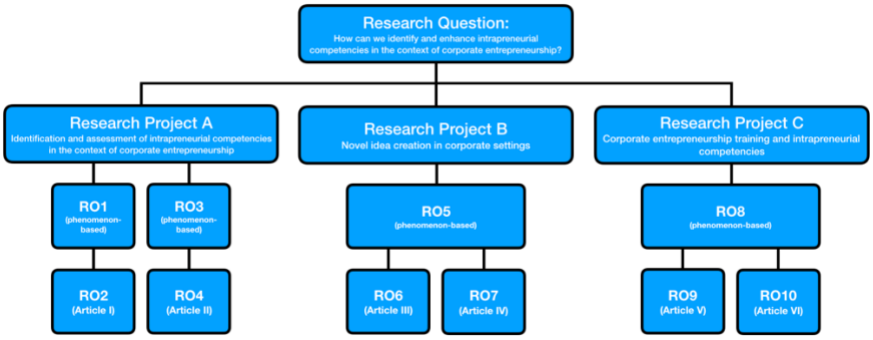

Figure 1: Overview of the different research projects, their accompanied research objectives and articles.

2.5. OVERALL RESEARCH APPROACH

In this dissertation, I employed a pragmatic research approach to science. Pragmatism finds its philosophical foundation in the historical contributions of the philosophy of pragmatism (Maxcy, 2003). As a paradigm, pragmatism advocates for "ontological experientialism" (i.e. reality can only be encountered through human experience and is thus ever-changing, based on our actions), "epistemological fallibilism" (i.e. we can never reach absolute certainty about knowledge, so we should strive for results that 'work' for the specific problem), "methodological openness and reflexivity" (i.e. researchers choose the methods or combination of methods that work best for answering their research questions), and a "value-laden" axiology, as the aim is to conduct research that benefits people (by solving real problems) where the researcher plays a role as an active interpreter through abductive inference (see section 4.2 for a more comprehensive description of pragmatism as a research paradigm).

The use of a pragmatic research approach allowed me to design a tailored research strategy for each objective and context. This resulted in six articles, out of which five have already been published in academic journals (Articles I, III, IV, V, and VI), and one that has been submitted to the Entrepreneurship Research Journal (ERJ). Two of these articles are solo-authored (Articles I and II) whereas the rest (Articles III to VI) were produced together with either domestic colleagues (Articles III and IV) or a mix of domestic and international scholars (Articles V and VI). Article III is published in a short-paper format with restrictions on the allowed pages (maximum eight pages), and Article IV is published in a special issue with a strong focus on the practical

application of the findings. All articles can be found in the appendices (Appendices A to F).

Taking a step back, I can see that the procedure used in each of the three projects I have initiated in my PhD research is the same. In each project, I firstly wanted to get inspiration from the existing literature (empirical) in a structured way (deductive). Afterwards, I employ different methods suited to each sub-theme, including qualitative methods (Projects A and B) and a mix of qualitative and quantitative methods (Project C). Initially, I intended to use quantitative methods in Project A as well. However, several circumstances – especially the COVID-19 pandemic – delayed the time plan, so that it was not possible to collect the amount of data needed to perform statistical analysis (see the "Discussion and Conclusion" section in Article II, Appendix B). While Project A and B follow a chronological order, Project C follows a thematic order (for an illustration of this, please see Figure 8).

In the next section, I will elaborate on the overall theme of each project and provide a state-of-the-art discussion around that theme (phenomenon-level), leading to the different research objectives related to each theme. Then, I will provide a state-of-the-art discussion specific to the research objectives (research-objective-level) and dive into the debate related to my specific research design and present the results from my empirical work. Finally, the implications will be described in an integrative way.

3. STATE-OF-THE-ART: AN INTEGRATIVE SECTION

This integrative section is based on the three different research projects I have focused most of my time on during my PhD period, which were presented in section 2.4.

3.1. PROJECT A: IDENTIFICATION AND ASSESSMENT OF INTRAPRENEURIAL CHARACTERISTICS

In the first of these projects, I was interested in the identification and assessment of intrapreneurial characteristics as well as intrapreneurial potential in the context of CE. I investigated this topic through these four research objectives:

- RO1 (phenomenon-based): To investigate the conceptual foundation for understanding the phenomenon of corporate entrepreneurship historically, contextually and cross disciplinarily.

- RO2 (substantive): To understand the (holistic) characteristics of an intrapreneur (corporate entrepreneur).

- RO3 (phenomenon-based): To understand how companies can assess intrapreneurial (corporate entrepreneurial) potential.

- RO4 (substantive): To explore the extent to which qualitative production-based tests can contribute to an in-depth assessment of intrapreneurial (corporate entrepreneurial) potential.

3.1.1. RESEARCH OBJECTIVE 1

Even though there is no universally accepted definition of CE (Gautam & Verma, 1997; Sharma & Chrisman, 1999; Ferreira et al., 2018), CE is generally believed to refer to the development of new ideas and opportunities within large businesses, leading to the improvement of organisational profitability (Kuratko, 2017). Thus, CE is different from entrepreneurship, as the latter refers to the act of creating a new venture outside an existing organisation (Parker, 2011). Furthermore, CE has a strong focus on stimulating entrepreneurial-thinking employees to act from within the organisation. Lampe et al. (2020) found that the conceptualisation of CE is mainly used by entrepreneurship, strategy and innovation scholars.

According to Kuretko (2017), the concept of CE has been discussed by academics since the early 1970s. Since then, the term CE has progressed over the last decades, and definitions have likewise varied (Kuretko & Morris, 2018; Tseng & Tseng, 2019). Sometimes, other related terminologies are used, such as organisational entrepreneurship (e.g. Cornwell & Perlman, 1990), intrapreneurship (e.g. Pinchot, 1985), corporate venturing (e.g. Burgelman, 1983), internal corporate entrepreneurship (e.g. Jones & Butler, 1992) and strategic entrepreneurship (e.g. Hitt et al., 2011). Due to the existence of different, yet associated themes, I used a phenomenon-based research objective (RO1) to guide the following section:

> RO1: To investigate the conceptual foundation for understanding the phenomenon of corporate entrepreneurship historically, contextually and cross disciplinarily.

I found my initial point of departure from the study by Kuretko (2017), which I then used to as a point of departure for an iterative process of searching backwards (through the reference list) as well as forwards (using the "cited by" feature in Google Scholar) to uncover other interesting articles related to the topic. This approach is sometimes referred to as pearl growing (Schlosser et al., 2006).

Decade of the 1970s

The concept of CE dates back to the 1970s (Elia et al., 2016). Peterson and Berger (1972) were the first to study large organisations' efforts to employ entrepreneurship as a strategy. Most of the early CE research was concentrated on internal venture teams and how to develop entrepreneurial activities inside an existing organisation (Kuretko, 2017). The latter has been heavily debated ever since, as some scholars believe that entrepreneurial activities inside existing organisations are an impossible act (e.g. Morrison, 2003; Blank, 2013a). Yet, a larger number of researchers have comprised the idea of CE and conceptualised it as a process of organisational rejuvenation (e.g. Pullen et al., 2009; Simsek & Heavey, 2011). For example, Ireland et al. (2009) conceptualised a CE strategy as 'a vision-directed, organization-wide reliance on entrepreneurial behavior that purposefully and continuously rejuvenates the organization and shapes the scope of its operations through the recognition and exploitation of entrepreneurial opportunity' (p. 21).

With its roots in the work of Von Hippel (1977), the internal venture team played a crucial role in creating the *corporate venturing* (CV) domain of CE. CV was established to define the addition or development of new businesses within an existing organisation (e.g. Sykes, 1986) and involves company involvement in the creation of new businesses. It is categorised into two main activities: internal corporate venturing (ICV) and external corporate venturing (ECV). ICV is generally defined as any innovation that is created within the firm, owned by the firm and moved to a new business that typically resides within the current corporate structure. On the other hand, ECV describes a situation where any innovation that is created

outside the firm and subsequently investing in or acquired by the corporation (typically young startups or early growth-stages ventures), making ECV a means to gain competencies. Lampe et al. (2020) found that CV has developed into a rather independent scholarly discussion, focusing on the structuring and financing of corporate ventures, based on absorptive capacity (cf. Cohen & Levinthal, 1990) and the knowledge-based view[3] as theoretical grounding. Also, this sub-domain has caught attention from the finance and accounting literature (Lampe et al., 2020).

Decade of the 1980s

Since Gifford Pinchot published his book on *intrapreneurship* in 1985, primarily based on case studies of experienced intra-corporate entrepreneurs, this term has gained increasing popularity (Neesen, 2019). In fact, Kuretko (2017) concluded that intrapreneurship and CE are the two main literature streams focusing on entrepreneurial activities in firms. As such, the concept of intrapreneurship needs special attention.

Intrapreneurship has been defined as the entrepreneurial behaviour of employees and the development of new ventures within the existing structures of an organisation (Deloitte Digital, 2015). Others have used an even broader definition of intrapreneurship, stating that it is merely 'entrepreneurship within an existing organisation' (Antoncic & Hisrich, 2001, p. 495). Both of these definitions are very close to the concept of CE. This has led scholars to question if intrapreneurship and CE are the same. Nevertheless, intrapreneurship has developed into an independent research stream (e.g. Lampe et al., 2020). The word 'corporate' does, however, imply that the organisation should have a certain size. The Oxford Dictionary and Cambridge Dictionary both describe 'corporate' as an adjective related to a *large* business company, which the OECD (2020) defines as enterprises that employ more than 250 people. Antoncic and Hisrich (2001) specifically avoid using the term CE in their study, as they not only focus on entrepreneurial activities in large enterprises but also in small- and medium-sized firms. In the past decade, several scholars have followed the line of thinking proposed by Antoncic and Hisrich (2001) and incorporated firm size when deciding whether their research should use the term intrapreneurship or CE; for example, the studies by Sijde and Veenker (2013), Carrier (1994), Bosma et al. (2010), and Bouchard and Basso (2011), to name a few. According to Kuratko (2017), researchers became disillusioned with the intrapreneurship concept by the end of the 1980s, which might be the reason why various scholars later have called for the interchangeable use the terms (e.g. McFadzean, 2005). Maybe the overlaps in the definitions of the two terms (intrapreneurship and CE) bewildered some. Still, others, for example, Christensen

[3] The knowledge-based view of firms is a further development of the resource-based view, developed by the Penrose (1959) and its later expansion by Barney (1991).

(2005) and Urbano and Turro (2013) request a clear distinction between the two terms.

Miller and Bauer (2017) divide intrapreneurship literature into two main categories: theoretical studies and empirical studies. Within the theoretical stream, the main goal is to explain intrapreneurial behaviour centred on already recognised frameworks, with a special focus on the process and antecedents of intrapreneurship. The empirical studies are found to be either quantitative (trying to explain the relationship between intrapreneurship and firm performance, intrapreneurship and innovation output, or individual characteristics and intrapreneurial behaviour etc.) or qualitative (seeking to understand intrapreneurial activities of practitioners, both the intrapreneurs and their managers). As the majority of studies are quantitative (e.g. Neesen, 2019), Miller and Bauer (2017) question why there is a lack of qualitative research trying to understand intrapreneurs as individuals and why most scholars tend to investigate intrapreneurs through other lenses (e.g. with innovation projects as the unit of analysis, managers or co-workers perspective of intrapreneurial behaviour).

From a recent literature review, Blanka (2018) stressed that CE and intrapreneurship are, in fact, distinct concepts. The former is generally enlisted, defined and studied as a top-down approach to innovation (firm-level construct), while the latter is generally associated with the independent and autonomous initiatives of employees, making it a person-centred bottom-up approach to innovation. Recent research has, nonetheless, showed that CE and intrapreneurship might be more similar than previously acknowledged. From a bibliometric analysis, Lampe et al. (2020) found that research focusing on intrapreneurship is in the same research area as articles focusing on CE, illustrating that both groups of articles focus on similar topics, such as the internal environment of CE. Nevertheless, articles within the domain of intrapreneurship typically take a behavioural perspective on individuals and are mostly studied by scholars from the human resources and psychology research fields (Lampe et al., 2020).

The top-down and bottom-up approaches can be tracked back to Burgelman (1983), who defined two behaviours: induced strategic behaviour and autonomous strategic behaviour. The former has developed into what we would define as CE strategy, for example, when a company facilitates induced innovation through programs like training activities, idea competitions, allocated innovation time[4] or similar. The latter refers to situations where employees autonomously see opportunities beyond those that management suggests and decide to act on those opportunities for the greater good of the company. This autonomous strategic behaviour is referred to by some scholars as informal corporate entrepreneurship (e.g. Hashimoto & Nassif, 2014),

[4] For example, the 20% rule at Google, where employees are encouraged to devote one day a week on side projects, they deem valuable for the company (e.g. Adams, 2016).

where the employees demonstrating this behaviour are what Pinchot originally would have defined as intrapreneurs (Miller & Bauer, 2017).

The work of Burgelman (1983), Pinchot (1985) and others made CE a separate research topic around the early to mid-1980s (Sakhdari, 2016). In the late 1980s, growing attention was given to the issue of levels of management as well as the struggle of managing mature organisational practices along with successful management of new corporate ventures (e.g. Sykes & Block, 1989). In general, top-level management is acknowledged in the literature due to its essential role in strategy making. Their attitude towards innovative and entrepreneurial activities is important, as they set the vision but also have the power to shut down projects. Still, several scholars have stressed that all levels within an organisation need a strong commitment before entrepreneurial behaviour can be a defining characteristic (e.g. Pearce et al., 1997). Studies of management levels tend to focus on getting a better understanding of the manager within the structures of entrepreneurial organisations and associated success factors. As such, senior-level, middle-level and first-level managers are found to be crucial for instigating and promoting a pro-entrepreneurship environment as well as the successful implementation of a CE strategy (e.g. Ling et al., 2008; Hornsby et al., 2009). Successful implementation of a CE strategy has been addressed by several authors over the years, with Kanter (1985) and Hisrich and Peters (1986) providing the fundamentals in this sub-domain. From this, scholars started to focus on understanding how to implement CV successfully; the work of Dougherty (1995) and Tidd and Taurins (1999) focused on utilising CV as a way to gain competencies. Some of the main topics within this area have been to pinpoint alternative incentive and management practices to meet the differentiated needs of the corporation and the intrapreneurs (Kuretko, 2017).

Decade of the 1990s

In the early 1990s, the foundation of *entrepreneurial orientation* (EO) as a domain within CE was established, especially by the work of Covin and Slevin (1991). Based on the idea that innovation is a dimension of strategy making, the scholars suggested the existence of a continuum of a company's strategic behaviour, ranging from more conservative to more entrepreneurial. The entrepreneurial end was, according to Covin and Slevin (1991), demonstrated by high levels of innovativeness, proactiveness and risk taking, three dimensions that were proposed by Miller (1983). Later, autonomy and competitive aggressiveness were included in the dimensions of EO. The strategic element inherent in EO makes it a firm-level construct (Blanka, 2018). Since Covin and Slevin (1991) laid the groundwork for this domain, there has been a focus on connecting EO to firm performance (e.g. Lumpkin & Dess, 1996; Rauch et al., 2009) and measuring the various dimensions of EO empirically in organisations (e.g. Lumpkin & Dess, 2001; Lumpkin et al., 2009). Also, there has been a growing interest from scholars in developing EO models, for example, the work of Wales et al. (2011), Covin and Wales (2012), and Anderson et al. (2015). Lampe et al. (2020) found that studies employing an EO focus generally draw on the

resource-based view (cf. Barney, 1991) and the dynamic capabilities (cf. Teece et al., 1997) literature. Furthermore, the conceptualisation of EO is also used within the intrapreneurship stream (Lampe et al., 2020). These studies focus on the 'climates' of intrapreneurship but not on the variation in characteristics and factors of individuals (Neesen et al., 2019).

Through the 1990s, more comprehensive definitions of CE arose. For instance, *new venture creation* within incumbent organisations and *strategic renewal* (SR) were proposed as two practises of corporate entrepreneurship, thus evolving the definitions. Zahra's (1993) research laid the groundwork for redefining the field of CE so that the concept now entailed the creation of new businesses or entrepreneurial innovations (such as products or processes) in incumbent organisations. Meanwhile, Guth and Ginsberg (1990) defined SR as a conceptual element of CE. Several studies have been focused on confining the concept of CE to financial performance (e.g. Stopford & Baden-Fuller, 1994) as well as acquiring organisational capabilities (e.g. Zahra et al., 1999a). Interestingly, Lampe et al. (2020) found that SR has developed into an independent scholarly discussion about the strategic renewal of organisations. This research topic is predominantly drawn from strategic management and discussed by entrepreneurship and strategy scholars as well as innovation and organisational studies scholars (Lampe et al., 2020). The importance of middle-level managers was also prominent in the 1990s, mainly due to their central organisational position (e.g. Fulop, 1991) – a topic that has received ongoing attention from scholars (e.g. Hornsby et al., 2009; Radaelli & Sitton-Kent, 2016).

Another emerging theme in the 1990s was the development of general models of the CE process (Ireland et al., 2009). The work of Hornsby et al. (1993) and Russell (1999) was aimed at capturing the entire process of CE and how it was related to factors in the organisation and the environment. Later, more refined CE models were developed together with sub-theme models, such as CV models, EO models and strategic entrepreneurship (Kuretko, 2017). This work has developed each sub-field and shed light on different aspects of CE, especially the external environmental conditions, organisational antecedents, the CE process and behaviour of individuals, and the potential output. Again, in the 2010s, there has been a renewed focus on developing integrated models of CE, e.g. the work of Kuratko (2010).

Decade of the 2000s

In the beginning of the 21st century, CE became a well-defined research field (e.g. Kuretko, 2017). Nevertheless, the term *strategic entrepreneurship* (SE) was proposed to describe the search for competitive advantage through momentous innovations that are absorbed into the existing organisation (e.g. Hitt et al., 2001). SE relates to a broader range of entrepreneurial activities or innovations that do not automatically involve new businesses being added to the company. Hitt et al. (2001) define SE as 'the integration of entrepreneurial (i.e., opportunity-seeking behaviour) and strategic (i.e., advantage seeking) perspectives in developing and taking actions desired to

create wealth' (p. 481). The creation of wealth is a significant focal point in the research of SE; exemplified by the work of Ireland et al. (2001) and Ketchen Jr. et al. (2008). The latter focuses on how companies (small to large) can build the competencies necessary for identifying opportunities that go across organisational boundaries. Several scholars later coined SE as one of the two main domains of CE, together with CV (e.g. Morris et al., 2011). Lampe et al. (2020) found that articles within the SE domain are generally focused on topics related to strategy, for example, organisational learning as well as the dynamic capabilities of entrepreneurial firms. As such, SE is mostly discussed by academics within the area of strategic management, innovation and entrepreneurship (Lampe et al., 2020).

Also, scholars in the 2000s increasingly focused on measuring CE – a theme that has gained momentum in the 2010s as well (Kuratko, 2017). Measurement scales like the *Corporate Entrepreneurship Assessment Instrument* (CEAI), *entrepreneurial intensity* (EI), and *The Health Audit for Corporate Entrepreneurship* have been important means of measuring various aspects of corporate innovation and CE strategy (Kuretko, 2017). CEAI was developed to assess, evaluate and manage an organisation's internal work environment to support the entrepreneurial behaviour of employees (Kuratko et al., 1990; Kuratko et al., 2014), while *The Health Audit for Corporate Entrepreneurship* (Ireland et al., 2006a; 2006b) was developed to assess an organisation's ability to foster entrepreneurship. These instruments have been important means of assessing numerous aspects of CE strategy, but Kuratko (2017) still calls for new effective tools and instruments to assess CE. Significantly, there has been a lack of instruments at the individual level, resulting in a state were no reliable or valid instruments have been developed (Kuratko & Goldsby, 2004).

Decade of the 2010s

During the 2010s, articles focused on measurement have increased, and there has been renewed attention on developing integrated models of CE (Kuretko, 2017). Also, more refined research into the different sub-areas of CE has been initiated in this period, for instance, the expansion of CE to include SMEs and public organisations (e.g. Nason et al., 2015; Kearney & Morris, 2015), the execution of CE in family businesses (e.g. Minola et al., 2016), the role corporate venture capital plays for innovation in companies (e.g. Weber et al., 2016; Wadhwa et al., 2016), ECV as a way of acquiring innovation (e.g. Basu et al., 2016; Titus Jr. et al., 2017), women's role in CE (e.g. Lyngsie & Foss, 2017), and the validation/termination of corporate entrepreneurial projects in organisations (e.g. Behrens & Patzelt, 2016).

Finally, since the very early days of CE research, there has been a focus on the corporate entrepreneur as an individual (Kuratko, 2017), a topic also heavily studied within the intrapreneurship domain (Miller & Bauer, 2017; Blanka, 2018). According to Gawke et al. (2017), the study of entrepreneurial activities by employees has been apparent since the 1980s. Even though CE is a firm-level construct, it is displayed in the actions and behaviours of the employees in these firms (Ren & Guo, 2011;

Stevenson & Jarillo, 1990), which is no surprise given their substantial role in the development of new ideas and opportunity exploitation. Some researchers have focused their work on innovation (or entrepreneurial) "champions" within organisations, placing these individuals as the main driving force behind CE (e.g. Howell & Higgins, 1990; Greene et al., 1999). According to Kuratko (2017), the research attention has, however, shifted to focusing more on identifying the characteristics of corporate entrepreneurs, with a particular interest in operational-level employees. An example is the study by Holt et al. (2007), where the different characteristics identified are discussed. Nevertheless, there is a lack of consensus in the literature on how we should understand and define intrapreneurs or corporate entrepreneurs (e.g. Blanka, 2018) as well as appropriate tools, methods and instruments to help managers spot intrapreneurial potential in individuals (e.g. Davis, 1999; Kuratko & Goldsby, 2004; Åmo & Kolvereid, 2005). Prior research has, according to Byrne et al. (2016), identified a number of individual characteristics of entrepreneurs, but these are not adequate as '[…] corporate entrepreneurs face specific organizational and external environments. The corporate entrepreneur's environment thus implies a very different set of challenges, constraints and opportunities to the entrepreneur' (p. 480).

Several sub-themes have been associated with the study of the corporate entrepreneur/intrapreneur as an individual; for example, the identification as well as the training and development of these individuals, both somehow incorporating measurement and assessment. Kierulff (1979), Herron (1992) and Lau et al. (2012) have provided valuable suggestions in terms of identifying corporate entrepreneurs (or intrapreneurs). However, the literature still lacks appropriate tools and methods to support managers in this endeavour (e.g. Davis, 1999). Training and developing individual CE competencies are recognized as highly influential in extant research. While some research on corporate entrepreneurship training (CET) has emerged, there is a lack of research that examines exactly how CE competencies can be nurtured and developed (e.g. Hayton & Kelley, 2006; Heinonen, 2007; Schmelter et al., 2010).

Empirical findings and discussion

The major concepts around entrepreneurial behaviour in incumbent organisations are depicted in Figure 2**Error! Reference source not found.**. This figure highlights that most research within the field of CE is focused on the organisational level, but some research is still being conducted at the individual level. Some scholars have termed this human-oriented CE (e.g. Elia et al., 2017). On the other hand, most research within the field of intrapreneurship is focused on the individual level but with some studies still conducted at the organisational level. There is an overlap between the CE and intrapreneurship literature streams, as also stated by Lampe et al. (2020). EO is a firm-level construct but still has ties to both the CE and intrapreneurship literature.

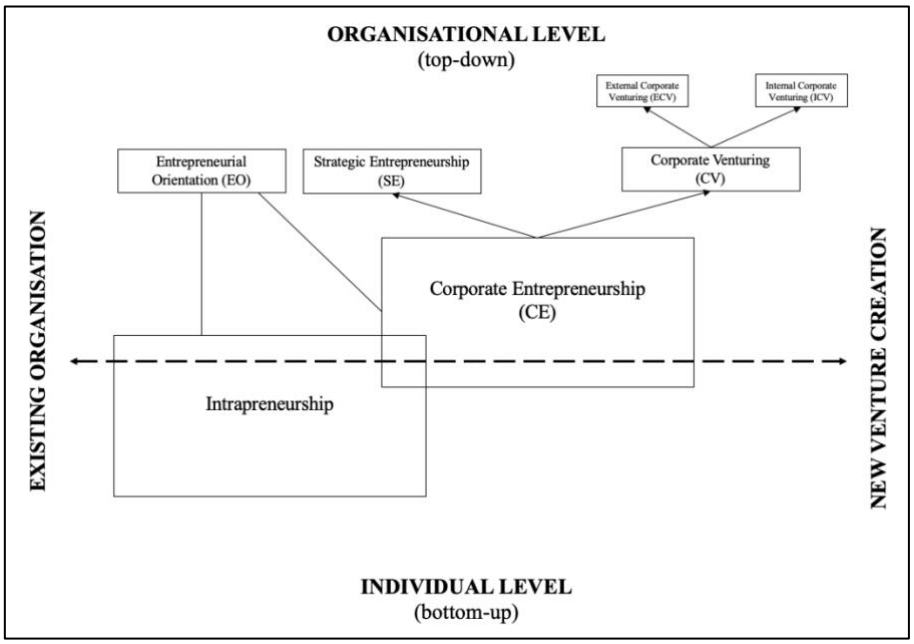

Figure 2: Mapping research on entrepreneurship within organisations.

From this review, seven different research focuses can be extracted: concept development, focus on management levels, the corporate entrepreneur as an individual (and intrapreneurship), implementation of CE, measurement of CE, aspects of CV, and elements of SE. These themes can be conceptualised into four main areas of interest: people (operational-level employees, first-level to senior-level managers), practices (management, rewards, support, implementation), processes (success factors and pitfalls), and payoff (effects on firm performance). These are depicted in Figure 3.

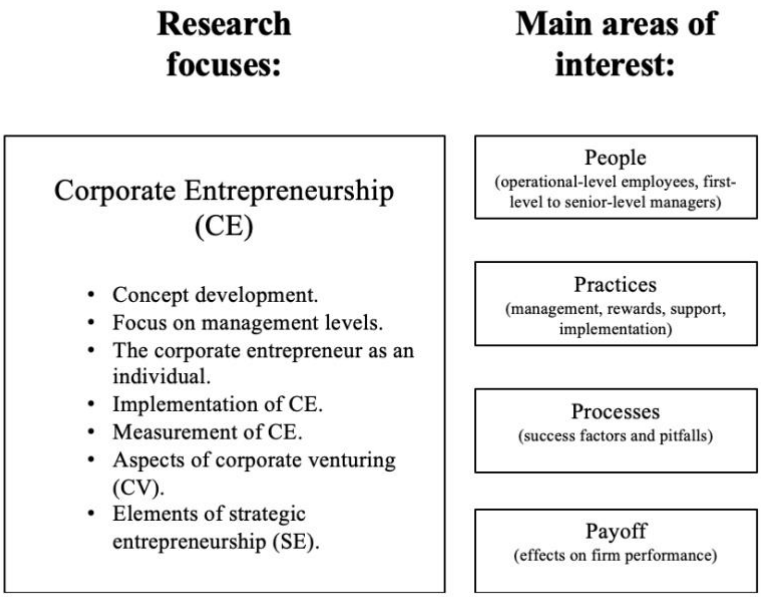

Figure 3: Main research focuses within the CE literature and the four main areas of interest.

The list of definitions of corporate entrepreneurship is long, as the concept has evolved (e.g. Kuretko, 2017; Elia et al., 2016). Some of these definitions are listed in Table 1 (in chronological order) together with their related sub-domain.[5]

[5] Only articles using the term 'corporate entrepreneurship' were used in this overview. A similar overview can be found in Elia et al. (2016), but the authors chose to include articles in their work where intrapreneurship is used as the primary construct.

Author	Definition of Corporate Entrepreneurship	Sub-domain (if any)
Burgelman (1983)	A process whereby firms engage in diversification through internal development.	Intrapreneurship
Miller (1983)	Activities that an organisation adopts to enhance innovation in products, risk-taking and reactive responses to environmental forces.	EO
Kanter (1985)	A firm's ability to learn and unlearn continuously by creating and exploiting new combinations of knowledge and by leveraging the organisation's intellectual capital and in particular human and social capital.	SR
Stevenson and Jarillo (1990)	The ability of individuals within the firm to pursue opportunities, which defines the ability of the whole organisation to be entrepreneurial.	SR
Zahra (1991)	The process of creating new business within established firms to improve organisational profitability and enhance a company's competitive position or the strategic renewal of existing business.	SR
Covin and Slevin (1991)	The basic strategic stance of a firm (measured through its innovation, proactivity and risk-taking behaviour) in relation to engaging in entrepreneurial behaviour.	EO

Zahra and Covin (1995)	A set of global practices that occur by discovering and following new opportunities via new business models, innovation or creating new businesses.	SE
Scott et al. (1998)	The process of stimulating innovative ideas and processes, often with a focus on wealth creation.	SE
Echols and Neck (1998)	A system enabling individuals to use creative processes that enable them to apply and invent technologies that can be planned, deliberate and purposeful in terms of the level of innovative activity desired.	SE
Sharma and Chrisman (1999)	A process by which an individual, or a group of individuals, in an association with an existing organisation, create a new organisation or instigate renewal or innovation with that organisation.	CV / SR
Hayton and Kelley (2006)	A process that renews companies, enhances their competitive advantage, spurs growth, creates new employment opportunities and generates wealth.	SR
Rutherford and Holt (2007)	A process enhancing the ability of the firm to acquire and utilise the innovative skills and abilities of the firm's members.	SR
Fisher (2011)	A process of corporate renewal in established firms. The goal of this process is to increase profitability, to enable strategic renewal and to foster innovativeness.	SR
Jaen and Linan (2013)	The activities of an organisation to enhance innovations, risk-taking and proactive responses to forces from the environment.	SE / EO

Garcia-Morales et al. (2014)	A process by which individuals inside an organisation undertake new activities and depart from routines to pursue new opportunities.	Intrapreneurship
Vanacker et al. (2017)	Formal or informal activities aimed at creating new businesses in established companies through product and process innovations and market developments.	CV / SE
An et al. (2018)	A set of firm-wide activities that centers on the discovery and pursuits of new opportunities through entrepreneurial activities, such as product innovation, venturing and strategic renewal.	-
Martín-Rojas et al. (2020)	A process that occurs inside an existing firm, regardless of its size, and leads not only to new business ventures but also to other innovative activities, such as development of new products, services, technologies, administrative techniques, competitive strategies and even new business models.	-

Table 1: Definitions of corporate entrepreneurship.

From Table 1, it can be concluded that the definitions of CE as a concept vary based on the lenses being used to study the topic, indicated by the related sub-domains. This is, however, not a surprise. Also, it can be derived that the definitions accentuate either the individual or the organisation. Most definitions take an organisational point of view, focused on the creation of new businesses, products and ventures. This finding is in line with the conclusions drawn in the study by Neessen et al. (2019). Some definitions do, however, focus on the individuals – or team of individuals – inside existing organisations from a process point of view (e.g. Stevenson & Jarillo, 1990; Sharma & Chrisman, 1999; Garcia-Morales et al., 2014). Several scholars mention individuals in their definition but still focus on the strategic managerial element of stimulating or enabling individuals to act in the desired way, for example, Echols and Neck (1998).

On the other hand, Kanter (1985) consider CE as a learning process that nourishes the human capital of the organisation to pursue business goals. In the same vein, Rutherford and Holt (2007) connect CE to the exploration and exploitation of employees' competences and skills. Others view CE as a strategic stance for diversification based on development from within the organisation (e.g. Burgelman, 1983; Zahra, 1991; Covin & Slevin, 1991).

Nevertheless, for this dissertation, CE is defined as:

> a process by which an individual or team of individuals inside an established organisation undertake entrepreneurial activities and pursue new opportunities and novel ideas that departs from traditional practice and routines for the benefit of that organisation as well as its promotion.[6]

This definition is similar to the one proposed by Sharma and Chrisman (1999). Both definitions focus on activities or processes; they appreciate the individuals – or team of individuals – that drive innovation forward (human-centred approach) and recognise a relationship between these individuals and the existing organisation. The

[6] The wording 'entrepreneurial' and 'inside an established organisation' could have been merged into the word 'intrapreneurial', which – in its original form – was used to describe an 'intra-corporate entrepreneur' by Pinchot (1985). Nonetheless, using the term intrapreneurial somehow creates redundancy if it is accompanied by the words 'inside an established organisation'. Also, some of the scholars advocating for a strong separation between the terms CE and intrapreneurship might be rather antagonistic towards such a definition, for example, Christensen (2005) and Urbano and Turro (2013).

latter is what clearly separates CE from entrepreneurship[7] (Phan et al., 2009), even though the process of exploring new opportunities in existing organisations entails some of the same risks as startups are facing, mainly because outcomes of innovation are difficult to predict (Phan et al., 2009). Nevertheless, the definition by Sharma and Chrisman (1999) does not encompass the managerial perspective of CE; namely, the fact that organisations can stimulate employees to act from within the organisation by introducing several initiatives, such as new organisational structures, processes, reward systems, or training and development programs. As already stated in the Foreword, I am genuinely motivated to understand how we can build better businesses, starting with the individuals – both the existing employees in companies and their managers – but also the young aspirants waiting to enter the job market. However, the development and training of individuals to become more intrapreneurial is only one part of the equation. Most researchers agree that for corporate entrepreneurial processes to be successful, companies are required to set up organisational structures that promote an innovative environment, and the top management must appreciate and support activities that diverge from the usual way of doing business (e.g. Echols & Neck, 1998; Hayton & Kelley, 2006). As also stated by Goodale et al. (2011), '[…] CE flourishes in established firms when individuals are free to pursue actions and initiatives that are novel to the firm' (p. 116). As such, it was important to specify *what* these individuals or teams of individuals are working on in CE processes, i.e. new opportunities and novel ideas, and not just 'common ideas' or concepts that are similar to what the company normally does.

Organisations (and their managers) have a significant impact concerning the attitude towards entrepreneurial activities driven by individuals. It is the top management that has the mandate to invest in new initiatives, for example, new recruitment and selection practices to find individuals with intrapreneurial potential, new development and training programs to enhance the competencies of the employees, or new process-based reward and performance systems that promote experimentation, ideation as well as failing and learning (pivoting). Such initiatives are managerial actions and management and strategy research is underpinned by the assumption that you affect things. For those reasons, I also wanted to include a managerial perspective in my working definition of CE. Also, I perceive managers in companies as one of the primary target groups for my research.

[7] CE is separated from entrepreneurship since it happens inside an existing organisation. In contrast, entrepreneurship is used to describe the process by which an individual (or team) pursue opportunities without regard to resources they currently control.

3.1.2. RESEARCH OBJECTIVE 2

This section is based on the paper titled "New Insights on Innovative Individuals: Uncovering the Characteristics of Corporate Entrepreneurs", published in Journal of Creativity and Business Innovation.

Rutherford and Holt (2007) stress that individual characteristics of employees are one of the three main categories of antecedents of CE. Similarly, numerous researchers have advocated for the importance of identifying intrapreneurial employees, as these are the main drivers of innovation in organisations (Pinchott, 1987; Davis, 1999; Åmo & Kolvereid, 2005; Hayton & Kelley, 2006; Miller & Bauer, 2017). As a result, many organisations have progressively tried to implement corporate entrepreneurship strategies focusing not only on training efforts but also on the identification of people with an intrapreneurial potential to support and further develop (Miller & Bauer, 2017). Åmo and Kolvereid (2005) furthermore advise organisations to not only look at their current employees when doing this exercise; recruiting individuals with intrapreneurial characteristics should, according to them, be an integrated part of a corporate entrepreneurship strategy.

The study of the individual within the process of CE is an important research topic (Corbett et al., 2014). Identifying these individuals is, however, a challenging task. The reason appears to be two-fold.

Firstly, numerous streams have emerged around the notion of entrepreneurial-thinking employees, for example, intrapreneurship (intrapreneurs), corporate entrepreneurship (corporate entrepreneurs) as well as corporate innovation (corporate innovators). While several researchers in each of these fields have been interested in their actors – i.e. the intrapreneur, the corporate entrepreneur, and the corporate innovator – the different streams have led to some confusion. On the one hand, the terms are used interchangeably (e.g. Pinchot, 1985; Hayton & Kelley, 2006; Ireland et al., 2009), indicating a common agreement that the actors at the individual level represent the same thing. On the other hand, within each field, researchers tend to adopt heterogeneous definitions and terminologies (Blanka, 2018), which creates confusion and challenges the ability for scholars to draw effectively on the work of others. Furthermore, research focusing on individuals has studied various types of employees, e.g. middle and operational managers (e.g. Shimizu, 2012) as well as operational-level employees. As such, there has been limitations to the cumulative progress of this research area. Burger and Van de Vrande (2016) call for further research to investigate who the intrapreneur is and thereby advance the theorisation.

Secondly, while great progress has been made in terms of organisational assessment tools (e.g. Kuratko et al., 1990; Hornsby et al., 2002; 2008; Ireland et al., 2006a; 2006b), no reliable or valid measures have been developed at the individual level (Kuratko & Goldsby, 2004). Individual characteristics are mentioned as a key component of the CE process by many (e.g. Ireland et al., 2009; Ireland et al., 2006a; 2006b; Hornsby et al., 2002; 2008), but scholars tend to focus on organisational

characteristics instead (Hornsby et al., 1993). Elia and Margherita (2018) came to the same conclusion in their study. Also, several studies use the firm-level labels (i.e. innovativeness, risk taking and proactiveness) developed by Miller (1983) to assess the individuals. However, such an approach is questionable – a topic also discussed by Farrukh et al. (2016). Another group of studies use entrepreneurial behaviour scales or standard entrepreneurship instruments (like the Global Entrepreneurship Monitor) by tweaking these into a corporate entrepreneurial setting, for example, Urbano et al. (2013), Bager et al. (2010), and Martiarena (2013). Again, this raises some concerns as intrapreneurs (corporate entrepreneurs) and traditional entrepreneurs are found to be two different things (Hill, 1987; Geisler, 1993; Davis, 1999; Hayton & Kelley, 2006; Camelo-Ordaz et al., 2012; Blanka, 2018). Although numerous researchers have found organisational-level instruments to be essential in measuring various aspects of corporate innovation (e.g. Kuratko, 2017), they have not been able to explain variations in innovation behaviour (Åmo & Kolvereid, 2005). In general, the lack of assessment methods at the individual level has left managers with minimal support in identifying these individuals (Davis, 1999). As such, further advancement and additional instruments are called for (e.g. Åmo & Kolvereid, 2005; Kuretko, 2017).

I used the following substantive research objective (RO2) to guide this section:

> RO2: To understand the (holistic) characteristics of an intrapreneur (corporate entrepreneur).

Existing research on intrapreneurial characteristics

According to Corbett et al. (2013), the existing literature provides little empirical evaluation of the individual in the context of CE. Nevertheless, I did an initial investigation of the existing research within this area. The analysis revealed that some efforts have been made to develop the topic. Existing research includes studies of what Blanka (2018) would define as “sub-categories” of characteristics, such as qualities (e.g. McGinnis & Verney 1987), motivations (e.g. Carrier, 1996), actions (e.g. Zampetakis et al., 2009), competencies (e.g. Rathna & Vijaya, 2009), spirit (e.g. Fayolle & Basso, 2010), attitudes (e.g. Clargo & Tunstall, 2011), behaviour (e.g. Lau et al. 2012), personality traits (e.g. Garrett Jr. & Holland, 2015), mindset (e.g. Rekha et al., 2015) as well as intentions (e.g. Tucker et al., 2017). While these studies provide bits of evidence to uncover the characteristics of intrapreneurs (corporate entrepreneurs), they – individually – do not paint the whole picture.

Furthermore, Burgers and Van de Vrande (2016) found varying definitions in the studies investigating the individual corporate entrepreneurs, from inclusive definitions (e.g. Hornsby et al., 2013) to more narrow ones used to compare them with traditional entrepreneurs (e.g. Martiarena, 2013). While no single definition of a corporate entrepreneur seems to exist, scholars do agree on the fact that corporate entrepreneurs are employed by a company (Burgers & Van de Vrande, 2016), which ultimately separates them from traditional entrepreneurs. In fact, various scholars

have found important differences between corporate entrepreneurs and traditional entrepreneurs (e.g. Hill, 1987; Geisler, 1993; Davis, 1999; Hayton & Kelley, 2006; Camelo-Ordaz et al., 2012; Blanka, 2018).

Blanka (2018) took a closer look at intrapreneurial individuals in her systematic review of the intrapreneurship field. By only using the search term intrapreneur*, she identified two different sub-groups related to individual-level factors: operational-level employees (demographics, personality, behaviour, perceptions, human capital, social capital, affiliation) and middle-level managers (personality, behaviour, leadership). In a similar vein, Wiethe-Körprich et al. (2017) did a systematic literature review on intrapreneurship following an individual-level approach. The authors used the following three search categories: intrapreneurship (comprising both "intrapreneur" and "intrapreneurship"), behaviour, and success. Through the analysis of 78 articles, they developed a list of 46 dispositions or items, which were all assigned to three competence-based categories: knowledge (3 items), skills (27 items), and attitudes (16 items). Furthermore, the scholars developed a competence model for intrapreneurship (based on the dispositions found in their review), consisting of six different facets of the intrapreneurship process (perceiving problems and chances, creating new ideas, planning and monitoring projects based on the new idea, implementing projects, reflecting ideas/projects, and selling ideas/projects).

The study of Wiethe-Körprich et al. (2017) and Blanka (2018) closes important gaps by performing systematic literature reviews concerning intrapreneurial individuals and provides new exciting insights. Several researchers have, however, advocated for a more inclusive approach to be used, when studying who the corporate entrepreneur is (e.g. Burgers & Van de Vrande, 2016). Both Wiethe-Körprich et al. (2017) and Blanka (2018) only use one of the relevant search terms (intrapreneur). Therefore, these studies do not provide a clear inclusive approach to understand the phenomenon that may include both intrapreneurs, corporate entrepreneurs and corporate innovators. As such, there seems to be a need for a more holistic meta-study that goes across these three streams of research to combine the findings.

The wide range of research focuses might be caused by the lack of consistency in the way corporate entrepreneurial activities have been defined by scholars over the years – something Sharma and Chrisman (1999) concluded in their extensive review of the CE literature. Moreover, although CE scholars in most cases benefit from integrating aspects of adjacent research fields (Busenitz et al., 2014) – such as the innovation literature, strategy literature, entrepreneurship literature and the organisational learning literature – it might also cause some disturbance, leading to a disparate and fragmented research field (Burgers & Van de Vrande, 2016), with no elaborate holistic concept defining the characteristics of the corporate entrepreneur. Burgers and Van de Vrande (2016) call for further research to theorise on who the corporate entrepreneurs is, which led me to the empirical work conducted in Article I.

Towards a conceptual model of holistic intrapreneurial characteristics

Within the innovation literature, Hero et al. (2017) conducted a holistic and comprehensive review to uncover individual innovation competencies. From using search terms related to innovation, such as innovation competence*, innovativeness, and innovation capability/ies, the scholars reviewed twenty-eight papers and, from these, identified seventeen sub-categories. Following the method of Hero et al. (2017), I conducted a systematic literature review to rigorously examine CE characteristics on an individual level to develop elaborate holistic definitions of these. I utilised an inclusive approach by including search terms related to the corporate entrepreneur, corporate innovator and intrapreneur, following the suggestions by Burgers and Van de Vrande (2016). Also, following the viewpoint of Shimizu (2012), studies focusing on both middle managers and operational-level employees were included and conceptualised as one group (viewed as "agents"), in contrast to upper management ("principal"), cf. agency theory.[8] Another reason for including studies on both middle managers and operational-level employees in the review was that Thornberry (2003) found that corporate entrepreneurs can be situated anywhere in the corporation - from blue-collar to white-collar workers.

The structured review was initially conducted using the EBSCO Business Source Premier database and the ProQuest search engine for scientific articles containing the following search term categories:

1) "corporate entrepreneur" AND[9] "corporate entrepreneurs"
2) "corporate innovator" AND "corporate innovators"
3) "intrapreneur" AND "intrapreneurs"[10]

However, manual searches disclosed divergent terms used by scholars to describe these individuals at the individual level, e.g. 'individual-level perspective on intrapreneurship' (e.g. Blanka, 2018), 'intrapreneurship competence of employees' (e.g. Boon et al., 2013) and 'human-oriented corporate entrepreneurship' (e.g. Elia et al., 2017). Consequently, I did a second search round. The following two search concepts were combined by using the Boolean operator 'AND':

[8] The agency literature originates from the economic literature, focusing on the risk sharing between individuals (see e.g. Wilson, 1968). An agency relationship can be defined as 'a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent' (Jensen & Meckling, 1976, p. 308).

[9] Boolean operator 'AND' is used to combine search concepts.

[10] Quotation marks were used in situations where the concepts in question were compound words comprised of two words, for example, Corporate and Entrepreneurship.

a) "corporate entrepreneurship" OR[11] "intrapreneurship" OR "corporate venturing" OR "corporate innovation"
b) "employee-centered" OR "person-centered" OR “individual” OR "individual-level" OR "people-centric" OR employee* OR "human-centered"

Eighty-seven scientific articles were reviewed and, from these, a total of 976 items proposed to characterise the individual were extracted. See a more comprehensive description of the approach and methodological considerations in section 4.3.

Empirical findings from Article I

Through a data-driven conceptualisation of these items, 19 general characteristics describing the intrapreneur were developed and elaborated. A condensed overview of the 19 intrapreneurial characteristics, their descriptions as well as the frequency of mentions in the article sample are shown in Table 2.

Characteristic	Description	Freq. of mentions
Creative innovator	Intrapreneurs are characterised as out-of-the-box thinkers that comes up with original and novel ideas which are appropriate for their employing organisation.	89
High achiever	Intrapreneurs are characterised by having a great being desire for achievement. They are ambitious with high growth expectations.	88
Proactive initiator	Intrapreneurs are characterised as the ‘dreamers who do’. They proactively take the lead in introducing and implementing innovations by acting opportunistically on ideas.	78
Risk taker	Intrapreneurs are characterised as being tolerant for risk tolerant to change the status quo. They seek to reduce risks from diversification experimentation.	76
Organisational networker	Intrapreneurs are characterised as networkers. They are not afraid of crossing organisational	61

[11] Boolean operator ‘OR’ is used to retrieve all citations including any of these search terms.

	boundaries and knows how to play the political game inside an organisation.	
Self-confident	Intrapreneurs are characterised as self-confident individuals that believes in their own capabilities to drive innovations forward.	58
Flexible open-minded	Intrapreneurs are characterised by being able to quickly change course of action and adjust when needed. They are eager to learn and are open to new ideas and experiences.	57
Enthusiastically perseverant	Intrapreneurs are characterised as enthusiastic individuals that stays positive about ideas and the employing organisation. They are perseverant and do not give up at the first sign of difficulty.	48
Opportunity recogniser	Intrapreneurs are characterised as being able to identify business opportunities. They are curious by heart and persistently search for new opportunities with a focus on customers and the employing organisation.	42
Experimental problem solver	Intrapreneurs are characterised as individuals that overcomes dilemmas and challenges through experimentation and discovery. They employ a hypothesis-testing mindset when finding solutions.	41
Persuasive influencer	Intrapreneurs are characterised as great influencers that can persuade others to agree on a new idea or vision.	37
Autonomous	Intrapreneurs are characterised as independent individuals that seeks elasticity and autonomy within the organisation.	35
Team organiser	Intrapreneurs are characterised as team-oriented and collaborative in nature. They have the abilities to develop and organise teams.	34
Change agent	Intrapreneurs are characterised as individuals supporting novel ideas and technologies and	34

	want to change their environment for the better.	
Idea generator	Intrapreneurs are characterised as great idea generators, being able to develop powerful and useable ideas for their employing organisation.	30
Business planner	Intrapreneurs are characterised as individuals that can understand complex processes and strategic plans. They can evaluate and assess opportunities objectively and uses evidence from the market.	29
Visionary	Intrapreneurs are characterised as individuals that are forward-looking and can visualise future business scenarios.	27
Customer-focused	Intrapreneurs are characterised as having a high-level empathy for customers (or target groups). They put customers first and understand customer issues.	14
Decision maker	Intrapreneurs are characterised as individuals that seeks to participate in decision making. They engage in evidence-based decision making and manage to stay objective, even if a project is required to be terminated.	13

Table 2: The 19 intrapreneurial characteristics (derived from Brøndum, 2019).

The full study is presented in Article I (see Appendix A).

Empirical considerations for Article I

Another approach to further theorise who the intrapreneur (corporate entrepreneur) is, would be to conduct in-depth interviews with intrapreneurs in companies to explore their competencies. Marvel et al. (2007) hint that some of the existing studies use a too general data sample to investigate the corporate entrepreneur, indicating a need for such a study. Also, according to Miller and Bauer (2017), there is extensive qualitative research exploring intrapreneurs as individuals. It could also be interesting to do in-depth interviews with the managers or sponsors of intrapreneurs to get another point of view of the topic. The importance of sponsors to advise and protect the intrapreneurs is something that several researchers have identified (e.g. Pinchot, 1987; Abetti, 2004). Further, Pinchot and Pellman (1999) present an evaluation checklist for managers to assess the intrapreneurial behaviour of the employees.

Miller and Bauer (2017), however, raise concerns about the tendency for scholars to explore intrapreneurs as individuals through others.

I found a structured literature review to be the most appropriate approach to investigate the topic, as the combined number of studies conducted at the individual level from the three research streams (intrapreneurship, corporate entrepreneurship and corporate innovation) were rather extensive. Also, several of the studies I ended up examining were based on interviews (see, for example, Carrier, 1996; Rodríguez-Pomeda et al., 2003; Abetti, 2004; Jones, 2005; Kenney & Mujtaba, 2007; Boon et al., 2013; Smitha et al., 2016).

3.1.3. RESEARCH OBJECTIVE 3

This section is based on the paper titled "Assessment and Corporate Entrepreneurship: Exploring a Promising New Approach for Identifying Intrapreneurial Potential", submitted to the Entrepreneurship Research Journal.

The assessment of human capacity has a long history. The first written account indicating the use of ability assessment was recorded during the Han Dynasty in China, where competitive exams were utilised for civil service selection, allowing individuals, irrespective of background and wealth, to get important positions in the government (Miyazaki, 1981). Later, Spanish philosopher Juan Huarte de San Juan developed the first theory of intelligence, portraying individual variations in memory, learning and imagination (Hunt, 2005). The modern history of the study of individual differences in human capacities is, however, credited to the work of Sir Francis Galton (Jensen, 2002). Galton originally studied the inheritance of human ability by examining the lineage of high-achieving individuals, before focusing on the study of identical twins to determine whether intelligence is genetic in the same way as many personality traits are (Jensen, 2002).

While the study of human capacity is essential in almost every research topic involving humans and significantly related to psychology, the capacity of humans within business studies is a highly relevant topic in the human resource management (HRM) literature. HRM can be defined as 'the policies, practices, and systems that influence employees' behavior, attitudes, and performance' (Noe et al., 2018, p. 3). Most scholars agree that identification and selection play a key strategic role in HRM, where cognitive ability tests, aptitude tests and personality tests are some of the most dominant methods employed to predict the job performance of individuals (Lievens & Chapman, 2019).

Within the field of CE, Hornby et al. (1993) suggest that organisations should invest resources in the assessment of prospective and current employees to spot individuals with intrapreneurial potential. According to Pinchot (1987), one of the primary causes for the lower returns of innovation in organisations is the fact that managers fail to understand the importance of identifying the right employees to support, nurture and empower. In the same vein, Hayton and Kelley (2006) state that 'the challenge for

managers in organizations seeking to promote corporate entrepreneurship lies in selecting and developing employees with the appropriate knowledge, skills, and personality characteristics to promote, persist, think creatively, adapt, and take risks.' (p. 412). Later, Deloitte Digital (2015) came to the same conclusion in their white paper – the biggest challenge of developing an intrapreneurial culture is not to create intrapreneurs but to discover the right individuals and encourage these. There seems, however, to be a lack of research within this area. To quote Davis (1999): 'Unfortunately, the current literature provides little to assist managers in identifying individuals likely to be successful in this unique organizational role' (p. 296). Menzel et al. (2007) agree, stating that '[…] no clear-cut profile is available to help identify intrapreneurs' (p. 734). As such, I used the following phenomenon-based research objective (RO3) to guide this sub-section:

> RO3: To understand how companies can assess intrapreneurial (corporate entrepreneurial) potential.

A critical review of existing methods to identify intrapreneurs and intrapreneurial potential

To better understand this research objective, I did an investigation of the topic using pearl growing (Schlosser et al., 2006) as a strategy to uncover interesting studies related to the topic. I used the study by Herron (1992) as the initial point of departure in an iterative process of searching backwards (through the reference list) as well as forwards (using the "cited by" feature on Google Scholar).

The analysis revealed that while numerous studies state the importance of identifying intrapreneurs (corporate entrepreneurs), only a limited number of studies examine identification methods. The problem with some of these studies is, however, that they fail to explain exactly how to use the proposed identification method(s). An example of this is the study of Kierulff (1979). While the author dismisses the use of psychological tests because they can be manipulated (consciously or unconsciously), he appraises personality characteristics as the most appropriate tool to identify intrapreneurs (corporate entrepreneurs). From a seven-page survey, Kierulff (1979) developed a list of 19 qualities of intrapreneurs (corporate entrepreneurs) that were later tested with executives to determine their importance. While the idea of using a set of characteristics to spot intrapreneurs (corporate entrepreneurs) is an interesting approach, the lack of transparency between the survey and the list of personality characteristics, the extent of divergence among the consulted executives on important qualities, as well as the fact that the author fails to explain precisely how to use the list of characteristics to identify corporate entrepreneurs, may lead academics and practitioners astray.

A few studies succeeded in both describing identification methods as well as how to use these. One of these is the study by Herron (1992). The scholar suggests three methods of identifying potential intrapreneurs (corporate entrepreneurs): assessment

tests (such as aptitude tests[12]), interviews and investigation of past performance. Preferably, the investigation should entail a combination of all three methods, according to Herron (1992). His suggestion follows the general understanding in social science research that individual characteristics can be evaluated by experts (through observation, interviews or similar) or measured with instruments like surveys or assessment tests (e.g. Johnson & Turner, 2003). On the other hand, scholars like Kenney and Mujtaba (2007) state that selection tests are not beneficial as entrepreneurial aptitude is self-identified. Nonetheless, Herron (1992) advocates for the use of assessment instruments as a supplement to interviews, when trying to spot intrapreneurial potential. In general, he is quite sceptical about the use of personality tests.[13] He, therefore, performs an experiment with the use of standardised aptitude tests developed by J. P. Guilford and his colleagues. Unfortunately, Herron's (1992) experiment fails to connect the dots between skills and aptitude tests, as the results did not show a strong correlation with his selected skill areas.[14] The reason might be that standardised aptitude tests, like the ones used in the study, are too general and abstract for this specific context.

Still, the idea of using other assessment instruments, beyond personality tests, is interesting, especially since research on the relationship between personality and intrapreneurs is relatively limited (Woo, 2018). Further, results from studies in the field of entrepreneurship have been rather inconclusive regarding the use of personality traits to project firm performance (e.g. Herron, 1992). Another aspect is that personality tests do not encompass characteristics, such as skills, competencies and motivation, that might make them ineffective in this regard (Herron, 1992).

A later study by Lau et al. (2012) used a more contextual-based test as a method of enquiry. Based on behaviourally anchored rating scales, the scholars developed forty behavioural incidents for the candidate to evaluate. Out of five available options in each incident (which corresponds to 1–5 points), the candidate chooses the one most appropriate to what they would do in reality. While the study includes great

[12] Aptitude tests are defined as 'a test designed to determine a person's ability in a particular skill or field of' (Oxford Dictionary, 2010). Aptitude tests are typically highly standardised and differ from achievement tests as they capture an individual's capacity for learning, not the knowledge associated with a specific curriculum (Metz & Jones, 2013). Some of the most famous aptitude tests are the Armed Services Vocational Aptitude Test (ASVAB), the Scholastic Assessment Test (SAT), the Graduate Record Exam (GRE), and the Occupational Information Network (O*NET) Ability Profiler (Metz & Jones, 2013).

[13] While personality tests have been heavily used by psychologists to uncover the psyches of entrepreneurs and predict future successful entrepreneurs, the results have often been inconclusive, in particular, concerning the use of traits to forecast firm performance. Furthermore, personality tests do not cover characteristics that go beyond personality traits, such as skills, competencies and motivation (Herron, 1992).

[14] Product/service design, Business, Industry, Leadership, Networking, Administrative and Entrepreneurial skills.

transparency and explains how to use the instrument to spot intrapreneurial (corporate entrepreneurial) candidates, the quantitative design of the test and, thus, the narrow focus, is a limitation. Also, as candidates only have five options to choose from in each incident, it makes it fairly easy for intelligent people to predict the high-scoring options.

In terms of using interviews, Herron (1992) outlines several items to look for during interviews of potential intrapreneurs; for instance, does the candidate express a desire to engage in innovation and change, does the candidate exercise great persuasive skills, tenacity and energy, and does the candidate display a combination of vision and realism. Also, the interview should include questions about the past exercise of skills. In fact, Herron (1992) stresses that past performance is the most critical area for judging potential intrapreneurs, as '[…] actual experience is the best predictor of future success' (p. 12). One problem with this belief is, however, that while some individuals will naturally demonstrate certain abilities, others may need a catalyst for these inherent capabilities to occur (Thornberry, 2003). One could imagine a situation where an individual does not immediately show any sign of intrapreneurial behaviour. Yet, if the individual is put in the right environment and given the proper support or training, the hidden or untapped potential might unfold (Thornberry, 2003). In the same vein, Oliver et al. (1991) find '[…] that most people have the necessary skills to become an intrapreneur, but that these skills usually remain hidden until the right opportunity comes along' (p. 11). As such, experience and past merits might not be able to predict intrapreneurial potential in all situations.

My analysis of existing studies within the topic of identifying intrapreneurs also revealed two operational tools: one designed as a self-reporting questionnaire with twelve polar questions (Pinchot, 1985) and the other designed as a management evaluation tool covering nine Likert scale questions (Pinchot & Pellman, 1999). While these have been used in later studies – for example by Kolchin and Hyclak (1987), Åmo and Kolvereid (2005), and Allali (2010) – both of these operational assessment tools have several shortcomings. Firstly, they only consist of twelve and nine questions, respectively, making them rather superficial and therefore insufficient to provide an in-depth understanding of the individual. Secondly, they are based on self-reporting, either by the individual employee in question or the manager. Self-perception questions can be unreliable due to biases affecting our reasoning and self-understanding (Podsakoff & Organ, 1986; Kahneman, 2011). Likewise, the leniency bias (Podsakoff et al., 2003) and the centrality bias (Moers, 2005) can affect managers' rating of peers. Thirdly, as they both focus on past behaviour – either the employee's self-perception of past behaviour or the managers' perception of the employees' past behaviour – they might not be suitable to predict intrapreneurial potential in individuals, as some individuals have hidden abilities for innovation (Ford, 2001; Cohen et al., 1972). It is the same story with the nine statements proposed by Chan et al. (2017) in their "intrapreneurial motivation scale" (5-point Likert scale), which was part of a larger survey instrument developed to assess the relationship between employees' entrepreneurial, professional and leadership motivations.

Empirical findings

An overview of the different methods companies can employ to identify intrapreneurial potential as well as a critical assessment of these can be found in Table 3 (the asterisk symbols indicate that the mentioned biases are further explained in Brøndum, 2020). While several approaches exist, most of them lack how-to guides and focus on uncovering past behaviour. Previous behaviour can be a good indicator of future behaviour as well, but in cases where individuals have hidden or untapped inherent capabilities for CE, they might not do the job. On the other hand, open-ended assessment tests are found to be good predictors of potential (e.g. Cropley, 2000), but are more complex, timely, and potentially also more costly to do for companies. Pre-existing open-ended assessment tests might also be too general and not related to CE/intrapreneurship.

Method	Strengths	Weaknesses	Examples
Employee questionnaires (self-reports)	- Short and quick to complete - Can be carried out as mass tests in the whole organisation rather easily - Resource-efficient data analysis	- Can be unreliable due to bias, for example, the positive and negative affectivity bias, the consistency motif bias, the social desirability bias, or the item ambiguity bias (Podsakoff & Organ, 1986)* - Focus on past behaviour (in the eyes of the employee) - Only scratches the surface, not in-depth analysis of the individual	- Kierulff (1979) - Pinchot (1985)
Manager rating questionnaires	- (same as above)	- Can be unreliable due to bias, such as, the leniency bias (Podsakoff et al., 2003)* and the centrality bias (Moers, 2005)* - Focus on past behaviour of employees (in the eyes of the manager)	- Pinchot and Pellman (1999)
Close-ended assessment tests	- (same as above)	- Might be general in their design and not related to the field of CE/intrapreneurship - Can be easier to predict high scoring options due to the quantitative design of close-ended questions or options - Can be unreliable due to bias, such as the social desirability bias	- Lau et al. (2012)
Open-ended assessment tests	- Opportunity to express exactly what you want, thus providing	- Takes more time to complete and can be rather complex - More time-consuming and costly data analysis	- Herron (1992)

	more reliable and in-depth answers - Potential to uncover hidden abilities - Not possible to predict high scoring answers - Does not focus on past behaviour and found to be good predictors of potential (e.g. Cropley, 2000) - Context-related and life-like scenarios	- Might be general in their design and not related to the field of CE/intrapreneurship - Can be unreliable due to bias, such as the positive and negative affectivity bias as well as the item ambiguity bias (Podsakoff et al., 2003)*	
Interview (with questions related to certain characteristics or past performance)	- Opportunity to express exactly what you want, thus providing more in-depth answers	- Time-consuming - Prone to bias, such as the representative bias and manipulative bias (Czarniawska, 2001)* - Focus on past behaviour - Can only indicate intrapreneurial potential, not fully assess	- Herron (1992)
Observation	- Most data-rich approach for evaluating actual behaviour - Context-related and life-like scenarios - Potential to uncover hidden abilities in individuals	- Time-consuming (both the observation as well as the data analysis) - Low applicability - Can be unreliable due to bias, such as the positive and negative affectivity bias, the consistency motif bias as well as the social desirability bias	- (none found)

Table 3: Overview of different methods to identify intrapreneurs in companies.

3.1.4. RESEARCH OBJECTIVE 4

This section is based on the paper titled "Assessment and Corporate Entrepreneurship: Exploring a Promising New Approach for Identifying Intrapreneurial Potential", submitted to the Entrepreneurship Research Journal.

Due to the limited methods of enquiry and how-to guides in the literature as well as the recognised flaws in the existing identification methods, I decided to look for inspiration and knowledge in related fields of studies. Within creativity research, the field is far more advanced when it comes to spotting creative individuals. The gold standard for assessing creative potential seems to be qualitative production-based tests (see Torrance, 1974; Guildford, 1967). A production-based test can be defined as a tool that evaluates subjects based on their responses to given tasks, problems, or situations, that is, their production of an output. As such, the subject will produce a personal output (no pre-made options to choose from), representing the best possible answer to a task in the given timeframe. The data analysis of these more qualitative, in-depth tests cannot be standardised to the same degree as self-reporting questionnaires, making them more time-consuming. To overcome this problem, E. P. Torrance developed an advanced guided scoring system based on generic examples and statistical infrequency, making the analysis more transitory (e.g. Torrance, 1980; Torrance et al., 1992).

The qualitative, open-ended, task-based design of production tests has been advanced for more than thirty years and highly appraised. Runco et al. (2016) stressed that qualitative production-based tests are the most widely used assessment method for individual creative potential. Similarly, numerous studies have found that production-based tests have high validity for assessing creative production (Almeida et al., 2008; Cliatt et al., 1980; Harkins & Macrosson, 1990; Kabanoff & Bottger, 1991; Nelson & Lalemi, 1991; Scibinetti & Tocci, 2011; Zabelina & Robinson, 2010). Althuizen et al. (2010) found that this kind of test has higher predictive validity than self-rating questionnaires and independent supervisor ratings of employees' creative abilities. Others have advocated of the use of these kind of test to assess potential rather than actual behaviour (e.g. Cropley, 2000).

As such, it seems that qualitative production-based tests add another element to the assessment of individuals by ensuring more profound insights. They are impossible to manipulate since they measure actual outcomes to the given subject-related task. Moreover, production-based instruments are more convenient and economical than observation and can be done in more extensive settings. These findings led me to the following substantive research objective (RO4) that I investigate further in Article II:

> RO4: To explore the extent to which qualitative production-based tests can contribute to an in-depth assessment of intrapreneurial (corporate entrepreneurial) potential.

Towards a new qualitative production-based test in the context of CE

To investigate this research objective, I explored the production tests used in the related field of assessing creative potential, especially the 'Torrance Test of Creative Thinking' (TTCT) by Torrance (1974). Furthermore, I studied how to design a qualitative production-based test in the context of CE. To guide the design of the new test, I was inspired by a series of proven procedures from the psychometric test development literature (e.g. Irwing & Hughes, 2018), adjusted to this setting, as there seems to be a lack of sources in terms of the development of qualitative production-based tests. Thus, the following suggestions made by Irwing and Hughes (2018) were used as inspiration in the development process:

1) Construct development: intrapreneurial characteristics
2) Overall planning: test design and administration
3) Task development
4) Task review
5) Test piloting (students)
6) Field tests (company)
7) Scale construction

According to Irwing and Hughes (2018), one should investigate if there is a need for a new test to be developed before starting the development process. The difficulties in identifying intrapreneurial potential as well as the fact that there has been theoretical advancement within the field of intrapreneurship and CE (e.g. Kuretko, 2017), are strong indicators that there is a need for additional metrics and instruments. Also, several scholars have called for new tools at the individual level (e.g. Davis, 1999; Kuratko & Goldsby, 2004; Åmo & Kolvereid, 2005; Kuratko, 2017).

One way of initiating the development of a test to evaluate intrapreneurial potential is to examine how an intrapreneur is characterised. As described in section 3.1.2, several scholars have focused on this topic, but a holistic definition of an intrapreneur (corporate entrepreneur) remains elusive. The resulting 19 intrapreneurial characteristics from Article I (Appendix A) was, therefore, used to describe the construct of this specific test, mainly because it is the most inclusive and rigorous review of individual intrapreneurial characteristics to date.

Expert informants (three academics and one practitioner) were invited to discuss the 19 characteristics to assess if they were in line with what the experts had experienced through research and in the real world of CE and intrapreneurship. Although some minor details about wording were discussed, there was a general consensus that these 19 intrapreneurial characteristics fit with the expert's understandings of CE.

The test design and administration were inspired by the work of Torrance (1974) due to that fact that the TTCT is highly recognised in academia and practice; numerous studies have confirmed its validity as well as the fact that it has been praised for its identifying potential.

It was decided to include around nine tasks in total, both verbal (written) and figural (drawing) tasks, each with a duration ranging from five to ten minutes. The overall duration of the test should be around seventy minutes. A paper-and-pencil format was chosen due to its low production costs compared to computer-based administration, even though the processing time for subjects to write by hand is longer. For each task, a short text piece was required to describe the task scenario with some premade empty lines for the subject to fill in their answers. An administer was needed to keep track of time and help out the subjects if they ran into any troubles or problems during the test. The tasks should have different scenarios throughout the test, and they should be closely related to a real-life business context. Each intrapreneurial-related task should be designed to measure a minimum of three of the 19 characteristics.

The task generation process followed an iterative process. The goal was to develop a set of realistic tasks that were meaningful for researchers and practitioners alike, closely related to a real-life CE setting that could be used to assess three or more of the 19 intrapreneurial characteristics by with mirroring these characteristics in the tasks. Together with experts, a total of 55 intrapreneurial-related realistic tasks were developed. Semi-structured interview guides, audio recordings of the discussions as well as transcription, were employed to verify interpretive accuracy and increase reliability. Afterwards, the transcriptions were shared and discussed with invited scholars (member checking). Throughout the whole task generation process, general grammar and linguistic rules regarding item design (e.g. Irwing & Hughes, 2018) – or in this case, task design – were integrated to secure high comparability between the scenario descriptions.

The intrapreneurial-related tasks were divided into three different categories:

a) hypothetical non-company-specific tasks (from the perspective of the subject)
b) hypothetical company-specific tasks (situationally specific to the role of the subject within their company yet hypothetical)
c) conceptual tasks (related to the subject's general knowledge of intrapreneurial concepts and driving innovations to successful conclusions)[15].

Following the recommendations of DeMaio and Landreth (2004), a group of experts were invited to review each of the 55 intrapreneurial-related tasks. The group was designed to include two subject matter experts to focus especially on task accuracy and task bias, an expert in test design to focus on developing a good design of the tasks, and an experienced corporate entrepreneur to focus on the comprehensibility of the tasks to the population as well as to identify potentially biased or objectionable tasks. In total, 33 tasks were excluded in the review process.

[15] Please see Article II (Appendix B) for examples of each task type.

Two test pilots were conducted with a total of seven graduates from the Corporate Entrepreneurship course at Aalborg University.[16] Eleven tasks were handpicked for the two test pilots, equivalent to a total duration of ninety-minutes. The tasks included a mix of the three different task types. Group interviews (Flick, 2009) accompanied the test pilots to get an in-depth understanding of the experience of doing this kind of test as well as to get inputs for further improvements.

Two field tests were completed with a total of 18 employees from an innovation department in a large international company, based in Denmark. Ten tasks were handpicked for these two field tests, equivalent to a total duration of ninety-minutes, as some additional time was added to perform the tasks, based on initial results from the test pilots. Also, as initial data analysis showed that the hypothetical non-company-specific tasks were much better at stimulating valuable answers concerning the 19 intrapreneurial characteristics, only this task type was included in the two field tests.

The responses from the two field tests were examined using an adjusted version of the consensual assessment technique (CAT) (Amabile, 1982), to test whether or not the associated intrapreneurial characteristics could be identified. Furthermore, the expert judges were used to explore whether or not it was possible to identify any difference in level between different responses. Three expert judges were invited into this process to increase the validity and examined if the test measures what it intends to and if the test is useful for that specific purpose, following the guidelines from Amabile (1982) and Hennessey et al. (2011). The panel of expert judges was comprised of an experienced intrapreneur, a CE consultant and one individual with experience in managing intrapreneurs. The scoring session lasted 4.5 hours in total. See a more comprehensive description of the approach and methodological considerations in section 4.3.

Empirical findings from Article II

Results showed that production-based tasks could indeed provide an in-depth assessment of intrapreneurial potential leading to interesting data related to intrapreneurial characteristics. The expert judges were, indeed, able to identify several characteristics for each of the ten selected hypothetical non-company-specific tasks. Furthermore, they were able to spot a difference in the level of the answers in all of the 19 characteristics bar one ("Autonomous"). No appropriate scores could, however, be derived from the conceptual tasks. The hypothetical company-specific tasks required personnel from the specific company in question to be properly assessed.

[16] The Corporate Entrepreneurship program is a thirty ECTS cross-disciplinary elective course at the master's level (www.ce.aau.dk).

From the focus group interviews, it was concluded that a qualitative production-based test was more interesting than traditional test methods; however, it was also more exhausting to do. The lifelikeness of the scenarios was found to be a significant motivational factor but could also be a challenge, for example, if such test is used in educational contexts or with newly graduates. The variation in the design of the different tasks and scenarios was also found to be a motivational factor. However, the number of tasks were advised to be reduced, preferably with an overall test duration around sixty minutes.

See the full study in Article II (Appendix B).

Empirical considerations for Article II

The results of this article are based on two test pilots and two field tests with a total of 25 individuals (seven masters enrolled in a CE course at AAU and 18 company representatives from a large international corporation). Additional tests are, nonetheless, required to make the results even more transferable. Another aspect is that the two field tests were conducted in the same company. It would have been preferable to do more tests in different companies. However, due to the COVID-19 pandemic, this was not possible to do within the given timeframe (see Foreword section for further explanation).

Since the field tests were conducted in a multinational corporation based in Denmark, along with a group of Danish expert judges, contextual and cultural factors may have an underlying effect. Results might have been very different if the tests were conducted in China with Chinese employees. Most of the articles from the literature review, of which the 19 intrapreneurial characterises were conceptualised (see Article I, Appendix A), are based on data from the West or have authors from the Western world (i.e. Europe, Australasia and North America). The tasks are based on interviews with practitioners also from the West. Consequently, a working proposition is that the test and scales developed in this study would work in Western cultures and contexts.

One of the essential aspects of test development is the issue of team size, as also mentioned by Irwing and Huges (2018). As this dissertation has only one investigator, as opposed to a large team with diverse skills (which is common when developing commercial tests), this component affected the choices I made during the test development process. For example, the original guidelines presented by Irwing and Hughes (2018) suggest several additional steps before the test is ready for mass-distribution, such as scale construction using a combination of confirmatory factor analysis and Item Response Theory as well as measuring reliability with a Cronbach's alpha test. However, to conduct such analysis requires larger sample sizes, ranging from a minimum of 200 samples to the preferable size of at least 500 to 1000 samples. To collect 500 or 1000 samples would, indeed, require a larger team to conduct the design of this open-ended production test.

The qualitative design of this test makes the distribution and subsequent data analysis rather exhausting compared to, for example, self-reporting assessment tools. A natural next step will, therefore, be to collect more samples together with a team and follow a similar procedure as proposed by Irwing and Huges (2018). However, this is beyond the scope of this PhD project.

3.1.5. PROJECT FINDINGS AND DISCUSSION

CE has progressed significantly over the last decades, and thus numerous definitions have been developed. Most scholars do, however, agree that CE is a firm-level construct, associated with the entrepreneurial process of new products, processes or business models that are somewhat distinct from the ordinary, leading to the improvement of organisational profitability as well as the promotion of such employee behaviour. The field has been studied by interdisciplinary researchers, including the disciplines of entrepreneurship, innovation, strategic management, human resource, psychology, and finance and accounting. This might be the reason why several sub-domains have emerged over the years, for example, corporate venturing, intrapreneurship, entrepreneurial orientation and strategic entrepreneurship. Still, individuals are found to be one of the most important antecedents for successful CE processes. Due to their crucial role, the study of the intrapreneur as an individual has been on the research agenda since the incarnation of CE back in the early 1970s.

Furthermore, several sub-themes have been associated with the study of the intrapreneur as an individual, e.g. individual characteristics, identification and assessment as well as training and development. While the latter (training and development) is found a crucial research topic, it was not within the scope of Research Project A but will be further elaborated in Research Project C. Based on the findings in each of the research objectives steering this research project, several implications can be drawn.

Implications for research, policy and practice

While intrapreneurship and CE might be different concepts, the actors in each research field represent the same thing. To move the research forward, scholars should embrace both definitions (intrapreneurs and corporate entrepreneurs) and build on each other's work. I believe that one way of allowing the research to advance within this area is to employ a more holistic definition of an intrapreneur (corporate entrepreneur). The development of the 19 characteristics defining an intrapreneur (Article I) is one attempt to move in this direction. Through these characteristics, researchers might be better equipped to undertake studies within this area and further develop the definition of intrapreneurial characteristics or competencies. Managers in companies might benefit from this advancement in the definition of an intrapreneur in terms of recruitment and selection, team formation, as well as the areas that should be prioritised in terms of training and development activities. Article I (Appendix A) provides several practical suggestions in this endeavour.

It is important to note that while some individuals might have the potential to unleash most of the 19 intrapreneurial characteristics, CE is considered a team-effort by scholars, especially in the opportunity development and capturing phases (Thornberry, 2001). As such, managers should use this advancement in the definition to create more well-orchestrated teams.

The conceptual model developed in Article I is one possible answer to the call made by Burgers and Van de Vrande (2016) to further advance theorisation. With such advancement, they advise other scholars to '[…] systematically compare different types of corporate entrepreneurs to come to meaningful categories that aid research and practise' (p. 81). While this was never the aim of Article I, the results could still be a starting point for this work. As such, the 19 characteristics may function as a foundation for further studies on how certain types of intrapreneurs may differ in characteristics. For example, one type of intrapreneurs may show higher levels of the "Risk taker", "High achiever" and "Proactive initiator" characteristics, whereas another type of intrapreneurs may show higher levels of the "Creative innovator", "Flexible open-minded" and "Idea generator" characteristics.[17] Also, the identified characteristics could lead to stronger and more focused curriculums in entrepreneurship education and incubator programs.

Companies are advised to place attention on their current (and prospective) employees if they want to pursue CE. Developing the right structures, processes and reward systems is only one part of the equation. Companies still need to discover the right individuals to support, nurture and empower. From the conceptualisation in RO3, companies now have a thorough overview of the strengths and weaknesses of different available approaches to identify intrapreneurs. The choice of approach should be based on the particular context and situation of the firm, but, in all cases, firms are advised to use a combination of instruments.

The qualitative production-based test designed and analysed in Article II does not provide insight into current or past intrapreneurial performance. Rather, it provides insight into the future potential to think and act as an intrapreneur. The right environment, encouragement, support or the appropriate training might, thus, unfold this untapped potential, as also discussed by Thornberry (2003), amongst others.

Nevertheless, the results in Article II open up a brand-new approach to identify and assess intrapreneurial potential. Researchers, as well as companies, are advised to look into approaches that can provide a more in-depth assessment of the individual as a supplement to more traditional recruitment and selection tools. This is important as staff selection is found to positively stimulate the intensity of CE in firms (Schmelter et al., 2010). Even though qualitative production-based tests are more

[17] See Table 2 for a short description of these characteristics or Article I (Appendix A) for the comprehensive descriptions.

complex and time-consuming that standardised (aptitude, personality) tests or questionnaires, they provide immense potential. The short, quick and highly applicable instruments proposed by Pinchot (1985) and Pinchot and Pellman (1999), amongst others, might be preferred to identify intrapreneurial merits at a large scale. However, production-based tests should be used to assess intrapreneurial potential. Such knowledge about employees' inherent intrapreneurial potential is highly valuable, as companies then have a better idea of which employees – in theory – would be most efficient to focus on in terms of CE initiatives. This goes for both current employees as well as new prospects.

Also, a more comprehensive assessment of the individual can provide an excellent basis for individualised counselling as well as training and development activities. Such knowledge might be highly valued, for example, for consultants working within the area of CET.

3.2. PROJECT B: NOVEL IDEA CREATION IN CORPORATE SETTINGS

The second project I initiated in my PhD period focused on novel idea creation in a corporate setting. I investigated this topic through three research objectives:

- RO5 (phenomenon-based): To understand how novel ideas are created and supported in corporate settings.
- RO6 (substantive): To understand how to nurture the process of novel idea generation in the context of business model innovation.
- RO7 (substantive): To understand how non-domain expertise can help to nurture the process of further developing and testing highly novel ideas.

3.2.1. RESEARCH OBJECTIVE 5

In general, scholars have found that the following three stages comprise CE activities: idea generation, selection and implementation (e.g. Burgelman, 1983; 1991; 1994; Floyd & Lane, 2000; Dutton et al., 2001; Shimizu, 2012). While each of these stages is of great importance for the success of CE activities, some scholars define the success of CE as positive organisational performance resulting from new ideas (e.g. Kuratko et al., 2004; Shimizu, 2012). Idea generation is, therefore, found to be critical for exploring new opportunities and/or strategic directions (e.g. Shimizu, 2012). Alipour et al. (2011) agree, stating that idea generation is one of the biggest concerns for managers in established companies. As such, the following section will focus on the first stage of CE activities, namely idea generation in a corporate setting.

For the remaining of this section, a 'corporate setting' refers to large companies or corporations, employing more than 250 employees.[18]

Critics would state that anyone can have ideas and that an idea is not worth anything; execution is what matters (e.g. Thornberry, 2001). While this is partly true, there might be a difference between 'common ideas' and ideas that are genuinely novel (unusual or unique). McFadzean et al. (2005) stress that new ideas can be placed on a novelty continuum, based on the work of Heany (1983), where common ideas would be placed on the low novelty end. On the high novelty end, are the ideas that are sought after in CE activities, that is, ideas that go beyond the current strategy of the firm (e.g. Shimizu, 2012), are distinct from traditional practice (e.g. Heinze & Weber, 2016) or depart from the usual routines in the organisation (e.g. Garcia-

[18] This is based on the definition of a 'corporate' in the Oxford Dictionary and the Cambridge Dictionary combined with the distinction of company sizes proposed by OECD (2020).

Morales et al., 2014). Also, scholars seem to acknowledge that creative solutions (i.e. solutions that are novel and useful) require the generation of many alternatives, as a larger quantity of ideas leads to a higher number of novel ideas (e.g. Rochford, 1991). For such reasons, the brainstorming literature is focusing on the the quantity of ideas generated (e.g. Diehl & Stroebe, 1987; Osborn, 1957). In fact, a whole stream of literature within the field of creativity has been focused on the development of techniques and tools that facilitate the idea generation process – both at individual and team-level. More recently, Schrage (2014) proposed that the most successful organisations do not spend most of their time on identifying and developing new ideas; instead, they use their time for testing business hypotheses.

Nevertheless, the development of novel ideas seems to be dependent on several organisational factors, such as control and reward systems, support from top management and a risk-taking culture (e.g. Hornsby et al., 2002; Kuratko et al., 2004; Zahra et al., 1999b), as well as individual-level factors, for example, the autonomous behaviour of middle and operational managers (e.g. Shimizu, 2012), and the individual characteristics of employees (e.g. Amabile, 1998). While some researchers advocate for ideas to be generated autonomously (a laissez-faire approach to innovation), most scholars seem to agree that idea generation must be monitored and nurtured as a management process (e.g. Conway & McGuiness, 1986; Morrison, 2003).

A recurring problem with new and novel ideas is that they are difficult to evaluate and, thus, associated with a high degree of uncertainty (e.g. Lind & van den Bos, 2002; March, 2006). Thus, companies are facing 'a problem of priorities' (cf. Conway & McGuiness, 1986) as new and novel ideas are competing with less novel but more feasible ideas (e.g. the incremental idea of changing the style of a product) for organisational resources. In such situations, the latter seems to win the resource-battle as they are more financially attractive in the short run (Christensen, 2006), even though '[…] the "foolish" and deviated ideas may contribute to the significant strategic renewal or development of new opportunities' (Shimizu, 2012, p. 200). In the same vein, Sherf et al. (2019) found that managers sometimes ignore employees' ideas as they are obligated to employ a short-term outlook.

To guide this section, I used the following phenomenon-based research objective:

> RO5: To understand how novel ideas are created and supported in corporate settings.

I found my initial point of departure from the studies by Schindehutte et al. (2000) and Feist (2010), which I then used to as steppingstones in an iterative process of searching backwards (through the reference list) as well as forwards (using the "cited by" feature on Google Scholar) to uncover other interesting articles and research areas related to the main topic.

Idea sources and triggers

New ideas can originate from almost everywhere, such as employees, managers, board members, customers, suppliers and other stakeholders. According to Schindehutte et al. (2000), insights on where ideas come from in corporate settings can be extracted from the new product development (NPD) literature. From an analysis of the initial stage of NPD (i.e. idea generation), Von Hippel (1988) identified four primary sources for ideas: users, manufactures, suppliers and others. In a similar study, Rochford (1991) proposed that the grouping of sources for new ideas should be based on whether the source is internal or external to the organisation. The former includes employees (from all departments), market studies and existing R&D programs, while the latter categorisation includes customer needs, competitor pressures, universities, public reports and patent banks, and suppliers. Later, Oden (1997) builds upon the work of Rochford, suggesting that the classification of sources for new ideas should be divided into four categories based on whether they were 'primary' or 'secondary' to the organisation:

- Primary internal (e.g. marketing, R&D)
- Secondary internal (e.g. management)
- Primary external (e.g. customers, suppliers, competitors)
- Secondary external (e.g. universities, private research institutions, literature)

Based on the work by Hornsby et al. (1993), which suggests that individuals decide to act intrapreneurial as a result of interactions between organisational characteristics, individual characteristics as well as a precipitating event, Schindehutte et al. (2000) study the latter (i.e. triggering events) concerning idea generation. The scholars identify forty different triggering events in the literature, such as 'employee initiative', 'strategic program', 'senior management initiative' (internal sources), 'a specific customer request', 'a competitor threat', and 'a change in people's lifestyles or expectations' (external sources). They propose five classification methods for triggering events in a corporate setting:

- internal/external (source)
- opportunity-driven/threat-driven (strategic force)
- technology-push/market-pull (market link)
- top-down/bottom-up (management hierarchy)
- systematic or deliberate/chance or opportunism (search type)

From their exploratory study, Schindehutte et al. (2000) find that most triggers in the company sample were planned, internal, controllable and driven by opportunity seeking.

More recently, the literature on open innovation[19] (cf. Chesbrough, 2003; 2012) has increased the focus on external sources, and thus expanded the list of potential sources. Onetti (2019) suggests that corporations can profit from supporting a startup community as well as engaging in corporate-startup collaborations, in which source activities include hackathons, trend spotting and corporate accelerators. According to Urbaniec and Żur (2020), there has been a sub-stream of CE literature in recent years focusing on the use of external partners, stating that 'corporate engagement with start-ups leads to new forms of business models' (p. 2).

That being said, the CE process is still heavily related to the employees and their characteristics, as they are the ones initiating and leading the process in the organisation (Sarooghi et al., 2015; Menzel et al., 2007). Also, while much of the relevant knowledge for CE actions might be embedded in ecosystem structures, it still requires individual-level action to obtain this knowledge (e.g. Autio et al., 2013) and to make new ideas available to the organisation (e.g. Desouza, 2011).

Individuals and idea generation: learnings from creativity research

According to Elia et al. (2017), 'CE is a process leaded by internal human resources of the organisation' (p. 389). Zahra (2015) states that CE is a process of 'creativity and learning, requiring intelligence, reframing and an ability to see things anew' (p. 733). In similar a vein, Kuretko (2017) describes that the key drive behind CE is the renewal of innovation and individual creativity in organisations. If creativity is the seed and antecedent of CE and thus innovation (e.g. Sarooghi et al., 2015), it is important to explore the individual characteristics as well as the facets of the internal organisational environment that can stimulate creativity.

Sternberg (2019) defines that 'creativity involves an individual's generating ideas that are novel, surprising, and compelling' (p. 88). In general, the creative process is seen as being comprised by two phases: (a) the generation of novel ideas and evaluation; and (b) selection of the most useful and meaningful ideas (Simonton, 2013). Contemporary research (e.g. Fürst et al., 2016) has found that different characteristics are needed for these two phases as 'idea generation involves wider, more defocused, behavioral and cognitive disinhibition, divergent cognitive processes, whereas the evaluation and selection of those ideas involves more behavioral and cognitive excitation, cognitive control and focused attention' (Feist, 2019, p. 355). In addition to this, Perry-Smith and Coff (2011) advocate that – on a team-level – divergent collective moods are necessary for these stages. The scholars found that an activated-pleasant mood state will produce most ideas, whereas the

[19] Chesbrough (2006) defines open innovation as 'the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation' (p. 1). The concept is the opposite of '[…] the traditional vertical integration model in which internal innovation activities lead to internally developed products and services that are then distributed by the firm' (Chesbrough, 2012, p. 20).

most novel ideas are selected in an unactivated-pleasant mood. Nevertheless, the former of these stages, i.e. idea generation (sometimes also termed divergent thinking, e.g. Kaufman & Glaveanu, 2019), will be the focus of this section.[20]

One stream of research focusing on individuals and idea generation is the literature on creative behaviour and personality. According to Elia et al. (2016), this research into the psychology of creativity is a major topic. Feist (2010; 2019) proposes a framework for understanding individual creative behaviour, comprised by generic-epigenetic influences on the brain, brain characteristics (structures and processes), and personality traits[21] (cognitive, social, motivational-affective and clinical). The main idea behind the model is that genetics affects the brain, which has influence on the categories of personality, which then – individually and mutually – affects the creative thought or behaviour of an individual. While each element in this model is essential, only personality traits will be covered in the following section.

Several scholars have found that the nature of enjoying exploring novel things and being curious, the cognitive personality trait termed 'openness to experience', is heavily associated with creative thought (e.g. Dollinger et al., 2004; Feist, 1998; 2019). Another trait of creative though is the ability to 'fluidly switching and moving between different categories of ideas or coming up with many ideas from distinct categories' (Feist, 2019, p. 356), also termed cognitive flexibility (e.g. Guilford, 2016). Studies have found creative individuals to be both more controlled and more flexible in their cognitive processing (e.g. Baas et al., 2013; Barron, 1963). Out of more social personality traits, extraversion is found to be the strongest trait associated with creative though (Feist, 1998; Furnham et al., 2008). Creative people are, however, found to be more independent, confident and assertive than they are social and outgoing.[22] Furthermore, creative people tend to be sceptical about social norms and questions tradition and authority (e.g. Rubinstein, 2003; Fiest, 1998). In terms of motivational-affective traits, scholars have found that creative individuals are driven, ambitious and persistent (Amabile, 1996; Fiest, 2019). Intrinsic motivation, such as the pleasure of creating something and the joy of undergoing the process of discovery, is associated with creative individuals. In contrast, extrinsic motivation, such as reward or recognition, is found to affect the creative achievement negatively (Amabile, 1996). The joy or excitement of discovery is related to high energy and a

[20] It should be noted that creativity in this thesis is defined as idea generation, and while several processes might appear prior to that – for example, problem identification and construction (e.g. Reiter-Palmon, 2018) – I do not discuss these processes here.

[21] The reason why creativity literature uses the term personality instead of, for example, characteristics, might be because this research area is one of the main constructs studied in psychology (e.g. Kaufman & Sternberg, 2019), in which personality traits has its roots.

[22] Independent, confident, assertive, social and outgoing are all associated with the 'extraversion' personality trait, found in the Big Five or the Five-Factor Model – see John (1990) for a comprehensive overview of each of the five personality traits.

positive mindset (Feist, 2012). Research in clinical traits has found that some disorders are connected to high levels of creative achievements, for example, bipolar disorder, psychoticism and schizotypy (Feist, 2019). Nevertheless, this particular aspect will not be elaborated any further.

Another research stream focusing on individuals and idea generation is the training and development literature (see Scott et al., 2004, for an inclusive review) as well as the assessment literature (see Plucker et al., 2019, for a comprehensive overview). While some scholars refer to creativity as being static, several studies indicate that 'the rules of creativity' can be learned from training (e.g. Scott et al., 2004; Rose & Lin, 1984; Torrance, 1972; Tang et al., 2018). Torrance (1972) based his work on assessing creative individuals primarily on the following four variables:[23]

- *fluency*, i.e. the ability to continue generating ideas even if you are tempted to stick to the first
- *flexibility*, i.e. the ability to have very different ideas
- *originality*, i.e. the ability to generate ideas that are unique and novel
- *elaboration*, i.e. the ability to further develop ideas without judgment.

Later, Torrance expanded the list of variables to include elements of *persuasion*, i.e. the ability to communicate ideas understandably and appealingly to others. This is exemplified by the criterion-referenced measures 'emotional expressiveness', 'storytelling articulateness', and 'expressiveness of titles' (Torrance, 1990; Torrance & Ball, 1984). Additionally, elements of *visualisation* and *imagination* were included, exemplified by the measures labelled 'unusual visualisation', 'internal visualisation', 'richness of imagery', 'colourfulness of imagery', and 'fantasy'.

In their review of creativity training, Tang et al. (2018) also highlighted that the ability to visualise future scenarios and to imagine what is not yet here is essential when individuals are to challenge the old way of thinking and produce novel ideas. The scholars furthermore paid special attention to *creative self-efficacy* – a topic that has received significant attention from scholars within the creativity literature (e.g. Reiter-Palmon et al., 2019). Creative self-efficacy is defined as 'the belief one has the ability to produce creative outcomes' (Tierney & Farmer, 2002, p. 1138), thus related to whether an individual believes in oneself and confidence in handling the necessary task(s) (Reiter-Palmon et al., 2019). Scholars have found that creative self-efficacy is associated with creative performance (e.g., Tierney & Farmer, 2002; 2011; Karwowski, 2014; 2016) and thus should be trained.

[23] Torrance builds his assessment instrument on Guilford's 'Divergent Thinking' variables (Guilford, 1959).

The individual characteristics and traits related to creativity and, thus, idea generation can be found in Table 4.

	Characteristic/trait	**Source(s)**
Personality trait perspective	Openness to experience	Dollinger et al. (2004), Feist (1998)
	Curiosity	Feist (2019)
	Cognitive flexibility	Guilford (2016), Barron (1963), Baas et al. (2013)
	Extraversion: independence, confidence and assertiveness	Feist (1998), Furnham et al. (2008)
	Norm-doubting and nonconformity	Fiest, (2019; 1998), Rubenstein (2003)
	Determination, ambition and perseverance (high energy and positive mind)	Amabile (1996), Batey and Furnham (2006), Feist (2012), Ceci and Kumar (2015)
Training and development perspective	Fluency	Guilford (1959), Torrence (1972; 1990)
	Flexibility	Guilford (1959), Torrence (1972; 1990)
	Originality	Guilford (1959), Torrence (1972; 1990)
	Elaboration	Guilford (1959), Torrence (1972; 1990)

	Persuasion	Torrance (1990), Torrance and Ball, (1984)
	Visualisation	Torrance (1990), Torrance and Ball, (1984), Tang et al., (2018)
	Imagination	Torrance (1990), Torrance and Ball, (1984), Tang et al. (2018)
	(Creative) Self-efficacy	Tang et al. (2018), Tierney and Farmer (2002; 2011), Reiter-Palmon et al. (2019), Karwowski (2014; 2016)

Table 4: Individual characteristics/traits related to idea generation.

Internal factors for idea generation in corporations

Several aspects of the internal environment of an organisation are found to affect creativity and thus, idea generation. From a meta-study, Hunter et al. (2007) found that most frameworks included similar elements, such as good relationships and collaboration with peers, top management support, autonomy and support for risk-taking. The scholars concluded that these elements were related to the creative performance of both the individuals in the organisation as well as teams.

Perhaps most famously, Amabile (1983) proposed a componential model for creativity, which has evolved over the years (e.g. Amabile, 1988; 1996; Amabile & Mueller, 2008) and now has more than 2,000 citations (Amabile, 2013). The model consists of four components necessary for creativity: domain-relevant skills (i.e. knowledge and expertise in relevant domains), creativity-relevant processes (i.e. cognitive processes contributing to novel thinking), intrinsic task motivation (i.e. motivation to engage in activities out of excitement or joy), and the surrounding (social) environment, typically created by managers in companies. While the latter is ‘outside the individual’, the three other components are related to the individual. According to Amabile (2013), ‘creativity should be highest when an intrinsically motivated person with high domain expertise and high skill in creative thinking works in an environment high in supports for creativity’ (p. 135).

Domain-relevant skills refer to knowledge, technical skills and intelligence in a particular domain where the individual is working. It may be influenced by the experience and educational level of the individual (McAdam & McClelland, 2002). According to Gardner (1993), two types of knowledge are essential for creativity; technical expertise and the ability to recognise opportunities and connect previously distinct elements of knowledge in new ways. Simonton (1980) have stated that individuals cannot be creative without the former, while Adams (2006) advocates for multi-disciplinary teams to balance the latter. Research has found that diverse functional teams outperform homogenous teams in terms of creativity (e.g. Choi, 2007; Fay et al., 2006; Keller, 2001). While diversity in teams is considered an essential factor to facilitate creativity, research on demographic diversity and creativity have found mixed results with no clear conclusions (Reiter-Palmon et al., 2019). Although domain-relevant knowledge is crucial, some scholars have stressed that too much domain-relevant knowledge and technical expertise can create strong patterns of thinking and perceptual fixation, which may lead to fewer and less novel ideas, for example, Byrge and Hansen (2014) and Ward and Kolomyts (2019).

Creative thinking is dependent on an individual's characteristics (Doran & Ryan, 2017). Amabile (2013) describes creativity-relevant processes as '[…] a cognitive style and personality characteristics that are conducive to independence, risk taking, and taking new perspectives on problems, as well as a disciplined work style and skills in generating ideas' (p. 135). She highlights cognitive flexibility, the ability to break though patterns and traits such as willpower and tolerance for ambiguity. Also, Amabile (2013) stresses that these skills can be trained. Several techniques and tools have been proposed to induce idea generation; for example, brainstorming, role-playing, concrete stimulus, forced analogy, incubation, prototyping and sketching (Herring et al., 2009). Desouza (2011) advocates for the use of customer-centred idea generation, problem-centred idea generation as well as price-centred idea generation, while Lillien et al. (2002) recommend the use of lead user idea-generation.

Motivation can be separated into intrinsic and extrinsic motivation (Deci, 1975). As mentioned in the previous section, intrinsically motivated people undertake a task or solve a problem because they find it exciting, engaging and they have an appetite for such work. On the other hand, extrinsically motivated people do the work because of some threat, such as peer competition or evaluation (e.g. Doran & Ryan, 2017). Lindenberg (2001) further divides intrinsic motivation into normative and hedonic motivation. While the former relates to the motivation caused by social or organisational norms, the latter refers to motivation caused by the enjoyment and excitement of fulfilling a certain task or solving a problem. According to Amabile (1996), people are more creative when they are intrinsic hedonic motivation. Intrinsic motivation is, in general, mostly found to stimulate creativity positively (e.g. positive engagement related to the job and tasks), while extrinsic motivation (e.g. external pressures, job requirements and influence from others) dampens creativity (Amabile, 1998; Shalley et al., 2004). However, Amabile (1996) has identified a type of

extrinsic motivation that can stimulate creativity – the so-called synergistic motivators. For example, frequent constructive feedback, recognition for creative ideas, as well as clear projects goals, can enable creativity. Conversely, non-synergic motivators, i.e. more formal and controlling motivators, such as financial rewards given if a particular sales target is reached, are found to be demotivating for creativity.

The work environment includes all the elements that can either stimulate or dampen creativity. Sherf et al. (2019) stress the importance of sharing novel ideas and sharing information. This is supported by Mauzy et al. (2003), who accentuate that effective information flows and idea exchange are crucial for idea generation. The scholars suggest that job rotation could be used to stimulate such a work environment. Another approach is to establish what Zahra (2015) has coined 'entrepreneurial hubs', i.e. a meeting place where exciting ideas can be shared and discussed. These idea-sharing arenas are typically isolated from the firm (Zahra, 2015).

In general, scholars have advocated that organisations should be supportive of creativity (e.g. Cummings & Oldham, 1997). Not only should organisations balance intrinsic and extrinsic motivations for employees, but they should also be ready to follow up on the ideas that the employees may bring forward (Desouza, 2011). As such, organisations should set aside resources for idea generation (as well as selection and implementation) as it is a time-consuming task (Reiter-Palmon, 2019). On the other hand, several scholars have suggested that resource constraints can positively affect creativity, as employees then need to find creative ways for implementing their ideas (e.g. Weiss et al., 2011).

Deci and Ryan (1985) found that managers play an essential role in the motivation of employees. In a similar vein, Shimizu (2012) specifies that top management needs to encourage autonomous behaviours of middle and operational managers, as they also play an important role. While autonomy is good, too much autonomy should be avoided as it can stimulate managers to act opportunistically, for example, by focusing on their group or personal interests instead of broader organisational interests. According to Sherman (1969), the top management also needs to be involved in the opportunity identification process and managers should be open to new ideas. Nevertheless, Sebora and Theerapatvong (2010) found that support for individuals might be more critical for idea generation than top managers support for creativity and innovation at a general level. The general organisational factors might, on the other hand, be more critical in terms of idea implementation (Sebora & Theerapatvong, 2010).

Lanitis (1970) advocates for planned and systematic idea generation mechanisms, rather than random idea generation. In the same vein, Conway and McGuiness (1986) define idea generation as a managerial process that should be somewhat monitored and encouraged. Work colleagues are also found to play a particular role. Zhou and George (2001) found that inputs from colleagues generate feedback; they can provide

new information and elaborate on unusual ideas, thus enhancing the idea generation process.

Amabile (2013) sums up most of the research conducted in this area and highlights the following positive factors for idea generation:

- multi-disciplinary collaborative work teams that are focused on ideas
- autonomy to perform the work
- idea-encouraging supervisors
- a top management team that supports and acknowledges creativity and innovation
- mechanisms for idea generation
- a culture of idea-sharing across the organisation.

According to Amabile (2013), the following factors are found to block creativity:

- a culture of criticising ideas
- political problems within the organisation
- an emphasis on the status quo
- a conformist and low-risk top management team
- excessive time pressures.

The aspects of the internal environment of an organisation found to affect creativity and, thus, idea generation are presented in Figure 4.

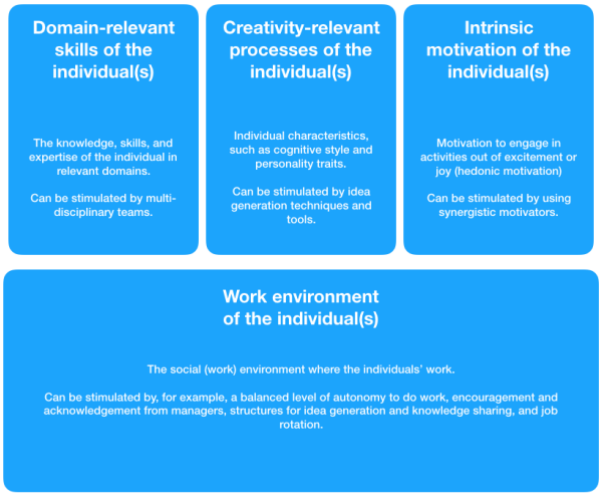

Figure 4: Internal aspects of idea generation in companies (inspired by Amabile, 2013).

Idea generation techniques

Osborn (1963) advocates that idea generation should be segregated from idea evaluation, which resulted in a growing number of studies focusing on the former (McAdam & McClelland, 2002). As such, numerous idea generation techniques can be found in the literature (Wang, 2019). Across the literature, idea generation techniques '[…] are designed to enhance the creativity process by overcoming blocks caused by emotional, cultural, perceptual and environmental factors' (Coates et al., 1997, p. 107). They can vary from informal activities, such as active/passive searching, to more formal processes, for example, brainstorming (Gonçalves et al., 2014).

Rochford (1991) states that ideas are generated either by individuals individually or by using one or several group idea generation methods. As such, it might be of no surprise that the idea generation techniques found in the literature either focus on the individual, group or both. For example, VanGundy (1988) categorised 105 different techniques based on whether they were individual or group methods. Additionally, he used other dimensions in the categorisation, such as whether the idea generation is verbal or done quietly, whether ideas are produced by compulsory relationships or done freely, and whether the technique uses related or unrelated stimulus to the problem at hand. Smith (1998) recognised 172 techniques for idea generation and divided these into three categories: *strategies* (i.e. active means for generating ideas); *tactics* (i.e. means using a single device, such as concrete, related or remote stimuli); and *enablers* (i.e. passive means of idea generation). Shah et al. (2003) used an even broader categorisation, as the scholars divided idea generation techniques into *intuitive* and *logical* methods. Intuitive methods help people break routines and overcome mental blocks, for example, brainstorming, role-playing and synectics. Logical methods, such as TRIZ, are based on existing sources. More recently, Wang (2019) proposed a new taxonomy for idea generation techniques, where individual techniques are categorised based on whether external stimuli are introduced and whether the technique highlights explicit or implicit knowledge processes. Group techniques are categories based on whether external stimuli are introduced and whether ideas are shared verbally or quietly.

Brainstroming (Osborn, 1963) seems to be the most common and well-known idea generation techniques in research and practice (e.g. Coates et al., 1996; McAdam & McClelland, 2002; Schöfer et al., 2015). The method aims to generate a large number of solutions to a problem without considering the utility, feasibility or importance initially (Gonçalves et al., 2014). Individuals, as well as teams, can use this technique. *Lateral Thinking*™ (de Bono, 1992) is another highly praised idea generation method (Coates et al., 1996). Rather than being a technique, Lateral Thinking™ is an approach to see unusual associations as well as concepts in a new way, instead of the more common linear (vertical) mode of thinking and using usual associations (Sternberg, 2019). Several techniques are associated with the Lateral Thinking™ approach, such as the redefining problems technique, the Six Thinking Hats (de

Bono, 1999), the filament technique (de Bono, 1992), The SCAMPER Technique (Serrat, 2017), the random input technique (de Bono, 1992) and more. Most of these techniques can be used by individuals and, preferably, by groups. *Synectics* (Gordon, 1961) is an extensive method, including techniques for problem analysis, ideation and idea selection. It uses analogies to distance people from the original context before eventually returning and forcing them to develop novel solutions to highly complex problems (Gonçalves et al., 2014). It is designed as a group process (e.g. Rochford, 1991). *TRIZ* (the Russian acronym for the 'Theory of Inventive Problem Solving') is a method based on logic. It was developed from an exhaustive study of invention patterns in the global patent literature. Individuals should analyse and compare the problem at hand with existing ways of solving problems found in the patents, thus excluding any form of intuition (Gonçalves et al., 2014). It can be used by individuals and, preferably, by groups (e.g. Schöfer et al., 2015).

Each of the mentioned idea generation techniques are detailed in Table 5 and categorised by the intuitive-logical taxonomy proposed by Shah et al. (2003) and whether they are individual or group based.

Idea generation techniques	**Method (intuitive/logical)**	**Individual / group**
Brainstorming	Intuitive	Individual and group
Lateral Thinking™ (including the redefining problems technique, the Six Thinking Hats, the filament technique, The SCAMPER Technique, and the random input technique)	Intuitive	Individual and group (teamwork is preferred)
Synectic	Intuitive	Group
TRIZ	Logical	Individual and group (teamwork is preferred)

Table 5: List of most common idea generation techniques.

Whether the idea generation process should be conducted by an individual or a team of individuals is an ongoing discussion in the creativity literature. According to Rochford (1991), some scholars favour multidisciplinary teams for idea generation (e.g. Lanitis, 1970; Buijs, 1979), while others have argued that individual idea generation is superior, as better and more unique ideas are created (e.g. Tauber, 1975; Davies & Pearson, 1980). In fact, both statements might be right.

On a general level, communication in groups seems to prevent the sharing of novel ideas (Diehl & Strobe, 1987), which raises questions about the use of teams in idea generation processes. Mullen et al. (1991) stress that a team produces both more ideas and more different ideas when they work individually at the beginning of the ideation process instead of as a collective. In the same vein, Marsh et al. (1996) propose that the more people participating in the same ideation process, the more likely they are to follow the same patterns of thought, thus resulting in a lower number of diverse ideas. Furthermore, when working individually, people can follow their interest without judgment from others, which enhances the level of intrinsic motivation, one of the critical ingredients in creative thinking (Amabile, 1998). On the other hand, including more people later in the ideation process increases the amount of collective knowledge, which, in theory, should also increase the chance for making new knowledge combinations to develop ideas even further (e.g. Ward & Kolomyts, 2010). This is in line with the suggestions made by Foss et al. (2008). The scholars express that teams are superior to individuals in terms of entrepreneurial competitive advantage, as greater creative output tends to descend from the cognitive variety among team members as well as the team's capability of integrating and applying various thought processes. In an experimental study, Paulus and Yang (2000) found that a group-writing technique resulted in greater productivity than individual writing since people increased their attention to others' ideas and used these as a stimulus in their individual idea generation. Nevertheless, the technique proposed by Paulus and Yang (2000) did not include a collective group ideation process; instead, the group perspective was used after the initial ideas were produced.

From the CE literature, Tseng and Tseng (2019), amongst others, have advocated for the use of 'Innovation Teams' (I-Teams), primarily based on studies from the field of innovation. According to Kuretko (2009), I-Teams are semiautonomous, have an allocated budget and management, and they have the authority to make decisions within the limits of a predefined protocol. Their primary focus is on cultivating and executing new ideas, not daily operations (Tseng & Tseng, 2019). As such, I-Teams are regularly separated from the rest of the corporation initially but might be incorporated into the organisation if the project becomes successful (Ireland et al., 2006a). The management of such teams is highly important. Pearce and Ensley (2004) advise leaders to foster early successes in teams working on new ideas, as this seems to strengthen a shared vision among team members. The latter is found to be crucial for the performance of I-Teams (Pearce & Ensley, 2004). Furthermore, Kratzer et al. (2006) studied disagreement (polarity) in I-Teams and its impact on creative performance. The scholars suggest that leaders play a significant role in solving disagreements as it negatively influences the performance of I-Teams, especially in the implementation stage. At the idea generation stage, disagreements are found to stimulate creative performance, but only to a certain degree, beyond this it has negative impacts (Kratzer et al., 2006).

Empirical findings and discussion

Results show that ideas can come from anywhere and that several triggering events can stimulate idea generation. Nevertheless, there is a growing amount of literature on employee-involved idea generation as well as ideas coming from the external environment. Customers, suppliers and other relevant stakeholders are found to be an essential source of new ideas in corporations. Recent research has shed light on other ways of utilising the external environment, such as open innovation and corporate-startup collaborations. A reason for the increased focus on external sources for ideas might be the fact that accessing a flow of ideas within a corporation is a challenging task (Morison, 2003) and a successful CE strategy is dependent on this (Kuratko et al., 2004; Menzel et al., 2007; Shimizu, 2012). Even when ideas come from the outside, individuals still play a crucial role. They are the ones taking action by obtaining the new knowledge, pushing the idea forward inside the corporation and leading the process (Sarooghi et al., 2015; Menzel et al., 2007; Autio et al., 2013; Desouza, 2011).

The creative performance of individuals is dependent on several factors. This topic has been studied from different 'angles' within the creativity literature. From the literature on creative behaviour and personality, results show that cognitive, social, motivational-affective and clinical traits affect the creative performance of humans (Feist, 1998; 2012; 2019). Examples include: openness to new experiences, curiosity, cognitive flexibility, extraversion (independence, confidence and assertiveness), norm-doubting and nonconformity, determination, ambitiousness and perseverance. From the literature on training and development and assessment, results showed a strong focus on the various cognitive processes that affect the creative performance of humans; for example, fluency, flexibility, originality, elaboration, persuasion, visualisation and imagination. It is important to note that these characteristics or skills can be enhanced through training (e.g. Amabile, 2013; Scott et al., 2004; Rose & Lin, 1984; Torrance, 1972; Tang et al., 2018).

A particularly interesting result from Project A of this dissertation (see section 3.1.2) is that the identified intrapreneurial characteristics strongly overlap with several of the creative traits or characteristics found in the creativity literature. For example, originality ("Creative innovator"), fluency ("Idea generatior"), flexibility ("Flexible open-minded"), imagination and visualisation ("Visionary"), and persuasion ("Persuasive influencer"). This is, however, in line with findings from numerous scholars who stress that the CE process is heavily related to creativity, as creativity in individuals is the seed of CE leading to new products, processes and business models (e.g. Menzel et al., 2007; Zahra, 2015; Sarooghi et al., 2015; Elia et al., 2017).

Another finding is that internal factors can stimulate or dampen idea generation in corporations. Amabile's (1983) proposed componential model for creativity sheds light on the following four factors, of which the first three are individual-based: domain-relevant skills, creativity-relevant processes, and intrinsic task motivation of

the individual. The final factor is the surrounding social environment of the organisation. Corporations can stimulate each of individual factors by, for example, utilising multi-disciplinary teams, setting up mechanisms for idea generation through various techniques (that can be taught and trained), and using synergic motivators instead of non-synergic motivators. In terms of the social work factors, corporations can stimulate creative performance by, for example, supporting multi-disciplinary work teams focused on new ideas, providing a balanced level of autonomy to do work, making sure that supervisors are encouraging and acknowledge idea generation and creativity, provide structures for idea generation and enforce knowledge sharing across the organisation, set aside resources for idea generation (as well as selection and implementation), and employ job rotation (e.g. Amabile, 2013). All these initiatives only work if the top management team supports and acknowledges creativity and innovation.

Results from the idea generation technique literature show that there are numerous methods to stimulate the ideation process. Some of the most referenced techniques are brainstorming, Lateral Thinking™ (which includes several different techniques), synectics and TRIZ. Some involve other stakeholders, such as potential customers, users or domain-relevant experts. Nevertheless, each of these idea generation techniques are rather dubious in terms of the innovativeness of the ideas generated. O'Reilly and Binns (2019) stress that most ideas generated through these methods are incremental, not radical or disruptive. In fact, most companies fail to develop radical ideas and concepts (Garcia & Calantone, 2002; O'Connor & Rice, 2013). As such, there seems to be a lack of techniques or tools that generate more novel or radical ideas.

While evidence seems to support the fact that idea generation is most efficient when done individually, group or teamwork is the preferred approach later in the process, especially concerning idea implementation. This is in line with findings from the CE literature, stating that CE is a team effort (e.g. Thornberry, 2001). Functional diverse teams seem to outperform homogenous teams (e.g. Choi, 2007; Fay et al., 2006; Keller, 2001) and so-called I-Teams have been found to be highly efficient if they are granted an allocated budget, decision-making power, a dedicated management practice, and are allowed to focus their time on new ideas, not daily operations (e.g. Kuretko, 2009; Tseng & Tseng, 2019). Several companies have created dedicated innovation labs or accelerators to facilitate and support the work of I-Teams, for example, the Accelerator Program at Bosch (Osterwalder et al., 2020).

3.2.2. RESEARCH OBJECTIVE 6

This section is based on the paper titled "Booster Cards: A Practical Tool for Unlocking Business Model Innovation", written in collaboration with colleagues P. Thomsen and J. C. Sort, published in the Journal of Business Models (SI).

While much of the existing literature within the fields of NPD, creativity and innovation focuses primarily on generating ideas for new products and services, scholars and practitioners alike have turned their attention to the creation of new business models (BMs) (Martins et al., 2015; Ramdani et al., 2019), especially in the last decade (e.g. Wirtz, 2019). The concept of BMs has been heavily studied and discussed ever since the term started to gain momentum around the end of the twentieth century (Osterwalder et al., 2005). Wirtz (2019) found a great increase of publications using the term BMs in both grey literature as well as traditional peer-reviewed articles from the beginning of the 2000s until 2017. While there seems to be a consensus among scholars that BMs are highly important, there is a lack of agreement on how to define a business model (Massa et al., 2017). In this dissertation, the following comprehensive definition by Osterwalder et al. (2005) is adopted: 'A business model is a conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams.' (pp. 17–18).

Hayton and Kelley (2006) stress that one of the essential activities in the CE process is the development of new business models, also referred to as business model innovation (BMI). In the same vein, Schmelter et al. (2010) describe how CE activities are centred around the introduction of new BMs. According to Massa et al. (2017), '[…] business models may represent a new dimension of innovation that complements traditional ones such as product, process, and organizational innovation, thus broadening the boundaries of innovation-related phenomena and, accordingly, theories of innovation.' (p. 74). Extensive research has found that BMI is crucial for firm survival, business performance and competitive advantage (e.g. Demil & Lecocq, 2010; Chesbrough, 2010; Amit & Zott, 2012; Wirtz & Daiser, 2018).

Due to varying definitions on what exactly BMI entails, Massa and Tucci (2013) suggested splitting the notion of BMI into two categories: business model design and business model reconfiguration. The first is related to the process of inventing new businesses and business models, whereas the latter concerns the process of restructuring and generating new ideas within existing business models. According to Wirtz and Daiser (2018), a critical advantage of BMI is that '[…] it sheds light on identifying new value propositions to generate revenues and to find new ways to create and capture value for its stakeholders' (p. 41). The process of BMI has been heavily studied. Wirtz and Daiser (2018) found twenty different studies focusing on the BMI process. Nevertheless, research seems to be developing in silos, as scholars tend to study this phenomenon from different angles (Wirtz & Daiser, 2018). From their analysis of relevant literature, Wirtz and Daiser (2018) propose a generic BMI

process containing the following phases: analysis, ideation, feasibility, prototyping, decision making, implementation and sustainability.

The notion of BMI (both designing and configuration) is, however, a challenging and complicated art (Teece, 2007). This might be the reason why there is a lack of tools to support managers innovating new BMs (e.g. Wirtz & Daiser, 2018). Similar to other types of innovation, BMI is a job for individuals, namely employees and managers in companies (Chesbrough, 2007; McGrath, 2010). As such, the typical barriers to creating new business models are related to the dominant logic present within the organisation (Prahalad & Bettis, 1986; Bettis & Prahalad, 1995; Chesbrough, 2003) and the level of capabilities in the organisation (Teece et al., 1997; Pisano, 2006). In this case, the former relates to the cognitive orientation of the employees and managers that constrains their ability to think up new business models and enact change that is outside the core of the organisation (Grant, 1988; von Krogh et al., 2000). The latter refers to the lack of capabilities in individuals to see new ideas and act upon them (Pisano, 2006). The following substantive research objective (RO6) steered the research agenda for Article III as well as the following section:

> RO6: To understand how to nurture the process of novel idea generation in the context of business model innovation.

Towards a new tool for generating ideas in BMI processes

To investigate this research objective, I conducted a literature review focused on business models, business model innovation and creativity, together with colleagues. From the review, we found that various suggestions have been presented in the literature on how to improve the ability to innovate BMs. Some scholars have developed different categorisations of BMs using a multitude of terms, for example, business model patterns (Osterwalder & Pigneur, 2010; Gassmann et al., 2014), business model recipes (Baden-Fuller & Morgan, 2010; Sabatier et al., 2010) and business model configurations (Taran et al., 2016), which practitioners and scholars alike then have been using as stimuli in a rather unstructured way in the ideation phase. An example of this can be found in the study by Lund and Nielsen (2014) as well as the BMG book (Osterwalder & Pigneur, 2010). Others have tried to use intuitive methods from the idea generation literature to stimulate creative thought. For example, Rumble and Minto (2017) used analogies as creative triggers, while Martins et al. (2015) used analogical reasoning as well as conceptual combinations to support the ideation of new business models.

Based on the idea of TRIZ as a logical idea generation technique (see section 3.2.1), this led us to believe that it might be possible to translate a taxonomy of BM configurations into a creativity tool where the different configurations could function as generic business analogies that could stimulate the production of novel business ideas in a more structured way. Our new combination of TRIZ and business model

configurations led to the development of 71 booster cards of successful BMs – see Figure 5 for examples of the actual Booster Cards.

The development of these cards, or artefacts, followed an iterative process. First, we created low fidelity prototypes (e.g. Herring et al., 2009; Blank et al., 2014) using MS PowerPoint. The slides included a short description of the successful BM configuration and a real-life example of a company utilising this BM configuration. We used a few of these slides whenever we did a workshop with companies or students, where part of the program was set aside to generate new ideas for BMs. A problem we encountered was, however, that we only managed to show a limited number of the 71 successful BM configurations during the ideation process as well as the fact that they were not 'physical artefacts' for the participants to touch and feel. Therefore, we then made a paper-based low fidelity prototype on A4 landscape paper where all 71 BM configurations were described. Again, we used the prototype in workshop settings and learned that while making a physical prototype is good, such a list with numerous pages in A4-format can be too overwhelming for people to comprehend.

Nevertheless, the workshop participants, which also included business consults, liked the idea about this 'tool' and we could see that it led to new inspiration. As such, we went on to develop a deck of 71 cards, each representing one of the successful BM configurations. We included more company examples on the bottom of the cards as people seemed to understand the BM configuration(s) better when they were able to connect it to a case.

Figure 5: Examples of different Booster Cards (derived from Thomsen et al., 2019)

We then started to experiment with how to develop a structured process for the best possible use of these cards, so that they supported individuals and teams to creatively experiment and develop better and more novel business model designs and reconfigurations. We used several of the recommendations found in the idea generation literature on how to increase creative performance, which also has been discussed in the previous section.

By providing examples of successful BMs found in totally different domains and industries, the cards encouraged people to think outside the dominant logic of the firm or industry causality, something Byrge (2020) also recently discussed. To overcome the problem of the (sometimes limited) level of capabilities, we spend some time on training the participants in the general 'language' of BMs (Osterwalder et al., 2005) as part of the ideation process. Also, we tried to incorporate multi-disciplinary teamwork during the process, following some of the findings from section 3.2.1 in this dissertation about how and when to use groups.

For two years, we tested these cards in a series of iterative and cumulative workshops, including ten workshops with students (small and large-scale workshop settings) and eight workshops with companies, involving a total of over 300 students and over 50 company representatives. Observation was used as a method for collecting data, together with unstructured interviews with participants. Furthermore, we used domain experts to qualitatively evaluate the outcome of each workshop concerning novelty (primary) and the usefulness (secondary) of the ideas.[24] After each workshop, we (the research team) had a reflective session where we analysed the data and, when applicable, invited other scholars into the discussion. See a more comprehensive description of the approach and methodological considerations in section 4.3.

Empirical findings from Article III

The results from our experiments showed that analogies and stimulation through the use of cards that represent BM configurations can, indeed, help individuals develop more relevant and original ideas. The most impressive result from using the BM configuration cards as stimulus is the great variety of ideas generated. We even observed radically divergent ideas when the same business case was applied in different settings. The greater variety of ideas is interesting, as scholars have found that the generation of many alternative ideas leads to more novel ideas (e.g. Rochford, 1991). Also, a high number of alternative ideas equals more knowledge to base decisions on – and more knowledge to base decisions on decreases uncertainty, which is an important aspect in innovation processes as they are naturally fraught with high uncertainty (e.g. Jalonen, 2012). Furthermore, individuals that had actively used the cards tended to hold superior understandings of the subject and could, thereby, contribute in more complex discussions, when compared to individuals that had not

[24] According to Perry-Smith and Coff (2011), a combination of novelty and usefulness is often used to measure creativity.

used the cards. From a managerial viewpoint this is interesting as the use of these Booster Cards then might lead to not only more complex strategic discussions in companies, but potentially also better and more novel ideas that break domain logic and industry causality.

However, two conditions are required to achieve such results.

Firstly, we recommend others use our proposed standardised process for applying the cards in various settings, as it is carefully designed to avoid creativity constrains and to bring as much knowledge into play as possible. For example, participants should start the ideation process individually. This is in line with findings of several other scholars, who found that individual ideation outperforms group ideation at the beginning of a process (e.g. Mullen et al., 1991). Afterwards, participants should work in pairs of two. On the one hand, working in pairs bring more knowledge into play, which is found to increase creative performance (e.g. Ward & Kolomyts, 2010), and, on the other hand, it avoids participants falling into the same patterns of thought. The latter tends to happen when too many people are participating in the same ideation process (e.g. Marsh et al., 1996). Also, the approach of working first individually and then in pairs allows people to follow their interests, which is found to enhance intrinsic motivation and, thus, creative performance (e.g. Amabile, 1998). Furthermore, when people work in pairs it is much easier to say "yes" and avoid judgement compared to being in a larger group of people. This follows the arguments of Amabile (2013). Subsequently, participants should work together in a team of four to six people. This increases the amount of collective (and potentially diverse) knowledge, which strengthens the chances for new knowledge combinations that can develop ideas even further (e.g. Ward & Kolomyts, 2010).

Secondly, to use the cards most efficiently, individuals are required to hold basic knowledge about the concept of BMs and, preferably, also have some experience in working with a BM framework, such as the BMC. This can, however, be achieved through various (free) sources, e.g. YouTube videos by Strategyzer (https://www.youtube.com/strategyzer) or online courses at www.edX.org and www.coursera.org to name a few. This aspect seems to overcome the problem of the sometimes-limited level of capabilities in individuals.

See the full study in Article III (Appendix C).

Empirical considerations for Article III

A natural next step would be to perform statistical experiments to compare the outcomes of applying the treatment (BM configuration cards) to one or more experimental groups. It would be interesting to comparing the results to a control group to see if the Booster Cards indeed lead to more novel and useful ideas compared to other types of ideation techniques, such as analogies (e.g. Rumble & Minto, 2017), analogical reasoning and conceptual combinations (e.g. Martins et al.,

2015), BM configurations used in an unstructured way (e.g. Lund & Nielsen, 2014), or even a completely unstructured process without any stimuli. Yet, this is beyond the scope of this PhD dissertation.

Another way of testing the usefulness of our structured process (and tool) would be to randomly pick a certain number of companies and introduce them to the process and tool through a workshop or similar. Then, we could make use of more quantitative methods such as questionnaires and ask company representatives about their use of our proposed approach as well as the usefulness. Such questionnaires could be sent out immediately after the treatment and again after six months. We could also make a design where we include tests before and after the treatment on general understandings of BMs as a concept (employee-level) as well as questions regarding the actual number of relevant and original ideas and the variety of ideas (managerial-level).

In Article III, we decided to develop a set of BM configuration cards based on the initial work by Taran et al. (2016). We could have chosen to develop a structured process based on the already existing BM pattern cards, which were created by Gassmann and colleagues at the University of St. Gallen (Gassmann et al., 2014), instead. While a process is described in Gassmann et al. (2013), it only reaches 'surface-level' descriptiveness. Further, the BM pattern cards created by Gassmann et al. (2013; 2014) only include 55 BM patterns, while the theoretical framework of BM configurations by Taran et al. (2016) entails a total of 71 successful ways of doing business. As such, we found the BM configurations to be a more extensive list, which is important when developing a logical idea generation technique, as this type of technique should encompass all (or close to all) potential existing solutions (like TRIZ).

3.2.3. RESEARCH OBJECTIVE 7

This section is based on the short paper titled "Business Model Creativity: A Horizontal Insight Model", written in collaboration with colleagues C. Byrge and S. Hansen, published in the Journal of Business Models.

As stated in section 3.2.2, creativity plays several roles in innovating BMs (e.g. Govindarajan, 2010). In the seven phases of a BMI process identified by Wirtz and Daiser (2018), creativity and idea generation are typically related to the very beginning of the process; i.e. the ideation phase. Even though many of the 'traditional' techniques found in the idea generation literature '[…] are agnostic about the nature of the ideas that are generated—disruptive or incremental' (O'Reilly & Binns, 2019, p. 54) more and more companies do not seem to struggle with getting new ideas. In fact, O'Reilley and Binns (2019) state that employee involvement in innovation has increased significantly during the last decade. A reason for this might be the advancement of new and more efficient ICT tools that have improved

corporate communication by facilitating knowledge sharing across corporate (organisational) boundaries (e.g. Menzel et al., 2007). Contemporary research by Arfi and Hikkerova (2019) has looked into how digital platforms can enable organisations to exchange knowledge with, for example, consumers in more rapid and efficient ways. Furthermore, online suggestion systems, (digital) idea contests, online co-production systems, digital innovation contests or hackathons[25] have become common sources for new ideas in companies (e.g. O'Reiley & Binns, 2019; Wiggins et al., 2014; Hjalmarsson & Rudmark, 2012; Prieto et al., 2020). Recent work by Kruszelnicki and Breuer (2020) describes how Adobe has developed a concept called 'Kickbox', where employees can suggest new ideas. The concept has evolved into different adaptions at other large corporations like Roche, Siemens Energy and Implenia (Swisscom, 2020).

Rather than coming up with new ideas, one of the big questions in corporations seems to be figuring out which ideas (and teams) to invest in (O'Reilly & Binns, 2019; Osterwalder et al., 2020). And when it comes down to a resource-battle between a novel idea that diverges from the traditional way of doing business and a less novel but rather feasible idea that is easily implementable, companies seem to choose the latter as they are more economically appealing in the short run (Christensen, 2006). Also, and maybe most importantly, novel ideas are more difficult to evaluate and thus associated with a high degree of uncertainty (e.g. Lind & van den Bos, 2002; March, 2006). At the very core, uncertainty refers to situations where it is very hard (or maybe impossible) to make correct decisions. Milliken (1987) describes that when uncertainty is high, there are a lot of assumptions and only a few facts. Also, cause and effect relationships are ambiguous (Milliken, 1987). As such, several scholars have proposed other types of idea generation techniques[26] or approaches during the last decade to further elaborate on ideas and make them more feasible by testing assumptions and thus decreasing uncertainty (O'Reilly & Binns, 2019). Examples are *Design Thinking* (Brown, 2009), the *Lean Startup* (Ries, 2011) and *Business Model Generation* (Osterwalder & Pigneur, 2010).

Design Thinking is a method for generating insights into customers' real problems and developing prototypes as potential solutions (Brown, 2009). It is an iterative process that '[…] encourages generating new ideas and insights (creativity) through empathic listening and then narrowing the focus through rapid prototyping and testing (implementation)' (O'Reilly & Binns, 2019, p. 52-53). It includes five phases (empathise, define, ideate, prototype and test) for a team to go through (e.g. Brown,

[25] O'Reiley and Binns (2019) define a hackathon as '[…] intense idea-generation sessions for cross-functional teams of employees' (p. 53), which usually is a one-off event conducted once a year or even quarterly in some organisations.

[26] While these approaches might not fit the typical definition of an idea generation technique, O'Reilly and Binns (2019) still mention these as ideation methods. Nevertheless, an approach or methodology might be more appropriate terminology in this context.

2009; O'Reilly & Binns, 2019). Design Thinking is human-centred and mainly based on non-obtrusive methods (e.g. observation) with the goal of disruptive innovation (Badke-Schaub et al., 2010). The approach was originally developed by David Kelley and colleagues in the international design consultancy IDEO (O'Reilly & Binns, 2019).

Initially developed by Blank (2007), Ries (2011) advanced the concept that is now recognised as the *Lean Startup* methodology. As an approach, it '[…] emphasizes a build-measure-learn logic with the development of a minimally viable product (MVP), putting the product in front of potential customers, rapid iteration and pivoting based on this learning, and the use of metrics that can lead to informed decisions rather than vanity metrics that make the manager look good' (O'Reilly & Binns, 2019, p. 55). Even though the Lean Startup methodology was developed for entrepreneurs, it has been successfully adopted by large corporations around the world. Examples are General Electric, Procter & Gamble and the National Security Agency (O'Reilly & Binns, 2019), thanks to the development of the educational programs 'The Lean LaunchPad' (for students) and 'I-Corps™' (for companies) (Blank et al., 2014). Both of these programs utilise the Business Model Canvas (BMC), a tool that was developed initially by Osterwaler (2004) and further described by Osterwalder and Pigneur (2010) in the book 'Business Model Generation'. The main idea is that individuals or teams go through each of the canvas' nine building blocks, which represent the important elements of a business, to develop repeatable and scalable business models (e.g. Blank, 2013b). The BMC '[…] helps users to systematically think through their business model and identify those elements needed to test the original hypothesis' (O'Reilly & Binns, 2019, p. 56). Several company accelerators, like the one at the German multinational engineering and technology giant Bosch, as well as independent accelerators, e.g. Y Combinator, use a combination of the Lean Startup and BMG methodologies (e.g. Osterwalder et al., 2020; O'Reilly & Binns 2019).

All three approaches emphasise the use of potential customers, end-users, partners, suppliers, domain-relevant experts and other domain-relevant stakeholders to further elaborate on ideas (Müller & Thoring, 2012). Also, they focus on building prototypes and testing in front of customers or users to get feedback and make rapid iterations, if needed. The Lean Startup and BMG, furthermore, put a focus on decreasing risks by testing (business) hypotheses in the market and using the BMC as a reference tool (Müller & Thoring, 2012). While the abovementioned approaches have had a tremendous effect (Blank, 2013b), insights from these groups (customers, end-users, partners, suppliers, domain-relevant experts) might work the best for some types of ideas. For example, novel ideas under risk (Zach & Turcan, 2018), that is, ideas that are novel and new, but that people can still relate to. However, in the case of novel ideas that diverge from domain logic and industry causality (e.g. Byrge, 2020), and deals with a high level of uncertainty, customers, end-users, domain-related experts and stakeholders might find it challenging to understand such ideas and further

elaborate on these as they are more complex (Zach & Turcan, 2018). This led me to reflect on whether other types of experts could be more appropriate for further developing these highly novel ideas they have huge potential and is therefore wanted in CE activities (Shimizu, 2012; Heinze & Weber, 2016; Garcia-Morales et al., 2014). The following substantive research objective (RO7) steered the research agenda for Article IV as well as the following section:

> RO7: To understand how non-domain expertise can help to nurture the process of further developing and testing highly novel ideas.

Towards a conceptual model for using non-domain experts in BMI processes

Together with two fellow scholars, I conducted a conceptual analysis of how creativity may support the BMI process of further developing and testing novel ideas. We used selected literature from the field of creativity and BM innovation as well as learnings from several action-research experiments with company representatives and students on the involvement of horizontal knowledge in the process of novel idea creation.

Horizontal knowledge is '[…] knowledge that is not directly related to a given problem or situation' (Byrge & Hansen, 2014, p. 43), but is instead knowledge that is horizontally relevant and therefore could open doors to new knowledge combinations that can further develop novel ideas. Horizontal knowledge is very different from vertical knowledge, the most common form of thinking, which is defined as 'knowledge directly related to a given problem or situation'. Byrge and Hansen (2014) state that if only vertical knowledge is used, it limits our abilities to solve problems and develop unique solutions. That being said, vertical knowledge should not be seen as a bad thing; logical knowledge is valuable in many situations. Horizontal knowledge should, therefore, be seen as a great supplement to vertical knowledge (Byrge & Hansen, 2014) and a way to bring more knowledge into play. Several other scholars have also advocated for the use of knowledge from non-related domains and industries, for example, Martins et al. (2015), Ward and Kolomyts (2019), and Byrge (2020).

A way of accessing horizontal knowledge is by practice (Byrge & Hansen, 2014; Byrge, 2020). By deliberately training this (creative) cognitive skill, individuals can better move back and forth between vertical and horizontal knowledge, whenever they are challenged with a problem or a situation calling for a creative solution to be made (Byrge & Hansen, 2014; Byrge, 2020). However, this is a challenging task, and it might also be the case that individuals do not hold the horizontal knowledge needed in a specific situation. Thus, another (and maybe more efficient) way of accessing horizontal knowledge is by involving horizontal experts, that is, people that hold knowledge which is horizontally relevant to the problem at hand, situation or idea. Hence, these people could be described as non-domain experts.

Based on our initial analysis, we conceptualised a five-step model for involving horizontal experts and consequently horizontal knowledge in the process of novel idea creation, called 'The Horizontal Insight Model' (see Figure 6).

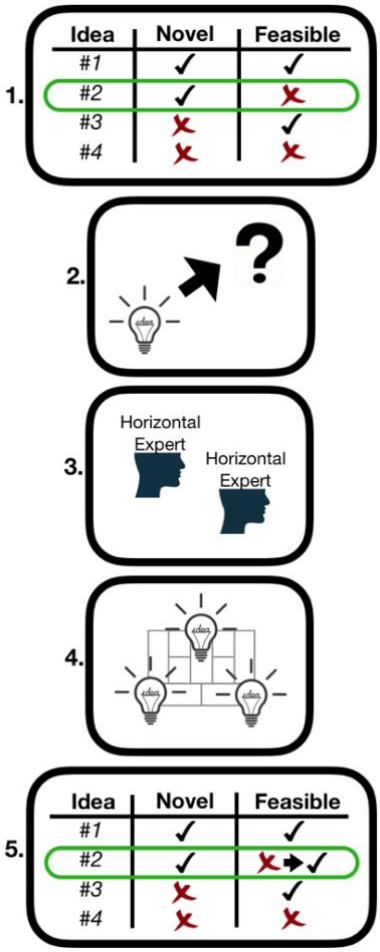

Figure 6: The Horizontal Insights Model (derived from Brøndum et al., 2018)

The point of departure is a sum of (new) ideas, which might come from internals and/or externals and triggered by several events (see section 3.2.1). *Step one* is a sorting activity where all the ideas should be categorised qualitatively according to novelty and feasibility. The former refers to whether the idea breaks with domain logic and industry causality (e.g. Byrge, 2020), or whether it is new from a firm or customer perspective (cf. Augusto & Coelho, 2009). The latter refers to whether the

idea, with the current knowledge available, is feasible or not. The goal is to identify the ideas that are (highly) novel but unfeasible (for various reasons) and work with these (independently or in parallel) in the following steps. These types of ideas are interesting as they have enormous potential (Shimizu, 2012) but are often eliminated by companies as they are financially unattractive at first sight relative to other, more feasible, ideas (Christensen, 2006). Therefore, ideas categorised as novel-not-feasible are the focus in this model.

In *step two*, the novel-not-feasible ideas are translated into an inter-domain principle by removing the domain-related themes. If a company is working with the novel idea of 'developing a taxi company without a taxi fleet', an example of this 'translation' would be to remove the domain-related principles, i.e., the system being a taxi company and the resources being a taxi fleet. This would equal to 'a system that runs without owning its core resource'. The translation of the idea into an inter-domain principle is what makes it possible to search for potential horizontal domains and knowledge from experts that have already tested and thus further developed a similar idea, but in a completely remote domain or industry.

Step three relates to a search activity. The principle becomes the stimuli or 'search-key' activating this activity. Simple Google searches, existing literature on business models, cases or databases covering BMI examples would be a good place to start. However, all kinds of information could be relevant in this step. The main thing is that knowledge related to the initial idea cannot be found, as it is somewhat new to the world – or almost new to the world.[27] However, at the principle level, this is not the case. Furthermore, asking domain experts for advice in this step is of no use as the idea breaks with domain logic and industry causality.

After the horizontal domains are identified, this area should be studied to get new insights in *step four* and prepare for an additional ideation process. Preferably, horizontal experts from the identified domain should be invited into the ideation process to access the knowledge first-hand. If this is not possible, conducting interviews with these experts is a second option to access horizontal knowledge. Available secondary data, such as case studies or other written material, could also work as a last resort to access horizontal knowledge. To apply the newly accessed horizontal knowledge in this step, and thus combine knowledge in new ways, might require a facilitated creative process to avoid cognitive constraints, for example, the Creative Platform (see Byrge & Hansen, 2014) or others. The idea of a taxi company

[27] Even though there is a stream of literature looking at the phenomenon of new-to-the-world products and technologies, most ideas are – in fact – not completely new to the world. Only a few examples of products throughout the history of time can be categorised as completely new to the world. Bergstein and Estelami (2002) mention the Walkman by Sony, Post-it® notes by 3M and the Xerox 914 (the world's first photocopier) as examples of new-to-the-world products.

without a taxi fleet is easier to develop further and thus turn feasible when a similar idea has been recognised in a horizontal domain. An example could be SETI@home, an idea that has already been successfully tested in a non-related domain and further developed into a working solution. In their search for life in the universe, the Berkeley SETI Research Center got the idea of creating a software (later entitled SETI@home) that could turn the power of private laypeople's computers into a supercomputer to analyse an enormous amount of data from radio telescopes, instead of developing the computer themselves. From this new knowledge, the company in the example might further develop their initial idea of a taxi company without cars into the idea of using a distributed system that integrates laypeople and their cars – a system running without its core, just like SETI@home.

Lastly, in *step five*, the initial idea categorisation from step one is adjusted. The goal is to feed novel-and-feasible ideas into the hands of the decision makers in the organisation, as a greater variety of ideas equals more knowledge to base decisions on. Again, this is an essential aspect of innovation processes, which by default are fraught with high uncertainty (e.g. Jalonen, 2012).

We tested our model through a series of iterative and cumulative workshops with a total of 18 companies. In each workshop, the companies deliberately followed our proposed model of involving horizontal experts. During each workshop, we used observation as the primary data collection method, combined with unstructured interviews with the participants to explore further the value of involving horizontal experts, from the company representatives' point of view. Between each workshop, the research team had ongoing reflective sessions where we analysed the collected data and further discussed the role of horizontal experts and how they can best contribute, based on this data. In addition, a total of 40 graduates from the Creative Genius program[28] at Aalborg University experimented with the use of horizontal experts as part of their project work. Each student reflected on the use of horizontal experts in the evaluation and further development of original ideas. We used these evaluation reports to understand better the value and how to use horizontal experts in the evaluation of novel ideas. See a more comprehensive description of the approach and methodological considerations in section 4.3.

Empirical findings from Article IV

Results from our empirical work showed that it is possible and highly valuable to use horizontal experts (and horizonal knowledge) in the further development of highly novel ideas that diverge from domain logic and industry causality. Also, results

[28] The Creative Genius program was a 30 ECTS cross-disciplinary elective course in creativity at the Master's level, running from 2012 to 2018 (https://www.creativegeniussemester.aau.dk/).

showed that the horizontal experts often helped further develop the highly novel ideas, so that they became more feasible for implementation.

See the full study in Article IV (Appendix D).

Empirical considerations for Article IV

The approach employed in Article IV is highly qualitative and interpretative. However, several alternative approaches exist. For example, we could have employed a mix of qualitative and quantitative methods by also providing company representatives follow-up questionnaires. This would have allowed the respondents to offer anonymous feedback, which could be a way of reducing the social desirability bias (i.e. when a respondent distort information for different reasons) inherent in interviews (Salazar, 1990; Kvale, 1996). Nevertheless, as we collected data in more than one way to triangulate, we did not find it necessary to also introduce follow-up surveys. Another alternative way of conducting this research would be to employ a rather inductive approach and through interviews and observation uncover how companies are working with highly novel and uncertain ideas – or how different types of expertise are utilised in these conditions.

Further actions would be to conduct experiments to compare the outcomes of applying our treatment (the Horizontal Insights Model) to one or more experimental groups (or teams). It would be exciting to study the implementation success rate of these novel ideas and compare the results of using this new approach to several control groups. Such control groups could, for example, work on the same novel ideas in parallel but employ the Lean Startup methodology, Design Thinking or BMG. This is, however, beyond the scope of this PhD dissertation.

Another way of testing the usefulness of our proposed model would be to (randomly) single out several corporations and introduce our model to them. Subsequently, we could then make use of more quantitative methods such as questionnaires and ask company representatives about their use of our proposed approach as well as the usefulness after a certain period. Such questionnaires could be sent out immediately after the treatment (introduction to the Horizontal Insights model) and again after some time (six months or a year). Questionnaires posed before and after the treatment could focus on the number of times horizontal experts were utilised as well as the perception of using horizontal expertise for further generating and testing novel ideas with high uncertainty.

3.2.4. PROJECT FINDINGS AND DISCUSSION

Researchers seem to agree that idea generation, selection and implementation are the three main stages that comprise CE activities (Burgelman, 1983; 1991; 1994; Floyd & Lane, 2000; Dutton et al., 2001; Shimizu, 2012). Although each stage is of high importance, the former of these (idea generation) has been the focal point in Research

Project B. A clear distinction between 'common ideas' and novel ideas has been made, as the latter are what is sought for in CE processes. That is, ideas that go beyond the current strategy of the firm (Shimizu, 2012) are distinct from traditional practice (Heinze & Weber, 2016) or depart from the usual routines in the organisation (Garcia-Morales et al., 2014).

From a phenomenon-anchored research objective, I have studied how novel ideas are generated and supported in a corporate setting. Drawing on literature from NPD, innovation and creativity, I investigated where ideas come from (including the triggering events), both from a human-centred approach by studying (creative) individuals (from a behavioural, psychological, training and development as well as an assessment perspective) and from an organisational approach (the internal organisational factors that stimulates or hampers idea generation). Furthermore, I investigated how idea generation can be supported in various ways; for example, by utilizing one or more idea generation techniques, which can be done individually or in teams.

As one of the essential activities in the CE process is the development of new business models (e.g. Hayton & Kelly, 2006) and not just new product or service ideas. I focused on this research area. It turned out that innovating BMs is a complex task; as such, several approaches have been proposed to improve the ability to innovate BMs. Nevertheless, there seemed to be a lack of structured processes describing how to develop new BMs based on existing sources – so-called logical idea generation techniques. This was investigated further in Article III.

While several approaches to further develop and test ideas have been proposed, these are mostly related to novel ideas in the context of market risks. Nevertheless, a specific type of idea, the novel idea that also features high uncertainty, seems to have been overlooked in the literature. These ideas are important as they have high potential (Shimizu, 2012), but are complex to understand and grasp for most people. A conceptual model for how to involve horizontal experts and thus knowledge was further investigated in Article IV.

From the findings in each of the research objectives steering this research project, several implications can be drawn.

Implications for research, policy and practice

Companies are advised to make use of multi-disciplinary teams to increase the chance of success from CE initiatives. Teams should be given autonomy to make decisions, have resources available and be allowed to work on novel ideas that might deviate from the core business. Special attention should, however, be placed on how to best utilise teams in idea generation processes as it seems that ideation works best when done individually and then in a larger group later on. The structured process described in Article III incorporates these findings.

Furthermore, companies should be structured in ways that collect ideas. Several approaches have been provided to support managers in this endeavour, for example, the use of (digital) idea platforms, (digital) idea contests, (digital) hackathons, corporation-startup collaborations and entrepreneurial hubs. Also, several idea generation techniques (e.g. Brainstorming, Lateral Thinking™, Synectics, TRIZ) have been provided. Now that there has been an increased focus on external sources for ideas (e.g. Urbaniec & Żur, 2020), further research could look into if they are as good a source of novel ideas as promised. It could be interesting to do an explorative study to investigate which source(s) generate the most novel ideas – both in terms of the degree of novelty but also the actual number of novel ideas.

Even though external sources for ideas have increased, individuals are still highly important as they are the ones taking action by acquiring this new knowledge from the outside, pushing the idea forward inside the corporation as well as leading the process. To be better at generating ideas, corporations are, therefore, advised to recruit people (employees and managers) that are open to new experiences, curious, independent, confident, assertive and norm-doubting. As some of these creative traits might be inherited, companies should also strive to stimulate and nurture the creative cognitive competencies of current employees and managers (e.g. fluency, flexibility, originality, elaboration, persuasion, visualisation, imagination and creative self-efficacy) through training activities. Further research could look into how ICT could facilitate such deliberate practice in corporations to increase efficiency as well as mitigate some of the challenges related to off-line training. Furthermore, companies are advised to set-up the right internal conditions to stimulate novel idea generation from employees and thus employee involvement. Several suggestions have been made in this endeavour in the previous sections, for example, authority (freedom to innovate), training and development opportunities and rewards. Another way would be to support and reward the managers that work as effective sponsors for CE teams. More research could look into this area and whether, from a training perspective, corporations should spend more time on training their managers to be better CE sponsors.

For the specific challenge of developing new BMs, Article III presents a new tool for companies to use. Even though the Booster Cards were intended to be designed as intuitive as possible, we found that novice users had a hard time using these stimuli cards without any prior knowledge of the field of BMs. This might be of no surprise as people need certain domain-related knowledge or expertise to be creative (cf. Amabile, 1983; 1996; 1998; 2013). Nevertheless, this suggests that companies are forced to follow a particular procedure to achieve better results in the process of developing new BMs. It seems that the Booster Cards (and several other similar tools) are not just a technique; they require a structured process to overcome some of the inherent challenges in innovation and thus achieve the most efficient results. Further research could look into whether this proposition holds – are structured ideation processes more efficient than non-structured processes in the context of BMI?

From a theoretical point of view, the main problem has been that more general idea generation techniques were created to develop new products and services, not new BMs. This makes perfect sense as the BM literature started to gain momentum long after most of these techniques were developed. However, tweaking general idea generation techniques into the context of BMI might be challenging. As such, the results in Article III lay the foundation for hopefully establishing more standard idea production processes for BMI. Furthermore, the Booster Cards are one of the first logically structured approaches (techniques plus process) to develop new BM ideas. Further research could look into other ways to develop such logical ideation approaches, or maybe even study whether logical ideation approaches are superior to more intuitive idea approaches in the context of BMI, for example, the one proposed by Rumble and Minto (2017) (analogies).

In Article IV, we studied how to involve non-domain expertise in the further development and testing of highly novel ideas with a high level of uncertainty besides high market risks. From a theoretical standpoint, the conclusion from this study could lead to an additional category for further developing and testing new ideas (novel ideas with high uncertainty), which supplements the existing methods or approaches found in the literature (e.g. Design Thinking, the Lean Startup methodology, BMG). Novel ideas with high uncertainty refer to ideas that are complex, highly novel and thus, have many unknowns. These ideas also face market risks. In contrast, novel ideas only dealing with market risks refer to ideas that might be novel and new, but people can still relate to them and understand them. This is outlined in Table 6.

	Sources for further development and testing	**Examples**
Novel ideas dealing with market risks	Vertical knowledge coming from: - End-users - Lead-users - Domain-related experts (e.g. researchers, partners, suppliers, competitors)	- Lean Startup (e.g. Ries, 2011; Blank, 2013b). - BMG (e.g. Osterwalder & Pigneur, 2010; Osterwalder et al., 2014; Osterwalder et al., 2020) - Customer-centred, Problem-centred and Price-centred idea generation (e.g. Desouze, 2011) - User-centred innovation (e.g. von Hippel & Jin, 2009) - Lead user idea generation (e.g. Lillien

		et al., 2002; Lüthje & Herstatt, 2004) - Design Thinking (e.g. Brown, 2009)
Novel ideas dealing with market risks and high uncertainty	Horizontal knowledge coming from: - Horizonal experts	- The Horizontal Insight Model (Brøndum et al., 2018[29])

Table 6: A new category for further developing and testing novel ideas and concepts.

Maybe the concept of novelty should not be as simple as low or high. Instead, novelty might be a continuum ranging from highly novel ideas to low-novelty ideas or 'common ideas'. For low-novelty ideas, the methods or techniques discussed in the previous section might not be the most appropriate, but this is outside the scope of this dissertation. For novel ideas that are new to the company, it might be advantageous to include end-users to develop ideas further and test these, as end-users will be able to understand this type of idea. For more novel ideas that are new to the company and maybe the industry, end-users might no longer be able to grasp this type of idea and thereby support the further development and testing of the idea. Other types of sources, such as lead-users and domain-experts, might therefore be more useful to involve. For novel ideas that break with domain logic and industry causality and, thereby, are new to the firm and customer, horizontal knowledge and experts might be the most appropriate type of source for further developing the idea and test it, as neither lead-users, domain-related experts nor end-users can fully understand this type of idea. Research by Zach and Turcan (2018) implies something similar in relation to developing new product concepts under uncertainty in the medical industry. However, more research is needed to fully understand the role of these type of sources of further idea development and idea testing when dealing with both high uncertainty and market risks.

From a process perspective, companies might need to reconsider which type of sources or experts they involve for further developing and testing ideas, depending on whether the idea or concept is highly complex with high levels of uncertainty or only dealing with market risks. Design Thinking, Lean Startup methodology and BMG have proven highly effective for novel ideas that potential users, domain-related experts and domain-related stakeholders can comprehend and grasp. However, for novel ideas that break with domain logic and industry causality, companies might benefit from trying to access horizontal knowledge and horizontal experts to reach new knowledge combinations and thus, minimise uncertainty.

[29] Article IV of this dissertation - see Appendix D.

Further studies are, nevertheless, needed so that more approaches are available to companies for their toolbox in this endeavour.

From a managerial perspective, companies might also benefit from involving horizontal experts in multi-disciplinary teams working with novel ideas that are complex and have high levels of uncertainty. Zach and Turcan (2018) found that cross-disciplinary development teams are highly relevant when working with this type of ideas. The scholars highlight that a necessary condition is resource efficacy, that is, a common belief among the team members that they have the right internal knowledge available but at the same time also a belief in their ability to acquire external knowledge or capabilities, if needed (Zach & Turcan, 2018). A way of involving horizontal experts might be to include them temporarily in the team, as these experts are working outside the organisation and thereby have other professional duties. Also, horizontal experts might only be valuable for a short period in the further development of novel ideas with high levels of uncertainty – and maybe various horizontal experts might be needed at different points of time. Further research could look into the temporal use of horizontal experts for CE teams working on novel ideas that break with domain logic and industry causality.

One of the limitations of the proposed model in Article IV is that it is dependent on a set of ideas of which some (or at least one) are novel, yet unfeasible. As such, further development of the Horizontal Insights Model would be to include a process or tool for developing novel ideas before the steps described in the previous section (and in Article IV). However, most idea generation techniques – if not all of them – are ambiguous around the innovativeness of the ideas generated through the process (O'Reilly & Binns, 2019); i.e. they are not focused on generating incremental or radical ideas respectively. A reasonable explanation might be that it is not possible to develop a technique to generate novel or radical ideas, as this type of ideas might emerge when a large quantity of ideas has been generated (Rochford, 1991; Byrge & Hansen, 2014). At least this is what several streams in the idea generation literature advocate. More research is, however, needed in this endeavour – but it is outside the scope of this dissertation.

3.3. PROJECT C: THE RELATIONSHIP BETWEEN TRAINING AND INTRAPRENEURIAL COMPETENCIES

The third project I focused on in my PhD period was centred around the relationship of training and intrapreneurial competencies. I investigated this topic through the following three research objectives:

- RO8 (phenomenon-based): To explore corporate entrepreneurship training programs as well as their relationship with intrapreneurial competencies.
- RO9 (substantive): To understand the impact of online embodied creativity training.
- RO10 (substantive): To explore how gamification can enhance trainee motivation in online creativity training.

3.3.1. RESEARCH OBJECTIVE 8

As previously mentioned, a corporation can stimulate CE activities in several ways. One path is to recruit individuals with intrapreneurial potential (e.g. Schmelter et al., 2010; Åmo & Kolvereid, 2005). Another way is to improve the organisations' current human capital via training[30] and education (Byrne et al., 2016; Miller & Bauer, 2017).

Schmelter et al. (2010) found a positive relationship between training and development and the CE intensity in SMEs. Furthermore, several scholars seem to believe that intrapreneurial competencies are not just obtained as a trait set; they can indeed be learned and increased with the right education, training and support (e.g. Twomey & Harris, 2000). In the same vein, Heinonen (2007) stresses that training plays a key role in nurturing individual intrapreneurial competencies, and Thornberry (2003) found that education – as well as coaching – are important means for stimulating and nurturing intrapreneurial competencies.

On the other hand, numerous scholars do not believe that entrepreneurship can be taught. According to Erkkilä (2000), the discussion on whether entrepreneurship can be trained or not is an ongoing scholarly debate. This scepticism could, therefore, be extended to the effectiveness of CE training (CET) (Byrne & Fayolle, 2009). While there have been some studies on CET, it is a relatively unexplored research area (Byrne et al., 2016) with a lack of studies examining exactly how intrapreneurial competencies (or characteristics) can be nurtured and developed (Hayton & Kelley, 2006; Heinonen, 2007; Schmelter et al., 2010). One of the reasons might be due to

[30] I use 'training' as a general term instead of teaching or education, as the former is more practical-oriented. Also, training as a term seems to encompass both educational activities in a university setting as well as teaching activities in a corporate setting.

the fact that several scholars appraise training and development as important in the context of CE, but fail to explain the what, who, why or how of CET (Byrne et al., 2016). Furthermore, some scholars advocate for on-going and unstructured training of intrapreneurial candidates (e.g. Kenney & Mujtaba, 2007), as formalised training kills the innovation spark. Meanwhile, others advocate for more structured CET programs to ensure learning objectives are met (e.g. Byrne et al., 2016; Hargaden, 2017). As such, I wanted to explore the phenomenon of CET and its relationship with individual intrapreneurial competencies.

To guide this section, I used the following phenomenon-based research objective:

> RO8: To explore corporate entrepreneurship training programs as well as their relationship with intrapreneurial competencies.

Existing research on corporate entrepreneurship training

Although CE and entrepreneurship education and training (EET), as independent research fields, have been studied heavily in the last decades, CET has received little attention from scholars (Byrne et al., 2016). Some scholars do argue that EET not only stimulates entrepreneurial behaviour, but also intrapreneurial behaviour (Bjornali & Støren, 2012). Nevertheless, Byrne et al. (2016) advocate for specific CET programs, as corporate entrepreneurs or intrapreneurs encounter '[…] a very different set of challenges, constraints and opportunities to the entrepreneur' (p. 480), due to the fact that the former are members of an established organisation and thus face specific environments connected to that organisation. In the same vein, Corbett and Hmieleski (2007) argue that intrapreneurs think differently from entrepreneurs; while Honig (2001) also found that they use different learning strategies. Another issue is the fact that not all scholars believe that entrepreneurship education, in general, is effective (e.g. Honig, 2004; Oosterbeek et al., 2010). Heinonen (2007) somewhat disagrees and describes how some aspects of entrepreneurship (the 'arts' of creative and innovative thinking) might not be teachable in the same way as the 'sciences' (e.g. business and functional management competencies). The latter is commonly taught via conventional pedagogies, such as lectures, literature reviews and examinations. However, due to its experiential nature, the 'arts' cannot be taught directly, as it needs to be experienced somehow (Heinonen, 2007). Rasmussen and Sørheim (2006) advocate for the use of learning-by-doing or other action-oriented approaches as this way of learning is found to accelerate trainee mastery (Fiet, 2001).

Nonetheless, is seems that the goal of initiating CET, from an organisational point of view, is to activate or stimulate the intrapreneurial competencies of individuals within that organisation (Sundbo, 1999).

Various terms are used in the few studies focusing on training in the context of CE, for example, corporate entrepreneurship training (e.g. Byrne et al., 2016), intrapreneurship training (e.g. Kuretko & Montagno, 1989; Thornberry, 2003), CE

education (Soares et al., 2020), and CE/intrapreneurship courses (e.g. Hargaden et al., 2017).

In the this dissertation, the term corporate entrepreneurship training (CET) will be used as I see CET as a firm-level managerial initiative that might be part of an organisational CE strategy used to stimulate or activate the competencies of the employees (cf. section 2.3).

With divergent definitions of this concept, Byrne et al. (2016) developed the following definition of CET: 'a systematic approach to improving individuals' entrepreneurial knowledge, skills and attitudes within an existing organisation' (p. 480). Thus, training can be seen as a group of activities initiated by the corporation '[…] to provide employees with certain knowledge, develop their skills and abilities and reinforce a positive change of behaviors and attitudes' (Shehata et al., 2020, Conceptual background section, para. 6).

The following review is based on existing CET programs presented in academic papers. I used pearl growing as a strategy to discover interesting articles related to this topic, starting from the by Byrne et al. (2016). This article was used as a steppingstone in an iterative search process by looking backwards (through the reference list) as well as forwards (using the "cited by" feature in Google Scholar).

According to Kanter et al. (1991), numerous companies started to develop CET programs during the late 1980s as a response to increased external and internal pressures. Since then, several CET programs have been proposed and/or studied by scholars. One of the earliest studies of CET is the article by Kuretko and Montagno (1989). The scholars present a three-day program,[31] designed to educate directors and managers of several Fortune 500 companies in the US, based on the intrapreneurship literature and the authors' experiences in the field. The aim was to: 1) define intrapreneurship, 2) promote creativity, 3) examine the current organisational culture through a survey about the internal climate, and 4) design business plans. The latter is seen as *the* tool for obtaining capital for the potential venture from top management. Their program includes different delivery methods such as lectures, video-taped case studies, group activities and discussions, project team development, individual assessment, and "champion" presentations at the conclusion of the program (Kuretko & Montagno, 1989). While this study is a significant contribution and might be a stepping-stone for the development of this sub-field of CE research, the focus of this particular CET program is rather theoretically driven. This is exemplified by the need for participants to understand the theoretical concept of intrapreneurship (through lectures and video-taped case studies), gain knowledge about organisational and cultural factors as well as lectures on creativity and how to

[31] It is not specified whether the program is delivered three days in a row or spread out over a longer period.

spot creative people in an organisational setting. However, there is no deliberate training in creative skills; instead, one brainstorming session is employed. The learning-by-doing in this CET program is merely related to the design of a business plan for a new venture. One possible explanation might be that this program was intentionally designed for directors and managers who should be the ones embracing new managerial approaches. Nevertheless, several scholars have argued for the importance of fostering the intrapreneurial competencies of managers as they too can become intrapreneurs (e.g. Hayton & Kelley, 2006; Ireland et al., 2009; Byrne et al., 2016) – and they play an important function in assisting and supporting intrapreneurial employees (Thornberry, 2003).

Koen (2000) presents a CET program taught at Stevens Institute of Technology in New Jersey, US. The participants were Executive MBA students (76% were managers) coming from large corporations. The scholar taught the CET program over a two-year period, involving more than 100 students. The program consisted of four different parts, which were taught 2.5 hours weekly over 14 weeks. The design was based on literature within the fields of intrapreneurship and venture capital as the study is centred around exploring whether executive champions (or sponsors) will invest in trainees' proposed business plans and give their support. In the first part of the course (weeks 1–4), the students learn the key factors separating successful corporate ventures from the unsuccessful ones. In the second part (weeks 5–8), both successful and unsuccessful organisational factors are reviewed. In the third part (weeks 9–11), the students develop a business plan in small teams for a business simulation. In the final part (weeks 12–14), students complete and present their business plan in front of a multi-company executive board, which concludes the program. Once again, this CET program has a strong focus on the theoretical – or reflective – part of the training (understanding intrapreneurship as a concept and organisational factors). The actual doing part – or deliberate practice – is centred around the development of a business plan (which includes skills in business planning, teamwork and communication).

According to Thornberry (2003), CET programs can take different forms depending on what type of change a corporate might seek. The scholar argues that CET programs can be designed to follow some of the categories of (or concepts related to) CE found in the literature,[32] namely: CV, intrapreneuring, organisational transformation and industry rule breaking. Together with colleagues at the Babson College, Thornberry (2003) developed company-specific CET programs for big American corporations seeking either CV or intrapreneuring to explore whether managers can become intrapreneurs. The programs in this study were quite similar in their design. They are scholar-driven based on CE literature, last a few weeks (the longest was a five-week course), participants create a business plan during the

[32] See also section 3.1.1 for a more comprehensive list of the major concepts related to CE.

program for a real opportunity, which later is presented to a group of executives to compete for internal resources. Some of the involved companies wanted to focus on managers and appointed these themselves, while others wanted to increase the number of entrepreneurial-thinking employees and thus made participation voluntary. In the cases of voluntary participation, an application was required together with a subsequent interview with senior management and program faculty. While the study does not precisely explain the content, methods and techniques used in the CET programs, interesting learnings are shared, which are derived from applying a qualitative approach. For example, this study reveals that identifying opportunities and ideas can be learned;[33] that coaching is a highly important teaching method in this context; that intrapreneurs can come from across the organisation; and that it is almost impossible to predict who will be real intrapreneurs and not just 'would-be' intrapreneurs, as passion cannot be taught in a classroom but only encouraged (Thornberry, 2003). The main focus in these CET programs is on creativity and business planning skills, but also on opportunity identification and opportunity development (Byrne et al., 2016).

The study by Heinonen (2007) presents an approach to teach CE for Master-level students in a university setting. The course titled '*Entrepreneurial behaviour and personal resources*' was taught at the Turku School of Economics, Finland, with a total of 12 participating Master's students. The program design was based on literature within the fields of CE and entrepreneurship education. The CET program lasted seven weeks, consisting of seven two-hour joint sessions where general knowledge about CE and entrepreneurship was provided via lectures and group discussions. Subsequently, one hour was allocated for the participants to spend on a personal diary, which was handed in by the end of the program. The students formed smaller teams to work on a case study assignment, where they interviewed a manager from a case company to uncover entrepreneurial and non-entrepreneurial behaviour in that organisation. Furthermore, the faculty team used symbol cards, poster-construction and a role-play activity to push students into an experiential stage. While this study introduces several new ideas on delivery methods and techniques for CET programs through an entrepreneurial-directed approach, it is run in a university setting with Master's students – not in the 'real world'. Thus, the biggest issue for this type of CET is to support students to put their newly gained knowledge into actual practice by undergoing the process of CE (e.g. Edwards & Muir, 2005), which can be hard as they are not currently employed by an organisation. The latter is a prerequisite for CE activities. Also, '[t]here is a clear difference between teaching young, inexperienced university students in an academic setting and training experienced management professionals in an organizational setting' (Byrne & Fayolle, 2009, p. 164). The main focus in this CET program is on the reflective part (theoretically as well as students' self-reflections and realisations) – not the actual

[33] However, the author fails to explain 'how'.

doing. Furthermore, students are asked to plan and organise a strategy event for an imaginary company (the role-play activity), instead of working on an actual idea coming from a company or something similar. The latter would have made the program a more life-like experience, and students could learn CE by doing it.

Byrne et al. (2016) presented an action learning study on a CET program called 'Developing Intrapreneurs Program' (DIP), a three-month-long initiative of which three weeks were allocated as intensive training weeks outside the company. The program was delivered 20 times over a seven-year period in different large companies, with an average of 24 managers (with diverse functional backgrounds) participating each time. The scholars based their research design on previous studies within the field of CET as well as action learning pedagogy to uncover learning outcomes of trainees. Participation in the program was voluntary, but managers had to apply with a written application (including at least two recommendations), do a competency test and an interview with the HR department. Once enrolled, participants developed a business plan for a new venture project (product or service innovation) in a multi-functional team of four to eight members. A team coach was dedicated to each team from the teaching faculty. During the process, each team were encouraged to seek information inside and outside their organisation. To conclude the program, the team presented their business plan in front of senior executives and sponsors from the company. The scholars stress the importance of participants having free time available to fully engage and not end up spending most of their working time on daily operations. Also, diverse teams were found to improve learnings from such a program. Trainees were found to have gained multi-disciplinary and organisational knowledge, which several scholars have stated are important in CE activities (e.g. Hayton & Kelley, 2006). Additionally, trainees also indicated an increase in proactive behavior, better self-awareness as well as networking capabilities (Byrne et al., 2016). Even though the study does not precisely disclose the actual content or structure, the results section shows that participants were exposed to new theoretical knowledge and academic content during the program, which they liked. The specific delivery methods (or techniques) are, however, not presented in the study.

Hargaden et al. (2017) present a CET program taught at '[…] a large English-speaking public institution in western Europe' (p. 4), without explicitly disclosing the name of the university. Forty-four students (all engineers but from different disciplines) participated in the course that ran for two years. The course design was based on CE, intrapreneurship and entrepreneurship education literature. Furthermore, based on recommendations by Menzel et al. (2007), they implemented scenario-based simulations, team-based learning-by-doing, trigger events as well as quest talks by real intrapreneurs as delivery methods. The underlying structure was based on the Lean LaunchPad program (Blank et al., 2014 – also see section 3.2.3), using the BMC to frame the business assumptions that each team had to test in front of customers in an agile and lean way (Blank, 2007; 2013b; Blank et al., 2014). With

a duration of twelve weeks, each team tested their BM hypothesis with potential users, customers and other stakeholders and presented a working prototype by the end of the course. By using the flipped classroom approach, the lectures were minimised to a two-hour session each week, where students watched videos and read the material before the class. The topics covered included '[…] the customer journey, building the value proposition, segmenting customers, channels of distribution, customer relationships (get/keep/grow), revenue streams and costs, developing partnerships (e.g. alliances, joint ventures), allocating resources' (Hargaden et al., 2017, p. 5). Furthermore, tools from the Design Thinking approach (e.g. Brown, 2009) as well as LEGO® Serious Play™ (e.g. Kristiansen & Rasmussen, 2014) were employed. At the beginning of the course, each trainee was required to pitch an idea (related to their employing organisation) that they wanted to develop further and test; yet, each team (consisting of four to six members) had to pick only one idea for the remainder of the course. The learnings from market tests were discovered in weekly presentations in front of the faculty, which culminated in a final pitching event where industry representatives were invited as well. Results from this action-learning research show that this type of course design – which deviates from more traditional lecture-style approaches – is effectful for training engineers to become corporate entrepreneurs (intrapreneurs). Trainees developed important knowledge and skills concerning CE processes and developed their mindset (Hargaden et al., 2017). As such, this CET program adopts a learning-by-doing-approach where trainees develop an understanding for and skills within BMG, hypothesis testing, prototyping, collaboration, communication and persuasion. Additionally, the scholars stress how trainees changed their mindsets; for example, from fear of chaos and failing to embracing chaos and enjoying pivoting ideas (Hargaden et al., 2017).

Friedl and Żur (2018) presented a study on the use of the first Massive Open Online Course (MOOC) on intrapreneurship. A team of university and industry partners developed this MOOC in a consortium funded by the Erasmus+ Knowledge Alliances program. Almost 3000 trainees (students, employees and employers) enrolled in this online CET program, free of charge. The design of the MOOC was based on intrapreneurship literature, entrepreneurship education literature as well as online education literature. The overall objective of the program was to motivate a vast number of trainees to become engaged in CE, with the following learning outcomes:

- 'understand the concept of intrapreneurship,
- familiarize examples of entrepreneurial organizations and intrapreneurship projects,
- identify opportunities at work and convert challenges into opportunities,
- identify stakeholders, target groups and sponsors of intrapreneurial projects,
- enhance their ability to form coalitions around new business ideas,
- develop and deliver a pitch to various audiences, including the board of directors.' (Friedl & Żur, 2018, p. 3)

The CET program was delivered in weekly, synchronous sessions, which corresponded to four hours of study time. Synchronous online training typically requires real-time interaction between the trainee and the instructor (e.g. Ally, 2004), while asynchronous online training refers to environments where the trainee can access the materials at any time (so-called self-paced training). All materials were uploaded every weekend before next weeks' activities began. The delivery methods included videos, readings, quizzes, forum discussion and seven activities, so-called e-tivities (cf. Salmon, 2004), which stimulate user participation in online environments. For example, in week three, the trainees select an idea they want to develop further in an online, intercultural team. Furthermore, trainees learn about the challenges and risks of CE as well as how to promote such initiatives in organisations. The program lasted four to seven weeks, depending on the course track. For the four-week version, this CET program concluded with an exam quiz. In contrast, trainees enrolled in the seven-week version presented their idea at a 'Pitch' event after they had the additional time to develop their ideas further. From numerous different evaluation techniques, Friedl and Żur (2018) stress that MOOCs are highly competitive to more traditional (offline) CET programs. Seventy-four per cent of the trainees scored the program at least four out of five when evaluating the overall learnings from the initiative. Time constraints from trainees working in companies were a major barrier. Besides, online teamwork was found to be challenging. While this CET program is very interesting because it is delivered online, many trainees will never experience the "doing" part of this program if they only do the first four weeks. The reason is that the first half of this CET program is mainly focused on understanding the theoretical concept of CE (e.g. through examples and previous projects) as well as organisational factors related to CE. However, there is a slight emphasis on opportunity identification, stakeholder management and coalition-building in the four-week version of this CET program.

Contemporary research by Kruszelnicki and Breuer (2020) investigates the effects of another interesting initiative within the field of CET – a company-driven program called 'Kickbox'. Developed by the US-based software company Adobe, the pan-corporate concept Kickbox is, in fact, an actual box containing information on how to test new ideas in front of customers. The concept is based on the Lean Startup methodology and offers an individual, gamified path consisting of six different levels: inception, ideate, improve, investigate, iterate and infiltrate (Randall, 2015). Each level is described in a set of physical cards that guide the employees through the process of turning an idea into a reality through the use of BMC, hypothesis testing in the field (via customer interviews), prototyping (especially by developing landing pages), and customer acquisition (Adobe, 2017). After submitting an innovative idea, every employee at Adobe is eligible to receive such a box, which also includes time (forty hours from their regular work) and resources (a prepaid credit card of $1000) to pursue the idea and test it in the market. More than 500 Adobe employees are now Kickbox graduates and more than 120 ideas have been funded (Kruszelnicki & Breuer, 2020); thus, both "completing" the red Kickbox as well as

the blue Kickbox (Randall, 2015). The latter is related to company building activities, for example, assembling an advisory board and gaining internal resources for the concept (Adobe, 2017). Kickbox later spread into the realm of other corporations, such as Swisscom and Rabobank, who made their own adaptions of the concept called 'Kickbook' and 'Blackbox', respectively (Kruszelnicki & Breuer, 2020). The scholars find that several private consultants have taken advantage of Kickbox being open-source (via www.kickbox.org) and thus developed company-specific CET programs tailored to the exact needs of their clients (Kruszelnicki & Breuer, 2020). The outcome of Kickbox (and its adaptations) are, unlike most of the other CET programs mentioned in this section, measured by the number of ideas going through the system. This is in stark contrast to, for example, the DIP program studied by Byrne et al. (2016), where the unit of analysis is the learner and that person's development. From intensive case studies, Kruszelnicki and Breuer (2020) report that no more than ten per cent of the initial ideas get funded at Adobe, Swisscom and Rabobank. On the other hand, Adobe has further developed and tested a disproportionately high number of ideas and at a much lower cost, compared to before they initiated the Kickbox concept (Randall, 2015). The CET program is found to break down the corporate silos, synchronise employees into talking the same innovation language and using the same methodologies as well as establish an innovative culture (Kruszelnicki & Breuer, 2020).

An overview of different CET programs found in the literature is illustrated in Table 7.

Source	Practitioner/ scholar-driven CET program	Voluntary/ mandatory	CET design	CET audience	CET duration	Environment
Kuretko and Montagno (1989)	Practitioner-driven	(not specified)	Theoretical based lectures and team-based project to develop a business plan	Directors and managers in Fortune 500 firms	Three days (not further specified)	Physical (not further specified)
Koen (2000)	Scholar-driven	(not specified)	(same as above)	MBA students with engineering background (74% were managers)	Fourteen weeks (2.5 hours weekly)	Physical (at the Stevens Institute of Technology, US)
Thornberry (2003)	Scholar-driven	Both voluntary and mandatory	Theoretical based lectures, coaching, and development of a business plan (not further specified)	Managers = mandatory Employees = voluntary	Three to five weeks	Physical (not further specified)
Heinonen (2007)	Scholar-driven	Mandatory for most of the students	Theoretical based lectures, group sessions and assignments as well as personal learning diary (self-reflection)	Master's students studying entrepreneurship as a major subject	Seven weeks (2-hour joint sessions + 1-hour reflective session each week)	Physical (at the Turku School of Economics, Finland)

Byrne et al. (2016)	(not specified)	Voluntary (but with a lengthy application process)	Action learning, development of a business plan in multi-functional teams (not further specified)	Managers	Three months (including three intensive weeks at a company retreat)	Physical (at the company and a company retreat)
Hargaden et al. (2017)	Scholar-driven	(not specified)	Lean LaunchPad, team-based learning-by-doing, developing a BM	MBA students (all engineers)	Twelve weeks (2-hour sessions each week plus presentations)	Physical (not specified further)
Friedl and Żur (2018)	Both scholar- and practitioner-driven	Voluntary (open for all – easy access)	Videos (theoretical), quizzes, forum discussions, and e-tivities. For some, also the development of an idea in online teams	Everyone – students, employees and employers	Four to seven weeks (four hours of study time each week)	Online (synchronous as new material was uploaded each weekend)
Kruszelnicki and Breuer (2020)	Practitioner-driven	Voluntary	Learning-by-doing, gamification through six entrepreneurial levels to turn an idea into a proven BM, including experimentation and prototyping	Everyone at Adobe, Swisscom and Rabobank	(not specified)	Physical (not further specified)

Table 7: Overview of CET programs found in existing literature.

Empirical findings and discussion

Results from the review of existing CET programs found in the literature show that CET programs can take many forms. While CET programs initially were practitioner-driven (cf. Kanter et al., 1991), scholars started to actively be engaged in both the development of CET programs as well as studying the effects of already running programs. Scholars tend to draw on literature within the field of CE, intrapreneurship and entrepreneurial education, and they predominantly employ qualitative case study methodologies.

The measure of effectiveness varies across the studies found in the literature. While some take a learners' perspective (e.g. Thornberry, 2003; Byrne et al., 2016; Friedl & Żur, 2018), others employ an output perspective. For example, Koen (2000) explores the number of executive investments made in the projects developed during the specific program, whereas Adobe (20015) launched their Kickbox concept to increase the total number of ideas tested and thus implemented (Kruszelnicki & Breuer, 2020). From a learners' perspective, the effectiveness of CET programs is generally found to be high in relations to the improvement of entrepreneurial attitudes, attributes, skills and knowledge of trainees – also referred to as intrapreneurial competencies (cf. Byrne et al., 2016). The question is thus not *if* CET works but rather a question of *how*, as also discussed by several scholars (e.g. Heinonen, 2007; Byrne et al., 2016). Nevertheless, there is a lack of longitutional studies exploring the effectiveness of CET. Both from a learners' perspective as well as from an (organisational) output perspective.

Initially, most CET programs were theoretically driven, focusing on teaching trainees about the concept of CE/intrapreneurship, organisational (and cultural) knowledge as well as multidisciplinary knowledge. Also, these programs were concentrated around skill development within business planning and teamwork (interpersonal skills). This tendency has, however, somewhat changed during the 2010s, when more practical and action-oriented (learning-by-doing) CET programs were developed, for example, the programs studied by Hargaden et al. (2017) and Kruszelnicki and Breuer (2020). While the development of a business plan is still a focal point in some of the more recent studies (e.g. Byrne et al., 2016), skills associated with the Lean Startup methodology (cf. Blank, 2013b; Blank et al., 2014) – such as BMG, customer discovery, customer development and agile engineering – are found to be significant features of CET programs and critical for the success of large corporations (e.g. Hargaden et al., 2017). Several scholars have, in fact, questioned the use of business plans. Osterwalder et al. (2020) call business plans 'the enemy of innovation' (p. 102) as they are documents that describe an idea and its execution without any tests in the market. As such, business plans maximise '[…] the risk of executing an unproven idea that looks good on paper and in spreadsheets' (Osterwalder et al., 2020, p. 102). In the same vein, Blank et al. (2014) advocate for a shift away from a plan-centric curriculum to a stronger focus on planning, as the former will only prepare trainees

for incremental innovation, not new venture creation. The intense focus on business plans in CET could, therefore, be somewhat questioned.

Innovation, creativity and ideation are mentioned as essential aspects in almost every CET program. While there has been a significant focus on learning-by-doing concerning the implementation part of CE (especially via the development of a business plan), the deliberate practice related to idea generation – what Thornberry calls the 'creative opportunity identification and shaping phases' (p. 343) – seems to have been somewhat neglected. In theory, this would mean that most of the ideas coming into these programs would not be evaluated as highly novel, even though this is the type of ideas that are sought after in CE activities (Shimizu, 2012; Garcia-Morales et al., 2014; Heinze & Weber, 2016). Training literature within the field of creativity has found that creative skills can indeed be learned through practice (Rose & Lin, 1984; Scott et al., 2004). As such, creativity training should receive greater attention in CET programs. One plausible explanation for this lack of attention on creativity training is that companies expect academics to stimulate trainees' creative thinking skills during their education (Robbins & Kegley, 2010). Nevertheless, educators '[…] face a daunting array of possibilities and approaches when trying to develop or select a Creative Thinking Program' (Robbins & Kegley, 2010, p. 46). Furthermore, research is still inadequate concerning instruction content, delivery method(s), and training length (Robbins & Kegley, 2010). In the same vein, Brøndum et al. (2019) stress that creativity training is dependent on several factors, such as the right instructors with the right knowledge as well as the right environment, which makes it a rather complex thing to set up.

While some CET programs were mandatory and/or focused on managers, there has been a change in perspective in recent years. The programs discussed by Friedl and Żur (2018) and Kruszelnicki and Breuer (2020) takes a bottom-up approach, emphasising a large number of trainees and individual discretion (voluntary). According to Byrne et al. (2016), training researchers are divided when it comes to the training effectiveness of mandatory versus voluntary programs. On the one hand, a mandatory program can send the signal that CE is a top priority for the corporation (Baldwin & Magjuka, 1997). In contrast, the most motivated trainees are likely to be the ones participating when a program is open to everyone (Baldwin & Magjuka, 1997). From the general training literature, Mathieu et al. (1992) and Yardle (2003) found that employees commonly react more positively to a traninig program when they voluntarily decide to participate instead of being enrolled by supervisors. Accoring to Hicks and Klimoski (1987), trainees present low motivation levels when being pressured to attend training by their superiors. No clear results can be drawn from the CET programs analysed in this study. Kenney and Mujtaba (2007) recommend that entrepreneurial aptitude is always self-identified and that CET programs should be an ongoing process and, thus, less formalised as structure dampens the innovation spark. Nevertheless, the scholars find that companies should pick several intrapreneurial candidates and focus attention on this group. This is in

stark contrast to the Kickbox concept, which is open for every employee at, for example, Adobe, but still requires employee discretion. From an economic perspective, initiating something like the Kickbox concept might not be possible for every company, as it is more costly to make an innovation initiative open for everyone compared to including some hand-picked individuals in training activities.

Most of the identified CET programs are conducted in a face-to-face learning setting (either in the company or at a university or business school). Only one online training initiative was found in the literature. This is quite surprising as online training is found to be cost-effective, convenient and an effective way for businesses to keep their employees' skills up to date (Strother, 2001). In the same vein, Bose (2017) reported that most corporate training is done online and thus, the primary method of delivery for employee training, making it an interesting topic in the context of CE. Furthermore, we live in a time where several elements of CE activities can be carried out online in remote settings. For example, it is now possible to do efficient teamwork via online tools such as Slack, Trello and MS Teams. It is possible to conduct high-quality customer interviews via Zoom or MS Skype, and external resources can be acquired cheaply via crowdsourcing marketplaces like Upwork™ or MTurk. The growth of online tools has been highly accelerated by the current COVID-19 pandemic (Koeze & Popper, 2020). The amount of learning undertaken (remotely and) online has likewise risen dramatically since the outbreak of the coronavirus and is thus anticipated to be changed forever (Li & Lalani, 2020). The online CET program studied by Friedl and Żur (2018) has some significant drawbacks: the synchronous design as well as the lack of embodied training for some trainees. As it runs at a fixed pace over a fixed period with time restrictions, time becomes an issue, especially when targeting a business audience. This was also highlighted by the scholars as the primary constraint. People working in companies have very limited time, so when they are not allowed to do the training at their own pace, maybe at their own place, it becomes an obstacle (Granger & Levine, 2010). Another issue is that the enrolled trainees might be in different time zones, making online groupwork and presentations difficult. Only the trainees taking the full program will experience the doing part of this program, which is unfortunate, as action-oriented learning is found by several training scholars to be highly important (e.g. Fiet, 2001; Rasmussen & Sørheim, 2006).

Taking these elements into consideration, it would be interesting to look at online training in the context of CET. The identified gap of deliberate practice in creative thinking and, thus, idea generation and shaping phases, could be a place to start, as it is one of the three main stages that comprise CE activities (e.g. Shimizu, 2012). Nonetheless, it has been highly overlooked in the training programs found in the literature. Instead, there has been a great emphasis on action-oriented approaches and learning-by-doing within the implementation stage. Furthermore, several of the identified intrapreneurial characteristics found in section 3.1.2 of this dissertation strongly overlap with several of the creative traits or characteristics that were

identified in section 3.2.1. This makes the training of these creative skills (e.g. originality, fluency, flexibility, imagination and visualisation and persuasion) very interesting, as they are strongly associated with several intrapreneurial characteristics found in Article I, for example, "Creative innovator", "Idea generator", "Flexible open-minded", "Visionary", and "Persuasive influencer".

One way to overcome some of the inherent challenges related to creativity training would be to develop an online asynchronous (self-paced) training program, as the need for instructors vanishes if the training program is digital and thus available to anyone at any time (Cole, 2000; Gold, 2001). Through e-learning, trainees can conduct the training at their own pace, in their own place and receive only what is needed (Granger & Levine, 2010). Nevertheless, the extant research on e-learning actually questions many of its proposed advantages (Granger & Levine, 2010; Blown, 2001). Consequently, going from traditional face-to-face training to the digital sphere is no bed of roses. Appropriate questions that arise are, for example, does online training have the same effect as traditional face-to-face training? Moreover, how do you keep trainees motivated when they are sitting at home or work and not in front of the instructor(s)?

These questions steered the research agenda for Articles V and VI of this dissertation (respectively) as well as the following two sections (RO9 and RO10).

3.3.2. RESEARCH OBJECTIVE 9

This section is based on the paper titled "Testing the Effects of Digital Gamified Creativity Training", written in collaboration with colleagues L. L. Hänninen, C. Byrge, P. N. Gómez, C. Tang, S. M. Dingli, and S. P. Xerxen. The paper is published in the Journal of Creativity and Business Innovation.

As previously stated, several meta-studies have concluded that creativity training has shown a significant effect on an individual's creative competencies and confidence (Rose & Lin, 1984; Scott et al., 2004; Torrance, 1972). As such, rational reasoning would assume that if creative thinking skills are advanced through training, then the intrapreneurial competencies related to creative thinking would naturally be nurtured by this training as well. At the minimum, it could be argued that individuals doing creative training would also increase some of the competencies that are important in CE activities, all things being equal. This does, however, not mean that creativity training per se will increase the likelihood of an individual unfolding their untapped or hidden potential concerning CE.

When looking at the existing literature, it becomes clear that creativity training can take many forms. Byrge and Tang (2015) suggest dividing creativity training into two main categories: reflective creativity training and embodied creativity training. Reflective creativity training focuses on the understanding of creativity as a

phenomenon, i.e. its concepts, theories, models, tools and techniques. In this way, the trainee develops a cognitive understanding of what creativity is, what the creative process is and consists of, what personal traits/characteristics creative people have, how creativity can be enhanced, and who could – or should – benefit from creativity. Embodied creativity training, on the other hand, is more action-oriented and focuses on becoming more creative – the actual "doing", through exercises and practice (Byrge & Tang, 2015). As such, it can be compared to the embodied training that is vital in, for example, sports and musical performance (Ericsson et al., 1993).

Most creativity training programs have a high ratio of reflective training compared to embodied training, which is very similar to the findings in section **Error! Reference source not found.** in relation to existing CET programs. Byrge and Tang (2015) also found that reflective creativity training is the most studied type of creativity training. Several researchers have, nonetheless, stressed the importance of changing this weighting to give a higher priority to embodied creativity training, with a view to make creativity more intuitive or second nature[34] (Byrge & Tang, 2015; Tang et al., 2018; Byrge & Gomez, 2019). In principle, this makes perfect sense, as the tens of thousands of practice hours required to be a professional musician or elite athlete are mostly made up by embodied training and not reflective/cognitive training. However, most of the existing creativity training programs that focus on reflective training still include some embodied training and thus offer a mix of delivery methods. As such, it becomes difficult (if not impossible) to see the significant effect of these two different formats separately (Tang et al., 2018). The following substantive research objective (RO9), therefore, steered the research agenda for Article V and the following section:

> RO9 (substantive): To understand the impact of online embodied creativity training.

Reviewing existing online embodied creativity training

Together with colleagues, I reviewed the stream of training papers within the creativity literature to identify any online embodied creativity training programs. We used pearl growing (Schlosser et al., 2006) as the search strategy, where the study by Robbins and Kegley (2010) was our initial point of departure for searching backwards (through the reference list) as well as forwards (using the "cited by" feature on Google Scholar).

Results showed only a few online creativity training programs. However, a common trait in these was that they had a high ratio of reflective training, and only a small part was dedicated to embodied ("doing") training. Furthermore, the programs were mostly synchronous, as they were dependent on the interaction between the trainee

[34] The term "second nature" generally refers to an act done spontaneously with no need for exertion (see Edelman, 2006).

and the instructor. An example is the online creative thinking program developed and studied by Robbins and Kegley (2010). The scholars designed their program in an educational setting using the book "Thinkertoys" (Michalko, 2006). Most of the training program consisted of reflective training, as students were taught the cognitive processes linked with creative thinking. Appertaining assignment-based tasks were delivered to the students via e-mail to be done in an environment of their choosing. These tasks were mostly reflective (e.g. in one task the students were asked to read a chapter in the Thinkertoys book and use no more than five sentences to describe how a specific creativity technique works) but some were more action oriented. For example, in another task, the students were asked to use random word stimuli to develop at least thirty surprising uses of a paperclip. Such an exercise is at the core of embodied creativity training, cf. the definition proposed by Byrge and Tang (2015). From employing an experimental study with pre- and post-tests of the students, Robbins and Kegley (2010) report that their program increased the students' creative self-efficacy as well as their creative abilities. In other words, online instruction is beneficial within the field of creativity training.

As we found very few online creativity programs in the literature, we conducted additional Google searches to look for grey literature or actual online embodied creativity programs that might exist without being present in the literature. The results were the same; no serious embodied online creativity training program existed. We did find a large number of MOOCs within the field of creativity. Such initiatives can, indeed, be labelled online creativity programs. However, they are all synchronous (starting at a specific date) and highly focused on reflective training (understanding the when and why of creative thinking) with only a small part dedicated to embodied training (understanding the how).

One example is the "Creativity Toolkit I" developed by the University of Illinois and offered on Coursera® (www.coursera.com). Some of the other tools we found could be labelled "online", as they were available on the Internet for download, but were meant for usage in traditional face-to-face environments, for example, the exercises found at www.idetræning.dk, distributed by the Danish Foundation for Entrepreneurship. These exercises are indeed embodied and could be done asynchronously but were not part of a particular creativity training program in the general sense. We did find some 'core' embodied online training programs but in other (related) fields.

Lumosity (www.lumosity.com) is an example of an online asynchronous brain training program, consisting of more than forty games designed to enhance cognitive skills related to fluid intelligence (Shute et al., 2015). While some of the Lumosity games are designed to train skills related to cognitive flexibility and there seem to be a relation between fluid intelligence and creativity (e.g. Benedek et al., 2014), the programs we found could not be defined as creative training programs. Also, as noted by Shute et al. (2015), the use of Lumosity is somewhat questionable. As a result, it

could be concluded that online creativity training is an emerging field of research with limited online tools available. These were characterised as synchronous and mostly focused on reflective training – not embodied creativity training, which seems to be a largely unexplored area.

A new online embodied creativity training program: Academy for Creativity

So, to study whether our assumptions about the potential benefits of an online asynchronous embodied creativity training program were accurate, such a program had to be developed. Together with fellow scholars, I applied for external funding and managed to secure a three-year Erasmus+ grant, with a consortium of five different universities. The project was established to develop an online creativity training program for students and teachers at Higher Educational Institutions in Europe[35] named CREMO (an acronym for CReativity E-MOdules in Education).

Through a period of three years, we managed to develop a free plug-and-play online training program solely focused on the deliberate (embodied) practice of the following creative skills: originality, fluency, flexibility, elaboration of ideas, visualising future scenarios, imagination and persuasion. We employed a participatory design approach (Sanders & Stappers, 2008) and included students, teachers, researchers, domain-experts and company representatives in the software development process. The training program, which was branded as "Academy for Creativity" (mainly to better communicate the initiative to practitioners), uses badges, progress trackers, difficulty levels, instant feedback on performance, experience points and an avatar to make the training more fun. It consists of 11 research-based games, an assessment method as well as profiles for both instructors and trainees. The game narrative uses a storyline of the avatar working in a company where creative solutions are requested. After completing each game round, the system provides instant feedback on the trainees' performance. The games have three levels of difficulty and trainees can adjust their training time as they wish, but constant exercise is required to advance from easy to medium and achieve high-level performance in each game. The platform includes flexible options for instructors and thus permits the planning of diverse training sessions for each trainee group. For example, the instructor can decide on the length of the training program (from fifteen minutes to fifty hours) as well as select the start and end dates. The system also automatically tracks trainee data concerning their participation as well as evaluation

[35] See more about the project here: https://ec.europa.eu/programmes/erasmus-plus/projects/eplus-project-details/#project/2015-1-DK01-KA203-004303

of their work. Trainees get a fail/pass based on the relationship between actual training time and the time (or workload) set by the instructor[36].

Furthermore, the software platform enables instructors to track the number of ideas produced by trainees, the idea descriptiveness, a detail index, number of ideas generated per hour as well as the time spent on training each of the different creative skills. Nevertheless, Academy for Creativity can also be used as a personal training tool without any involvement of a human instructor. By August 2019, Academy for Creativity reached 100,000 users.

An essential discussion within online training literature, which is an emerging field (e.g. Shattuck, 2015), is the degree of technology involvement. Van Wart et al. (2019) argue that training can be delivered through four different modes of technology involvement:

1) A traditional mode depending wholly on face-to-face synchronous instruction, where the instructor might use technology such as MS PowerPoint slides or similar, but it is kept to a minimum.
2) A technology-assisted mode where the use of technology is more extensive (e.g. via the use of learning management systems like Moodle or Blackboard), but the instruction is still synchronous and done psychically.
3) A blended or hybrid mode where the use of digitally mediated sessions might be higher than face-to-face instructions. The former can be either synchronous (e.g. video-conference sessions) or asynchronous (e.g. pre-recorded videos that are always available), while the latter is still synchronous. An example is the "flipped classroom approach", where trainees spend a larger proportion of their time watching pre-recorded videos (asynchronous) with fewer instructor-based sessions.
4) A fully online mode where the instructor(s) and trainees never meet psychically due to exclusive use of technology. Some fully online training programs have synchronous elements (e.g. synchronous video-conference sessions, synchronous timed assignments or exams, or synchronous group activities). However, many programs are fully asynchronous (self-paced) to maximise trainee and instructor flexibility. Nevertheless, trainees are still required to complete course requirements within a window of time, typically split into modules with definite timelines.

The online creativity program described in Robbins and Kegley (2010) is somewhat tricky to place within the abovementioned taxonomy, as the authors fail to explain how and where the reflective training is conducted explicitly. Most of the focus in the article is on the assignments, which are distributed via e-mail. As such, it could

[36] For visualisation of the software user interface, please see Figures 20 and 21 in Article V (Appendix E) as well as Illustrations 6 and 7 in Article VI (Appendix F).

be classified as a technology-assisted instruction mode. The different MOOCs available online can be defined as fully online instruction modes with several synchronous elements (e.g. assignment deadlines, start and end dates). Academy for Creativity is also a fully online instruction mode, but unlike the MOOCs, it is fully asynchronous if used as a personal training tool. On the other hand, when it is used in a classroom setting as an add-on (embodied training) to existing teaching activities (reflective training) or in a company to stimulate creative thinking (embodied training), some elements can be synchronous so that they fit the teaching or work schedule of the trainees. For example, the amount of training time required each week, start and end date and so forth.

Towards an approach to understand the impact of online embodied creativity training

From a comprehensive literature review of meta-studies within the field of online training, Van Wart et al. (2019) conclude that there is no significant difference between the face-to-face instruction and fully online instruction concerning learning achievement. Some studies find that the former mode of instruction (face-to-face) is more effective when it comes to complex, practical or technical skill enhancement; for example, the skills related to becoming a surgeon which require haptic awareness, precision, and thus, instant feedback (Dolan et al. 2015), technical work like statistics (Kartha, 2006) or quantitative material (Anstine & Skidmore, 2005). On the other hand, others have found that online training achieves higher learning. Nevertheless, for most skills, the no-significant-difference finding still holds, according to Van Wart et al. (2019). The scholars do, however, speculate that some of the studies '[…] indicated inferior learning in learning achievement are picking up on the fact that teaching facilitation, institutional support, etc., was indeed inferior. It is equally likely the smaller number of studies indicating online teaching produces superior results is actually because of enhanced online teaching and the Hawthorne effect (i.e., awareness of the observed being observed)' (Van Wart et al., 2019, p. 11-12). It is important to note that for learners to understand a concept or topic (reflective training), the difference in effectiveness between face-to-face instruction and fully online might be insignificant. Hansen (2008) did not find any difference between traditional and online learning settings when it comes to theoretical knowledge attained in learning processes that are cognitive and nonapplied. This might be a reasonable explanation for the results found by Van Wart et al. (2019). Nevertheless, the impact of solely embodied training has not been studied. Therefore, we know very little about the impact of online embodied training programs in general and for online embodied creativity training programs specifically.

To study the impact of an online embodied creativity training, we conducted an experimental study with one hundred undergraduate students. The students were all enrolled in the advertising and public relations Bachelor program at the Complutense University of Madrid. This institution was chosen as two of the authors were

employed here. Each participant in the experiment received student credit for their involvement, and we divided them into a control (*n*=49) and an experimental group (*n*=51). Students in the experimental group did ten hours of asynchronous online creativity training using the Academy for Creativity platform, while the control group did not. The ten hours of training had to be done within four weeks. Before the actual training began, we did a workshop to: a) show the students how to use the software; and b) screen the students' online readiness level. However, we did not find any evidence that the students lacked online competencies, which may influence the results (e.g. Van Wart, 2019).

We employed a mix of qualitative and quantitative methods in our research design. Following the advice of Arthur Jr et al. (2003), we focused solely on the learning outcomes (sometimes also called the transfer effect) and not the reaction criteria, as the latter does not reveal what trainees learn from a specific program. Arthur Jr et al. (2003) recommend that learning criteria should be measured through the use of tests. As such, we employed two tests: an online version of the ATTA (Golf & Torrance, 2002) to measure domain-general creative skills and a paper and pencil domain-specific test to measure the transfer effects of creative skills to the particular domain (advertisement). Both tests were qualitative as the students were given one or more tasks to solve by either writing or drawing. The two student groups did both tests before and after the experiment. The domain-general test was evaluated by a team of specialised evaluators providing the online ATTA tests, while two expert judges with significant experience evaluated the responses of the domain-specific paper and pencil test by employing the Consensual Assessment Technique (CAT, cf. Amabile, 1982). The quantitative data was collected through a creative self-efficacy questionnaire where both groups did a pre- and post-questionnaire with Likert style 7-point scales.

Our research design had some similarities with the one used by Robbins and Kegley (2010), for example, the use of a domain-specific test as pre- and post-assessment. Nevertheless, we used a shortened, online version (ATTA) instead of the original TTCT by Torrance (1974) supplemented by a domain-specific pre- and post-test. The latter was also employed to evaluate if trainees improved their performance within their specific domain (advertising), something Arthur Jr et al. (2003) highlights as important (they label it "behaviour criteria"). We also followed the other general guidelines when doing experiments (e.g. Kirk, 2012 – see section **Error! Reference source not found.** for further explanation), for example, having a control group and an experiment group and not providing the same treatment to all subjects, like in the case of Robbins and Kegley (2010).

As all subjects did production-based pre- and post-tests, which are designed to measure the output(s) of one or more tasks, the influence of the Hawthorne effect (e.g. Chiesa & Hobbs, 2008) is found to be unsubstantial. While only the experimental group might have felt observed during their training time (even though

it was done online, i.e. at their own place and pace), all subjects were observed when they did the pre- and post-tests. Only the creative self-efficacy pre- and post-test were quantitative, whereas the domain-specific and domain-general creativity tests consisted of production-based assignments that are hard (if not impossible) to manipulate. See a more comprehensive description of the approach and methodological considerations in section 4.3.

Empirical findings from Article V

Through statistical analysis (Cronbach Alpha and paired T-tests) results from our experiment showed that trainees in the experimental group significantly increased their domain-specific (advertising) and domain-general creativity skills after doing ten hours of embodied creativity training in an online environment. Furthermore, the creative self-efficacy of trainees in the experimental group was also enhanced from the online training. In comparison, the control group did not perform more creatively in either of the post-tests.

See the full study in Article V (Appendix E).

Empirical considerations for Article V

While the findings from our study are significant, students are different from employees in companies, which makes the transferability of results somewhat questionable. The creative skills or abilities that can be enhanced by using Academy for Creativity are, however, very generic with several scholars finding evidence that these can be trained by all sorts of individuals and in diverse settings. For example, Byrge and Tang (2015) took a closer look at the effect of creativity training on service management students in an education setting, while Birdi et al. (2012) examined the effect of TRIZ-based creativity training on engineers in an organisational setting.

As such, a natural next step would be to do a similar study, but in an organisational setting with employees instead of students. We did actually test the use of online embodied creativity training in a large global healthcare company, but only for attitudinal responses (also called “reaction criteria”, cf. Arthur Jr et al., 2003). Forty employees used Academy for Creativity to train their creative abilities for four weeks as a substitute for face-to-face embodied creativity training, when most of the world was locked down due to the first wave of the coronavirus outbreak. Preliminary results from follow-up interviews with the employees showed that they liked online embodied creativity training as a supplement to face-to-face training (which they were used to do) and that it was easy to do at any time of the day. The downside was the lack of social presence, as they were used to do the creativity training in small groups. It would have been even more interesting if we could have employed the same study design as in Article V (with pre- and post-tests), but due to the COVID-19 pandemic, this has not been possible.

3.3.3. RESEARCH OBJECTIVE 10

This section is based on the paper titled "Online Gamified Training for Business Innovation: Examining an Embodied Gamified E-learning Module on Creativity", written in collaboration with colleagues L. L. Hänninen, P. N. Gómez, C. Byrge, C. Tang, S. M. Dingli, and S. P. Xerxen. The paper is published in the Journal of Creativity and Business Innovation.

Online training usually provides the trainee with more control of their learning (Brown, 2001). Working independently from a distance and doing unsupervised training at your own pace and place, should – in theory – enhance trainee motivation and thereby also the general learning achievements and thus performance (e.g. Alexander, 2001; Long & Smith, 2004). Nonetheless, studies on learner control have failed to prove this motivational advantage and instead identify several adverse outcomes, including less time spent on task and use of inferior learning strategies (Bell & Kozlowski, 2002; Brown, 2001). Time spent on task as well as high practice levels might, in fact, be the two essential principles concerning the advancement of knowledge and skills of trainees. For more than a hundred years, scholars have advocated that trainees who practice a task more than others, gain more knowledge and enhance their skills (e.g. Goldstein, 1993; Thorndike, 1913). Also, it has been established by academics interested in the acquisition of expertise that trainees who spend more time on practising, learn more than those who spend less time (e.g. Ericsson et al., 1993). Nevertheless, the problem of stimulating and sustaining trainee motivation in the context of online training is a well-documented theme (Keller & Suzuki, 2004).

Several processes have been suggested to increase trainee's motivation in online training. According to Keller and Suzuki (2004), motivation in online training can be stimulated and sustained by incorporating the ARCS-model (a name based on its acronym: attention, relevance, confidence and satisfaction) in its design. Firstly, online training should gain and sustain the trainees' attention by using interesting graphics or animation and generate curiosity by using unsolved problems. Secondly, online training should build relevance. The goals and instructions should be clear for the trainee. Connecting the content to the trainees' future career can, for example, stimulate an authentic learning experience. Thirdly, the trainees should gain confidence by achieving small successes. Fourthly, online training should give the trainees a positive feeling of satisfaction from the learning experience. This can be achieved through extrinsic reinforcements, such as rewards or acknowledgement. Also, the trainees should feel that the required work was fair to achieve the results, otherwise, the motivation will be lost.

Extrinsic incentives are also one of the main elements of gamification, which is another approach to stimulate motivation in online training by providing a game-like experience to the trainee (Seaborn & Fels, 2015). While the use of a game-like design

in a non-game context might be aimed at self-gratification, the goal of using gamification is typically extrinsic and offers valuable effects outside the system, according to Hamari and Koivisto (2015). Several scholars have described how numerous startups successfully has managed to put a gamification layer on top of their core activity, such as Foursquare (location-based service), Fitocracy (fitness-tracking service), Codecademy (code-teaching service), and Badgeville (sales-tracking service) (Deterding et al., 2011; Hamari et al. 2014; Hamari & Koivisto, 2015), thus making it a promising approach to improve trainee motivation and engagement (e.g. Seaborn & Fels, 2015). Interestingly, Thom et al. (2012) explore how the removal of game-like elements in a gamified social network for companies actually reduced engagement. Additionally, gamification is expected to be quite influential concerning the transformation of business operations in some of the world's largest organisations (Blohm & Leimeister, 2013). Alsawaier (2018) furthermore describes how gamification has huge potential in today's educational system. The effectiveness of gamification is, however, still a pertinent issue, according to several scholars, especially in non-entertainment contexts (e.g. Hamari et al., 2014; Seaborn & Fels, 2015).

Based on the promising results found particularly in practice, we assumed that a gameful design would result in a positive reaction by trainees using the online embodied creativity training program. We also assumed that peer-rating of creative production (extrinsic incentive), if delivered in a gamified way, would further increase trainees' (intrinsic) motivation and engagement, as feedback is found to be a crucial principle for learning (e.g. Van Wart, 2019). Since gamification still is a relatively new phenomenon and, thus, an emerging research topic, we wanted to better understand how practitioners perceived this method of delivery in the context of online embodied creativity training. Thus, the following substantive research objective (RO10) steered the research agenda for Article VI and the following section:

> RO10 (substantive): To explore how gamification can enhance trainee motivation in online creativity training.

Exploring the concept of gamification

Gamification has been defined as '[…] a process of enhancing services with (motivational) affordances in order to invoke gameful experiences and further behavioral outcomes' (Hamari et al., 2014, p. 3026). As such, gamification is different from both digital games as well as traditional games, which have been around for ages (Blohm & Leimeister, 2013). While no universal definition exists, gamification is generally believed to describe the use of game-like elements and mechanics in a non-game environment or context to improve motivation and engagement of users or trainees (Seaborn & Fels, 2015; Ludgate et al., 2015; Alsawaier, 2018). It has been used in an array of settings; for example, healthcare and wellness, business (activities and workflows), marketing and education (Lister,

2015). Alsawaier (2018) describes how gamification is different from game-based learning: '[g]amification is not when learning is changed into a computer game but rather when adding a design layer of game elements to enhance learning, increase engagement, and encourage positive behavior' (p. 59).

An example of gamification is NikeFuel, a concept that Nike™ developed in the early 2010s, where runners all around the world could buy a small sensor to put into their Nike™ running shoes and thus keep track with their performance. On top of the core activity (running), Nike™ created an online community where users were able to share their results, receive badges when milestones were reached (e.g. 100km), and obtain different status levels (Blohm & Leismeister, 2013). Another example is the Kickbox concept developed by Adobe (2015) previously described in section 3.3.1, where the process of turning an idea into a proven BM inside a company is gamified by the use of six different levels. A new level can only be reached when several achievements are earned. For example, to go from level 4 (investigate) to 5 (iterate), the intrapreneurial candidate is required to: a) create a product website; b) test more than five value proposition adds on this website; c) drive more than 250 visitors to the website; and d) get more than 25 visitors interested or engaged (Adobe, 2015). The Kickbox concept is an example of employing gamification without any use of digital media. Nevertheless, IT-based mechanisms – such as the ones mentioned in NikeFuel – are typically associated with the concept of gamification (e.g. Blohm & Leismeister, 2013).

Blohm and Leimeister (2013) stress that gamification has the potential to stimulate the internal (intrinsic) motivation of trainees in the long run, even though game element like rankings and reputation points have been frequently used to induce competitive dynamics in the examples found in the literature. While studies have shown that extrinsic incentives generally fail to increase motivation and may produce several negative effects (e.g. Deci et al., 2001), extrinsic incentives like achievement points, badges, feedback or rankings can, in fact, activate intrinsic motivation (Blohm & Leimeister, 2013). In educational settings, several scholars have found that gamification elements positively affect motivation (e.g. Barata et al., 2013; de Frietas & de Frietas, 2013; Hanus & Fox, 2015; Leaning, 2015; Todor & Pitică, 2013). Thus, Seaborn and Fels (2015) call for '[…] more research on how to design for intrinsic motivation using extrinsic motivators' (p. 17). Nevertheless, Alsawaier (2018) calls for more studies employing a mix of qualitative and quantitative data sources to fully understand gamification, as the literature is highly represented by the latter.

From a comprehensive review on the empirical research papers on gamification, Hamari et al. (2014) found that points, leaderboards and badges were the most used motivational affordances. Other common categories were the use of levels, a story/theme, clear goals, a feedback system, rewards, progression bars, and the use of challenge(s). In the same vein, O'Donnell (2013) advocates for the use of badges, progression bars, leaderboards and a visual storyline as the most prominent elements

for effectiveness within an educational setting. From another literature review, Lister (2015) found that points, levels, badges and leaderboards were the most common elements analysed in the literature.

Towards an understanding of the impact of gamified design in online creativity training

In Academy for Creativity (see section 3.3.2), we implemented gamification and other motivational elements. We utilised interesting graphics to give the sense of a virtual world of a typical office to gain attention – along with a storyline of an avatar (a robot) that wishes to keep co-workers convinced that it is human. To do so, the trainee has to help the avatar with office-related challenges that require creativity, as creativity might be one of the hardest skills to automate – a means to generate curiosity. Academy for Creativity consists of 11 research-based challenges (or games) with three levels of difficulty. Before each challenge starts, instructions are given to the trainee by an animated pedagogical agent (an owl) to state the goal of the specific challenge, which – together with the setting of an office and office-related challenges – builds relevance and stimulates an authentic learning environment. Trainees get experience points based on their performance and receive instant (positive) feedback on their work as well as suggestions for improvements – to provide the trainee with small successes and build their confidence. By completing different levels, trainees also gain badges (bronze, silver and gold) and can track their overall progression. After completing ten hours of training, trainees can apply for a certificate to legitimise their skill enhancement – an extrinsic reinforcement designed to stimulate motivation even further. Leaderboards are only available when an instructor sets up a fixed-term training program for trainees. For example, if a teacher uses the software in a class, or if a manager (or consultant) uses it in a company to enhance employees' creative skills during a fixed period. As feedback from instructors and other trainees is found to be a vital principle for learning (e.g. Van Wart, 2019), we tested a peer rating system where trainees rated each other's work (the creative output of, for example, a poster, a movie or new word combinations) every now and then in exchange for experience points.

We conducted an exploratory study to understand if the use of such gamification elements improved trainee motivation and engagement in asynchronous online embodied creativity training. An exploratory research design was selected to broadly explore and understand online training practices, behaviours and preferences (reaction criteria) of students and teachers from Aalborg University (Denmark) as well as the Complutense University of Madrid (Spain). These two universities were chosen as several of the authors were employed at these institutions. Following the suggestions of Alsawaier (2018), we used both qualitative and quantitative data sources in our research design.

Firstly, we collected qualitative data from several semi-structured focus group interviews, conducted both at Aalborg University and the Complutense University of

Madrid. Several teachers were invited to use the online training program in their classes to get a diversity of academic disciplines involved. The participants (n=59) were all Master-level students, who had been introduced to Academy for Creativity in class and used it as an extracurricular training tool. An interview protocol was used to guide the semi-structured focus group interviews, with a focus on uncovering motivational factors leading to high practice levels and increased engagement. Afterwards, the interviews were utilised to:

a) explore the phenomenon of gamification in online training even further
b) identify relevant themes
c) design a quantitative (online) instrument to further explore the research problem.

The online survey was sent out to all the registered users of Academy for Creativity at that time. Out of 937 eligible e-mail addresses, 49 completed the questionnaire, resulting in a response rate of 5.23%. See a more comprehensive description of the approach and methodological considerations in section 4.3.

Empirical findings from Article VI

Results from both the qualitative and quantitative data revealed that intrinsic motivation was enhanced through the use of some gamification elements. Specifically, progression bars, levels and badges were found to be more motivating than any type of feedback. Some trainees even defined the experience of using Academy for Creativity as fun and entertaining. On the other hand, the expectation of being evaluated on creative output, either by an instructor or through peer-rating, was found to demotivate trainees. The trainees wanted to have fun and learn by playing, rather than get experience points from evaluating other's creative output. Furthermore, results from interviews with instructors (teachers) revealed several recommendations for increasing usage of online embodied creativity programs in educational settings. For example, by introducing the software in class with an introduction to creativity theory, making training obligatory with a strict deadline, not expecting more than 15 minutes of training each day from trainees, and relating the online training to the general course objectives in class discussions.

See the full study in Article VI (Appendix F).

Empirical considerations for Article VI

In this explorative study, we used qualitative data sources to develop a questionnaire, which was later employed to collect more quantitative data. While we found this approach most appropriate, we could have switched this around. For example, by employing pre-existing motivational surveys followed by in-depth interviews conducted with some of the respondents. The potential problem was that the questionnaire (online survey) was distributed to all registered trainees at Academy for Creativity at that time. The registered trainees were not only Danish and Spanish

students from Aalborg University and the Complutense University of Madrid; there were also trainees from all around the world (predominantly in Europe, though) and they were a mix of students, employees, consultants, teachers and managers. Through the database, it was only possible to select the 'student' users and send them an e-mail. However, due to the newly installed GDPR rules around this time, we chose not to collect data from users such as their actual geographical location, only the country where they were located.

Another approach would have been to focus on interviews with trainees solely but for a more extended period, for example, as employed in Grounded Theory (e.g. Annells, 1996). Since gamification is still a relatively young and unexplored research area, especially in the context of embodied creativity training, a qualitative inductive approach like Grounded Theory could be particularly well-suited (e.g. Milliken, 2010). Nevertheless, we wanted to use a mix of qualitative and quantitative methods, as we were interested in both investigating the depth as well as the width of the insights. It was, therefore, a bit frustrating that we did not get a higher survey response rate.

This research objective could also have been studied by employing an experimental research design, where a control group used a version of the Academy for Creativity software without any gamification elements. On the other hand, the experimental group could use the gamified version of the training program and then compare their motivation and engagement during the training period. Such a design would be quite similar to the one employed by Thom et al. (2012), who found that removing gamification elements reduced motivation and engagement of trainees.

Finally, an interesting approach to possibly get deeper insights into motivational perspectives, would be to use physical markers (for example, skin reaction detectors and eye tracking) on trainees combined with reaction interviews or questionnarires. I did co-develop such a research design together with some of the scholars involved in the CREMO project, which led to a conference paper (see Hänninen et al., 2019). However, I had to withdraw from this sub-project in the early data collection phase due to work pressures and was therefore not included as a co-author. Nevertheless, results from the experimental study showed that online embodied creativity training led to higher attention levels, higher emotional responses and higher levels of likability compared to identical embodied creativity training done in a traditional face-to-face instruction mode.

3.3.4. PROJECT FINDINGS AND DISCUSSION

One way to improve an organisation's CE capabilities is to through the training and education of the current workforce (Byrne et al., 2016; Miller & Bauer, 2017). The study of CE training programs is relatively limited, even though its importance has

been stated by numerous authors (e.g. Twomey & Harris, 2000; Schmelter et al., 2010).

From a phenomenon-anchored research objective, I have studied CET programs and the relationship with intrapreneurial competencies. Through an extensive review, I investigated the what, who, why and how of different CET programs found in the literature. While various angles or lenses have been used to study this phenomenon, the general belief is that intrapreneurial competencies can indeed be nurtured or stimulated through training. CET programs can take many forms, depending on the target audience, learning objective and instruction methods employed. No one-size-fits-all approach seems to exist. Nevertheless, in recent years, CET programs have shifted to: a) become increasingly action-oriented instead of mainly theoretical and reflective; b) focus more on educating many trainees instead of a few (a voluntary bottom-up approach); and c) focus on developing a validated BM of a novel idea or concept instead of writing a business plan. This action-oriented focus has, however, not spread to the idea generation phase, which is considered one of the core CE activities (e.g. Shimizu, 2012). As such, the deliberate practice of creative thinking has been somewhat neglected in CET programs. This is surprising as creative skills are found to be essential in CE processes as well as intrapreneurial competencies. Also, traditional face-to-face instruction is still the most used instruction mode, even though online training is found to have a huge potential for companies and educational institutions.

Due to the lack of action-based creativity training as well as the many possibilities with online training, I wanted to further explore this area. It turned out that online creativity training is an understudied field, especially when dividing creativity training into reflective (theoretical-based) and embodied (the “doing”) training. No serious online embodied creativity training programs were found. Together with a group of fellow researchers, I managed to secure funding to develop such a program, specifically targeted at higher educational institutions in Europe. Thus, we investigated the impact of an online embodied creativity program further in Article V.

While several benefits of online training have been proposed by academics and practitioners alike, numerous scholars have highlighted severe drawbacks as well, mainly drawing on the distance learning literature. One of the most common themes mentioned in the literature is a lack of trainee motivation and engagement. Gamification is a relatively new and promising technique to increase intrinsic motivation through the use of extrinsic, game-like reinforcements in a non-game context. In Article VI, we studied whether gamification could be used to minimise the weaknesses and capitalise on the strengths of online creativity training.

From the findings in each of the research objectives steering the focus of this research project, several implications can be drawn. These will be discussed in the following section.

Implications for research, policy and practice

The findings in RO8 provide an updated overview of the CET literature since Byrne et al. did their review in 2016. They add new learnings to one of the biggest questions around CET programs – the *how*. CET is becoming more action-oriented and focused on the "doing" (e.g. hypothesis testing, prototyping, BMG), targeting new groups (all employees), and includes new delivery methods (e.g. online instruction mode, flipped classroom and gamification elements). Some of these new programs are even open-source and free, which makes them more accessible. As such, companies do not have any excuse to neglect the training and development of their employees to unlock the hidden intrapreneurial potential. Investing in CET will lead to employees increasing their skillset. Further studies could look into if these new type of action-oriented CET programs are, in fact, more effective – both from a learners' perspective as well as an organisational output perspective. Also, more research is needed to uncover if the one-size-fits-many approach actually has the same effect on managers as it does on employees. For example, should corporate sponsors receive different CET training than the intrapreneurial candidates? How should such a training program be designed, and which delivery methods should be used? Undertaking the intrapreneurial activities of turning a novel idea into a reality might be radically different from supporting and protecting intrapreneurs (cf. Pinchot, 1987; Abetti, 2004).

Some of the specified learning objectives and goals of the CET programs are related to achieving knowledge about a theoretical concept (e.g. intrapreneurship, corporate entrepreneurship, creativity or innovation) or general knowledge (e.g. multi-disciplinary knowledge as mentioned by Byrne et al., 2016). Nevertheless, several of the CET programs do focus on enhancing the knowledge, skills or attributes heavily related to the 19 intrapreneurial characteristics found in Article I of this dissertation. This is illustrated in Table 8. While some of the programs focus mostly on the reflective (theoretical) part and thereby aiming trainees to gain knowledge about these areas (e.g. Kuretko & Montagno, 1989), some programs do offer a mix of theoretical understanding and actual "doing" (e.g. Friedl & Żur, 2018), while some programs predominantly focus on the "doing" part (e.g. Hargaden et al., 2017; Kruszelnicki & Breuer, 2020). It should be noted that no program was found to include all 19 characteristics. Also, some characteristics were not found to be included in any of the existing CET programs. A plausible explanation to this might be these specific characteristics require individual counselling over a more extended period to cultivate; for example, the characteristics "Self-confident", "Enthusiastically perseverant", and "Visionary". Further research could explore the type of instruction mode that is most efficient concerning each of the 19 intrapreneurial characteristics, especially the ones that was not found in the existing CET programs.

19 intrapreneurial characteristics	**Learning objectives and goals found in the CET programs**
Creative innovator	Creativity and innovation (Thornberry, 2003); knowledge about creativity and assessing own creativity (Kuretko & Montagno, 1989)
High achiever	(not found)
Proactive initiator	Proactiveness (Byrne et al., 2016)
Risk taker	(not found)
Organisational networker	Networking (Byrne et al., 2016); organisational knowledge (Kuretko & Montagno, 1989; Friedl & Żur, 2018); find sponsor (Koen, 2000); resource allocation (Koen, 2000)
Self-confident	Self-awareness (Heinonen, 2007; Byrne et al., 2016)
Flexible open-minded	Flexibility (Thornberry, 2003); pivoting (Hargaden et al., 2017; Kruszelnicki & Breuer, 2020)
Enthusiastically perseverant	(not found)
Opportunity recogniser	Opportunity identification and development (Thornberry, 2003)
Experimental problem solver	Experimentation and hypothesis-testing (Hargaden et al., 2017)
Persuasive influencer	Persuasion and communication (Hargaden et al., 2017; Friedl & Żur, 2018); (champion) presentations (Kuretko & Montagno, 1989; Koen, 2000)
Autonomous	(not found)

Team organiser	Teamwork and coalition building (Friedl & Żur, 2018); collaboration (Hargaden et al., 2017)
Change agent	(not found)
Idea generator	Ideation (Hargaden et al., 2017; Kruszelnicki & Breuer, 2020)
Business planner	Business planning (Kuretko & Montagno, 1989; Koen, 2000; Byrne et al. 2016); business model generation (Hargaden et al., 2017; Kruszelnicki & Breuer, 2020)
Visionary	(not found)
Customer-focused	Customer discovery (Hargaden et al., 2017; Kruszelnicki & Breuer, 2020)
Decision maker	(not found)

Table 8: Overlaps between the 19 intrapreneurial characteristics and focus areas in existing CET programs.

While online training has considerable potential, companies should be aware of the differences in the design of the online training programs before implementing them. Many online training programs are synchronous, as they rely on an instructor and sometimes also online groupwork, assignments or presentations. Such a design makes time a constraint, especially when targeting a business audience. Friedl and Żur (2018) reached this conclusion in their study. On the other hand, asynchronous training programs have the advantage of being accessible at all times; trainees can do the training at their own pace and place and are not dependent on an instructor. Yet, doing group-based activities with other trainees following the same asynchronous training program is almost impossible. The lack of social presence is a significant drawback in asynchronous training programs. As such, these programs are more focused on the individual. This is in line with findings from Zielinski (2000), who identified that the feeling of being isolated and lacking a direct instructor were two of the major aspects affecting trainee motivation in online environments.

Is online training even worth investing in, then? The findings of Article V do demonstrate that online creativity training is effective. This is in line with the findings of Robbins and Kegley (2010), who found that online instruction is valuable within the field of creativity training. However, our study shed light on a completely unexplored area, namely creativity training with a sole focus on the embodiment aspect – in other words, learning by doing, or even learning by playing (cf. Galetta,

2013) in an online environment. This is interesting, as action-oriented approaches are found to be especially crucial within the fields of entrepreneurship (e.g. Fiet, 2001; Rasmussen & Sørheim, 2006), creativity (Byrge & Tang, 2015; Tang et al., 2018; Byrge & Gomez, 2019), and thus, CE (e.g. Sarooghi et al., 2015; Byrne et al., 2016). Also, previous studies within the field of creativity research have focused on programs comprised of a mix of reflective and embodied training (where the latter plays the largest part in the program). The mix of delivery methods makes it impossible to figure out which of the two had the most considerable effect on trainees' learning achievement (Tang et al., 2018). The results of this study do indicate that creativity training programs that are solely focused on embodied training are effective. As such, when designing new CET programs, practitioners and scholars alike can reduce or balance the emphasis on reflective (theoretical) creative training and instead solely focus on the embodied part and still have considerable impacts. This would result in more ideas but also better and more novel ideas. Further research could develop more nuanced knowledge in this endeavour. For example, it could be interesting to study whether online embodied creativity training outcompetes traditional face-to-face reflective creativity training. Alternatively, studies could investigate if online creativity training solely focusing on embodied training (like Academy for Creativity) is more effective than training programs with a mix of reflection and embodiment, for example, the MOOC "Creativity Toolkit I", available at the Coursera® platform.

Article V might also be one of the first studies examining whether online creativity training has a transfer effect on trainees' own profession (domain). In our case, results showed that the advertising/communication students undertaking the training performed significantly better (produced more novel ideas) on domain-related (advertising/communication) tasks than the control group. These results indicate that online creativity training has a huge potential when implemented in companies. Further research could look into, if this proposition is true, will employees become more creative in their own domain or profession from doing online creativity training?

With Academy for Creativity, teachers and managers now have a free asynchronous online creativity training program to put in their curriculum or toolbox. While this leaves teachers and managers with yet another program to choose from, which can be problematic (cf. Robbins & Kegley, 2010), this program has been tested for its effect in two different experimental studies (Articles V and VI). As such, it provides an answer to the call made by Robbins and Kegley (2010) concerning the lack of research in instruction content and delivery method(s) in the field of creativity training programs.

It is important to note that embodied creativity training should not be seen as a stand-alone thing; preferably, it should be combined with some reflective (theoretical) training. For teachers, this is an important aspect. Therefore, we provided a best-

practice guide on how to implement online embodied creativity training in teaching activities in Article VI. However, in companies, the online embodied creativity training could be used as a stand-alone solution to enhance employees' creative thinking abilities. The success of such effort is, nevertheless, dependent on management and their support. Also, management should describe what the purpose of the training is, for example, to develop more novel ideas, make creativity intuitive within the company, or to develop a more creative culture.

Further studies could, nevertheless, integrate embodied creativity training into an existing CET program and uncover its effect on trainees. Do trainees develop more novel ideas during and after the CET when the deliberate practice of creative abilities is part of the program? Are more projects being realised? Finally, it would be very interesting to do a longitudinal study in a business setting or as part of a CET program to examine the effect of online embodied creativity training in terms of changes in work performance – what Arthur Jr er al. (2003) would refer to as the behavioural criteria – as well as the more general results from an organisational-point-of-view (the results criteria, cf. Arthur Jr et al., 2003). Nevertheless, this is outside the scope of this dissertation.

Can game-like elements improve trainee motivation and engagement in online environments? In Article VI, results show that the use of extrinsic reinforcements can, indeed, contribute to the intrinsic motivation of trainees. For example, trainees reported that they were having fun while doing the online embodied creativity training. Having fun can enable better learning (e.g. Prensky, 2001), and according to Francisco-Aparicio et al. (2013), carrying out activities for the pleasure of doing them is at the core of intrinsic motivation. Our findings are in line with other studies within the gamification literature, which found that gamification elements increased trainee motivation (e.g. Barata et al., 2013; de Frietas & de Frietas, 2013; Hanus & Fox, 2015; Leaning, 2015; Todor & Pitică, 2013). As such, our study confirms some of the key principles of gamification but in a completely new environment: online embodied creativity training in an educational setting.

Nevertheless, we made an interesting discovery – the potential of being evaluated was demotivating for trainees, despite game-like elements being employed in this activity. While this is in line with general beliefs in the creativity literature, which states that experienced judgment from others decreases intrinsic motivation (e.g. Amabile, 1998; Byrge & Hansen, 2014), the use of leaderboards and competitive dynamics is something that is highlighted by many scholars in the gamification literature. A plausible explanation to this finding is that some of the trainees were enrolled in a creativity course where The Creative Platform (Byrge & Hansen, 2014) was used as a didactic approach, in which "no experienced judgment" is one of the main pillars. Thus, these trainees were not used to being judged for their creative performance, which could result in negative emotions when suddenly being evaluated in an online embodied creativity training program. Another plausible explanation is

that leaderboards are, in fact, a demotivating factor. Domínguez et al. (2013) came to a somewhat similar conclusion in their study of a gamification plugin to a Blackboard platform used by more than 200 undergraduate students. Further research could look into this area by being more specific about each of the employed gamification elements in an online training program.

Still, practitioners can benefit a lot from using gamification elements in the design of new (online) CET programs or online creativity training programs. One can imagine a situation where the top management decides to put creativity on the agenda by focusing on training and development activities for middle managers in the whole organisation or the employees in a specific department. In such situations, the training becomes mandatory. As most corporate training today is done online, gamification can be used as a medium to stimulate intrinsic motivation and engagement of trainees in such situations. If the online training program is asynchronous in its design and done individually, incorporating game-like elements might be of high importance to increase trainee motivation and engagement and, thus, reach higher learning outcomes. The same goes for teachers wanting to implement creativity training in their curriculums by making it mandatory for their students. In such situations, the potential of using gamification as a technique seems apparent.

While the experiments in Article V and VI were done in an educational setting, it would be interesting to conduct something similar in a more business-like environment. We did run an experiment with the use of an online embodied creativity training program in a large international medico company, based in Denmark. The involved employees (40 individuals) were accustomed to traditional face-to-face embodied creativity training, but due to the COVID-19 pandemic, they were forced to find an alternative. The employees did find the online embodied creativity training fun and entertaining, but they missed the social aspect. Further research could investigate whether additional features, such as online group work, would increase trainee motivation and engagement. Likewise, it could be interesting to look at whether this also applies to an educational setting. There was, however, no evidence of this in the study we conducted (Article VI).

3.4. INTEGRATIVE IMPLICATIONS

I have investigated the main research question of this dissertation through three different projects, which have several research objectives. The conclusions from each research objective and, thus, each research project were presented in sections 3.1.5, 3.2.4, and 3.3.4. Nevertheless, the integrative impact of this thesis will be explained in the following section. Figure 7 shows how the different research objectives in my dissertation are connected and thus, integrated.

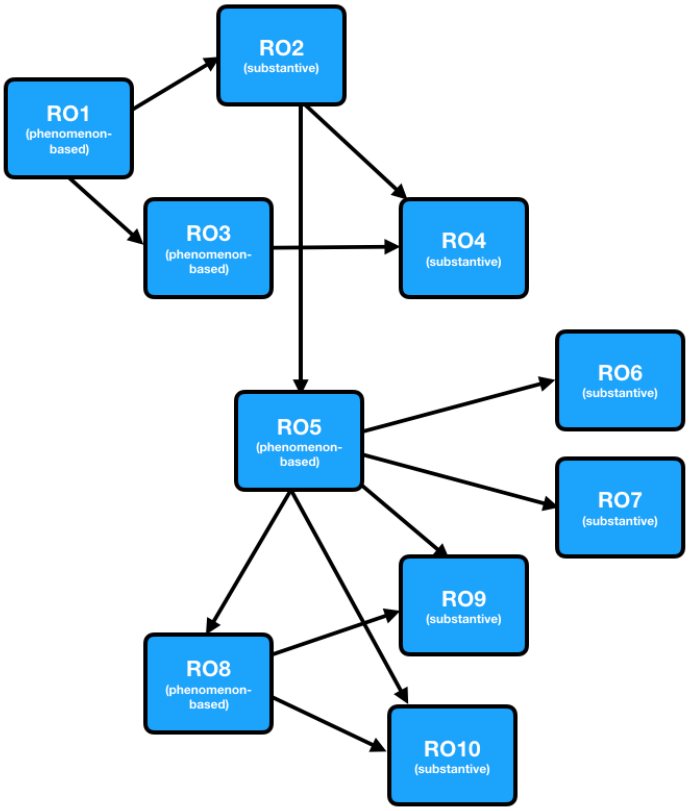

Figure 7: The connectedness of the different research objectives.

In Research Project A, I was interested in the identification and assessment of individual intrapreneurial characteristics. In RO1, I found that CE crosses several related, yet different, streams of literature, leading to varying diverse definitions of the concept. Most of these take an organisational point of view. Nevertheless, I provided a new, process-based human-centred definition of CE, which also encompasses a managerial perspective. In RO2, I found that identifying potential intrapreneurs is a challenging task, due to definitional confusion in the literature as

well as a lack of practical tools. I wanted to investigate both factors. In Artice I, I provided a more holistic definition of an intrapreneur (corporate entrepreneur), which includes 19 characteristics defining such an individual. This definition can be used in various ways, for example, in terms of recruitment and selection, team formation (developing more well-orchestrated teams), as well as to spot the areas that should be prioritised in training and development activities. In RO3, I critically assessed the few existing methods to identify intrapreneurs found in the literature. Companies now have an overview of the strengths and weaknesses of the different approaches available to identify intrapreneurs, which can help them choose the approach that best fits their particular context and situation. Nevertheless, in RO4 I wanted to provide an alternative approach, since many biases were found in the existing identification methods. Also, none of the existing methods were developed to identify intrapreneurial potential, that is, hidden abilities within individuals. For example, when the right opportunity comes along or an individual is put in the right environment or given the right training, their intraprenuerial potential may develop. In Article II, I provided a new approach to identify intrapreneurial potential through the use of qualitative production-based tasks. Companies and consultants are now equipped with an additional tool to help them spot intrapreneurial potential. Furthermore, the tool can work as a compass for individualised counselling of candidates or in the design of training and development activities.

In Research Project B, I was interested in novel idea creation in corporate settings. In RO5, I found that ideas can come from anywhere, making it a somewhat complex phenomenon that should be structured and managed. Individuals, i.e. the employees, play the most crucial role concerning novel idea generation. As such, I found several recommendations for how companies can stimulate and support individuals in this endeavour as well as how and when teamwork should be emphasised. In an integrative way, learnings from RO5 about efficient idea generation processes (individual versus team-based) was employed in both Article III (RO6) and Article IV (RO7). In RO6, I found that while previous literature has focused on novel idea generation for products and services, ideas for novel BMs are becoming highly important in organisations as well. Nevertheless, this is a rather complicated art, mainly due to the dominant logic and level of capabilities in the firm, a lack of tools and unstructured processes in the ideation phase of BMI. In Article III, I provided a new tool (the Booster Cards), based on a logical idea generation technique (TRIZ), and a structured process to follow in the ideation phase of BMI. As such, companies can now develop better and more novel BM ideas that break domain logic and industry causality by following a structured approach (technique plus process). The same goes for teachers; they now have a structured process which can strengthen the teaching and enhance student motivation. In RO7, I found that the current approaches for further developing and testing novel ideas might not be appropriate for ideas that are more complex, as they diverge from domain logic and industry causality. As such, I proposed a new process for including non-domain experts (horizontal experts and horizontal knowledge) to further develop and test highly novel ideas in Article IV.

Companies now have an alternative approach in their toolbox for working with highly novel ideas, which deviates from other approaches (e.g. with a focus on users, suppliers, competitors and other stakeholders related to the domain).

In Research Project C, I was interested in studying the relationship between training and intrapreneurial competencies. In RO8, I found that the most significant issue was not if training activities could lead to improved intrapreneurial competencies, but rather how to design CET programs in the most efficient way. I provided an updated overview of CET programs in the literature and found that action-oriented approaches are becoming increasingly used. Nevertheless, the deliberate practice concerning the idea generation process of CE (which I investigated in Research Project B) has been somewhat neglected in CET programs – and so has the use of online training. As such, I wanted to explore the effects of the deliberate practice of creative abilities (related to intrapreneurial competencies) in an online environment in RO9. In Article V, I provided new knowledge about the impact of online embodied creativity training programs. Companies and teachers now have a free online tool that they can implement in their organisation or curriculum(s), which is found to not only improve the general creative abilities of trainees but also enhance creative thinking in trainees' own profession (domain). In RO10, I found that one of the most cited weaknesses of online training is the lack of trainee motivation and engagement. As such, I wanted to study whether implementing game-like elements (extrinsic reinforcements) in online embodied creativity training could lead to improved (intrinsic) motivation of trainees. Article VI provided new insights into the creative training literature on the possibilities of online training and gamification. Practitioners can benefit heavily from using game-like elements in the design of new (online) CET programs or online creativity training programs to increase trainee motivation and engagement, especially if the training is mandatory (Hicks & Klimoski, 1987; Mathieu et al., 1992; Yardley, 2003) and/or asynchronous.

Overall, the findings from each research objective has been integrated into other research objectives or even articles. In RO2 (Article I), I identified 19 intrapreneurial characteristics defining an intrapreneur (corporate entrepreneur). In RO4 (Article II), I developed an approach to assess 18 out of the 19 intrapreneurial characteristics. If an individual is found to be low-scoring on one or more of the creativity-related intrapreneurial competencies (e.g. "Creative innovator", "Idea generator", "Flexible open-minded", "Visionary", and "Persuasive influencer"), I learned in RO5 that these could be enhanced in two ways. Either by employing a process-technique or through training. Within the process/technique perspective, I have learned that potential intrapreneurs might benefit from using, for example, Booster Cards (Article III) to develop more novel business ideas that deviate from industry logic and causality (RO6). Also, I have learned that potential intrapreneurs might benefit from using (non-domain) horizontal experts to further develop and test novel business ideas (RO7 and Article IV). Within the training perspective, I identified both online and traditional face-to-face instruction modes in RO8. As one of the critical elements in

CET programs is learning-by-doing, I tested an embodied online creativity program and found that it is possible to train this in an online environment (RO9 and Article V). Also, I found that gamification can help to motivate trainee's engagement in an online environment (RO10 and Article VI).

Given these findings, the next section will thoroughly discuss the research design that underpinned these findings and implications.

4. RESEARCH DESIGN

The aim of this section is to outline the research design of this dissertation. According to Creswell (2014), a research design is the proposal to conduct research, concerning the intersection of philosophy, strategies of inquiry and specific methods. The goal of this section is to demonstrate how the research process and question have been influenced by the methodological choices and to describe some of the explicit and implicit approaches influencing the dissertation.

As also described in the Foreword, I have engaged myself in several projecs during by time at Aalborg University, all around the same topic: building better businesses. These projects have been done with different people with the purpose of solving problems in the real world. But not by following the existing (social) practices; instead, I wanted to make a change by initiating something new. I did this both indirectly (by enhancing the competencies of the employees of tomorrow, the students) and directly (by running actual training for current employees as well as developing tools, frameworks and processes for managers in companies). The guiding principle of all these activities has always been to produce governing ideas and knowledge products that are useful and meaningful for practitioners.

The timeline of the three main projects that I have been involved in during this PhD period is illustrated in Figure 8. This figure illustrates that some of these projects started before the actual PhD period, and some prior activities affected the projects. Yet, in the PhD period, I was heavily focused on the research part of these projects.

Research Project A originates from my significant involvement in the development of two multi-disciplinary action-based entrepreneurship courses at AAU – the New Venture Creation (NVC) program and the Corporate Entrepreneurship program. The development of these programs was a break with the traditional way of doing things. The New Venture Creation program intended to deviate from reflective courses focusing on understanding entrepreneurship as a phenomenon, where there was a strong focus on teaching students how to write a business plan (no business plan survives first contact with customers anyway). Instead, the course was about becoming more entrepreneurial as a trainee – a learning-by-doing approach to entrepreneurship, as also poposed by Fiet (2001) and Rasmussen and Sørheim (2006). At least in Denmark, at this point, this was quite innovative and 'new to the industry'. This was when entrepreneurship was not a hot topic in the political sphere in Denmark nor within the educational institutions. Even though we could find inspiration from Sweden, the UK and especially the US, we created something that did not exist in our contextual setting.

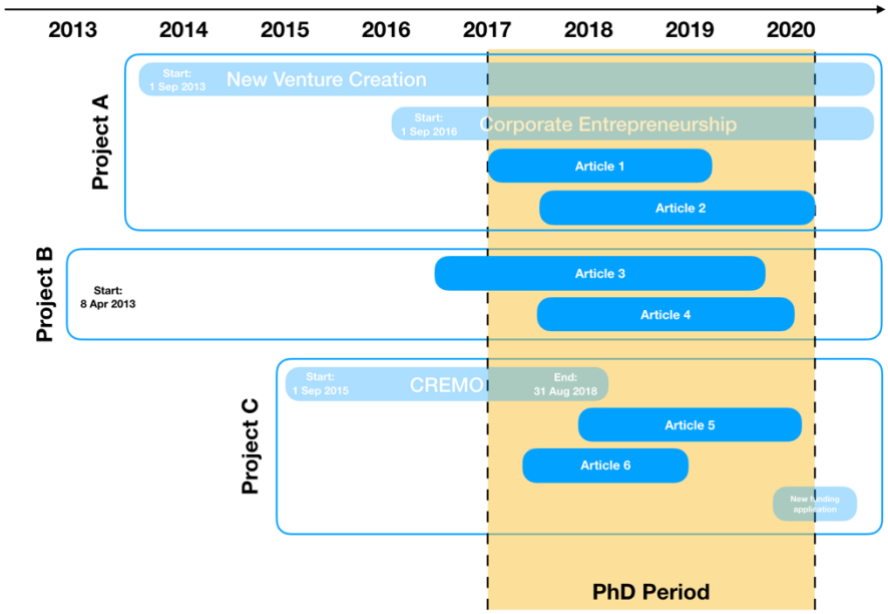

Figure 8: Timeline of projects.

Also, NVC was a full-time semester program at a university built on Problem-based Learning,[37] corresponding to a student workload of 30 ETCS (a full semester). Similar courses in the US were only 1, 2.5 or maybe 5 credits. The Corporate Entrepreneurship program was a break with the traditional ways of doing internships. We encountered several companies that were unsatisfied with only having one intern trained in one discipline, no guiding (or sparse) structures by the university and thus the company ending up with all the responsibility. We saw a need for multi-disciplinary teams to work on a company's real-life and complex problems, with the university providing support in terms of structure and guidance of the 'internship' period. Both programs have been further developed iteratively and cumulatively each year, based on interviews with participants (such as students, company representatives and mentors) and academic discussions within the lecturing team. Not only was I interested in developing the best possible programs for the trainees and involved companies, but I became very interested in opening up the topic of

[37] Problem-based Learning (PBL) is a student-centred approach focusing on students learning a subject and solving a problem through group work (e.g. De Graff & Kolmos, 2003). It is generally defined as a construct between the construction of knowledge, meta-learning and contextual learning (Gijselaers, 2003). PBL can be used in many constellations and modes of knowledge (Savin-Baden, 2014), whereas the key features in these modes are propositional knowledge produced within academia and knowledge validated through practical work (Gibbons et al., 1994).

identifying corporate entrepreneurial potential and how to enhance and nurture these competencies. The course is quite similar to the one Hargaden et al. (2017) later proposed as a CET program[38].

Research Project B originates from the steering focus group of the development of CREBS[39] (Center for Research Excellence in Business modelS) – the research group I became a part of in my first full-time research position at the Department of Business and Management at AAU. When CREBS was established in 2012, it was the world's first interdisciplinary research centre focusing on business models. Even though it was dedicated to doing excellent research in the area of business models, we also look at developing tools and processes for practitioners. The latter focus is still the goal of the research group (now lab) today. We did several smaller innovation projects with local companies where we tried out new tools and processes within the realm of business model innovation. I was very interested in developing new tools, frameworks and processes that actually made sense for these companies, in a "language" they would understand and find valuable and eventually could help them build a better business.

Research Project C originates from my involvement as Project Manager in the Erasmus+ project CReativity E-MOdules in Education (CREMO). Not only did I manage the 3-year project on a daily basis, but I was also the primary author of the initial funding application. The project ran from 1 September 2015 to 31 July 2018, with a consortium of five universities from around the world. The funding was given exclusively to the development of an online creativity training program for students and teachers at Higher Educational Institutions in Europe. Personally, I was very interested in this project because I wanted to change the way creativity is typically trained, which is very reflective. The focus is usually on understanding creativity as a phenomenon, its concepts, theories, models, tools and techniques. Yet, developing a reflective understanding of creativity will not necessarily make trainees more creative. To become more creative, trainees need to also focus their time on embodied creativity training – the equivalent to the type of training that is fundamental in sports and musical performance. However, the problem is that embodied creativity training is very reliant on access to the right resources, for example, the right mentors, coaches, training programs and environments. As such, I wanted to explore how we could make use of the internet and all its possibilities to develop an embodied creativity training program that was meaningful for both instructors and trainees focusing on the learning-by-doing part of creativity. Thus, the focus was on changing

[38] The Corporate Entrepreneurship course at AAU is, however, taught for Master students from all around the university, not for company representatives, like the one by Hargaden et al. (2017).

[39] The research group name was later changed to Business Model Design Center (BMDC) and again into the Business Design Center (BDC). In late 2019, the name was (once again) changed to Business Design Lab (BDL) – see www.business-designlab.com.

the way creativity is being trained. For instructors, we wanted to develop a plug-and-play solution that was easy to implement in their current curriculums (teachers) or organisations (managers) and track the progression of the trainees. For the trainees, we wanted to create something exciting and entertaining, but still educational and useful. I have maintained some of the relationships established in this Erasmus+ project, and together we applied for a new project in Summer, 2020, where we also invited new partners into the consortium.

4.1. MY EPISTEMOLOGICAL FOUNDATION

When I started in the position as PhD Fellow, I had a quite clear standing ground. I had been trained mostly in qualitative methods from my years as a Bachelor and Master's student at Aalborg University and had come to appreciate the interpretative paradigm (e.g. Burrell & Morgan, 1979) from my lectures and supervisors. After I finished my studies, I was employed at the Department of Business and Management. My previous lecturers and supervisors became my colleagues, and some of my old classmates became part of the CREBS research group too. Knowing that the worldview of researchers is shaped by the discipline area, the beliefs of past instructors, supervisors and lecturers as well as previous research experiences (Creswell, 2014), it is of no surprise that the research I participated in was strongly dominated by the interpretive paradigm and qualitative methods and techniques. An example of this is illustrated by the two studies I eventually decided to include in this PhD dissertation related to Research Project B. Here, we used observation as a method for collecting data, together with unstructured and semi-structured interviews with participants. The main goal of this triangulation was to uncover if the presented methods, processes and tools were meaningful to the users (reaction criteria). That is, we wanted to understand if users experienced a sense of purpose and whether or not the tools had value. The development of the conceptual methods, processes and tools was, therefore, mainly based on insights into what the companies got out of it and whether they thought it made sense. Also, we used domain experts to evaluate the outcome of each experiment in Article III and Article IV; we used evaluation reports from Master's students to understand further the value of using horizontal experts and the best practice for how to use them in the evaluation of novel ideas. Furthermore, in terms of research, we were working within a relatively 'young' area (business models) at the time. In new and yet to be explored research areas, qualitative approaches are often favoured to answer the 'what', 'why', and 'how' questions. Thus, as business models were a relatively new area, it made it a bit harder to test hypotheses, look at cause and effect and make predictions, which are some of the key features of the positivist or functionalist paradigm (e.g. Burrell & Morgan, 1979; Lincoln & Guba, 1985). That being said, it is not impossible to study the questions of 'how many' or 'how much' that are often answered by quantitative research when entering a new and young research area. We were, however, interested in investigating the depth of the insights and developing more nuanced knowledge

that practitioners could apply in their daily work with business development, strategy and innovation, which a qualitative approach could provide.

Nevertheless, when I started to work closely with companies and not just study them from the outside, it became clear that what practitioners like and seem to appreciate the most is research and knowledge products that give them a quick and definite answer to a certain problem. I experienced several times that the knowledge that I generated was not going to be translated into what I ideally would like to do. We could not generalise findings in the way that practitioners wanted us to. A possible explanation is the fact that we are now living in a complex world, which is very different from how the world looked when, for example, Michael E. Porter developed his Five Forces framework (Porter, 1979) or the Value Chain management tool (Porter, 1985). Companies might have become used to such normative tools and frameworks, however, in a complex world, frameworks and tools often cannot provide all the answers. They might help you think through the challenges to come up with the answers.

Around this time, I got involved in the CREMO project (Research Project C). My involvement in this project placed me in another circle of researchers. Here, I encountered scholars coming from the field of creativity – a research field that is dominated by quantitative research, where the vast majority of scholars were trained in quantitative methods and methodology. Also, creativity research is an older and more established research field compared to business models. Even though there were no research obligations with the grant we received from the Erasmus+ Strategic Partnership Programme, we were interested in doing some research related to the development of the Academy for Creativity software. Another reason why I wanted to join this project was that I was curious to learn about new methods from these scholars and about creativity as a field, as it is closely related to corporate entrepreneurship.

One of the studies we conducted in Project C was about testing the effects of this new approach to train creativity as we needed to examine if and how the software, we had developed, actually influenced people. This was not only about meeting some of the impact measures in our initial project application but also about communicating with users of the software and potential investors that may be interested in taking over the project after the project funding ended. Designing and conducting a more classic experimental study with a control group and an experimental group relied on a different set of theoretical assumptions and took a different form in practice. These types of studies rely on the detection of the effects on an intervention and focus on large samples selected randomly, thus employing a positivism research philosophy based on demonstrating causality, which relies on the assumption that the world is external and objective. We did, however, utilise a more qualitative-like method in the research design as we used expert judges to evaluate a domain-general and a domain-

specific creativity test. Nevertheless, the qualitative responses from one of the tests were quantified using the consensual assessment technique (CAT) (Amabile, 1982).

The work we did in Project C made me realise that following more quantitative research designs is somewhat "easier". Easier, in the sense that if we believe that everything can be observed objectively, that we can control everything and that we can be sure about measurements, it makes research – and the world – rather simple. Yet, the world and the topics in social sciences are not simple; on the contrary, they are very complex. This calls for research designs that match this complexity, including pluralistic and integrative research methods.

We still need to embrace the general requirements from practitioners and try to develop tools, methods and frameworks that these people find meaningful, effective, purposeful and understandable. This sometimes requires us to do research that seeks generalisable results, is normative in nature and thus, providing an immediate or clear response. It should be noted that the study of effects from creativity training as well as the measures of individual creative skills or qualities are well established and recognised within the creativity literature, which might be the reason why we were able to conduct such a study when the sub-field we were interested in, online embodied creativity training, was completely new.

Still, the experiences I had in Project C made me recognise that operating in the more quantitative world can be very good for some research objectives, but it also has limitations. Quantitative methods cannot, on their own, provide the depth of insight required for the research areas that have always interested me. The first studies[40] related to this project were rather explorational in nature with a stronger focus on qualitative methods and techniques as we were trying to develop the online creativity training program. Afterwards, we needed to understand how the software we had developed affected people. Not only if it made sense to train creativity online, but there was a strong demand to examine the impacts from the CREMO project (mainly the Academy for Creativity software), both from the grantee side but also from other stakeholders and eventually the practitioners. Numbers, significance levels and percentages are very powerful in the communication of project results. The experimental study design applied in the project is useful for provide such numbers, significance levels and percentages. To investigate and develop nuanced knowledge, we may need to apply qualitative methods or a mix of qualitative and quantitative methods. Nevertheless, I believe that we, as researchers, should choose whatever method works the best for answering the research question. But the research should be meaningful for its audience and useful for practitioners.

[40] The first study in this project, Dingli et al. (2018), was conducted and published in 2018 (not included in this dissertation). Article VI was published in 2019, while Article V was published in 2020.

From my experiences as a research assistant in CREBS and a Project Manager in the CREMO project, I became curious to start up my own research project where I was completely in charge of the research design, i.e. defining the research questions, selecting the strategies of inquiry and choosing the research methods. I had been experimenting with each side of the quantitative-qualitative continuum, moving from an interpretive/constructivist social science stance on the far left, to a functionalist/positivist paradigm on the far right (cf. Ellington, 2009). These experiences made me reject the polarisation between the two worldviews, where researchers need to take an absolute stance. Onwuegbuzie (2000) has used the term "uni-researchers" to describe this phenomenon of researchers that stick exclusively to either quantitative or qualitative research methods. Onwuegbuzie and Leech (2005) describe uni-research as a threat to the progress of social research as relying on only one research paradigm can be limiting.

During my PhD period, I have been very open to learning new research methods, striving towards methodological pluralism. Not only when entering a research collaboration with other scholars with different experiences, training, social belongings than myself, but also through elective PhD courses. For example, I attended a 5-credit course in Field Experiments, a 2-credit course in Action Research, a 3-credit course in Quantitative Methods for non-quantitative researchers as well as a 5-credit course in Inductive Theory Building. The reason for my openness was that I wanted to learn more about the possibilities of applying qualitative and quantitative methods in a way that makes sense for what I am interested in studying. Does learning about, for example, new quantitative methods open new doors for the things I find interesting? Should quantitative methods be part of my research design and in what way?

This whole journey made me believe that sometimes sticking to one research method works, while at other times, you need to apply mixed methods (Tashakkori & Teddlie, 1998; Creswell, 2014) or multiple methods. Every method has its limitations and different approaches can be complementary. When I reflect on this process, I see that I have arrived at this rather pragmatic way of seeing the world and have adopted a pragmatist position in my research project(s) and, in general, how I see the world.

In the following section, I further elaborate and discuss the pragmatist research paradigm, both in terms of its position compared to the positivist and constructivist paradigms as well as how pragmatism has influenced the choices I have made during my PhD period and as a scholar in general. The aim is, therefore, to reflect on my positionality as a researcher, not to solve the problems of the philosophy of science.

4.2. PRAGMATISM AS A PARADIGM

While there are numerous paradigms or worldviews that structure and organise modern social science research (e.g., functionalism, interpretivism, participatory action frameworks, pragmatism), they are all principally philosophical in nature and embrace the following shared elements: axiology (beliefs about the role of values and morals in research); ontology (assumptions about the nature of reality); epistemology (assumptions about how we know the world, how we gain knowledge, the relationship between the knower and the known); methodology (shared understanding of best means for gaining knowledge about the world); and rhetoric (shared understanding of the language of research) (Creswell, 2009; Lincoln et al., 2011). With these different philosophical foundations comes the division of social research methods into two groups – quantitative methods (normally associated with positivism) and qualitative methods (associated with constructivism).[41] Purists from the quantitative and qualitative paradigms have attacked advocates of the opposing tradition in the so-called 'paradigm war' for decades, claiming their approach to be superior (e.g. Burrell & Morgan, 1979). While positivists believe that the world exists apart from our understanding of it, constructivists claim that the world is created by our conceptions of it (Morgan, 2014a).

Pragmatism offers an alternative epistemological paradigm to the positivist and interpretative paradigms (e.g. Hall, 2013). The pragmatist research paradigm[42] (e.g. Howe, 1988) finds its philosophical foundation in the historical contributions of the philosophy of pragmatism[43] (Maxcy, 2003). Instead of relying on the 'Incompatibility Thesis' (Howe, 1988) – the belief that quantitative and qualitative paradigms are exclusive and not interchangeable – pragmatists have challenged this by embracing a plurality of methods. As a Bachelor and Master's student at Aalborg University, I somehow got drawn into this debate, especially during my Master's degree in Innovation and Entrepreneurship, where students were enrolled either as a MIKE-B (business) or MIKE-E (economics). I was enrolled as the former. The scholars designing the program created an 'us' (the business students being taught in

[41] It should be noted that there are several other perspectives associated with qualitative research, such as critical, feminist, postmodernist and poststructuralist (Creswell, 1998; Denzin & Lincoln, 2005). Nevertheless, Glesne (2006) outlines that most qualitative researchers follow the constructivist paradigm. Also, the positivist versus constructivist paradigms are the two paradigms that dominate research methodology textbooks and epistemological debates in the social sciences (e.g. Teddlie & Tashakkori, 2009).

[42] While most researchers refer to pragmatism as a paradigm, others (e.g. Morgan, 2007) prefer to describe the relevant belief system as symbolising a pragmatic approach.

[43] Pragmatism, as a philosophical tradition, originated in the United States around 1870. Its first generation was initiated by the 'classical pragmatists' such as Charles Sanders Peirce (1839–1914) and colleague William James (1842–1910), while the second generation of 'classical' pragmatists was led by John Dewey (1859–1952), Jane Addams (1860–1935) and George Herbert Mead (1863–1931).

qualitative methods) versus 'them' (the economics students being taught in quantitative methods) as all methodology lectures were separated. This situation affected how we structured our project work – in my case, around qualitative methods – and our choice of supervisors. When I later was employed as a research assistant, I naturally joined forces with some of the people that were previously my lecturers and supervisors – the advocates for qualitative methods. Yet, due to certain circumstances, I got involved in the CREMO project. First, as the main writer of the Erasmus+ Strategic Partnership application and, later, the project funded half of my salary as a part-time administrate officer managing the project. The clash with quantitative scholars was, in retrospective, very rewarding. It formed me into the scholar I am today – a scholar that does not want to enter into debates about whether one approach is superior to the other. In my view, both approaches have their strengths and weaknesses. Therefore, I did not want to take "an ultimate stand". Instead, I am now interested in designing research projects that are likely to answer my research questions while bringing new value to both practitioners and scholars in the field of corporate entrepreneurship and other related fields.

4.2.1. ONTOLOGICAL EXPERIENTIALISM

As a research paradigm, pragmatism is based on the premise that scholars should use the philosophical and/or methodological approach that works best for the particular research problem that is being examined (Tashakkori & Teddlie, 1998). It accepts that there can be single or multiple realities that are open to empirical investigation. On the other hand, some pragmatist researchers have proposed their opinion that there is an objective reality that exists apart from human experience. This reality is, however, grounded in the environment and can only be encountered through human experience[44] (Tashakkori & Teddlie, 1998; Morgan, 2014a). There is certainly such a thing as reality, but it is ever-changing, based on our actions. Thus, attempts to find an enduring, external reality are doomed to failure, according to pragmatists. Martela (2015) concludes that the ontological position of pragmatism could, therefore, be categorised as *ontological experientialism*.

As a human being, I believe that there is a reality, but it is ever-changing due to our actions. The reality we knew years back is not the same anymore. Even the reality we knew yesterday might have changed. When we try out new things, we get new experiences. And these experiences form the new reality. It is, therefore, of great importance that we keep trying out new things and changing the world for the better

[44] The notion of experience is a critical aspect in pragmatism and has its roots in the work of Dewey (1920–2008).

through experimentation. If people like Eric Ries and Steve Blank[45] never performed different experiments for developing startups, the Lean Startup methodology would not have been conceptualised, tested and then disseminated. Therefore, I believe that we, as researchers, are obligated to identify new ways of 'doing' in practice that may be valuable if they are implemented. We should (as scholars), therefore, not only focus our time on identifying research gaps, but also consider practice. For example, in Article III of this dissertation (see Appendix C), I – together with two other scholars – identified something that could potentially make practice better, i.e. a tool that can help individuals break dominant logic (domain logic and industry causality) in idea generation processes in the context of BMI but also develop a process on how to train people in using this tool. Together with practitioners (educators at Aalborg University and various company representatives), I tried to develop this tool so that it was useful for these practitioners.

Another example is Research Project C. After understanding the problems with creativity training from a practical perspective, I saw great potential in developing an online embodied creativity training tool to solve this problem. Together with practitioners (educators, employees, students, and managers), we began developing this new tool by investigating how such a tool could create value for practitioners. Our experiences later formed the basis of scientific papers (see Articles V and VI – Appendix E and Appendix F). So, during my PhD period, I have tried to develop new ways of doing in practice and, together with practitioners, I have attempted to create and implement these new tools. Simultaneously, I have also studied how to design these new tools, how to implement them and how it affects the organisations involved.

Stating both that there is a single real world and that all individuals have their own unique interpretations of that world, is not a problem in a pragmatic approach. In fact, the attention is on '[…] creating knowledge through lines of action points to the kinds of 'joint actions' or 'projects' that different people or groups can accomplish together' (Morgan, 2007, p. 72). Hence, there is an emphasis on developing shared understandings with other researchers to develop shared lines of behaviour, even though these other researchers might pursue research in different ways. As a scholar, I believe in building projects with others – practitioners and fellow researchers. Even though we do not hold the same worldview, I believe we can learn collectively and from each other.

[45] Eric Ries is the author of The Lean Startup book, which eventually formed the lean startup movement, where entrepreneurs were advised to apply an experimental sequential scheme developed in cycles to decrease uncertainty and avoid building products that nobody wants (Ries, 2011). Eric Ries is a former student of Steve Blank, and the customer development methodology, developed by Blank (2007), is a cornerstone in Ries' lean startup methodology (e.g. Chesbrough, 2020).

4.2.2. EPISTEMOLOGICAL FALLIBILISM

Pragmatists refuse to get involved in the debate over truth and reality (Creswell & Plano Clark, 2011) and reject the conventional philosophical polarity between objectivity and subjectivity (Biesta, 2010). One of the main foundations of pragmatist philosophy is that knowledge and reality are based on beliefs and habits that are socially constructed (Yefimov, 2004). In general, pragmatists agree that all knowledge in this world is socially constructed, but some versions of those social constructs match individuals' experiences more than others (Morgan, 2014a). Pragmatists question that reality can ever be determined once and for all (Pansiri, 2005). Instead, reality is seen as a normative concept; reality is "what works". The criteria for judging the value of research is, therefore, its effectiveness (Maxcy, 2003), 'Effectiveness is viewed as establishing that the results 'work' with respect to the specific problem that the researcher seeks resolution of' (p. 85). Yet, we, as scholars, can never reach a final "truth" or absolute accuracy. Or, as Peirce (1931) puts it: 'We never can be absolutely sure of anything […]' (vol 1., p. 147). Both Peirce (1931) and Dewey (1938) termed this doctrine "fallibilism", whereas Martela (2015) denotes it as "epistemological fallibilistic instrumentalism".

Effectiveness has, indeed, been a guiding principle throughout my PhD period. One example is related to the development of the production-based test to assess corporate entrepreneurial potential (Article II – see Appendix B). Here, a significant part of my research aim was to design something that was effective and meaningful to practitioners. This was conducted via interviews, questioning if each of the intrapreneurial tasks made sense, how they related and reflected their intrapreneurial reality in their everyday job and so on. As such, the goal was never to reach an ultimate truth or accuracy; instead, it was to develop something meaningful and effective for practitioners as well as other researchers. The same goes with the development of two approaches or techniques to enhance the process of novel idea creation in corporate settings (Articles III and IV – see Appendix C and Appendix D).

As pragmatism rejects the traditional philosophical dualism of objectivity and subjectivity (e.g. Biesta, 2010), one could argue that pragmatism lies somewhat in the middle on the quantitative-qualitative continuum, with positivism at one end and constructivism at the other end (e.g. Teddlie & Tashakkori, 2006). This is illustrated in Figure 9.

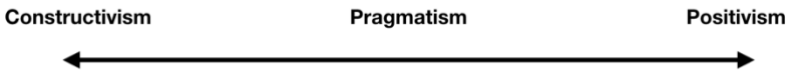

Figure 9: Pragmatism' position on the quantitative-qualitative continuum (based on Ellington, 2009; Teddlie & Tashakkori, 2006).

4.2.3. THE ROLE OF ABDUCTIVE INFERENCE

Morgan (2007) introduces a framework to illustrate how a pragmatic approach differs from each of the quantitative (positivist) and qualitative (constructivist) approaches concerning the connection of theory to data and making interpretations from data (see Figure 10). Where qualitative and quantitative research connects theory to data using induction and deduction, respectively, the pragmatic approach relies on abduction to move back and forth between deduction and induction.

	Constructivism	Pragmatism	Positivism
	Qualitative Approach	Pragmatic Approach	Quantitative Approach
Connection of theory and data	Induction	Abduction	Deduction
Relationship to research process	Subjectivity	Intersubjectivity	Objectivity
Inference from data	Contextual	Transferability	Generality

Figure 10: The pragmatic approach versus qualitative and quantitative approaches (based on Morgan, 2007).

Morgan's (2007) version of abduction is described as initially converting observations into theories and then evaluating those theories through action. This is quite similar to a process where inductive results from a qualitative approach can act as inputs to the deductive goals of a quantitative approach, or the other way around. Thus, the researcher is actively involved in creating theory and data. Pragmatists believe that during some phases of the research, an objective approach (by not interacting with subjects) might be optimal, while at other phases, interacting with research subjects to construct realities might be required, i.e. taking a subjective approach (Teddlie & Tashakkori, 2009). Martela (2015) stresses that even though the notion of abduction originally materialised in pragmatist philosophy in the writings of Peirce, pragmatism is frequently discussed without referring to abduction. Martela (2015) describes the aim of abductive inference as '[…] to arrive at the best available

explanation taking all into account – one's observations, one's pre-understanding, and any other material available such as previous theoretical explanations about the phenomenon. 'Best' here thus does not refer to any objectively best explanation, but to the best explanation from the point of view of the current standards of evaluation of the particular researcher or research community with regard to the values they see that science should advance' (p. 548). In short, abduction is a learning process that often requires the researcher to go back and forth between theory and empirical data (Wodak, 2004) to form the most warranted explanation of the matter at hand. Thus, the researcher is playing an active role in this "inference to the best explanation" (Martela, 2015). Due to fallibilism, it is, however, never the goal to come to a final truth about the matter at hand. To a certain extent, abduction is about evolving the researcher's way of perceiving until eventually reaching what Dewey (1938) denotes a 'resolved unified situation' (p. 111) – '[···] a wholeness in which one's new way of seeing the matter is able to explain in a satisfactory way what before represented a mystery' (Martela, 2015, p. 549).

Throughout my PhD period, I have worked on solving practical problems together with practitioners. For each problem, I have tried to understand the phenomena at hand by both investigating existing theories and collecting provisional data related to the phenomena to develop a potential solution to the problem. The solutions have been tested in an iterative learning process, going back and forth between theory and newly gained data from the experiments, which created new learnings. These new learnings and insights have sometimes created additional questions that also needed my attention or even new projects or sub-themes to further investigate. Yet, in each of the projects, I have come to a "resolved unified situation" (cf. Dewey, 1938), where the underlying research questions, the applied theories and the insights gained have somehow crystallised. An example is the development of the intrapreneuria tasks for the production-based assessment test (see Article II – Appendix B). From the outlook, it was impossible to know how these tasks should be designed. As it was a completely new area within the field of CE, it was not possible to find a guide for developing such tasks. From existing theory in the related field of creativity, I had an idea of how to design the tasks, based on learnings from the "Torrence Test of Creative Thinkin"' (TTCT) (Torrence, 1974). Nevertheless, I did not know if it would work in a completely different setting. I knew, however, that I could gain access to researchers and practitioners with expert knowledge that could be used to understand the phenomena at hand. From these interviews with practitioners and researchers and existing theory, I developed several types of intraprenuerial tasks following an iterative process, namely hypothetical non-company-specific tasks, hypothetical company-specific tasks and conceptual tasks (see Article II – Appendix B for a further explanation of these), without knowing what would work "best". I made experiments with these different task types in various settings and conducted more expert interviews to further develop these, so that they were meaningful to practitioners. The learning was that some of these task types did not result in the type of data that would say anything about the intrapreneurial characteristics, I was

searching for. At some point, this learning process crystalised to a point where I could explain how these tasks should be designed. And I played a very active role, as a researcher, in creating the data and new knowledge.

4.2.4. THE ROLE OF THE RESEARCHER

In terms of the relationship between the researcher and the research process, Morgan (2007) stresses that we, as researchers, can never be completely objective nor completely subjective. Instead, we have to alter between different frames of reference; for example, achieving mutual understandings with research participants, our colleagues as well as other scholars that review and read our final work. And an intersubjective approach captures this duality, according to Morgan (2007). Research relying on pragmatism entails acting in the physical and social world (Miettinen, 2000). As such, the researcher is an active agent in the research. Furthermore, since the researcher is part of the action that produces knowledge, this means that the researcher is one of the objects of knowledge. As knowledge is built, formed and explained in action, experimental knowledge is emphasised. For example, Dewey (2008), stressed that reflective experiments could facilitate the development of experience-based learning and action. The notion of knowledge generated by experimental action of different types of actors supports the participation of practitioners, scholars and other relevant stakeholders.

Even though my ambition as a researcher is mostly driven by developing research that is effective for practitioners, I also acknowledge that I am part of a context with other researchers. My affiliation with the research world, however, compels me to act in certain ways, namely, to write up my findings in a certain way and in a certain language, which lives up to the ‘norms’ within the community of researchers, so that my research results can get published. I accept this situation as I also want my work to act as an inspiration source and maybe steppingstone for other researchers. Yet, some of the articles in this dissertation are written more for practitioners than others. Figure 11 illustrates how some of my papers are mainly directed towards communicating with peer researchers (e.g. Articles I and V), while others are mainly directed towards communicating with practitioners (Articles II, III, IV, and VI). Still, all papers have elements that are relevant for both groups.

Figure 11: The relation between me, my research peers and practitioners.

As previously described in section 4.2.3, I have played a very active role in creating knowledge (theory) and data throughout this PhD period, together with both research peers and different practitioners. In some of my studies, I have been dependent on the involvement of various companies to run experiments. Establishing relationships with practitioners can, however, come with some obstacles. For example, for the development of the production-based test, I established a collaboration with an experienced CE consultant; both to involve this person as an expert in the learning process, but also to assist me in finding companies that would be willing to set aside resources (employees and their time) to do the actual test and follow-up group interviews. In the initial stages of the learning process, where the proposed solution is still a prototype and thereby somewhat experimental, it can be hard to find companies that are willing to allocate, for example, twenty employees for two hours, as forty hours of "missed" work time is a big sunk cost. Also, when having a more formal collaboration with a practitioner, like the consultant I collaborated with, you have to acknowledge that this person is carrying a full-time job with deliverables outside this collaboration – and their 'real' job is the main priority. Furthermore, there might be multiple interests at play in such collaborations. Therefore, you, as a researcher, have to be very flexible. In my case, some important meetings have been postponed due to other and more important affairs (in the eyes of the practitioner). Also, scheduled experiments with companies have been cancelled at the very last minute. This is part of the game, which I fully understand. Nevertheless, I would have liked to do more experiments with companies in this particular study (Article II – Appendix B) to test for effectiveness, but this was not possible at the time, mainly because of the abovementioned factors and COVID-19.[46]

[46] Two different experiments with companies in Denmark were scheduled for the Spring 2020, but they were simply not doable as Denmark closed down for several months due to COVID-19. Also, when Denmark opened up again, many companies were either very busy or reluctant to invite externals to their premises in fear of a local outbreak forcing them to close down again.

4.2.5. THE ROLE OF TRANSFERABILITY

In relation to inference from data, pragmatism rejects the dichotomy between classifications of universal/general (quantitative approaches) or specific/context-dependent (qualitative). Research results can never be so specific that they do not have any implications for other actions in other areas nor can they be so generalizable that they apply in all settings and contexts (Morgan, 2007). Instead, the focus is on the transferability of results, or '[…] the extent to which we can take the things that we learn with one type of method in one specific setting and make the most appropriate use of that knowledge in other circumstances. Once again, this involves a process of working back and forth, in this case between specific results and their more general implications' (Morgan, 2007, p. 72). Throughout my PhD period, it has been important for me to consider whether the research results I developed could be used in other settings. For the more researcher-oriented articles, I have tried to describe the implications my results might have for other (related) research fields. For the more practitioner-oriented articles, where specific tools or processes have been developed and tested, the focus has been on both involving different types of stakeholders in the development process and reflecting on how to apply them in different settings to achieve the "best" result. For example, different types of experts and researchers (not only from my research group) were invited to 'high-level' discussions to bring in new inspiration; company representatives from various company types and sizes and students from different academic backgrounds were also engaged. An example is the development the 71 Booster Cards for breaking dominant logic (pattern breaking) in idea generation processes in the context of BMI and the accompanying development of a "best practice" process for how to train people in using the tool (see Article III – Appendix C). Firstly, we invited different experts to help us develop a prototype of the cards. Secondly, we tested the prototype and process with a vast number of companies and different organisational types (e.g. SMEs, big corporates, public organisations) to secure some "empirical transferability" between companies. Also, we invited several other scholars to high-level discussions of results and how to move forward. Thirdly, in the learning circle of developing a "best practice" process for how to use the tool, we tried out numerous different approaches and eventually found the one that, from the data we collected, worked the most efficiently and could be used in a vary of contexts. Again, this was discussed with externals (experts and scholars). Fourthly, from existing literature we found that the use of cards as stimuli has also been used by others – for example, the BMI Lab at St. Gallen University (the BMI Pattern Cards) – which also signals some level of transferability as it has been used, successfully, in other contexts and environments. Still, we also give recommendations on what to consider, when using the tool and process in other settings than the ones we have utilised.

4.2.6. METHODOLOGICAL OPENNESS AND REFLEXIVITY

The pragmatic approach is influenced by philosophical assumptions underpinning research methods, making researchers less restricted in terms of how they can carry

out research. Thus, methodologically and philosophically, pragmatism offers a mix of quantitative and qualitative methods to answer research questions (Johnson & Onwuegbuzie, 2004; Onwuegbuzie & Johnson, 2006). Pragmatism allows scholars to select the methods (or combination of methods) that work best for answering the research questions, whether it is a single method, multiple methods or a mix of methods (Johnson & Onwuegbuzie, 2004; Tashakkori & Teddlie, 1998). Pragmatists will consider "what works" to answer research questions carefully and thoughtfully (e.g. Bryman, 2006). Thus, the choice of methods should not be based on the choice between the constructivist or positivist paradigms. Pragmatist scholars' choice of one version of reality over another is, therefore, directed by how well that choice results in anticipated outcomes (Tashakkori & Teddlie, 1998).

Throughout my PhD period, I have not been fixated on following one way of conducting research. Instead, I have been open to learning new methods so that I could develop the best possible research design to answer my research objectives. Thus, I accepted that there are many different ways of interpreting the world and undertaking research, that no single point of view can provide the entire picture, and that there may be multiple realities. By default, if you, as a researcher, need to find the best suitable research design and are not restricted by the "Incompatibility Thesis", you need to know of a lot of different methods. Therefore, I engaged in projects with researchers that had been trained in other approaches, and I also took several methodological courses as part of my PhD program. Ultimately, this resulted in three research projects, where the first is based on design-based research (but will eventually follow a mixed-methods approach) and the second includes two independent design-based research studies. In contrast, the third is based on a mixed-methods approach.

The notion of "what works" has been debated by incompatibilists (Howe, 1988). Nevertheless, in the eyes of the pragmatist, "what works" does not mean that it, then, is true (Boisvert, 1998). Pragmatist researchers do not dismiss philosophical arguments to get their research done. Instead, they have concluded that the broader philosophical arguments cannot be solved, as meaning is conjoined from the experience and needs of humans and is context-dependent (Dillon et al., 2000). Pragmatists believe that an inquiry[47] is effective only if it achieves its purposes. As such, the ethical goal of research is '[…] to gain knowledge in the pursuit of desired ends' (Morgan, 2007, p. 69). In the same vein, if a method achieves its purpose, it will be considered appropriate (Maxcy, 2003). Thus, according to Patton (2002), the purpose of the research should eventually select the method. Morgan (2007) stresses that neither research questions nor research methods are in themselves important or automatically appropriate. Rather, the researcher should – in a somewhat reflexive way – choose what is important to study and what is a proper way to study it (Morgan,

[47] Inquiry is a central term in pragmatism and played a central role in Dewey's thinking (e.g. Morgan, 2014a).

2007). This calls for a process of decision making where the researcher carefully examines the particular contingencies and makes a decision about which approach to apply in the specific study (Morgan, 2014b). To support the researcher in deciding on the design, the researcher can seek consensus among the members in their reference group, i.e. the research community that the researcher is part of (Morgan, 2014a; 2014b).

In this PhD period, I have carefully thought about the research approaches to apply in all studies. The process of decision making is, however, easier to control when conducting a study where you have the exclusive rights and final say – for example, projects where you are the 'project manager' or projects you run completely by yourself. In the studies where I collaborated with other scholars, I took an active part in the decision-making process about design and was very open to suggestions from my colleagues. Also, I studied new and unfamiliar methods as part of my PhD position to gain new knowledge about these and identify new ways of conducting research, which potentially could influence my way of thinking. The same goes for the studies where I had the final say. I was still open to new ideas from other scholars as well as inspiration from methodological PhD courses, which could help me in designing the "best" possible research design for each particular study.

I involved my research community in the design process in various ways. In Article I (see Appendix A), I searched for consensus in the community of researchers in the field of CE by examining how scholars, historically, articulate and define corporate entrepreneurs (intrapreneurs). In Article II (see Appendix B), I sought consensus with both academics and practitioners – e.g. a CE consultant, employees in corporations and business managers. In Article III (see Appendix C) and Article IV (see Appendix D), the community was a small group of researchers that I collaborated with for a longer period (one group consisted of two rather pragmatic BM researchers, the other of two action-oriented creativity scholars). Furthermore, the community consisted of the company representatives we involved in the experiments. In Articles V and VI (see Appendices E and F), I collaborated with five other researchers for more than five years. In the first three years, the main focus was on fulfilling the project requirements, while we got much stronger research focus around one-and-a-half-year into the project period. After the funding period ended, the collaboration was merely focused on conducting different studies related to the project.

According to Morgan (2014b), pragmatists think that we are free to believe whatever we want; however, some beliefs are more possible than others to meet our goals and needs. Tashakkori and Teddlie (1998) stress that as a pragmatist researcher, you are also free to '[…] study what interests you and is of value to you, study it in the different ways that you deem appropriate, and utilize the results in ways that can bring about positive consequences within your value system' (Tashakkori & Teddlie, 1998, p. 30). Throughout my PhD period, as well as my previous work as a research assistant, I have engaged in research areas I found interesting. Sometimes, in

academia, you cannot completely control this, as you might have a professor who could dictate what you should work on and how. Nevertheless, I have been able to focus my energy and time on what interested me: to build better businesses for the future. As previously described, the guiding principle of my work has always been to produce governing ideas and knowledge products that have positive impacts for the stakeholders in my value system. This is in line with pragmatic research, as it tends to have an interconnected value for the individual researcher, practitioners, peer scholars as well as society in general, at least when results are somehow "transferable" (cf. Morgan, 2007) (see Figure 12).

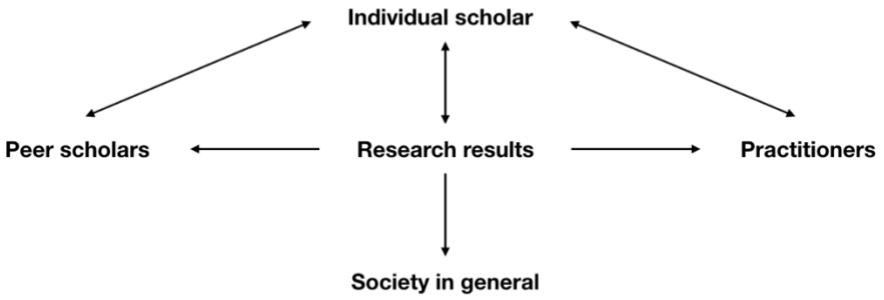

Figure 12: The value system of pragmatism.

4.2.7. THE ROLE OF PROBLEM SOLVING

As a research paradigm, pragmatism positions itself toward solving practical problems in the real world (Biesta, 2010; Martela, 2015). Pragmatic researchers should identify problems that recur in society and try to develop solutions to address those problems. And any concept can be relevant, as long as it supports action. Thus, pragmatism has emerged as a method of inquiry for more practical-oriented scholars (Maxcy, 2003; Creswell & Plano Clark, 2011). Pragmatism is thereby focused on change and the future, as our actions – as humans – bring change to the world (Baert, 2003). According to James (1907/1991), all our beliefs are ultimately future-oriented "rules for action". Dewey (1938) replaces the words *belief* and *knowledge* with the term 'warranted assertability' to highlight the ever-changing nature of human convictions (p. 7). Dewey claims that in a pragmatic inquiry 'we begin in a situation where we don't know our way around, and inquiry come to an end when we do' (Hookway, 2008, para. 60). Warranted assertions could, according to Martela (2015), therefore be understood as '[…] outcomes of inquiry that are so settled that we are ready to act upon […]' (p. 540), but still remain open for change in the future.

Throughout my PhD period, I have been focused on solving practical problems and creating change through actions. I was interested in solving the practical problem of how companies can spot intrapreneurial potential in their current or future employees. Who should the manager(s) choose to send to, for example, a CET program, workshop or similar? Who should the company invest in to get the highest return? This practical problem led to another problem: what intrapreneurial competencies or characteristics should companies actually be looking for in individuals? Another practical problem that interested me was how novel ideas are created and supported in corporate settings and, especially, how this can be improved. How can we design techniques that allow individuals to break the dominant logic, i.e. domain logic and industry causality? How can we design tools that can bring more knowledge into play when there might be a lack of capabilities within a team or an individual? Lastly, I was interested in solving the practical problem of creativity training, which may be inaccessible for most people as not everyone is fortunate to access to the right resources (e.g. the right mentors, the right coaches, the right training programs, the right environment). I saw potential in developing an online embodied training tool, but such a tool created new practical problems such as: can embodied training be done online with the same impact as traditional face-to-face training? How can you motivate trainees when doing (distanced) training online? The actions I made and the solutions I developed together with fellow scholars and practitioners are, however, not thought of as "final". They will be further developed as we learn more; this could be initiated by myself in further studies, other scholars or practitioners. Still, some of the tools and methods that crystallised during my PhD period were in a state that could be acted upon and thus could be denoted as "warranted assertions" (cf. Martela, 2015).

4.2.8. SUMMARY

Pragmatism, as a paradigm, advocates for: ontological experientialism (i.e. reality can only be encountered through human experience and is thus ever-changing, based on our actions); epistemological fallibilism (i.e. we can never reach absolute certainty about knowledge – researchers should, therefore strive for warranted assertibility, meaning results that "work" with respect to the specific problem); methodological openness and reflexivity (i.e. researchers should avoid fetishism of method and technique and instead – through a reflexive process – choose the methods or combination of methods that work best for answering their research questions); and a value-laden axiology, as the aim is to conduct research that benefits people (by solving real problems) where the researcher plays a role as an active interpreter through abductive inference.

As such, my PhD projects, experiments, publications and collaborations have made contributions to both research and practitioners. However, my publications and my gained knowledge will also create possibilities for other researchers and practitioners to use my findings as stepping stones for initiating action and to create new learnings

that will take the field of corporate entrepreneurship to an even more elaborate level – in the same way as I have used previous findings and experiences from both researchers and practitioners as stepping stones for my research. This collective learning cycle will eventually take the research field and practice closer and closer to something that 'works well'. Figure 13 provides an overview of how the research inputs included both my own experiences as a practice-oriented scholar, previous research on CE and related fields of creativity and distanced learning, practitioner experiences concerning CE as well as a mix of methods. Also, the figure shows how my PhD project has produced outputs that are relevant from a research perspective, practitioner perspective and a methodological perspective, through the different sub-projects that included both experiments and more reflective studies.

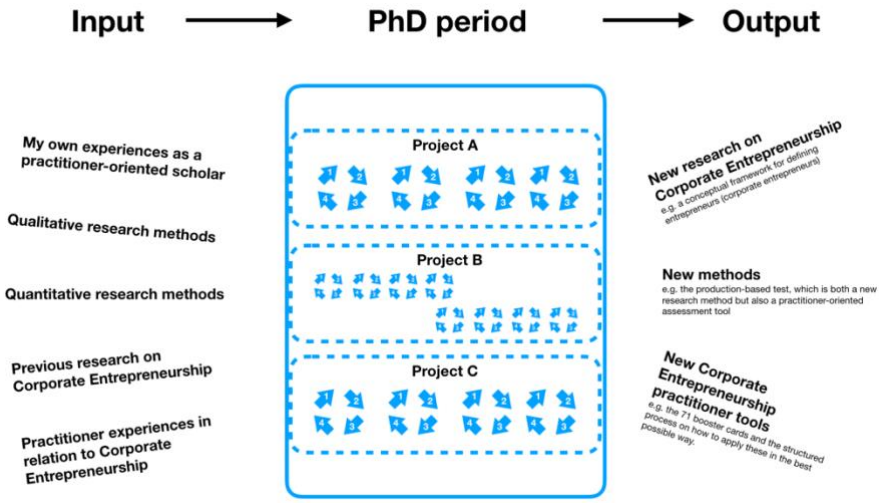

Figure 13: Inputs to PhD period and the developed outputs.

That being said, all insights I have generated in my PhD period, including the outputs described in this dissertation, should be seen as propositions that may influence outcomes in the future. I do not claim that they work in all settings under all circumstances. Hopefully, the outcomes are helpful to practitioners (educators, managers, consultants) wanting to improve the process of identifying and nurturing corporate entrepreneurial potential in organisations as well as peer researchers interested in this area. The inclusive design in each research project, where practitioners have been part of the experimental process, indicates that the insights are considered valuable. Nevertheless, pragmatic instrumentalism does not imply that any solution is good if it seems suitable in a particular setting or context. To establish warranted assertions, these have to be developed through a credible inquiry process (Martela, 2015). Thus, in the following section, I attempt to disclose the data collection techniques that I utilised, in as much detail as deemed appropriate.

4.3. DATA COLLECTION STRATEGIES

A theoretically rich phenomenon such as the field of corporate entrepreneurship might be impossible to analyse in a single study or within the restrictions of a single research design. For this reason, I aimed to provide an answer to the guiding research questions of this dissertation by unpacking the relative phenomenon across three related areas of inquiry (Research Projects A, B and C) and through a number of different phenomena-based and substantive research objectives. Some of these have resulted in scientific articles, seven of which are included in this dissertation (see Appendices A to F).

The included articles apply a variety of research methods to study the field of corporate entrepreneurship; some include a mix of qualitative and quantitative methods, while others only entail a single method. This is consistent with my worldview, as pragmatism allows the researcher to select the methods (or combination of methods) that work best for answering the specific research questions. This means, for example, that a mix of quantitative and qualitative methods may be used to answer the research questions (e.g. Johnson & Onwuegbuzie, 2004; Onwuegbuzie & Johnson, 2006).

In each of the included articles, the particular methodological choices and research methods applied are described. However, due to journal word counts and restrictions on the maximum number of pages, it has not been possible to discuss all the research methods in detail in the papers. For example, Article III is published in a short paper format (restriction of maximum eight pages), and Article IV is published in a special issue with a strong focus on the practical application of the findings. The following sections will further discuss the research methods that have been applied in the papers, including their basic elements, aims and characteristics. As such, this section is an attempt to describe the data collection strategies used in this dissertation in an integrative way.

4.3.1. SYSTEMATIC LITERATURE REVIEWS

Systematic literature reviews originate from the field of medicine and are linked to evidence-based practice (Pittaway, 2007). Petticrew and Roberts (2006) define a systematic review as '[…] a method of making sense of large bodies of information, and a means of contributing to the answers to questions about what works and what does not – and many other types of questions too.' (p. 2). In contrast to traditional narrative reviews, systematic reviews are more fit to answering a specific question and less a discussion of the literature in general (Petticrew & Roberts, 2006). Also, systematic reviews provide a transparent and clear approach that is reported to the reader, whereas traditional narrative reviews are typically more ambiguous (Pittaway, 2007).

Systematic reviews are structured in their design and typically follow a set of methods that explicitly work to limit systematic bias, primarily by trying to identify, review and integrate all relevant studies (of whatever design). The review should explicitly describe the procedure, be comprehensive in its scope and be reproducible (Fink, 2005). The data collected in systematic reviews is categorised as secondary data. Even though systematic reviews are somewhat structured, they are less rigid than 'structured literature reviews' (see Massaro et al., 2016, for a comprehensive guide to the latter). This is one of the reasons why the systematic approach was used in this dissertation instead of the approach suggested by Massaro et al. (2016). I was not interested in doing some of the additional steps in the structured literature review approach, for example, measuring article impact. Instead, I was interested in covering a broader spectrum of articles while answering my initial question. Only focusing on high-ranking journals could lead to bias, as articles in 'B' journals tends to be more original, phenomenon-based (instead of theory-based) and aimed at non-academics as well (and not only academics), when compared to articles in 'A' journals (Hoffmann, 2017). I chose an integrative approach where all types of journals were, at first, considered relevant. This fits with my more pragmatist orientation where both theoretical- and practitioner-oriented inputs are equally relevant. Also, Grant and Booth (2009) stress that systematic literature reviews are suitable if the goal is to uncover what is known (concerning the initial question) as well as to give recommendations for practice, which is something I adhere to, as a pragmatic researcher.

Thus, this dissertation uses a systematic literature review to identify the known characteristics of a corporate entrepreneur (intrapreneur) by following the six steps suggested by Jesson et al. (2011):

1. Define the research question
2. Design the plan
3. Search the literature
4. Apply exclusion and inclusion criteria
5. Apply quality assessment
6. Synthesis

This data collection strategy is applied in Article I of this dissertation[48] (see Appendix A).

[48] Please note that in the published article, the approach used is labelled as 'structured'. While this is partly true, as systematic literature reviews are indeed structured, the approach used in the article is not what Massano et al. (2016) would define as 'structured literature review', but rather a systematic review approach (cf. Petticrew & Roberts, 2006).

4.3.2. INTERVIEWS

According to Brinkmann (2008), interviewing can be defined as '[…] a conversational practice where knowledge is produced through the interaction between an interviewer and an interviewee or a group of interviewees' (p. 470). While numerous forms of interviews exist, they can be arranged on a continuum from structured to unstructured (Mason, 1994). The most used approach in social science is, however, the semi-structured approach (e.g. Brinkmann, 2008), where the interviewer develops a written interview guide beforehand, but still allows room for the conversation to flow to relevant topics (Kvale, 1996; Kreiner & Mouritsen, 2005; Ayres, 2008).

Much of the primary empirical data in this dissertation has been collected using interviews in different formats. This includes individual, group and workshop session interviews. Individual interviews were performed with experts (Article II). Focus group interviews involved corporate entrepreneurial students (Article II), company representatives (Article II) as well as communication and creativity students (Article VI). Workshop session interviews were conducted with both students and company representatives (Articles III and IV). Interviews were preferred as a data collection strategy in this dissertation as they are a vastly efficient method of collecting rich data. Also, as the ambition was to get insights from individuals and use various knowledgeable individuals with different views of a phenomenon, interviews can ensure plausibility and depth in the data (e.g. Kvale, 1996; Ayres, 2008).

The individual expert interviews were conducted using a semi-structured interview approach, where the interviewer, beforehand, creates an interview guide to steer the conversation, but with room for letting the conversation flow to relevant topics (Kvale, 1996; Kreiner & Mouritsen, 2005; Berg & Lune, 2012). The same approach was applied in the focus group interviews; nevertheless, in line with the suggestions made Berg and Lune (2012), the main focus in these interviews was to facilitate discussions among the participants of the group around specific topics.

Different interview guides were developed for each study with inspiration from theory, peer scholars as well as practitioners in the field. In each situation, the proposed interview guide was discussed before the actual interview with both peer scholars and practitioners to ensure that the intended data could be obtained. Another reason for this step was to mitigate some of the bias engrained with the interview technique (Kvale, 1996); for example, to ensure that interview questions were not predetermined to evoke biased responses (e.g. Ogden, 2008). To avoid interviewees (subconsciously) providing representative answers (e.g. Kreiner & Mouritsen, 2005), I frequently asked for practical examples, which, according to Czarniawska (2001), enhances the likelihood of getting practical answers instead of representative answers. After each interview, I made a quick summary to capture key aspects of the interview and to note anything that the voice recorder could not capture, for example,

body language. The findings of the interviews were discussed with practitioners, researchers and the interviewees to ensure that my understandings were accurate.

In the workshop sessions, I employed unstructured interviews, i.e. interviews where neither the question nor the answer categories are decided in advance (Minichiello et al., 1990). Compared to semi-structured interviews, the scholar's control over the conversation should be kept at a minimum in unstructured interviews; however, this does not mean that the questions should be random and non-directive (Zhang & Wildemuth, 2009). The researcher still needs to keep in mind the general purpose and scope of the study (e.g. Patton, 2002) and is allowed to loosely guide the conversation based on a list of questions (Zhang & Wildemuth, 2009), sometimes referred to as an agenda or 'aide memoire' (Minichiello et al., 1990). Such an agenda can contain general topics but not the actual questions to be asked (e.g. Zhang & Wildemuth, 2009).

We used this approach as unstructured interviews are a natural extension of observation (Patton, 2002), which was the main data collection strategy in the workshops. Also, as unstructured interviews wholly rely on the impulsive generation of questions in the natural flow of the interaction between the researcher and the informant (e.g. Zhang & Wildemuth, 2009), we found this approach to be very efficient to capture the participant's experiences and perceptions in creative workshop settings, where structures are seen as constraints and the number of participants can be high, making more structured interviews inappropriate. We developed a general agenda with topics related to the participant's experience within our proposed process but without explicit questions to ask.

Expert interviews

Expert interviews are seen as a particular form of semi-structured interviews (Flick, 2009) and they have become widely popular within social research (Bogner et al., 2009). Experts are interesting in a research context as they are in a position to put their own interpretations into practice. Unlike 'ordinary people', this type of respondent holds deep knowledge about the research object. Expert interviews are usually employed in the exploratory phase of a project and offer an effective way to rapidly obtain reliable data (Dorussen et al., 2005) and thus 'good' results (Bogner et al., 2009), as long as the interviewee is considered an expert. The latter is one of the main topics discussed in this area.

According to Deeke (1995, as cited in Flick, 2009), people '[…] who are particularly competent as authorities on a certain matter of facts' (p. 165) can be defined as experts. Pfadenhauer (2009) separates specialists from experts, stating that '[…] the expert thus has a more comprehensive knowledge that enables him not only to solve problems, but moreover to identify and to account for problem causes as well as for solution principles' (p. 82).

Defining experts in this research was based on purposive sampling. The individuals either had extensive theoretical or practical knowledge within the field of corporate entrepreneurship or the use (and development) of production tests (see Table 9).

	Title of expert	**Inclusion criteria**
Expert 1 (RVT)	Professor in Entrepreneurship	Holds vast theoretical knowledge within the area of Corporate Entrepreneurship.
Expert 2 (CHB)	Professor in Creativity	Holds theoretical and practical knowledge within the area of the use and development of production tests.
Expert 3 (AMO)	Associate Professor in Entrepreneurship	Holds vast theoretical knowledge within the area of entrepreneurial personalities.
Expert 4 (MAJ)	Serial corporate entrepreneur, previous manager of corporate entrepreneurial accelerator at a major international company, now private consultant in corporate entrepreneurship training	Holds vast practical knowledge within the area of CE and CET.

Table 9: Interviews with experts.

Expert interviews were used in the exploratory phase of Research Project A; they gave me the opportunity to obtain good results by talking to highly motivated people that were willing to cooperate, exchange ideas and open doors to other interviews. Also, this approach shortened the data gathering process, which can be quite time consuming when entering a new field (Bogner et al., 2009).

Focus group interviews

Focus group interviews are interviews conducted with a small group of people, typically around six to eight participants (Patton, 2002), utilising a scholar-led discussion to produce data (Morgan, 2008). Compared to other interview types, there are no requirements to reach consensus; rather, it is the groups' discussion that is of interest and forms the data collection (Morgan, 2008). The interviewer plays a crucial role in mediating between the participants, for example, by encouraging reserved

persons to participate or ensuring that dominant persons do not take over the discussion (Flick, 2009).

Focus group interviews are data-rich and can support the respondents in remembering events, which can lead to answers beyond those generated in one-on-one interviews, as some respondents may have greater confidence in a group setting (Flick, 2009). Also, they are less time-consuming and resource-intensive compared to individual interviews (e.g. Flick, 2009). Group composition is a key aspect of research design for focus groups. Participants should be comfortable so that they want to share their opinions about the topic in question. To generate lively conversations and stimulate active exchanges among the participants, researchers can create homogeneous groups, i.e. groups that consist of participants who share a similar perspective (Morgan, 2008).

In this dissertation, the group interviews were employed as a summative evaluation (cf. Morgan, 2008) to hear about the participants' experiences with the proposed tool, process or framework, for example, the production test (Article II) or the software platform (Article VI). An overview of the different focus groups used can be seen in Table 10Table 10.

	Description of group	**Article**
Focus groups 1-2	A total of seven Master's students with diverse study backgrounds participated. However, the students were all enrolled in the same elective course in corporate entrepreneurship (30-ETCS), making them a somewhat homogeneous group. One focus group contained three participants while the other contained four participants.	Article II
Focus groups 3-5	A total of 18 employees from an innovation department in a large international company participated. The employees had different titles, ages and education backgrounds, but were a homogeneous group as they were all working in the same division. The participants were divided into three focus groups, each containing six people.	Article II
Focus groups 6-15	A total of 59 students with diverse study backgrounds participated. 35 of the students were enrolled in a Bachelor program in communication at Complutense University, thus making them a homogeneous group. The participants were divided into five groups with six participants in each group, while a final group consisted of five participants. 24 students were enrolled at a Master's level executive education course in creativity (30-ECTS), making them a somewhat homogeneous group. The participants were divided into four focus groups with six participants in each group.	Article VI

Table 10: Interviews with focus groups.

Workshop session interviews

In some of the studies, we used workshop sessions to test (and further develop) our proposed tool, framework or process (Articles III and IV). The data collected in these workshop sessions were based on unstructured interviews with the workshop participants.

In Article III, we did ten workshop sessions with students and eight sessions with companies, involving more than 300 students and 50 company representatives from small- and medium-sized enterprises in Denmark. The workshop sessions included small-scale settings (less than ten participants), medium-scale settings (from ten to 49 participants) as well as large-scale settings (from 50 to 130 participants). Before each workshop, a comprehensive workshop plan was made in an excel spreadsheet with all the activities and their time estimate. The workshops all followed a similar structure:

1. Firstly, we did a short introduction. Sometimes this introduction was a lecture, depending on the knowledge-level of the participants and the setting (with students we almost always did a lecture, while with companies, the introduction was more of an inspirational talk).
2. Secondly, we introduced the tool.
3. Thirdly, we introduced a case. When working with companies, the participants used their own organisation as the case. With students, we used either well-known cases or invited a business manager to do a live company presentation as the case.
4. Fourthly, we instructed the participants on how to use the tool.
5. Fifthly, we let the participants work on their own in groups consisting of four to eight people. During their work, we did unstructured interviews with the participants to hear their experiences with the proposed tool.
6. Sixthly, participants presented their work, either to an opponent group or in a plenary.
7. Finally, at the very end of the workshop, we conducted a workshop session interview with all participants, again to develop understandings about their experiences with and the effect of the proposed tool.

In Article IV, we did 18 workshop sessions with companies, involving more than 50 company representatives from a total of 18 small- and medium-sized enterprises in Denmark. The workshop sessions were small- and medium-scale settings, ranging from four to 15 participants. A comprehensive workshop plan was made in an excel spreadsheet before each workshop, in which all the activities, as well as their time estimate, were carefully written. We contacted the companies before the actual workshops and asked them to prepare a list of relevant challenges they were facing. Together with the company, we identified one challenge and performed an idea production session from which we selected the most novel and interesting ideas. For each selected idea we discussed, selected and invited potential horizontal experts to a following workshop. Each workshop followed the same procedure:

1. Firstly, we did a short inspirational talk about creativity and the role of horizontal experts in the creative process.
2. Secondly, the selected idea in focus was briefly presented.

3. Thirdly, we instructed the participants to follow our proposed process in smaller groups consisting of four to eight people.
4. During their work, we did unstructured interviews with the participants to hear their immediate experiences with the proposed process to use horizontal experts.
5. Fourthly, participants presented their work in a plenary.
6. Finally, we conducted a workshop session interview in the plenary at the end of the workshop to hear about their experiences with and the effect of the use of horizontal experts in the creative process.

4.3.3. FIELD OBSERVATIONS AND NOTES

According to McKechnie (2009), observation is one of the oldest research approaches and can be traced back to Aristotle (Adler & Adler, 1994). It is a data collection technique where researchers observe participants' behaviour within a specific research field (Baker, 2006). The approach is well suited for studying processes (Brundin, 2007). Typically, observation is used in natural settings to capture behaviour in the real world. However, it can also be used in another setting chosen by the scholar, for example, a lab or similar (McKechnie, 2009). Furthermore, observation can be applied in situations that are completely free, manipulated by the researcher or partially controlled, as when participants are confronted with certain conditions or directions to follow, but still have the freedom to do so in their own way (Jersild & Meigs, 1939). The level of commitment of the researcher can range from nonparticipation (an unobtrusive observer role) to complete membership (a fully emerged participant-observer role), the latter often being used in ethnographic studies (Baker, 2006). Thus, observation can be a complex research approach as the researcher needs to play different roles and use various techniques (Baker, 2006).

Field observations are used in this dissertation to get real-time data from, for example, participants trying out the production test (Article II), participants using the booster-cards (Article III), or participants undergoing the process of involving horizontal experts in an idea development phase (Article IV). The goal was to collect observational data as it occurred during either the test piloting and field test of the production test (Article II) or the workshop sessions (Articles III and IV). This included data such as expressions, body language and articulations. The situations were all partially controlled by the researcher(s) in settings chosen by the researcher(s).

In Article II, I used observation together with focus group interviews to triangulate the data and thus enhance the credibility of the study. I took note of how long participants were focused, their body language when they had to do another test task and other expressions such as loud, deep sights or laughs. While the participants went through the production test, I played the role of an instructor as well as being an unobtrusive observer. In Articles III and IV, we used observation as a data source to

capture how participants experienced our proposed processes and tools in the workshop sessions. For example, for how long the participants concentrated, do they seem happy, frustrated or confused when a new processual step is announced. We used observation in combination with unstructured interviews to triangulate the data, following Patton's (2002) recommendation. As the workshop participants went through our proposed tool or process, we played the role of facilitators, interviewers and unobtrusive observers taking notes.

In all instances, I made "running notes" of what was going on. The notes included both the actual observations as well as researcher interpretations, in compliance with the guidelines of Van Maanen (1988). Furthermore, I wrote a quick summary of the most important elements immediately after the event so that the information was still fresh in my mind. In situations where more than one researcher was present (e.g. some of the workshop sessions in Articles III and IV), the research team shared and discussed the field notes after the event to verify interpretive accuracy and increase reliability.

It should be noted that the presence of a researcher may cause a change in behaviour in individuals simply because they are being studied or evaluated. This intrinsic bias is called the Hawthorne effect (e.g. Chiesa & Hobbs, 2008). Scholars need to be aware of possible alterations in behaviour, even though the awareness of the researcher is short-lived and, thus, behaviour turns back to normal relatively quickly. Behavioural alternations could be, for example, over-performance or doing actions that are favourable for an individual, which could be done consciously or subconsciously (Oswald et al., 2014). As such, it can be very challenging to determine whether this played a part in a particular study or not. Data triangulation is, however, mentioned by several scholars (e.g. Oswald et al., 2014) as a way to handle the Hawthorne effect. In this dissertation, observation was never used as a stand-alone data collection technique; instead, it was used in combination with other methods to triangulate the data. Furthermore, we attempted to minimise the influence of the researcher(s) in the events, and the aim was to interrupt as little as possible while participants were working on their own.

4.3.4. QUESTIONNAIRES

A questionnaire is '[…] a set of standardized questions, often called items, which follow a fixed scheme in order to collect individual data about one or more specific topics' (Trobia, 2008, p. 652). As a data collection technique, questionnaires are quite similar to structured interviews; nevertheless, instead of a dialogue between the interviewer and informant, the conversation is administrated by the wording in the particular instrument and the order of questions (Trobia, 2008). Questionnaires are frequently administered in a standardised fashion so that answers are comparable across different settings. The information is typically collected in one of two ways: either by letting the respondent fill in their answers themselves on a piece of paper or

computer; or through an interview, which can be done over the phone or face-to-face (Ballou, 2008).

Even though questionnaires are commonly referred to as a quantitative method, the questions asked can range from close-ended to open-ended. The latter defines questions where the respondent has the opportunity to formulate an answer without any definite answer categories provided (Ballou, 2008). Johnson and Turner (2002) describe three types of questionnaires. Type 1 questionnaires are very unstructured with open-ended questions where the respondent can answer the questions in their own wording and in the order they like. Type 3 is completely structured and only uses closed-ended questions with response categories such as rating scales, rankings, semantic differentials and Likert scales. Type 2 questionnaires are a mix, using both open-ended and close-ended questions for the respondents to fill out themselves (Johnson & Turner, 2002).

Developing a valid and reliable questionnaire can be a challenging and time-consuming operation (O'Leary, 2014). Choi and Pak (2005) have identified 48 types of bias in questionnaires, which are either related to the design of the questions (e.g. wording, missing or inadequate data, leading questions, intrusiveness, inconsistency), the overall design of the questionnaire (e.g. formatting problems, length of questionnaire leading to nay- or yea-saying, flawed structure leading to skipping of questions), or the administration of the questionnaire (non-objective interviewer, the subconscious reaction of the respondent, learning or hypothesis guessing by the respondent, inaccurate recall by the respondent, cultural differences). Furthermore, the researcher(s) require a good theoretical knowledge of the research topic beforehand, some knowledge of the target population (Trobia, 2008) and previous experience in pilot-testing the questionnaire (e.g. Johnson & Turner, 2002). Due to some of these constraints, researchers frequently adopt pre-existing questionnaires or alter existing ones (adapting) to fit better their specific study (Sousa et al., 2017). Questionnaire adoption is the preferred approach of the two, as even small alterations in an existing questionnaire can be harmful to the validity and reliability.

Questionnaires are used in this dissertation as they generate standardised, quantifiable, empirical data, which allows for comparison. Also, they are a cheap, quick and efficient way to collect large amounts of data. In Article V, we used a questionnaire before and after the intervention in an experimental design with 100 undergraduate communication students from Spain. The questionnaire can be categorised as Type 3 (cf. Johnson & Turner, 2002), and consisted of five questions using a Likert 7-point scale (ranging from 'strongly disagree' to 'strongly agree'). We adapted three questions about creative self-efficacy from Tierney and Farmer (2002) and developed two questions related to one's belief in creativity training. The students were asked to spend about five minutes answering the questionnaire individually in class using paper and pencil, resulting in a response rate of 100%.

In Article VI, we developed a short questionnaire based on the themes we had identified in the initial focus group interviews. We followed the guidelines of O'Leary (2014) as well as Johnson and Turner (2002) to comply with the basic principles of questionnaire construction. The questionnaire was a self-reporting, computer-administrated Type 2 (cf. Johnson & Turner, 2002) questionnaire, meaning it contained a mix of close-ended (the initial six questions) and open-ended questions (two questions at the end) for the respondents to answer. We used a nonprobability sample (purposive sample) as we sent out the questionnaire to all of the registered users of the software (www.academyforcreativity.com) at that time, which included students and teachers from higher educational institutions in Europe.[49] An invitation was sent to the users' e-mail addresses with a follow-up e-mail reminding them to answer the questionnaire one week after the initial e-mail invitation. In total, 937 eligible sample cases (e-mail addresses) were invited to answer the questionnaire, but only 49 completed the questionnaire, resulting in a response rate of 5.23%. There is no agreed-upon minimum acceptable response rate in web surveys. However, according to Fan and Yan (2010), approximately 10% lower than mail or telephone surveys. Nevertheless, a response rate of 5.23% is still quite low; we were aiming for a response rate of 10–20%. There might be several possible explanations for this low response rate. First of all, we did this questionnaire while the software was still running in BETA mode. We were having some technical issues; for example, some users were having trouble with running our software, in particular due to web browser issues. Also, due to these technical issues with the software, we were running several tests, which resulted in the creation of numerous test users with accompanying temporary e-mail addresses. When sending out the e-mail invitation to the survey, we were not able to filter out all the test e-mail addresses, meaning that not all of the 937 eligible cases were real e-mail addresses. So, the "real" response rate was a bit higher than 5.23%. Based on these circumstances it is believed that the real response rate may be closer to 10%.

4.3.5. TESTS

Tests are typically associated with quantitative research and used to '[…] measure attitudes, personality, self-perceptions, aptitudes, and performance of research participants' (Johnson & Turner, 2002, p. 310). Tests are often used together with other data collection types, also called intermethod mixing (Johnson & Christensen, 2019). According to Johnson and Turner (2002), tests can be seen on a continuum ranging from purely quantitative tests to purely qualitative tests. Standardised tests, such as intelligence, personality, achievement and aptitude tests, are conceivably the most common test type (Johnson & Christensen, 2019). Most of these are purely quantitative using close-ended questions, rating or Likert-type scales. On the other side of the continuum, qualitative tests are characterised by open-ended items or

[49] As the European partners in the project were from Denmark, Spain and Malta, most of the respondents were from these countries.

problems where the participants, either orally or in writing, express their feelings, answers or solutions to the provided scenario (Johnson & Turner, 2002). Examples are word association tasks, essays and sentence completion (Dillon et al., 1987). Using tests can be a quick way to measure many characteristics of individuals and can be done in large settings (e.g. Johnson & Turner, 2002). The weaknesses of using tests as a data collection technique are that:

1. They can fail to measure the appropriate construct
2. Test scores only show the final solution, thus excluding the respondent's mind process that led to this solution and thereby not providing an in-depth assessment of the individual
3. Tests in most situations needs to be complemented by other methods of data collection (Johnson & Christensen, 2019).

One of the areas where tests plays an important role is in experimental research, which typically '[…] involves the randomized allocation of cases to experimental and control groups, exposing only the experimental group to a treatment whilst controlling the influence of extraneous factors' (Jupp, 2006, p. 107). According to Kirk (2012), true experiments comprise three essential features:

- independent and dependent variables (the former also being referred to as the treatment variable, while the latter is also called the outcome variable)
- pre- and post-testing
- experimental and control group(s).

In most experiments, the dependent variable is measured at least twice; once in the beginning by employing an appropriate pre-test and once again after the treatment or intervention, also called post-testing. Such an experimental design, with pre- and post-testing, was employed in Article V of this dissertation (see further details below). Arthur Jr et al. (2003) stress that tests are typically used when evaluating learning outcomes of traninig, which was exactly the purpose of Article V.

As test development is a complex and rather resource-intensive activity, which includes many of the same steps as questionnaire development (see section 3.3.4) to affirm the reliability and validity of the instrument (Johnson & Christensen, 2019), many scholars use pre-existing (standardised) tests in their research design. Using pre-existing tests is advantageous because it provides potentially strong psychometric properties and the availability of reference data might allow for comparability (Johnson & Turner, 2002). On the other hand, they can be expensive to purchase or may not be appropriate for specific constructs (Johnson & Turner, 2002). The latter might be the reason why (experimental) scholars produce their own instruments (e.g. Johnson & Turner, 2002; Johnson & Christensen, 2019). Numerous materials have been published on how to develop (standardised, quantitative) tests with several

guidelines to follow, for example, The Wiley Handbook of Psychometric Testing (Irwing & Huges, 2018).

The scoring of the participants' test results can be a tricky and time-consuming task. Therefore, scoring guides and norms are typically provided by test developers so that scoring of the participants can be done in a precise manner and compared to standardised scores (Morgan & Harmon, 2001). Still, the scoring process can be a limitation of a test-based approach if misapplied or misinterpreted by the grader (Naglieri & Goldstein, 2009). For computer-administrated tests, the scoring can be completed automatically and instantly (Johnson & Christensen, 2019). Usually, either Exploratory Factor Analysis or Confirmatory Factor Analysis is used by the test developers to create the underlying constructs and scales, which the scoring is eventually based on, utilising statistical analysis (Irwing & Huges, 2018). An example of more qualitative scoring is the Consensual Assessment Technique (CAT), which was developed by Amabile (1982) to assess creativity output. The method relies on a panel of expert judges that are asked to rate the creativity of a certain output[50] with the highest transparency and objectivity (Hennessey et al., 2011).

In this dissertation, qualitative tests are used for several purposes and in different ways. In Article II, a researcher-designed test is developed and tested to a study area, which is dominated by quantitative tests and questionnaires, to provide new and more in-depth insights. In Article V, a pre-existing domain-general creativity test (ATTA; Golf & Torrance, 2002) was applied together with a researcher-developed domain-specific creativity test and an adapted (quantitative) questionnaire (see section 4.3.4) in an experimental research design. These tests were used before and after the treatment (10-hour online embodied creativity training) to measure the learning outcome of online training.

For Article II, the test development followed some of the proven steps from the psychometric test development literature provided by Irwing and Huges (2018). Their procedures were used as inspiration for how to develop qualitative tests. Two pilot tests were performed with seven graduates from the Corporate Entrepreneurship course at Aalborg University,[51] accompanied by focus group interviews. The two field tests were completed with 18 employees from an innovation department in a

[50] In the original work by Amabile (1982), a product-centred operational definition is used. The term 'product' is used to describe the subject of assessment, which is distinctive from the process or the person. It could be an actual product (e.g. a silly design made of paper and cardboards, a collage or a poem) but could also be a written response.

[51] The Corporate Entrepreneurship program is a 30 ECTS cross-disciplinary elective course at Master's level (www.ce.aau.dk).

large international company, based in Denmark. The company representatives also participated in focus group interviews after the completion of the test.

A preliminary scoring session of subject answers was done using an adapted version of the Consensual Assessment Technique (CAT) (Amabile, 1982). I followed the requirements for efficient use of the CAT proposed by Amabile (1982) and Hennessey et al. (2011). First, expert judges should have some familiarity with the domain in question. If used within creativity, this means that the judges are not required to have developed highly creative outputs themselves (Hennessey et al., 2011). Rather, it is their field expertise that is of importance. Similarly, if CAT is being used within the corporate entrepreneurship domain, expert judges are not required to be corporate entrepreneurs themselves but should be familiar with the domain and the individuals performing it. Second, judges should make their assessment individually and without any training or agreements with each other (Hennessey et al., 2011). Because the CAT is based on the consensual definition of creativity, stating that '[a] product or response is creative to the extent that appropriate observers independently agree it is creative […]' (Amabile, 1982, p. 1001), the expert judges should not be given a specific definition to assess creativity. Instead, evaluation should be based on the judges' subjective definition of creativity and without any discussions with the other experts (Hennessey et al., 2011). Thirdly, judges should rate outputs relative to one another, not against any absolute standards (Amabile, 1982; Hennessey et al., 2011). Fourthly, judges should assess outputs in a different (random) order, preferably using continuous scales, for example, 'high', 'medium' and 'low' (Amabile, 1982). When the judgements are done, ratings on each dimension should be analysed for inter-judge reliability. In this study, the CAT was utilised with small modifications for several reasons. Rather than using the approach to prove that high levels of judge agreement exists, the CAT was used to: a) have judges define and select the level of classification (i.e. low, medium or high) for the responses to each task and the related characteristics; b) understand why a consensus in the scoring was established from the voice of the judges; and c) better apprehend why conflicting scores appeared. The learnings and examples from these sub-steps should eventually be developed into a guided scoring system, making the assessment possible for non-experts and thereby more practice oriented.

Changes in the original approach proposed by Amabile (1982) were necessary, as the final goal was to develop a guided scoring system based on examples. Nevertheless, to develop such a guide, judges were needed to select and define the level of classification (i.e. low, medium and high) for each task and the related characteristics. It was, therefore, necessary to include a more qualitative investigation answering all the 'why's' behind the judges' subjective and correlated assessments. For instance, why is one answer rated as high on one characteristic and low on another? The implicit thought process behind the actual judgement was found to be highly valuable. Without this, it would not be possible to develop such a guided scoring system with examples that make it doable to assess an individual without the use of

expert judges. Another way of developing the scoring guide would be to use a combination of confirmatory factor analysis and item response theory, as also mentioned by Irwing and Hughes (2018). However, as this particular study only had one investigator (me), the issue of team size (Irwing & Hughes, 2018) comes into play and affects the choices in the development process. A larger team with diverse skills (which is common when developing commercial tests) might be able to develop a highly advanced guided scoring system based on generic examples and statistical infrequency evaluation, like the one developed for the 'Torrance Test of Creative Thinking' (TTCT) (e.g. Torrance, 1980; Torrance et al., 1992).

Another deviation was the use of the 19 intrapreneurial characteristics (and their definition) in the assessment process instead of basing the judgement on the judges own subjective definitions. Hennessay et al. (2011) explicitly state that such an approach '[…] calls into question both the claim of judge-based subjectivity and the meaning of interjudge reliability' (Hennessay et al., 2011, p. 254). I partially agree with this statement, however, the aim of using the CAT in this particular study was never to perform tests for inter-judge reliability or judge-based subjectivity. Instead, the focus was on understanding why the judges rated as they did and the reasons for their agreements and disagreements. The specific number of judges required for such studies has been investigated heavily. Amabile (1982) used 125 judges during her five-year development of the CAT in numerous studies and suggested 13 judges for an experiment. In recent years, other scholars have managed to produce satisfactory results with less stringent conditions and fewer judges (Baer et al., 2004). Some researchers even stick to only using two expert judges (Byrge & Tang, 2015). As the main purpose of using judges in this particular study was to investigate why there was a consensus and not specifically if an agreement could be reached, the use of three expert judges was found appropriate. Involving more judges would, however, have improved the rigorousness of the study. However, it is a resource-intensive and time-consuming process, so doing it with more people without any research funding is hard.

For Article V, we used a researcher-developed (qualitative) domain-specific creativity test and a pre-existing (qualitative) domain-general creativity test along with an adapted (quantitative) questionnaire (see section 4.3.4). The researcher-developed domain-specific test consisted of an advertisement task designed by two of the authors (communication scholars), which was conducted by the participants before and after the experiment. The scoring, from 1 to 3 (1 being the lowest and 3 being the highest), was performed by two expert judges following the CAT (Amabile, 1982). Both judges were senior academics within the field of communication and creativity. The pre-existing (qualitative) domain-general creativity test we used was an adapted digital version of The ATTA (Goff & Torrance, 2002), which is a shortened version of the original TTCT by Torrance (1974). It consisted of four tasks (two open-ended questions and two drawing exercises) and was conducted by the

participants before and after the experiment.[52] The tasks were performed individually on a computer, and the participants were asked to use their student ID to keep them anonymous. The scoring was done by two professional graders from a test development company. Afterwards, the research team conducted a Cronbach Alpha analysis to test for inter-rater reliability between the two graders.

4.3.6. SUMMARY

This dissertation includes diverse empirical data and several data collection strategies, which have been thoroughly described in this section. An overview of the articles and the related applied data collection technique(s) can be found in Table 11.

	Applied data collection technique(s)
Article I	- Systematic literature review
Article II	- Expert interviews - Focus group interviews - Field observation - Researcher-developed (qualitative) production-based test
Article III	- Workshop session interviews - Field observations
Article IV	- Workshop session interviews - Field observations
Article V	- Researcher-developed (qualitative) domain-specific creativity test - Pre-existing (qualitative) domain-general creativity test - Adapted questionnaire (mix) (all used as pre- and post-testing in an experimental design)
Article VI	- Focus group interviews - Questionnaire (mix)

Table 11: Overview of the included articles and the applied data collection technique(s).

[52] The pre- and post-test was identical, but the tasks were not the same. For example, in the pre-test, the first open-ended question text was: ‘What is blue? Enter your ideas one at a time, trying to generate as many different ideas as possible in two minutes.’ (Hänninen et al., 2020, p. 12). In the post-test, the first question open-ended question text was: ‘What is red? Enter your ideas one at a time, trying to generate as many different ideas as possible in two minutes.’ (Hänninen et al., 2020, p. 12).

5. CONCLUSION

This section will present some reflections on my contributions and areas for further research building on this dissertation. It will provide a conclusive frame of this thesis as a whole and refer back to the main research question. As my contributions to research - as a pragmatic experimental researcher - also have implications for practitioners and vice versa, I will describe my contributions to each group in an integrative way. Each of the six articles included in this dissertation have been written as independent papers for publication and, thus, present their respective conclusions and contributions. As such, I do not want to repeat all of the individual findings.

5.1. CONTRIBUTIONS TO SCIENCE AND PRACTICE

As mentioned in the introduction, the research proposal for this dissertation originally stemmed from practice. I encountered numerous companies that were interested in the topic of CE and wanted to become better at this. Not only did they want to recruit new prospects possessing the appropriate competencies, they also wanted to enhance the human capital of current employees. In response to this, I wanted to explore new ways of identifying intrapreneurial individuals as well as develop new tools, methods and approaches that could facilitate the development of new and novel ideas and business models and, thus, strengthen the capabilities of the organisation as a whole.

This led me to formulate the following main RQ:

> How can we identify and enhance intrapreneurial competencies in the context of corporate entrepreneurship?

As this is a relatively broad RQ, it led to the development of several research objectives, which were investigated in section 3. For this, I employed a pragmatic research approach that allowed me to design a tailored research strategy for each research objective and context.

Throughout my research, I aimed to contribute to new governing ideas and knowledge (products). Not only should my work contribute to fellow researchers, but it should also be useful and meaningful for practitioners. As such, it is important to ask: did my work, as a pragmatic, experimental researcher, develop new tools, methods and approaches for identifying and enhancing intrapreneurial competencies in the context of corporate entrepreneurship?

As I have demonstrated throughout this dissertation, I confidently can answer “yes” to this question. From problems based in practice, I have explored existing tools, frameworks and approaches, and developed new alternatives for identifying and

enhancing intrapreneurial competencies, both for the individual but also from a managerial perspective.

I envisage that the concept of corporate entrepreneurship is still in the embryo stage and will become more prevalent in companies around the world in the coming years. For decades, scholars have been preaching that corporations should tap into the power of their employees to be able to innovate radiply, change and transform to the ever-changing markets and fierce competition caused by globalisation (e.g. Tseng & Tseng, 2019). With the current COVID-19 pandemic, the uncertainty and complexity of our environments have only magnified – and the mantra "innovate or die" has never been truer for businesses. Managers are now forced to move faster and to try out new ideas with high market risk and uncertainty like never before. The public sector is also pushed into innovation at a speed that few governments have ever envisaged. As such, there is a need for organisations to become better at identifying and enhancing the corporate entrepreneurial (intrapreneurial) competencies of their employees to respond to this new reality and survive. By no means do I imply that the tools, methods and approaches presented in this dissertation represent the ultimate truth or absolute pathway for companies to follow. Instead, my contributions should be seen as proposals (or inferences) to practical problems related to the field of corporate entrepreneurship, which will evolve as new learnings emerge.

Understanding the corporate entrepreneur (intrapreneur)

Burgers and Van de Vrande (2016) argue that the field of corporate entrepreneurship lacks an elaborate holistic concept defining the characteristics of the corporate entrepreneur (intrapreneur). In this dissertation, I provided a comprehensive conceptual model of 19 individual intrapreneurial characteristics, based on nearly 1,000 items found in the literature. This work contributed a better understanding of the intrapreneur by defining each of the 19 characteristics transparently and should, therefore, be seen as further advancement of the theorisation in this endeavour. This work both contributes to the corporate entrepreneurship literature as well as the intrapreneurship literature, which are strongly related (and maybe even identical, cf. Lampe et al., 2020), but with scholars in both camps arguing for a separation between the two streams. This work also contributes to practitioners, especially (HR) managers in companies, to provide them with a guide for what they need to look for in prospective and current employees to pursue a bottom-up approach to innovation. Furthermore, this work contributes to educators who are designing Corporate Entrepreneurship courses, as it highlights the competencies or characteristics that such courses should address. These advances in theorisation could also be used as a fine-grained checklist when evaluating trainees, on an individual level, before, during and after a course.

Identifying corporate entrepreneurs (intrapreneurs)

The lack of appropriate tools to identify intrapreneurs (corporate entrepreneurs) is stated by several scholars, for example, Davis (1999) and Menzel et al. (2007). In this dissertation, I developed an overview of the different methods used by scholars to identify intrapreneurs and critically reviewed these in relation to their ability to spot intrapreneurial potential, based on learnings from the related field of creativity. This is the first attempt to systematically provide such an overview and, thus, identify gaps for scholars to act upon. It also contributes to practice, as (HR) managers and corporate entrepreneurship consultants can use this overview to make a qualified decision about which approach(es) to employ in their specific situation when it comes to selecting and developing employees to fill the role of corporate entrepreneurs (intrapreneurs).

Identifying corporate entrepreneurial (intrapreneurial) potential

From the literature, it became clear that some people have hidden abilities for innovation (Ford, 2001; Cohen et al., 1972), which might need to be stimulated for these latent capabilities to shine through (Thornberry, 2003). This was something I also experienced when collaborating with companies and noted in discussions with corporate entrepreneurship consultants about training – it is not always possible to identify in advance individuals who would become "real" corporate entrepreneurs (intrapreneurs). In this dissertation, I investigated whether it was possible to design a tool that could identify differences in levels of specific intrapreneurial characteristics between individuals. The result was a brand-new approach to identify and assess individual intrapreneurial potential, based on qualitative intrapreneurial tasks and a scoring guide. While this approach deviates from existing methods and approaches found in the literature, it contributes to the existing knowledge and opens new doors for other scholars to follow. Another contribution is the actual method for designing and evaluating responses from qualitative production-based tasks and learnings about how they can help to provide a more in-depth insight into intrapreneurial potential at an individual level. For practitioners, this work provides insights into a new way of identifying who has corporate entrepreneurial (intrapreneurial) potential. While it is a rather complex and time-consuming approach, especially compared to some of the exiting methods found in the literature (e.g. the 12-question survey by Pinchot, 1985), the complexity is also the strength of this approach, as it provides in-depth insights into each individual.

Novel idea generation in business model innovation processes

The creation of new ideas and business models that are novel is a crucial activity in corporate entrepreneurship (Hayton & Kelley, 2006; Goodale et al., 2011). However, while Teece (2007) stresses that designing new (and novel) business models is a complex and complicated task, there is also a lack of tools to support the process of

innovating new BMs (Wirtz & Daiser, 2018). I reached the same conclusions from working with trainees (both students and employees in companies). In this dissertation, I investigated whether it was possible to develop a tool for designing more and better business model ideas. My contribution is a new tool (the Booster Cards) for novel idea production as well as "best practice" knowledge for how to train practitioners in using them in practice (a structured process). As such, it contributes to educators running action-based courses in business models and corporate entrepreneurship. However, the main contribution is for people performing corporate entrepreneurship – the corporate entrepreneurs (intrapreneurs) of the world – as they now have a logically structured approach (techniques plus process) to develop new business models ideas. Corporate managers also gain valuable insights into processes that should be supported as well as the competencies that must be developed for employees to succeed in this endeavour. Finally, besides contributing to the corporate entrepreneurship literature and the business model innovation literature, this dissertation also contributes to general entrepreneurship literature and innovation and creativity literature.

The further development and test of highly novel and complex ideas

Highly novel ideas that diverge from domain logic and industry causality have huge potential. Nevertheless, they are complex to understand, difficult to evaluate and, thus, have a high degree of uncertainty (Lind & van den Bos, 2002; March, 2006). These ideas are often neglected by companies because they are not financially attractive in the short-run (Christensen, 2006). This was something I experienced over and over again when working with companies on various projects. One of the main problems was that existing approaches all relied on domain-experts to develop and test the idea(s). In this dissertation, I investigated whether it was possible to use horizontal knowledge to develop and test highly novel ideas. I provided a new perspective for how to work with highly novel ideas and a process for how to include non-domain experts and horizontal knowledge in the further development and testing of these ideas. This extends the understanding of idea development and testing to go beyond simply users, customers and domain experts, and contributes not only to corporate entrepreneurship literature but also to the idea generation literature. The actors (i.e. the corporate entrepreneurs as well as managers) now have a structured process for how to involve horizontal (knowledge) experts for turning unfeasible ideas into feasible concepts.

Embodied training in online environments

One of the most significant issues for corporate entrepreneurship training relates to how intrapreneurial competencies can be nurtured and developed. The deliberate practice of creative abilities related to intrapreneurial competencies has been neglected in existing corporate entrepreneurship training programs. Also, the use of online training is still a relatively new topic in the corporate entrepreneurship training

literature, even though almost all corporate training is happening online today (Bose, 2017). From practice, I experienced a lack of available creativity training programs, as the training of individuals was highly dependent on the right instructors and the right environment. In this dissertation, I investigated the unexplored area of online embodied creativity training – training solely focused on the 'doing part' of creativity. Based on an experimental research design, which included more than 100 trainees, I provided new insights about the positive effects of online embodied creativity training in terms of learning achievements as well as knowledge transfers into trainees' own profession (domain). Previously, only reflective creativity training programs had been studied in online environments. While this work mostly contributes to the existing knowledge within the creativity training literature, it also contributes to practitioners. Educators have an online tool to include in their curriculums or the design of new corporate entrepreneurship training programs. Furthermore, managers and consultants have an online training program that has proven to enhance trainees' creative abilities related to corporate entrepreneurship.

Gamification in online training

However, trainee motivation and engagement are ongoing concerns with online training, especially when the training is mandatory (Hicks & Klimoski, 1987; Mathieu et al., 1992; Yardley, 2003). In this dissertation, I investigated the effect of using extrinsic reinforcements (game-like elements) to stimulate intrinsic trainee motivation and engagement in an online embodied creativity training program. I provided new insights on how gamification can stimulate trainee motivation in online training environments. Furthermore, I provided "best practice" knowledge for how to implement online embodied creativity training, which is especially useful for teachers and educators. This work extends the knowledge related to applied creativity training and, thus, contributes to the creative training literature on the possibilities of online training and gamification. Also, the work contributes to the gamification literature as it highlighted some of the key principles of using gamification and its effectiveness.

5.2. EVALUATION AND FURTHER RESEARCH

This dissertation attempts to unfold the concept of corporate entrepreneurship from a human-centred and managerial perspective. Thus, it consequently opens up new avenues of research. Hereby, I hope that the presented findings and inferences will bring inspiration to other researchers in their endeavour to advance the business model concept in the future.

Not everything can be captured in a dissertation. While several contributions have been made so far, all research has limitations. I – therefore – have reflected on some of the shortcomings of my work; areas that constitute limitations and, thus, opportunities for further investigation. These reflections can be found in the empirical

considerations related to the articles (see pages 50, 62, 86, 94, 121, and 126) as well the discussions related to each of the three research projects (sections 3.1.5, 3.2.4, and 3.3.4).

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Appendix A. Article I

NEW INSIGHTS ON INNOVATIVE INDIVIDUALS: UNCOVERING THE CHARACTERISTICS OF CORPORATE ENTREPRENEURS

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Abstract

Corporate entrepreneurs are one of the main drivers of innovation in organisations. Despite their importance, the research of these entrepreneurial-thinking employees – also often referred to as intrapreneurs – has been quite disparate and fragmented with no elaborate holistic concept defining their characteristics. This study rigorously examines the historical research done within this area on an individual level through a structured review approach. Eighty-seven articles were analysed, and 976 items were extracted from these. The results revealed 19 general characteristics: creative innovator, high achiever, proactive initiator, risk taker, organisational networker, self-confident, flexible open-minded, enthusiastically perseverant, opportunity recogniser, experimental problem solver, persuasive influencer, autonomous, team organiser, change agent, idea generator, business planner, visionary, customer-focused, and decision maker. The theoretical and practical implications of these findings are discussed, and future research is suggested.

Keywords: intrapreneurship, intrapreneurial characteristics, corporate entrepreneurship, entrepreneurial employees, innovation Management, systematic literature review.

Introduction and Background

Innovation is found to be crucial for organisations to remain competitive in today's globalising world (Chesbrough, 2003) and continuous innovation has shown to be a not-so-secret ingredient for the most successful organisations (Kuratko, 2009). For innovation to happen, special attention may need to be put on the entrepreneurial-thinking employees who play a key role in the development of new ideas and opportunities, which ultimately increase organisational profitability and improve the competitive position. Research directed on the entrepreneurial-thinking employees is evolving, and several streams and focuses have emerged, e.g. intrapreneurship, corporate entrepreneurship, corporate innovation as well as corporate venturing. The main ones are the intrapreneurship and corporate entrepreneurship literature (Kuratko, 2017). These concepts both focus on the innovative behaviour among employees (Kanter, 1984; Pinchot, 1985a; Kuratko et al., 1990; Pinchot & Pellman, 1999). Intrapreneurship is generally associated with the independent initiatives of employees (a bottom-up and laissez-faire approach to innovation), whereas corporate entrepreneurship is associated with a top-down managerial approach to strategically stimulate this innovative behaviour to renew the organisation (Blanka, 2018).

The concepts of intrapreneurship and corporate entrepreneurship have mostly been studied at the organisational level (Lau et al., 2012; Blanka, 2018). Still, scholars have had a particular interest in the actors related to each concept. Within intrapreneurship studies, Pinchot (1985a) coined the term "intrapreneurs" to cover entrepreneurial-thinking people within incumbent firms that creates innovation. Filion (2002) suggests that an intrapreneur is "a person who plays an entrepreneurial role in an organisation" (Filion, 2002, p. 158). Both definitions underline that intrapreneurs are somewhat different from entrepreneurs as they work within an existing organisation. Even though intrapreneurs and entrepreneurs sound alike, research has found some important differences between the two (Hill, 1987; Geisler, 1993; Davis, 1999; Camelo-Ordaz et al., 2012). Some of the key distinctions seems to be that "[…] intrapreneurs are able to use the existing resources of the company, they operate within organizations and they work within organizations that already have their own policies and bureaucracy" (Blanka, 2018, p. 4), causing different opportunities, problems, and restrictions (Hayton & Kelley, 2006).

Several studies on intrapreneurs use the entrepreneurial behaviour terminology as a starting ground (e.g. Lau & Chan, 1994; Kuratko et al., 2004; Zampetakis et al., 2009; Wakkeeet al., 2010; Lau et al., 2012) as intrapreneurship is somewhat implanted in the entrepreneurship discipline (Amo & Kolvereid, 2005; Molina & Callahan, 2009).

Within corporate entrepreneurship studies, the actors creating innovation within established companies are defined as "corporate entrepreneurs" (e.g. Kanter, 1984; Green et al., 1999; Hayton & Kelley, 2006). Lau *et al.* (2012) states that the corporate entrepreneur is "[…] characterised as an individual who creates innovation of any kind within an established firm" (Lau et al. 2012, p. 674). In fact, the term

intrapreneur and corporate entrepreneur are used interchangeably by several authors (e.g. Pinchot 1985a; Hayton & Kelley, 2006; Ireland et al., 2009), implying some sort of consensus that at the individual level, the actors (intrapreneurs and corporate entrepreneurs) represent the same thing. Nevertheless, most studies at the individual level lack elaborate holistic definitions that entail the features or qualities belonging to these individuals, i.e. the characteristics. As a result, after more than 30 years of research about intrapreneurs and corporate entrepreneurs, it is still not clear what characterises this type of employees.

Some attempts have been made to uncover their characteristics, including studies of their behavioural characteristics (e.g. Lau et al. 2012), their personality traits (e.g. Garrett Jr. & Holland, 2015), their motivations (e.g. Carrier, 1996), their attitudes (e.g. Clargo & Tunstall, 2011), their spirit (e.g. Fayolle & Basso, 2010), their intentions (e.g. Tucker et al., 2017), their actions (e.g. Zampetakis et al., 2009), their qualities (e.g. McGinnis & Verney 1987), their mindset (e.g. Rekha et al., 2015) as well as their competencies (e.g. Rathna & Vijaya, 2009). Yet, there is still no elaborate holistic concept defining the characteristics of intrapreneurs and corporate entrepreneurs on an individual level.

The aim of this study is to rigorously explore what characterises these actors on an individual level. The hope is that more elaborate holistic definitions of these characteristics would make it possible to study the phenomenon more in-depth. It is also the hope that it opens up for new, more systematic, perspectives on the assessment and development of intrapreneurial and corporate entrepreneurial potential. This can help managers to better identify the right people to nurture and support, which is central to increase the returns of innovation in organisations (Pinchot, 1987). A third aim is to find avenues for future research. The following sections of this study present the research design, results, conclusions as well as discussions on implications for researchers and practitioners.

For the remaining part of this study, ‘intrapreneur’ will be used as a general term encompassing both corporate entrepreneur, corporate innovator as well as intrapreneur.

Research

Structured Review

In recent years, Blanka (2018) systematically examined the intrapreneurship literature, including a focus on the individual level. She identified five different research streams: an individual-level perspective, an organisational-level lens, a context orientation, an outcome lens, and promoting factors, solely using the search term intrapreneur*. In order to make a more elaborate exploration of the research related to this matter, it may be relevant to use more search terms such as corporate entrepreneurs, corporate innovators and the like.

Consequently, the structured review was initially conducted using the EBSCO Business Source Premier database for academic articles containing the search terms ‘corporate entrepreneur’, ‘corporate entrepreneurs’, ‘corporate innovator’, ‘corporate innovators’, ‘intrapreneur’, ‘intrapreneurs’. These terms were used for search in titles, subjects, abstracts or keywords (Boolean phrase, English, limited to peer-reviewed work in academic journals). Quotation marks were used to exclude irrelevant mentions based on grammatical coincidence. This led to 123 unique citations. An additional search was conducted via the ProQuest search engine through the NOFT feature (anywhere except full text; English, limited to peer-review work in academic journals). This search generated 335 unique citations (initially 443 hits). Combining these resulted in a total of 374 unique citations after replicates were omitted (see Figure 14).

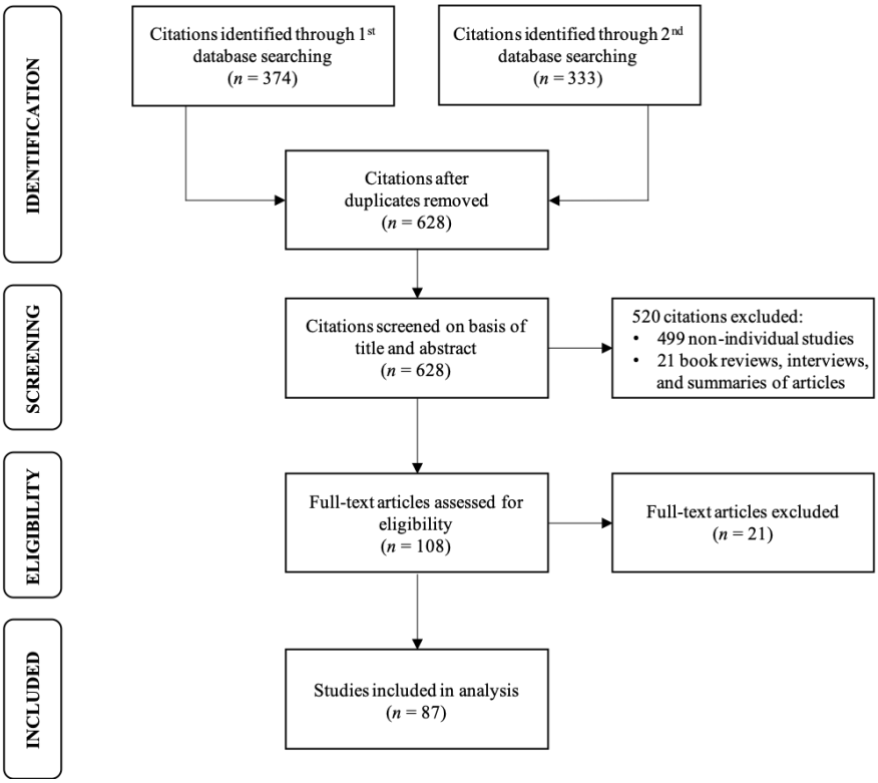

Figure 14: Data extraction path

Manual searches showed, however, that researchers frequently use different terminologies to describe intrapreneurs at the individual level, e.g. ‘individual-level

perspective on intrapreneurship' (e.g. Blanka, 2018), 'intrapreneurship competence of employees' (e.g. Boon et al., 2013) and 'human-oriented corporate entrepreneurship' (e.g. Elia et al., 2017). Therefore, a second round of searches were conducted including both "corporate entrepreneurship" OR "intrapreneurship" OR "corporate venturing" OR "corporate innovation" AND "employee-centered" OR "person-centered" OR individual OR "individual-level" OR "people-centric" or employee* OR "human-centered". The EBSCO Business Source Premier database generated 178 hits and ProQuest search engine generated 258 hits. These search criteria yielded 254 extra citations after replicates were omitted. The total review set was 628 unique citations.

Titles and abstracts were examined to identify relevant articles. The selection criteria were that the paper should include a focus on the individual level. One hundred twenty-nine papers were selected. Furthermore, book reviews, interviews, and summaries of articles were excluded. The total papers selected for the review set was 108.

The selected papers were reviewed for their conceptual, theoretical, empirical development and contributions. Twenty-one papers mentioned intrapreneurs but failed to define or elaborate the term further (for example their traits, behaviours or skills) and were therefore removed from the review set. The final review set selected for analysis included 87 papers.

Analysis

An analysis was conducted searching the review set for items that characterise intrapreneurs. The analysis identified 976 items, e.g. 'ability to adapt', 'act on their ideas', 'challenge the traditional paradigms'. These were categorised, grouped, and conceptualised in the following steps.

Firstly, items were categorised based on their importance into two groups: a primary and a secondary group. The 'primary' group was defined to include the items that had been used in a model framework, training program, questionnaire, interview guide or had been well-defined by the original author(s) (n = 567). The 'secondary' group was defined to include items that were mentioned but were not used in a model framework, training program, questionnaire, interview guide or had been ill-defined by the original author(s) (n = 409).

Secondly, items were grouped according to synonymity; for example, 'doer', 'action-oriented', and 'proactive' were grouped and so were 'independent' and 'autonomous'. Items that were identified to be inherently related was also grouped, for instance 'originality' and 'innovative' as well as 'idea generation' and 'creative'.

Thirdly, a data-driven thematisation was conducted which resulted in 34 draft characteristics associated with an intrapreneur; for instance, 'communicator',

‘ambitious’ and ‘open-minded’. The thematisation was iteratively tested and further developed in collaboration with researchers and practitioners within entrepreneurship psychology, creativity, and intrapreneurship. Based on a synthesis of the identified theory as well as the discussions with experts, relevant draft thematisations were merged, such as ‘ambitious’ and ‘achievement-oriented’, ‘challenge seeking’ and ‘problem-solving’, ‘communicator’ and ‘persuasive’, ‘flexible’ and ‘open-minded’, ‘business visualiser’ and ‘visionary’. In most cases, the item mentioned most frequently within a theme was chosen as the denominator for the title, e.g. ‘opportunity recognition’ (17 mentions) became ‘Opportunity recogniser’. For some characteristics, this approach did not result in an appropriate title. For instance, in the characteristic ‘Self-confident’, the item of the same name (‘self-confidence’) was cited 8 times whereas ‘self-efficacy’ and ‘locus of control’ was quoted 16 and 17 times respectively. Nonetheless, self-confident was found to be more applicable on the individual level as it is person bound. In situations where two items had almost the same number of citations, like ‘persuasion’ and ‘influencing’, these were consolidated into one – in this case ‘Persuasive influencer’.

Fourthly, 76 items were eventually excluded from the sample as they ended up not being included in any of the 19 intrapreneurial characteristics. Some of these items were only mentioned once in the literature and found to be too controversial by the experts (e.g. ‘cynical about the corporate system’, ‘system manipulator’), some were too general to fit a characteristic (e.g. ‘subjective’, ‘informal’, ‘social skills’, ‘intelligence’), while others were too experience-based (e.g. ‘expertise in at least one field’, ‘prior business failure’) or vague (e.g. ‘industry skills’, ‘educated’).

The thematisation resulted in 19 characteristics defining an intrapreneur. In the following pages, the different characteristics are portrayed in more detail. The link between the 900 items and the final 19 characteristics can be found in Table 12.

Freq. of mentions	***Charac-teristic***	***Items from the literature*** [the level of frequency of each item is shown in brackets]
89	**Creative innovator**	Creative performance (betterment, new innovation, original, novel, pragmatic/appropriate solutions) [30]; innovative (keen to innovate, novelty, break patterns, newness, uniqueness) [17]; non-conformist (out of the box thinking, do things differently, untraditional) [8]; non-routine, enjoys working with (likes variety) [5]; innovativeness (to rejuvenate market offerings) [5]; innovative (behaviour) [5]; value generator (new combinations or arrangements of existing resources within the organization) [4]; betterment (wanting to find better ways of doing things) [3]; creative imitation (e.g. can adapt an idea to a new setting) [2]; creative urge [2]; innovative (creative) [2]; analogic reasoning (combining knowledge in new ways) [1]; synthetic thinkers

		[1]; lateral thinking [1]; innovator (original) [1]; innovative (ability) [1]; innovative (capital) [1]
88	**High achiever**	Achievement, desire for/need for [23]; ambitious [9]; high internal motivation [7]; result-oriented [6]; passion, high level of [6]; competitive [6]; entrepreneurial (attitudes, beliefs, intentions, values) [5]; hard working [5]; goal-oriented [4]; drive, personal [4]; high growth expectations [3]; determined/addicted to winning [3]; innovative (drive and spirit) [3]; desire to succeed [2]; aggressiveness [1]; recognition, responds to [1]
78	**Proactive initiator**	Proactive (forward-looking, open to new ideas and to support them, take actions/initiative) [29]; initiative (lead in introducing and implementing innovations, leads the implementation) [15]; doer (dreamers who do, turns ideas into reality, exploits) [14]; action-oriented (gets hands dirty) [8]; acts (in crisis, on ideas, without limiting to resources) [8]; opportunism [2]; self-selection (advantageousness, initiative) [2]
76	**Risk taker**	Risk taker (as a promotor of innovative action, to accomplish task-related problems) [47]; calculated risk taker (assume calculated risks from experimentation) [10]; moderate risk taker (some degree of risk taking) [6]; financial risk averse (reputational and career risk instead of their own financial risks, not financial as entrepreneurs) [5]; courageous [3]; risk tolerant [3]; bold [1]; fearless [1]
61	**Organisational networker**	Networking (brokerage/gatekeeper to outside knowledge, internally and externally) [10]; coalition builder (get support) [6]; networker (knows how to co-ordinate and make connections, use formal networks to gain assistance, use of network and resource arrangement) [6]; resource allocation (acquire resources whenever needed, pulling together/securing resources) [5]; overcome organisational barriers (and resistance) [4]; negotiate, ability to (with management) [3]; relationship builder (to circumnavigate bureaucracy roadblocks, to resource allocators) [3]; non-system-bound (to accomplish his or her vision) [2]; network (personal) [2]; sponsor, finds (mentor/protector) [2]; network builder (mobilize social capital internally, builds networks to circumnavigate bureaucracy) [2]; organisational knowledge (internal and external environment) [2]; corporate politics skills [2]; boundary crossers [1]; brokering [1]; external relationship [1]; integrates (across organisational barriers) [1]; stakeholder communication [1]; help and guidance from certain seniors, seek [1]; interaction builder [1]; interpersonal relations, effective [1]; organisational skills (internal and external environment) [1]; organisational navigator (navigates corporate politics to bring an innovation to the forefront) [1]; knowledge about (organisational) environment [1]; innovative (communicate to upper management) [1]

58	**Self-confident**	Locus of control [17]; self-efficacy (creative, entrepreneurial, intrapreneurial) [16]; self-confidence [8]; self-motivated [6]; self-esteem, high [5]; confidence [2]; assertive [2]; self-awareness [1]; self-reliant [1]
57	**Flexible open-minded**	Flexible (against change, can pivot strategically, reactivity) [23]; open-minded (to new ideas, to learning, experience, improvement, to try new activities, to participate in community activities) [22]; ambiguity tolerance, high [7]; adaptable [2]; mental versality/flexible [1]; complexity comfort (in a dynamic work environment) [1]; learning-rich work, available for [1]
48	**Enthusiastic ally perseverant**	Persistent [12]; optimistic [7]; perseverance (in spite of obstacles) [5]; enthusiastic (about the product and business, new skills) [5]; tenacity [5]; determination [4]; resilient (deal with setbacks and rejection) [3]; energy [3]; energic [2]; positive [2]
42	**Opportunity recogniser**	Opportunity recognition [17]; opportunity seeking [8]; opportunity spotting (focus on customers and the corporation) [6]; opportunity identification/ discovery [5]; business opportunities, identifies [2]; curious [2]; idea search (spotting) [1]; opportunity creation [1]
41	**Experimenta tional problem solver**	Problem solver (finds a way, resolve dilemmas, is motivated/driven by problems) [13]; challenge seeking, eager for challenges (change status quo, the system, traditional paradigms) [7]; experimentation and discovery (feedback of results) [5]; information seeking/searching (questioning, observing, experimenting and networking) [5]; learning from failure/mistakes [3]; systematically learning (experimentation, experiences) [2]; questioning (status quo) [2]; innovative (experimentation) [1]; inquiring [1]; cognitive ability [1]; overcome challenges, enjoys [1]
37	**Persuasive influencer**	Persuasion (of ideas, sponsor) [10]; influencing, positive (rally individuals round their idea/innovation and obtain commitment) [7]; communication, good (of idea, verbal skills) [5]; cast enactment (influence and inspire people to accomplish their vision of the future, agree to a private vision) [3]; salesmanship [3]; acceptance (get other to agree to a private vision, of a new idea) [2]; convincing [2]; inspiring [2]; presentation skills [2]; integrates (vision) [1]
35	**Autonomous**	Autonomous (want flexibility and freedom to pursue novel and interesting ideas, go beyond norms) [29]; self-employment, desire for/sense of [4]; independent [2]
34	**Team organiser**	Responsible [6]; team development (building/mobilize/recruit capacities and lead these) [5]; team worker/-player [5]; extraversion [5]; team-oriented [3]; conscientiousness [3];

		cooperative/collaborative [3]; interpersonal skills (to work effectively with others) [2]; integrity (trustworthiness) [1]; reliable [1]
34	**Change agent**	Agent of change (push for change, want to change the environment, push for a button-up process) [16]; idea implementation (promotor of, initiator, from idea to profitable reality) [7]; encourage others (to do innovation and entrepreneurship, in teamwork) [3]; support others (to act entrepreneurial) [2]; idea champion (advocacy) [1]; championing [1]; innovative (champions) [1]; innovative (change) [1]; opportunity promotor [1]; advocacy [1]
30	**Idea generator**	Idea generation (generates and present novel/new/original/powerful and useful/valuable/company specific ideas) [27]; idea identification (be innovative) [1]; idea development [1]; divergent thinking [1]
29	**Business planner**	Opportunity exploitation/seizing [10]; business planner [8]; planning organisational activities (elaborate planners) [3]; opportunity evaluation/assessment [3]; develop and enact detailed processes and strategic plans [1]; business creation training in [1]; business aspects understanding of [1]; business skills [1]; business evaluation [1]
27	**Visionary**	Visionary (who dream of taking the company in new directions) [17]: imagination (to explore all possible problems, to juggle potential plans) [7]; visualization (conceptualize beyond status quo, scenario enactment, and forward-looking) [3]
14	**Customer-focused**	Market research, do their own market research (scan the environment and is evidence-based) [4]; customer-driven/centric [3]; customer empathy/knowledge/understanding [3]; observation skills (customers) [2]; market understanding (can predict the market) [2]
13	**Decision-maker**	Decision-making, desire to participate in (intuitive when data or time don't permit analytical solutions, objective otherwise, takes sophisticated decision based on evidence) [11]; intuitive (pattern matching) [2]

Table 12: The classification of individual intrapreneurship characteristics.

Results

The analysis revealed 19 characteristics of intrapreneurs as shown in Figure 15. The 19 characteristics are elaborately defined in the following.

Figure 15: The 19 intrapreneurial characteristics

Creative innovator: Intrapreneurs are creative and innovative people (Davis, 1999; Lizote et al., 2014) They are innovative in the sense that they are out of the box (lateral) thinkers (Moriano et al., 2014) that do things differently (Boon et al., 2013) or even untraditionally (Rodriguez-Pomeda et al., 2003). As a result, they come up with original and novel ideas that are appropriate to the employing organisation (Molina & Callahan, 2009). Another way they generate value to the organisation is through rejuvenation of market offerings (Jain & Ali, 2012), e.g. though new combinations or arrangements of existing resources (Lizote et al., 2014). Intrapreneurs are creative in the sense that are able to combine knowledge in new ways through anagogic reasoning (Hayton & Kelley, 2006) and can adapt an idea to new settings (Duncan et al., 1988), but also combine ideas into a complex whole as synthetic thinkers (Molina & Callahan 2009). They have a creative urge to find better ways of doing things and some enjoys variety (Davis, 1999) and non-routine work (Bager et al., 2010).

High achiever: Intrapreneurs have a big desire for achievement (McGinnis & Verney 1987; Kuratko et al., 2004; Amo & Kolvereid, 2005; Jain & Ali, 2012). They are ambitious about their entrepreneurial endeavour with high growth expectations: even higher than entrepreneurs (Matthews et al., 2009; Blanka, 2018). They are

intrinsically motivated (e.g. Hayton & Kelley, 2006) and have a high internal motivation for results and reaching their goals of turning a new idea into a profitable reality and not just doing what the shareholders would appreciate (Duncan et al., 1988; Rathna & Vijaya, 2009). They are passionate and hardworking individuals determined to win (Vandermerwe & Birley, 1997; Koen, 2000; Seshadri & Tripathy, 2006; Elia et al., 2017). They can be competitive (Kierulff, 1979) and sometimes come off as aggressive to succeed (Holt et al., 2007; Smitha et al., 2016) and some will respond to organisational recognition (Oliver et al., 1991).

Proactive initiator: Intrapreneurs are "dreamers who do" (Pinchot, 1987). 'Doing' is in the very core of intrapreneurs (Pinchot, 1985b; Byrne et al., 2016); they do not only come up with ideas, they proactively take the initiative to lead in introducing and implementing innovations (Seshadri & Tripathy 2006; Heinonen & Toivonen, 2008; Wakkee et al., 2010; Rigtering & Weitzel, 2013). Intrapreneurs are not always the inventor, but they are the main implementor of new ideas (Camelo-Ordaz et al., 2012). They are not afraid to get their hands dirty (e.g. Kolchin & Hyclak, 1987) and are self-selecting when an advantage appears (Abetti, 2004; Delin & Dyer, 1983). They do not wait for someone to put them in charge, they act in an opportunistic way on ideas without limiting to resources currently available (Fayolle & Basso, 2010).

Risk taker: Intrapreneurs are risk tolerant (Hayton & Kelley 2006; Matthews et al., 2009). On one hand, they are courageous (e.g. Pinchot, 1987) and not afraid of taking risks to change the status quo (Rigtering & Weitzel, 2013), pursue innovations or accomplish task-related problems (Osman et al., 2017), even if it can result in alienation from upper management (Pinchot, 1985b). They do not fear the risk of failure (Smitha et al., 2016); they are opportunistic and willing to act boldly to capture opportunities even if there is no assurance of success (Chen et al., 2015). However, on the other hand, they seek to reduce risks from diversification and experimentation (Lau et al., 2012; Elia et al., 2017; Vandermerwe & Birley, 1997). They accept calculated risks (Kuratko & Goldsby, 2004; Rodriguez-Pomeda et al., 2003; Cox & Jennings, 1995) as a result of their rapid learning abilities and from undergoing frequent iterations of learning through trial and error (Vargas-Halabí et al., 2017). When it comes to financial uncertainties, they are more risk averse than their entrepreneurial counterparts (e.g. Matthews et al. 2009; Boon et al., 2013). They boldly take repetitional and career risk instead of their own financial risks (Martiarena, 2013; Nikolov & Urban, 2013).

Organisational networker: Intrapreneurs are networkers, in particular inside their organisation (Menzel et al., 2007; Moriano et al., 2014; Fayolle & Basso, 2010; Hayton & Kelley, 2006). They have effective interpersonal and brokerage skills (Hayton & Kelley, 2006; Blanka, 2018; Rathna & Vijaya, 2009; Byrne et al., 2016) and knows how to coordinate and make connections – both internally and externally – to get support and build coalitions (Abetti, 2004; Belousova & Gailly, 2013; Lau et al., 2012; Matthews et al., 2009). Their organisational wisdom and brokerage skills

help them in making effective relationships and to navigate corporate politics, overcome bureaucracy roadblocks as well as other organisational barriers in a diplomatic way (Ross, 1987; Hornsby et al., 1993; Rigtering & Weitzel, 2013). They use their interpersonal skills to build trusting relationships to corporate sponsors to gain support and protection to increase their chances for success (Abetti, 2004; Oliver et al., 1991; Cox & Jennings, 1995). As such, they mobilise and secure internal resources when needed (Chen et al., 2015; Jones, 2005; Miller & Bauer, 2017; Smitha et al., 2016) and are not afraid to cross organisational boundaries and use innovative ways of communication to achieve their vision (Pinchot, 1985b; Amo, 2006; Lau et al., 2012).

Self-confident: Intrapreneurs have creative, intrapreneurial and entrepreneurial self-efficacy (Schenkel et al., 2009; Douglas & Fitzsimmons, 2013; Nicholson et al., 2016; Nikolov & Urban 2013; Thornberry, 2003; Urbano et al, 2013). They believe in their own capabilities to successfully launch a new product, service, solution or business model (Tucker et al., 2017). They have the confidence to engage in creative activities which also impacts their embodied opportunity exploitation behaviour (Heinonen & Toivonen, 2008; Schenkel et al., 2009). Intrapreneurs believe that they have control over the outcome of events in their lives, i.e. inner locus of control (Smitha et al., 2016; Bahrami et al., 2016; Camelo-Ordaz et al., 2012; Elia et al., 2017; Herron, 1992; Hornsby et al., 1993; Jain & Ali, 2012). Furthermore, they have a high self-esteem (Tucker et al., 2017; Nikolov & Urban, 2013; Pinchot, 1987; Shetty, 2004) and yet they still have a high level of assertiveness (Davis, 1999; Woo, 2018). Even though intrapreneurs believe that they can organise and perform the needed actions to manage prospective situations, the level of self-efficacy might be higher for their entrepreneurial counterparts (Garrett Jr. & Holland, 2015).

Flexible open-minded: Intrapreneurs have a flexible, open mind (Herron, 1992; Matthews et al., 2009; Fayolle & Basso, 2010). They can quickly change course of action when results are not being achieved (Zampetakis et al., 2009). They are listening and learning from what they hear and can pivot strategically (Vandermerwe & Birley, 1997; Miller & Bauer, 2017). They are mentally versatile (Boon et al., 2013); they tolerate the simultaneous presence of diverging approaches, expectations and needs (ambiguity tolerance) and thrive in dynamic work environments that are complex (Elia & Margherita, 2018). They are highly adaptable and deficient to schemas and rigid procedures (Vargas-Halabí et al., 2017). Intrapreneurs are open to new ideas, new experiences, new directions and to try or participate in new (community) activities (Hayton & Kelley, 2006; Rathna & Vijaya, 2009). They enjoy learning a new skill and are thriving for continuous learning for improvement (Boon et al., 2013). They seek new knowledge from diverse sources through open discussions and does not play their cards closely (Kierulff, 1979). Furthermore, they are available for learning-rich work (Carrier, 1996).

Enthusiastically perseverant: Intrapreneurs are enthusiastic and tenacious by nature (Davis, 1999; Maxon, 1986; Herron, 1992). They show great enthusiasm about the idea and the employing organisation (Kierulff, 1979). They have a high energy level (Kuratko et al., 2004; Shatzer & Schwartz, 1991; Vandermerwe & Birley, 1997), are positive (Rekha et al., 2015; Rutherford & Holt, 2007) and will positively affect others (Elia & Margherita, 2018). Intrapreneurs are not afraid of being the last man standing and do not give up at the first sign of difficulty (Seshadri & Tripathy, 2006; Smitha et al., 2016). They have a strong determination (Jain & Ali, 2012; Miller & Bauer, 2017), are willing to do whatever it takes to succeed (Pinchot, 1985b) and are resilient when dealing with obstacles and rejections (Vandermerwe & Birley, 1997; Davis, 1999).

Opportunity recogniser: Intrapreneurs are opportunity spotters (Belousova & Gailly 2013; Blanka, 2018; Clargo & Tunstall, 2011; Garrett & Holland, 2015; Molina & Callahan, 2009; Urbano et al., 2013). They are able to identify business opportunities with a focus on customers and the corporation (Abetti, 2004). They are able to see patterns in technological, demographic, and market trends and connect the dots into suggestions for new products, services or business models (Bjornali & Støren, 2012; Hayton & Kelley, 2006). They are curious by heart and consistently look for new opportunities to arise (Ahmed et al., 2013; Farrukh et al., 2016). When they discover a market opportunity worth pursuing, they will promote it as they can interpret these at ease (Vargas-Halabí et al., 2017; Vandermerwe & Birley, 1997).

Experimentational problem solver: Intrapreneurs are problem solvers (O'Neill, 2014). They are driven by problems, overcoming challenges and resolving dilemmas (Rathna & Vijaya, 2009; Luchsinger & Bagby, 1987; Kuratko et al., 2004). They solve problems by experimentation and discovery, learning in a systematic way from experiences (Corbett & Hmieleski, 2007; Davis, 1999). They acknowledge that learning through failure (trail-and-error) is valuable (Elia et al., 2017). Intrapreneurs employ a hypothesis-testing mindset, are curious and focus their attention on information to get a good understanding of what they want to learn from experiments (Vandermerwe & Birley, 1997). Furthermore, they are inquiring, questioning and observing in their search for solving problems (Elia et al., 2017).

Persuasive influencer: Intrapreneurs are persuasive (Herron, 1992; Koen, 2000; Kenney & Mujtaba, 2007; Miller & Bauer, 2017). They can influence and inspire others to agree on a new idea or private vision for the future very convincingly (Kolchin & Hyclak, 1987; Rodriguez-Pomeda et al., 2003; Amo, 2006). They are cast enactors (Boon et al., 2013) that, in a positive way, are able to gather individuals around their ideas and gain commitment (Byrne et al., 2016; Elia & Margherita, 2018); not only from fellow co-workers, but also from certain corporate sponsors (e.g. Abetti, 2004). They master the art of salesmanship (investigating and satisfying customer needs) with great verbal, communication and presentation skills (Wood, 1988; Rathna & Vijaya, 2009).

Autonomous: Intrapreneurs have a desire for autonomy (Pinchot, 1985b; Allali, 2010; Bahrami et al., 2016). They enjoy organisational elasticity to pursue novel and interesting ideas (Nikolov & Urban, 2013). They seek freedom to create and are willing to go beyond norms autonomously to get empowerment (Bendickson & Liguori, 2014). They are independent individuals with a sense of self-employment within the organisation (Lau & Chan, 1994; Carrier, 1996).

Team organiser: Intrapreneurs are team-oriented (Smitha et al., 2016; Jones, 2005; Kuratko et al., 2004). They enjoy being around people and know intrapreneurship is a team sport. They are collaborative by nature (Rodriguez-Pomeda et al., 2003), are seen as team players (Zampetakis et al., 2009) and have great interpersonal skills to work effectively with others (McGinnis & Verney, 1987). Intrapreneurs are also team developers; they are self-appointed leaders with the abilities to build effective teams of volunteers and recruit capacities (Pinchot, 1985b; Jones, 2005). They manage to do this as they are responsible, conscientious, reliable with high integrity and trustworthiness, even though they do not have the experience per se (Vandermerwe & Birley, 1997; Miller & Bauer, 2017; Woo, 2018).

Change agent: Intrapreneurs are agents of change (Lau & Chan, 1994; Carrier, 1996; Kuratko & & Goldsby, 2004; Lizote et al., 2014). They are individuals who support and enables novel ideas or technologies as they have a thriving desire to change their environment for the better (Amo, 2006; Herron ,1992) and they push for this change sometimes through a button-up process (Vargas-Halabí et al., 2017). Because of their strong belief in change and advocacy for new technologies, procedures and business models, they can sometimes be seen as the idea champion that implements an idea to a profitable reality for the organisation, even though the original idea might have come from elsewhere (Rigtering & Weitzel, 2013). They encourage others to innovate and supports them to act intrapreneurial (Ross, 1987).

Idea generator: Intrapreneurs are idea generators (Rigtering & Weitzel, 2013; Osman et al., 2017; Agor, 1988). They have the ability to generate novel, new, and original ideas (Elia et al., 2017; Elia & Margherita, 2018; Lukes & Stephan, 2017; Molina & Callahan, 2009; Mustafa et al., 2016; Rekha et al., 2015; Allali, 2010; Bager et al., 2010; Blanka, 2018) that often reflect a broad shift in perspective (Chen et al., 2015; Zhu et al., 2014). They are good at making connections through an open - and not dominant - creative mindset (Brenton & Levin, 2012; Woo, 2018). Intrapreneurs are natural ideators and get ideas for products for their companies (Chen et al., 2015; Pinchot, 1985b). They are not afraid of proposing innovative ideas or solutions (Elia & Margherita, 2018) but they also have a pragmatic imagination to develop workable, company specific ideas that are both powerful and valuable (McGinnis & Verney, 1987; Brenton & Levin, 2012).

Business planner: Intrapreneurs are elaborate business planners (Matthews et al., 2009; Wood, 1988; Hornsby et al., 1993; Delin & Dyer, 1983; Kuratko & Goldsby,

2004; Thornberry, 2003). They have strong business acumen (Herron, 1992) and understands the business aspects of the project (or new venture within the company) they are involved in (Koen, 2000). When compared to their entrepreneurial counterparts, they might be even better to foster and enact comprehensive processes and complex strategic plans (Corbett & Hmieleski, 2007). Intrapreneurs have an analytical eye to decide what steps are needed for success and can differentiate between good ideas and good opportunities (Byrne et al., 2016). They are able to, objectively, evaluate and assess (business) opportunities through analytical skills, which they base on evidence from the market (Belousova & Gailly, 2013; Shatzer & Schwartz, 1991).

Visionary: Intrapreneurs are visionaries (Carrier, 1996; Davis, 1999; Duncan et al., 1988; Matthews et al., 2009; Menzel et al., 2007; Rathna & Vijaya, 2009; Delin & Dyer, 1983). They wish to take the company in new directions and have a forward-looking approach (Kuratko & Goldsby, 2004). They have the ability to envision and conceptualise beyond the existing conditions using their imagination (Ahmed et al., 2013; Miller & Bauer, 2017). Intrapreneur have explored all thinkable problems in their mind and can manage potential plans as they visualise future business scenarios (Pinchot, 1987). They foresee the future and how to fulfil their vision of turning a prototype into a success in the market (Pinchot, 1987; Boon et al., 2013).

Customer-focused: Intrapreneurs are customer-centric (Koen, 2000; Kolchin & Hyclak, 1987). They have a clear passion for putting the customers first (Brenton & Levin, 2012). They authentically understand and can translate customer issues as well as see patterns in the market and in general (Vandermerwe & Birley, 1997). They have a high level of customer empathy and can walk in the shoes of the customers (Brenton & Levin, 2012). Through observation of customer behaviour and market trends, they hold great knowledge about customers, their needs and can predict the market (Elia & Margherita, 2018; Menzel et al., 2007). Intrapreneurs carefully do their own market research and because of their personal investment, they do a very comprehensive and systematic job compared to traditional marketing people (Pinchot, 1985b; 1987).

Decision maker: Intrapreneurs are decision-makers (Cox & Jennings, 1995; Garrett Jr. & Holland, 2015; Schenkel et al., 2009). They wish to participate in making decisions and seek power to be part of the process (Nikolov & Urban, 2013; Clargo & Tunstall, 2011). Intrapreneurs are better than most in collecting information and engage in more complex, evidence-based decision-making (Garrett Jr. & Holland, 2015). If a project turns unsuccessful, they manage to be objective even if it means closing it down (Shatzer & Schwartz, 1991). However, when data or time do not permit analytical resolutions, they make decisions based on intuition and pattern matching skills (Agor, 1988; Pinchot, 1987).

Conclusion and Discussion

This study used a structured review approach focused on the individual level of studies on intrapreneurs. The results identified 19 characteristics of intrapreneurs: creative innovator, high achiever, proactive initiator, risk taker, organisational networker, self-confident, flexible open-minded, enthusiastically perseverant, opportunity recogniser, experimental problem solver, persuasive influencer, autonomous, team organiser, change agent, idea generator, business planner, visionary, customer-focused, and decision maker.

In the initial work of Pinchot (1985a) the intrapreneur was depicted as a person with the qualities of being a visionary and action-oriented corporate hybrid with a high level of dedication and self-confidence as well as an appetite for risk. Quite surprisingly, the results in this study show that much of the subsequent research has supported the original work of Pinchot (1985a). Still, the 19 characteristics (and their description) might provide a more varied picture that can open up for new ways to assess intrapreneurial potential scientifically.

Vargas-Halabí et al. (2017) proposed a model of intrapreneurial competencies consisting of five sub-dimensions of employee attributes, i.e., opportunity promoter, proactivity, flexibility, drive, and risk taking. The 19 characteristics from this study confirms that these attributes are along the most mentioned characteristics of intrapreneurs as they are found to be somewhat inherent in the intrapreneurial characteristics. Yet, this study points to additional factors being substantial when looking at the individual level of intrapreneurship.

Similar to this study, Hero et al. (2017) did a review to uncover individual innovation competencies. The scholars identified 17 sub-categories: flexibility, motivation and engagement, achievement orientation, self-esteem, self-management, future thinking, alertness to new opportunities, creativity skills, cognitive skills, collaboration skills, networking skills, communication skills, process management skills, management skills, content knowledge, making skills and technical skills. Only 28 papers were reviewed in Hero et al. (2017) compared to 87 in this study. Furthermore, the Hero et al. (2017) paper only used search terms related to innovation such as innovation competenc*, innovativeness, and innovation capability/ies, while this study used terms from both disciplines like corporate entrepreneur/s and corporate innovator/s. Still, the 17 categories identified in Hero et al. (2017) are quite related to the 19 characteristics found in this study; for instance, achievement orientation and high achiever, self-esteem and self-confident as well as future thinking and visionary. Maybe the characteristics of an innovator and an intrapreneur have key similarities. As a result, the studies of innovators could prove useful to understand intrapreneurs better. Further research could look into this matter.

Furthermore, it is interesting to see that creativity seems to play a substantial role at the individual level. At least there are overlaps between the 19 characteristics and

several creative qualities; for instance, creative innovator (originality), self-confidence (creative self-efficacy), flexible open-minded (flexibility), idea generation (ideation), and visionary (visualisation of future scenarios). The role of creativity in innovation, corporate entrepreneurship and intrapreneurship literature is often focused on the ideation phase. However, the results from this study suggests that creativity may be a critical ingredient across a wide range of innovative and entrepreneurial activities.

This study advocate for a comprehensible understanding of individual intrapreneurial characteristics on its own. It is one of the first studies to rigorously and structurally examine the historical research done within this area on an individual level. Previous studies have looked into diverse aspects about the corporate entrepreneur or intrapreneur, but they have been disparate and fragmented, mainly due to varying definitions. Furthermore, prior research has mostly been based on the organisational level (Blanka, 2018).

The 19 identified characteristics presented in this study are treated as somewhat equally important. Yet, Table 12 shows a clear difference in the frequency of citations in the literature; some items are mentioned significantly more than others. This might be an indicator of what the most important qualities of an intrapreneur are and opens up interesting follow-up questions like: is it necessary for an intrapreneur to possess all 19 characteristics and are some more vital than others? It would be interesting to investigate this even further; either by interviewing intrapreneurs and their managers and have them rank the 19 characteristics in terms of relevance or merely by engaging in rather open discussions to determine what qualities (out of the 19) they mention the most. Davis (1999) already did something similar in her study of decision criteria in the evaluation of potential intrapreneurs, but with the newly gained knowledge and advanced understanding, new insights might be revealed.

Due to the more elaborate definitions of intrapreneurs characteristics, managers and researchers might be better prepared to identify employees with intrapreneurial potential. This is important, as a key variable to increase the returns of innovation in organisations is to be better at identifying the right people to support, nurture and empower (Pinchot, 1987). If managers gain better insights about their employee's intrapreneurial potential, it will make it easier to refocus the innovation strategy by selecting for the right people instead of the right ideas. A possible approach would be to qualitatively assess each person in a division (or team) on a binary scale in terms of the 19 characteristics; a zero should be given when a person does not possess a specific quality at all, whereas one should be given when an individual clearly possess the quality in question. It may also be possible to develop far more advanced measurements for this. Some obvious biases must be expected, though, especially the leniency bias, which describes situations where a manager tends to be more indulgent than his or her peers (Podsakoff et al., 2003). A possible workaround would be to have more than one rater or a developed scoring guide based on these 19

characteristics. The approach might also be influential in terms of putting together intrapreneurial teams based on members characteristics. Further research is needed to assess potential intrapreneurs for their characteristics.

Due to the more varied picture of the different qualities of an intrapreneur, the 19 characteristics identified in this study could be used as a compass to design more customised training programmes to stimulate innovative and (corporate) entrepreneurial behaviour. Organisations, educators as well as consultants should, however, be aware of the fact that some characteristics might need different approaches to train than others and might take longer to cultivate; for instance, self-confident compared to business planner. All 19 characteristics seem to be trainable; however, further research is needed to better understand how these characteristics may be trained.

The 19 intrapreneurial characteristics might also be usable for HR managers in their search for talents that can drive innovation and play an entrepreneurial role in the organisation. A possible approach would be to cross-check the 19 characteristics with results from the favourite mean in recruitment processes: the personality test. This approach should only be used as an indicator, as the research on the relationship between personality and intrapreneurship is relatively limited (Woo, 2018). Based on the findings in this study, a valid hypothesis could be that an open, flexible and inventive mind might be the very core of being an intrapreneur. You need to be open-minded to take risks, to take action, to see opportunities (when no one else does), to include others, to have empathy for others etc. You need a flexible mind to be persistent (when something goes wrong), see different perspectives when solving problems, to be experimental, to trust and believe in yourself etc. And you need to be inventive to come up with new ideas, to persuade others (in new ways), break the patterns etc. Maybe that is why some scholars have found a connection between intrapreneurs and especially the 'openness' trait from the Big Five personality dimensions (e.g. de Vries et al., 2016). Potential new research could look into this avenue. Further research is, however, needed to better understand the relationship between these 19 characteristics and standard personality tests.

In an academic and educational context, intrapreneurship has also gained in importance over the years. The 19 characteristics could again be used as an indicator to identify talents to support through the system – both to foster more academic intrapreneurs (the ones that drive new strategic directions) as well as the intrapreneurs of tomorrow: the students. One could imagine that the 19 characteristics of this study could lead to stronger and more focused curriculums in entrepreneurship education and incubator programs.

Guidelines for Applying Research to Practice

The results of this study can be applied using different perspectives (individual-, team-, and organisational level).

At the individual level, the 19 characteristics could be used as a checklist for personal development and contribute to a more detailed psychological understanding of oneself. Which of the 19 characteristics are you particularly strong in and where are your Achilles heel(s)? The latter is maybe of most interest, as this represents the potential areas for further development and training. Also, if you are aware of these 19 characteristics and your strength and weaknesses, it becomes easier for you to figure out which individuals you should try to persuade to get onboard to enhance the chances for success on making your next big thing a reality.

At the team level, the 19 characteristics can be used in several ways. One would be to go through each of them and discuss which characteristics that are highly represented in the team and which characteristics you might lack. Again, underrepresented characteristics could be brought into a team by either developing these through customised training – or by recruiting new team members from the other parts of the organisation or the outside. Another way would be to assemble innovative and (corporate) entrepreneurial teams based on the 19 characteristics, making sure that all of them are represented in a team from the beginning. Involving HR in this exercise might be of great value, as results from personality tests could be cross-checked with clear connections between these and the 19 characteristics, e.g. the ‘openness’ personality trait from the Big Five test.

At the organisational level, the 19 characteristics would be a good starting point for the top management to reflect on the current intrapreneurial and innovative human capital in the organisation. It should give a clear picture of which areas to focus on in terms of recruitment, training programs etc. to support innovative and (corporate) entrepreneurial activities in the organisation.

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Appendix B. Article II

ASSESSMENT AND CORPORATE ENTREPRENEURSHIP: EXPLORING A PROMISING NEW APPROACH FOR IDENTIFYING INTRAPRENEURIAL POTENTIAL

Submitted to the Entrepreneurship Research Journal.

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Abstract

Nurturing and supporting the right employees can substantially increase innovation returns in organisations. Nevertheless, identifying the employees who have the potential to become successful intrapreneurs can be difficult. Existing methods are based on self-perception questions and past experience, which can be deceptive due to various bias. This study explores how open-ended qualitative tasks may be designed and used to analyse employees' intrapreneurial potential. Inspired by the procedures for designing psychometric tests, several intrapreneurial-related tasks were developed, reviewed, and tested together with experts and practitioners. Results show that production-based tasks can evaluate numerous intrapreneurial characteristics in a new and more elaborate way, thus providing a more in-depth assessment of intrapreneurial potential. This paper makes recommendations for test and task design. The proposed production-based test complements the basic notions of using self-reporting for identifying potential intrapreneurs, an issue that has received limited attention within the scholarly community. Further research is needed in this area concerning validity, meaningfulness and applicability within intrapreneurship and corporate entrepreneurial studies.

Keywords: *corporate entrepreneurship, intrapreneurship, assessment, intrapreneurial potential.*

Introduction

Innovation is paramount to stay competitive (Chesbrough 2003) in today's world of extreme hyper-competition and globalisation (D'Aveni 1994). In incumbent organisations, a powerful approach to fast-track innovation is to leverage existing resources – in particular, the employees (Deloitte Digital 2015). Several scholars have praised entrepreneurial-thinking employees as the main drivers of innovation in organisations; thus, increasingly organisations are turning their attention to corporate entrepreneurship (CE) as a competitive strategy (Lizote et al. 2015). They do so by investing in training programs (Miller and Bauer 2017) and accelerator-like initiatives, where employees can act on intrapreneurial endeavours for the greater good of the corporation. They also identify people with an intrapreneurial personality or potential (Miller and Bauer 2017) to better develop, support and empower those individuals. For example, Hornsby et al. (1993) advises organisations to invest resources in the assessment of current employees to spot individuals with intrapreneurial potential. According to Åmo and Kolvereid (2005), organisations should not only look at their current employees when playing the corporate entrepreneurship game, but recruiting individuals with intrapreneurial potential should also be an integrated part of the corporate entrepreneurial strategy.

The biggest challenge of developing an intrapreneurial culture is not to create intrapreneurs, but to discover the right individuals and encourage them (Deloitte Digital 2015). As such, identifying the employees who have the potential to become successful intrapreneurs (corporate entrepreneurs) is a difficult task. This is in part because there is a lack of methods and tools to identify these individuals.

When Gifford Pinchot (1985) introduced intrapreneurship as a term, he was primarily focused on the individuals. Ever since, there has been a focus on the intrapreneur as an individual in the intrapreneurship literature (Miller and Bauer 2017) as well as the CE literature (Kuratko 2017). Within the CE literature, the individuals are typically coined *corporate entrepreneurs*. However, several scholars from both domains tend to use the terms intrapreneur and corporate entrepreneurs interchangeably (e.g. Pinchot 1985; Hayton and Kelley 2006; Ireland et al. 2009), which indicates that these actors play a similar role. On a conceptual level, Blanka (2018) found that CE and intrapreneurship are distinct; the former is typically associated with studies at the firm-level, whereas the latter is mostly associated with the individual. Therefore, this paper uses the term *corporate entrepreneurship* for firm-level variables and *intrapreneurial* for individual-level variables, following the distinction recommended by Twomey and Harris (2000). Thus, the term *intrapreneur* will be used to describe the individual actor inside a large business throughout the paper.

Although the study of individuals is present in both of these research fields, most assessment scales that have been developed use the organisation as the main unit of analysis (Elia et al. 2017). These instruments are essential means of measuring various aspects of corporate innovation (Kuratko 2017); however, they have not been

able to explain variations in innovation behaviour among individuals (Åmo and Kolvereid 2005). Kuratko and Goldsby (2004) stress that at the individual level, no reliable and valid measures have been developed yet, even though several scholars have proposed some valuable suggestions, for example, Kierulff (1979), Herron (1992) and Lau et al. (2012). However, according to Davis (1999), the literature offers little help to managers in identifying people likely to be successful in this unique organisational role making it hard to differentiate the real (potential) intrapreneurs from promotors who make big promises but do not follow through. Thus, supervisors often end up validating their employees' intrapreneurial potential by using gut feelings. This might be one of the reasons why Åmo and Kolvereid (2005) called for further advancement and additional instruments focused on the individuals. More recently, Kuretko (2017) reviewed significant research in this field from its incarnation and still found that it was an unexplored research area and called for new methods.

This paper explores a promising new approach for identifying intrapreneurial potential using a researcher-designed qualitative test, labelled as a 'production-based' test. A production-based test is defined as an instrument that assesses subjects based on their responses to given tasks, problems or situations; that is, their production of an output. This type of qualitative production-based test is completely new to the field of corporate entrepreneurship and intrapreneurship; yet, similar domain-specific tests have been widely used and tested in the closely related discipline of creativity research. In the area of creativity, such tests have been found to have higher predictive validity than self-rating questionnaires (Althuizen et al. 2010). Runco et al. (2016) accentuated that production tests are probably the most widely used assessment method for individual creative potential. In the same vein, Cropley (2000) recommended the use of these kinds of tests to evaluate potential rather than actual behaviour. This paper explores how production tests may be promising in contributing to a more in-depth assessment of intrapreneurial potential in individuals.

In the following sections, this paper introduces the theoretical framework, research design, results and conclusions. It also discusses the practical and theoretical impact of this new perspective for identifying intrapreneurial potential in individuals.

Theoretical framework: Evaluation methods of individuals within the context of corporate entrepreneurship and intrapreneurship

While individual characteristics are mentioned as a key component of the CE process by several scholars (Ireland et al. 2006a, 2006b, 2009; Hornsby et al. 2002, 2008), most previous research has used the firm as the unit of analysis (De Jong et al. 2011) or focused on organisational characteristics instead of individual (Hornsby et al. 1993; Elia and Margherita 2018).

A literature review on the assessment methods employed within the context of CE and intrapreneurship identified two general approaches: either scholars use an organisation/firm-level approach where the assessment of individuals is included as a minor focus, or they employ a solely individual perspective. The organisational-level approach is primarily used by scholars from the corporate entrepreneurship, entrepreneurship orientation and entrepreneurship domains, while the individual-level approach is generally used by researchers within the intrapreneurship domain. In some studies, for example the one by Elia and Margherita (2018), equal attention is given to the organisational level as well as the individual level. Within each main focus area, various methods of assessing individuals have been identified, ranging from questionnaires (or surveys) to tests (for example, personality, aptitude and simulations), as well as interviews and observation. An overview of these are illustrated in Figure 16.

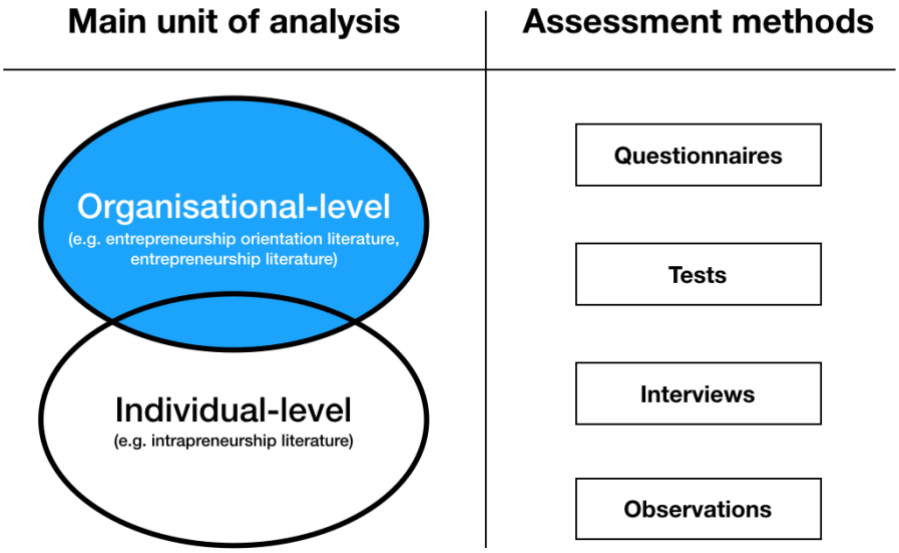


Figure 16: Categorisation of assessment methods of individuals within the CE and intrapreneurship literature.

The use of questionnaires

Several scholars within the field of CE have developed questionnaires specifically for this context. Most of these focus on the organisational factors that may facilitate or hamper the success of entrepreneurial processes within organisations, thus taking

an organisational-level approach (Elia and Margherita 2018). Measurement instruments such as the Corporate Entrepreneurship Assessment Instrument, the Entrepreneurial Health Audit, the Corporate Entrepreneurship Climate Instrument, entrepreneurial orientation and entrepreneurial intensity have been important means of measuring various aspects of CE (Kuretko 2017), with Miller's (1983) firm-level dimensions of innovativeness, proactiveness and risk-taking as the dominating constructs. Some scholars even tried using Miller's (1983) firm-level labels to assess individuals; an approach that is quite problematic, as also discussed by Farrukh et al. (2016).

As CE and intrapreneurship are somewhat implanted in the entrepreneurship discipline (Åmo and Kolvereid 2005; Molina and Callahan 2009), some studies have used entrepreneurial behaviour scales to assess the individuals (Kuratko et al. 2004; Zampetakis et al. 2009; Wakkee et al. Elfring and Monaghan 2010; Mustafa et al. 2016). Others use standard entrepreneurship instruments like the Global Entrepreneurship Monitor tweaked into an intrapreneurial setting (Bager et al. 2010; Clargo and Tunstall 2011; Martiarena 2013; Urbano et al. 2013). Both approaches are problematic as intrapreneurs are found to be different from traditional entrepreneurs (Hill 1997; Geisler 1993; Davis 1999; Hayton and Kelley 2006; Camelo-Ordaz et al. 2012; Blanka 2018).

From the intrapreneurship literature, the questionnaires by Pinchot (1985) and Pinchot and Pellman (1999) are worth mentioning, as they have also been used in several later studies (Kolchin and Hyclak 1987; Åmo and Kolvereid 2005; Allali 2010). In the 'Are You an Intrapreneur?' questionnaire, Pinchot (1985) suggests twelve polar questions. Individuals are asked to go through questions, such as 'Do you think about new business ideas while driving to work or taking a shower?' (Pinchot 1985, 86) and 'Do you get easily annoyed by others' incompetent attempts to execute portions of your ideas?' (Pinchot 1985, 87). If there are more positive response than negative, the author implies that the respondent might already act like an intrapreneur. Pinchot and Pellman (1999) offer a manager-report questionnaire called 'The Intrapreneurial Evaluation Checklist' consisting of nine questions. Using a Likert rating scale (ranging from 'to an exceptional degree' to 'below average'), the manager should examine how the employee displays intrapreneurial characteristics compared to the general population of employees. The questionnaire includes questions like 'Is a moderate risk taker; is optimistic, but not out of touch with reality' (Pinchot and Pellman 1999, 160) or 'Even when breaking the rules, works in the best interests of the companies' customers' (Pinchot and Pellman 1999, 161). Each question about the individual is based on characteristics of successful intrapreneurs from the perspective of the main author's practical experience and previous publications.

Both of these questionnaires have obvious strengths: they are short, quick to complete, easy to score and can thereby be easily carried out as mass tests across the

whole organisation, division or department. The assessment tools in question also have various limitations. Firstly, the surveys only contain twelve and nine questions respectively to uncover intrapreneurial abilities; as such, the instruments might only be investigating surface-level intrapreneurial characteristics. Secondly, due to their quantitative and indirect design, it becomes hard to get a qualitative insight into the individuals in question, which could be vital in this matter. Thirdly, they both focus on past behaviour. While the test by Pinchot (1985) focuses on past behaviour in the eyes of the employee, the test by Pinchot and Pellman (1999) focuses on past behaviour of employees in the eyes of the manager. As some individuals have hidden abilities for innovation (cf. Ford 2001; Cohen et al. 1972; Thornberry 2003), these two instruments might not be suitable to predict corporate entrepreneurial potential in individuals. Fourthly, both assessment tools are based on self-reporting. Self-perception questions can be deceptive due to various biases affecting reasoning and self-understanding (Podsakoff and Organ 1986; Kahneman 2011). Test subjects can be affected by their mood in a positive or negative way (the positive and negative affectivity bias), they might want to appear consistent and logical in their responses (the consistency motif bias), present themselves in a favourable light instead of showing their true feelings (the social desirability bias) or simply misunderstand questions or meanings of words leading to random responses (the item ambiguity bias) (Podsakoff and Organ 1986). Likewise, when a manager rates peers, both the leniency bias (Podsakoff et al. 2003) and the centrality bias (Moers 2005) can occur. Leniency bias refers to situations where a more favourable rating is given than justified (because you know the individual well). Centrality bias indicates situations where managers compress ratings so that they differ insignificantly from the norm. Despite these issues, self-reporting is still the most widely used assessment method in organisational and management research (Podsakoff and Organ 1986) as well as within corporate entrepreneurship (Elia et al. 2017). The popularity is mainly caused by the easiness of distribution, high applicability and resource-efficient data analysis (Gupta and Beehr 1982).

The use of tests

Tests are an alternative method of enquiry. Looking at the continuum of tests, they range from purely qualitative (with open-ended items or tasks) to purely quantitative tests that are standardised and close-ended (Johnson and Turner 2003). Herron (1992) advocates for the use of aptitude tests along with interviews as well as past performance. However, standardised aptitude tests, like the one used by Herron (1992), which was developed by J.P. Guilford and colleagues, might be too general and not related to the field of CE. The experiment of using this particular aptitude test failed, as the results did not show a strong correlation with Herron's selected skill areas, which were: Product/service design, Business, Industry, Leadership, Networking, Administrative and Entrepreneurial skills (Herron 1992).

Within the corporate entrepreneurship and intrapreneurship literature, very few studies have employed more contextual-based tests as a method of enquiry. As far as

the author knows, one of the only cases seems to be the simulated incident method proposed by Lau et al. (2012). It is a good example of a purely quantitative test designed to assess intrapreneurial potential. The test included forty lifelike incidents for the subject to evaluate by choosing one out of the five listed options, which were developed using behaviourally anchored rating scales with subject experts. Nonetheless, the quantitative design with only five options to choose from in each incident makes it somewhat easier to predict the high-scoring options. Also, the test is developed using Miller's (1983) firm-level labels to assess individuals, which is a questionable approach.

The use of interviews and observation

Herron (1992) explicitly suggests the use of assessment tests (aptitude tests) together with interviews as well as investigation of past performance to identify intrapreneurial individuals. They outline several items that should be uncovered during an interview session; for example, if a person expresses a desire to engage in innovation, if a person displays persuasive skills, tenacity and energy, and if a person demonstrates a combination of vision and realism. Also, the interviews should include questions about the past exercise of skills. In fact, Herron (1992, 12) stresses that past performance is the most critical area for assessing potential intrapreneurs, as "[…] actual experience is the best predictor of future success". One problem is, however, that some individuals have hidden abilities for innovation (Ford 2001; Cohen et al. 1972) but might not be aware of the intrapreneurial spirit hidden within. Similarly, Thornberry (2003) states that some people might need a stimulant for these latent capabilities to shine through. As such, intrapreneurial potential cannot be identified by investigating past performance by their interviews or observation. Interviews might indicate a potential but may be hard to assess fully, especially due to the discrepancies between what people say and do, which might be unintentional or done for opportunistic reasons. Czarniawska (2001) term these as representative bias and manipulative bias, respectively.

From a theoretical perspective, observations may be the most data-rich approach for evaluating behaviour. Instead of relying on what people say they do, you can observe what they actually do (Johnson and Turner 2003). In a corporate entrepreneurial setting, one way of using observations as an assessment method would be to have individuals (individually or in teams) do context-relevant simulations or challenges (as discussed in the Human Resource Management literature) and observe their actual behaviour when put in these lifelike situations. However, using observations to identify intrapreneurial personalities can be a complex task for managers, as the most prominent intrapreneurs might work in remote departments or they might not even work in the organisation yet. Also, the data analysis afterwards can be very time-consuming, and observing large populations can be difficult (Johnson and Turner 2003). Furthermore, observation might only be appropriate when assessing actual behaviour, not potential behaviour. One could imagine a situation where an individual does not show any sign of intrapreneurial behaviour. If they are put in the

right environment and given the appropriate support or training, their hidden potential might unfold. This is in line with arguments proposed by Thornberry (2003). Observation might therefore only be an appropriate assessment method to identify people that already have an intrapreneurial track record, and maybe not intrapreneurial potential.

New inspiration from assessing creative individuals

Outside the CE and intrapreneurship research fields, qualitative production-based tests have been quite influential. For example, within creativity research, Guilford's (1967) 'Alternative Uses Test (AUT)' and the 'Torrance Test of Creative Thinking' (TTCT) by Torrance (1974) offer serious alternatives to self-reporting, observations, interviews and quantitative (standardised) tests. In both the AUT and the TTCT, test subjects must produce responses to a given task, problem or simulation. The key is that the respondent produces an output that is personal and represents the best the respondent can create at the given time frame, without having pre-made options to choose from. The data analysis of these qualitative production-based tests cannot be standardised to the same degree as seen in self-reporting schemes, making them more time-consuming. Still, Torrance (1980; Torrance et al. 1992) managed to develop a highly advanced guided scoring system based on generic examples and statistical infrequency to somewhat streamline the data analysis of the qualitative outputs.

The TTCT has been praised as the most widely used test of creativity (Davis 1997), as well as the most referenced of all creativity tests (Lissitz and Willhoft 1985). Numerous studies have found TTCT to have high validity for assessing creative production (Almeida et al. 2008; Cliatt et al. 1980; Harkins and Macrosson 1990; Kabanoff and Bottger 1991; Nelson and Lalemi 1991; Scibinetti and Tocci 2011; Zabelina and Robinson 2010). The TTCT is furthermore found to have higher predictive validity than both self-rating questionnaires and independent supervisor ratings of employees' creative abilities (Althuizen et al. 2010). As such, it seems this type of production-based test adds another element to the assessment of individuals ensuring more profound insights. It is almost impossible to cheat a production-based test since it is designed to collect actual responses to given subject-related tasks. This is in stark contrast to self-perception questions, which, by default, are easier to manipulate for personal or social reasons (Podsakoff and Organ 1986). Furthermore, production-based instruments are more convenient and economical for organisations to employ compared to observation and can be done in larger settings. Finally, some scholars have advocated for the use of these kinds of tests to assessing potential as well as use them as a basis for differentiated counselling, instead of actual behaviour (Cropley 2000).

The TTCT is comprised of two forms: a figural and a verbal form. Both have two parallel forms, A and B. The TTCT-Figural (A and B) includes three different figural (drawn) tasks ('Picture Construction', 'Picture Completion', and 'Lines'), while the TTCT-Verbal (A and B) includes six verbal (written) tasks ('Asking', 'Guessing

Causes', 'Guessing Consequences', 'Product Improvement', 'Unusual Uses', and 'Just Suppose'). Each task has time restrictions ranging from five to ten minutes, and the total duration of the test is seventy minutes; the time frame of the verbal test is forty minutes whereas the figural test lasts thirty minutes. Each task starts with a short explainer description and is at a level so that kids can understand them. When the TTCT is used with children, the descriptions are read aloud by an administrator; otherwise, the subjects are supposed to read the explainer text themselves.

The tasks in the TTCT are designed to identify certain creative abilities in the subsequent data analysis process, which is a rather time-consuming activity (Clapham 2004). The original version of the TTCT was scored using Guilford's (1959) 'Divergent Thinking' variables: fluency, flexibility, originality and elaboration (Kim 2006; Plucker and Makel 2010). The figural test was later updated to include the scoring variables 'Resistance to Premature Closure' and 'Abstractness of Titles'. In contrast, the flexibility variable (scored by the variety of categories of relevant responses) was excluded from the figural test due to indistinguishable scores (Torrance and Ball 1984; Torrance 1990). Thirteen criterion-referenced creativity measures labelled 'Creative Strengths' were later included, namely: emotional expressiveness, storytelling articulateness, movement or action, expressiveness of titles, synthesis of incomplete figures, synthesis of lines or circles, unusual visualisation, internal visualisation, extending or breaking boundaries, humour, richness of imagery, colourfulness of imagery and fantasy (Torrance 1990; Torrance and Ball 1984). While the TTCT has been highly praised, it has also been criticised for only measuring a finite number of creative abilities which do not operationalise Torrance's definition of creativity (Kim 2006). As a result, Plucker and Runco (1998) suggested the use of two (or more) indicators of creativity for assessment, based on the specific purpose. Another point of criticism is the fact that the TTCT might be more appropriate to assess creative potential rather than actual creative achievements (Cropley 2000). This is the key reason why TTCT can be an interesting approach for identifying intrapreneurial potential.

Inspired by the TTCT, this study will explore whether it is possible to design a qualitative production-based test in the context of CE that can identify differences in levels of specific characteristics between individuals. The study examines whether such a test can be designed so that it fits the context as well as provide deeper insights into intrapreneurial potential in individuals. It develops task examples, a test design as well as qualitatively tests these for validity, based on test development literature. Finally, the study provides examples of how to extract, score and analyse data from such a qualitative production-based test.

Research design

The development of a new test may involve certain standard procedures, including item development, testing of items on suitable samples and analysing results (Irwing and Hughes 2018). Test development is a complex task and can be resource intensive

in terms of affirming the reliability and validity of the instrument (Johnson and Christensen 2019). While the literature on test development is highly advanced for psychometric tests, which are usually quantitative in nature, there seems to be a lack of sources in terms of the development of qualitative production-based tests. As such, the suggestions of Irwing and Hughes (2018) were used as inspiration in this paper. The authors suggest that the steps in test development can be done iteratively and should be modified depending on the type and purpose of the specific test (Irwing and Hughes 2018). For this paper, the procedure was executed using the following steps:

1. Construct development: intrapreneurial characteristics
2. Overall planning: test design and administration
3. Task development
4. Task review
5. Test pilots (students)
6. Field tests (company)
7. Scale construction

Construct development: intrapreneurial characteristics

A point of departure for developing a test to assess intrapreneurial potential is to look into what characterises an intrapreneur. Several studies have investigated the factors related to intrapreneurs, that is, intrapreneurial characteristics. For example, Hayton and Kelley (2006) presented a competency framework with measurable knowledge, skills and abilities that contribute to these competencies. The authors present seventeen characteristics concluded from the corporate entrepreneurship literature only. In another paper, Elia et al. (2017) suggested twenty psychological characteristics of individuals involved in corporate entrepreneurial processes, along with four professional characteristics (background and work experience) as well as twenty-eight organisation-related antecedents. These were identified from a multidisciplinary literature review in the fields of corporate entrepreneurship, creativity and organisational innovation.

More recently, Brøndum (2019) reviewed empirical research done at the individual level of intrapreneurship and corporate entrepreneurship to uncover the characteristics of these individuals. In total, nineteen intrapreneurial characteristics were identified from nearly a thousand items found in the empirical data. The paper reviews the research from its starting point until now covering a total of 87 sources.

The nineteen characteristics found in the Brøndum (2019) paper will be used as the guiding intrapreneurial abilities in this study. This is because the scope in the Brøndum (2019) review is context-dependent to this present study, and it is by far the most comprehensive and rigorous review of individual intrapreneurial characteristics

to date.[53] In Table 13, the nineteen characteristics are briefly described (please see Brøndum 2019, for a more comprehensive description of each characteristic).

Characteristic	Short description
1. Creative innovator	Out-of-the-box thinking, comes up with original and novel ideas appropriate for the employing organisation. Can combine knowledge in new ways and adapt ideas to new settings.
2. High achiever	Desire for achievement, ambitious with high growth expectations about their entrepreneurial endeavour. Passionate, hardworking and determined to win.
3. Proactive initiator	Dreamers who do. Proactively take the lead in introducing and implementing innovations. Act opportunistically on ideas.
4. Risk taker	Risk tolerant, courageously takes risks to change the status quo. Seeks to reduce risks from diversification experimentation. Boldly takes reputational risks but not personal financial risks.
5. Organisational networker	Builds relationships, coordinates and make connections internally and externally. Not afraid of crossing organisational boundaries. Knows how to play the political game in an organisation.
6. Self-confident	Believe in their own capabilities to drive innovations to successful implementation. Have the confidence to engage in creative activities.

[53] As a comparison, Blanka (2018) reviewed 32 articles from 2005 to 2016 by exclusively using the keyword *intrapreneur* in her review of the literature on intrapreneurship at the individual level. In a closely related field, Hero et al. (2017) identified seventeen individual innovative competency factors from 28 articles.

7. Flexible open-minded	Can quickly change course of action and adjust when needed as well as being open to new ideas and experiences. Eager to learn new things.
8. Enthusiastically perseverant	Stays positive, determined and does not give up at the first sign of difficulty. Shows great enthusiasm about ideas and the employing organisation
9. Opportunity recogniser	Identifies patterns and business opportunities with a focus on customers and the employing organisation. Curious by heart and consistently looking for new opportunities.
10. Experimentational problem solver	Overcomes dilemmas and challenges and finds solutions through experimentation and discovery. Employs a hypothesis-testing mindset.
11. Persuasive influencer	Influences and inspires others to agree on a new idea or vision through trustworthiness and effective communication.
12. Autonomous	Independent, freedom-seeking individuals with a desire for organisational elasticity and autonomy.
13. Team organiser	Team-oriented and collaborative. Self-appointed leaders with abilities to develop and organise teams.
14. Change agent	Supports and enables novel ideas and technologies – thrives to change the environment for the better.
15. Idea generator	Natural idea generators. Comes up with ideas that are powerful and workable for the employing organisation.
16. Business planner	Strong business acumen and understands comprehensive processes and complex strategic plans. Objectively evaluates and assesses opportunities through analytical skills based on evidence from the market.

17. Visionary	Visualise and conceptualise beyond the current status quo through a bold, forward-looking approach.
18. Customer-focused	Puts customers (or target groups) first; understands and can interpret customer issues. High level of empathy.
19. Decision maker	Wish to participate in decision making. Collects information and engages in evidence-based decision making. Manage to be objective, even if a project needs to be closed down.

Table 13: The nineteen intrapreneurial characteristics (derived from Brøndum, 2019).

Expert informants (three academics and one practitioner) were invited to discuss the nineteen characteristics and if they were in line with what the experts had experienced through research and in the real world of intrapreneurship. The results from this qualitative validity test revealed a high agreement between the experts on these nineteen characteristics of an intrapreneur. As such, the author used these characteristics as the guiding construct throughout the test development process.

Overall planning: test design and administration

The design and administration of the TTCT was used as guiding inspiration in the test design and administration, particularly because:

1. The TTCT is highly popular and acknowledged in academia and practice;
2. Multiple studies have confirmed its validity; and
3. Scholars have praised it for being able to identify potential (Cropley 2000).

The specifics of the TTCT and the design and administration choices made by the author are shown in Table 14.

TTCT design	**Test design choices made by the author**
The TTCT consists of nine tasks[54] (six verbal and three figural), which last either five or ten minutes each. The total duration of the TTCT is seventy minutes. The answers are conducted	- Include around nine tasks – both verbal (written) and figural (drawing).

[54] Torrance (1980) uses the term ‘activity’ instead of ‘task’.

both as drawings (figural) and written text (verbal).	- Each task should last between five and ten minutes - The total duration should be around seventy minutes.
Each task includes a short scenario description (five to ten sentences) describing the task and some space for the subject to fill in their answers (empty lines or illustration boxes). When used with children, an administrator reads the descriptions aloud, otherwise, subjects read it themselves.	- Include a short scenario description for each task - Include empty lines or illustration boxes to make it as self-explanatory as possible. - Use an administrator to keep time and tell when time is up.
The tasks in the TTCT (except activities 1 to 3 in the verbal form) are based on different scenarios, meaning that subjects need to familiarise with distinct situations throughout the completion of the test. The scenarios are very general and can be used d with children as well as adults.	- Tasks should have different scenarios throughout the test and not only one consistent scenario/case - The tasks should be closely related to a real-life business or everyday-life situations and developed for adults (including young adults) only, as these are the target group.
The subjects do the test individually, using a paper-and-pencil format. Subjects are not allowed to talk to each other but can get assistance from the administrator if any doubts occur during the session.	- Subjects should fill out the test, individually, by hand using pen and paper. Potentially computer-administrated in the future. - Restrict subjects from talking to each other, use phones, computers or other distracting devices. - Allow the subjects to ask questions to the administrator quietly and one-on-one.
Each task in the TTCT is designed to measure several abilities (or characteristics) and not only one or two.	- Develop each intrapreneurial-related task to be able to measure at least three of the nineteen

	characteristics (see 'Task development' section).

Table 14: Test design and administration choices for the intrapreneurial test.

Task development

The development of intrapreneurship-related tasks followed an iterative process. The objective was to develop numerous tasks containing a short scenario description as closely related to a real-life corporate entrepreneurial setting. Furthermore, each task should be able to assess more than one of the nineteen intrapreneurial characteristics (preferably three or more).

First, a systematic attempt to translate the tasks from the TTCT to a corporate entrepreneurial setting was conducted during an expert interview with a creativity researcher with vast experience using and scoring the TTCT. In total, eight intrapreneurial tasks were developed (n = 8). These were tested for meaningfulness with different scholars (two creativity researchers and one entrepreneurship psychological researcher) to get feedback for further improvement. Simultaneously, the author conducted a series of expert interviews with an experienced intrapreneur. The author also gathered new inspiration by reviewing several relevant papers (Lau et al. 2012), publicly available training systems as well as exercises and tasks closely related to the intrapreneurial characteristics (for example, idetræning.dk, academyforcreativity.com, strategyzer.com, www.teachingentrepreneurship.com). The initial intrapreneurial tasks were then further developed based on the feedback, new knowledge and inspiration. Also, a series of new tasks were eventually designed (n = 24).

From an initial analysis by the author, some of the nineteen intrapreneurial characteristics turned out not to be present in the sample of developed tasks, for example, 'Team organiser', 'Organisational networker' and 'Enthusiastically perseverant' (see Table 13). Therefore, a series of individual expert interviews and creative discussions with a production test scholar and an intrapreneurship expert were conducted with the aim of developing new tasks that could measure these characteristics as well as several others. The sessions resulted in twenty-three additional intrapreneurial tasks (n = 23).

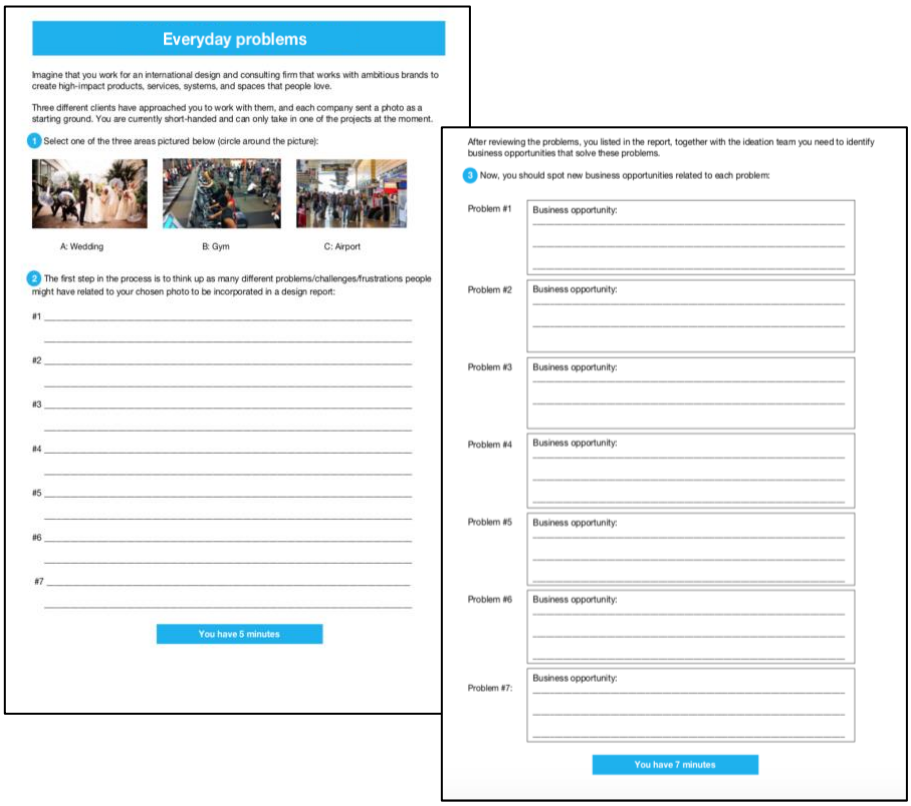
Throughout the task generation process, some of the more general grammar and linguistics rules regarding item design (Irwing and Hughes 2018) were incorporated to secure high comparability between the scenario descriptions. And for all expert interviews, the data processing and analysis entailed methods to ensure validity and reliability, including semi-structured interview guides, audio recordings of the interviews as well as transcriptions. The latter was shared afterwards and discussed with the invited subject experts (member checking) to verify the interpretive accuracy by the author and thereby increase reliability.

The total number of intrapreneurial tasks produced was fifty-five. These were categorised into three sub-groups by the author:

a) Hypothetical non-company-specific tasks (from the perspective of the subject).
b) Hypothetical company-specific tasks (situationally specific to the role of the subject within their company yet hypothetical).
c) Conceptual tasks (related to the subject's general knowledge of intrapreneurial concepts and driving innovations to successful conclusions).

To somehow qualify the accuracy of this categorisation exercise, several colleagues were invited to participate in the process. The components of the hypothetical tasks were based on the input from practitioners, making them grounded in real business or everyday-life situations. An example of each type can be seen in illustrations 1, 2 and 3.

'Everyday problems' is an example of a hypothetical non-company-specific task (see **Error! Reference source not found.**). It is designed to assess whether a subject can empathise with the chosen customer group ('Customer-focused'), solve their issues ('Experimental problem solver') in an original way and beyond the obvious ('Creative innovator'). The subject might identify business opportunities that add value to the corporation (by including partnerships or new revenue streams) as well as the customers ('Opportunity recognition') and generate various solutions that are distinct from each other ('Flexible open-minded'). Some might produce ideas that are particularly forward-looking ('Visionary') but still manage to develop solutions for each of their listed problems ('Enthusiastically perseverant') before time is called. Subjects are expected to write their answers using the pre-made blank lines within the given time frame (five minutes for the first sub-task and seven minutes for the second sub-task). In this example, there are seven predefined spaces to fill-in different problems and business opportunities. The task is intentionally designed so that subjects only see the first sub-task without knowing what is going to happen when they turn the page.



Everyday problems

Imagine that you work for an international design and consulting firm that works with ambitious brands to create high-impact products, services, systems, and spaces that people love.

Three different clients have approached you to work with them, and each company sent a photo as a starting ground. You are currently short-handed and can only take in one of the projects at the moment.

1 Select one of the three areas pictured below (circle around the picture):

A: Wedding B: Gym C: Airport

2 The first step in the process is to think up as many different problems/challenges/frustrations people might have related to your chosen photo to be incorporated in a design report:

#1 ____

#2 ____

#3 ____

#4 ____

#5 ____

#6 ____

#7 ____

You have 5 minutes

After reviewing the problems, you listed in the report, together with the ideation team you need to identify business opportunities that solve these problems.

3 Now, you should spot new business opportunities related to each problem:

Problem #1 Business opportunity:

Problem #2 Business opportunity:

Problem #3 Business opportunity:

Problem #4 Business opportunity:

Problem #5 Business opportunity:

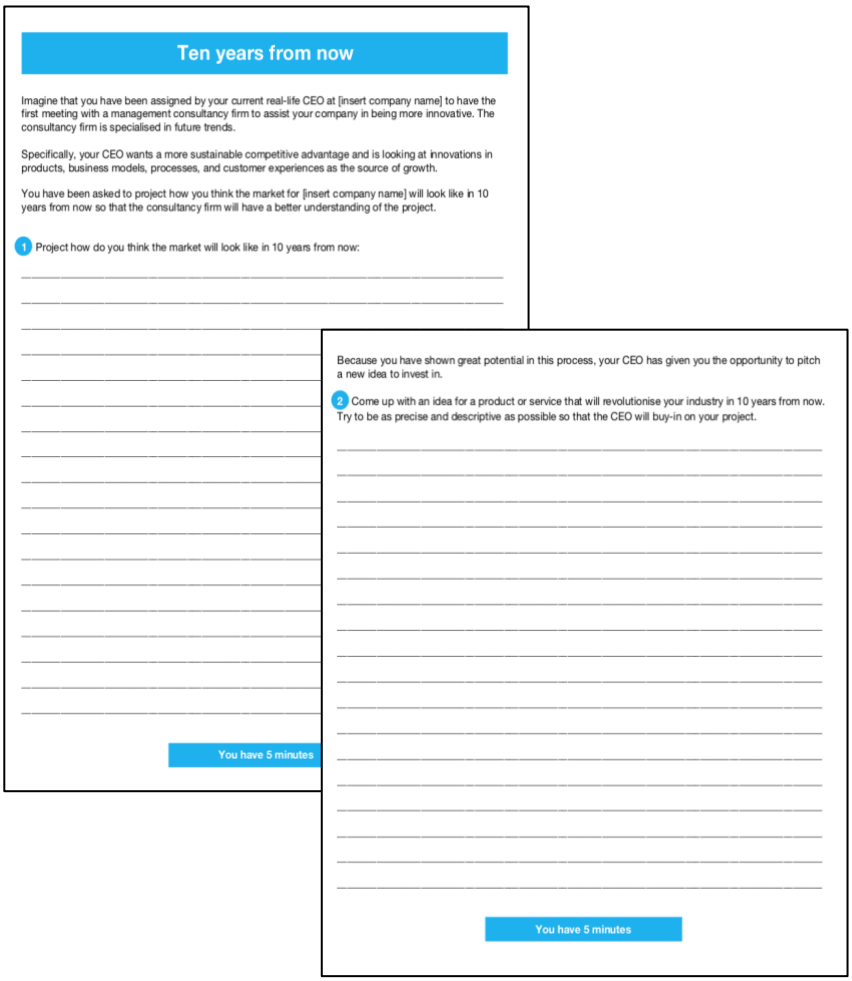
Problem #6 Business opportunity:

Problem #7: Business opportunity:

You have 7 minutes

Illustration 1: Example of a hypothetical non-company-specific task.

The task called ‘Ten years from now’ (see **Error! Reference source not found.**), is an example of a hypothetical company-specific task, as it is situationally specific to the role of the subject within their company. It is designed to assess whether the subject can envision future business scenarios (‘Visionary’), identify new opportunities from this (‘Opportunity recogniser’) and come up with an original idea (‘Creative innovator’) that is communicated in a compelling way (‘Persuasive influencer’). Subjects are expected to write their answers in the pre-made blank lines with five minutes available for each of the two sub-tasks. This task is also intentionally designed so that subjects only see the first sub-task without knowing what is going to happen when they turn the page.



Ten years from now

Imagine that you have been assigned by your current real-life CEO at [insert company name] to have the first meeting with a management consultancy firm to assist your company in being more innovative. The consultancy firm is specialised in future trends.

Specifically, your CEO wants a more sustainable competitive advantage and is looking at innovations in products, business models, processes, and customer experiences as the source of growth.

You have been asked to project how you think the market for [insert company name] will look like in 10 years from now so that the consultancy firm will have a better understanding of the project.

1 Project how do you think the market will look like in 10 years from now:

You have 5 minutes

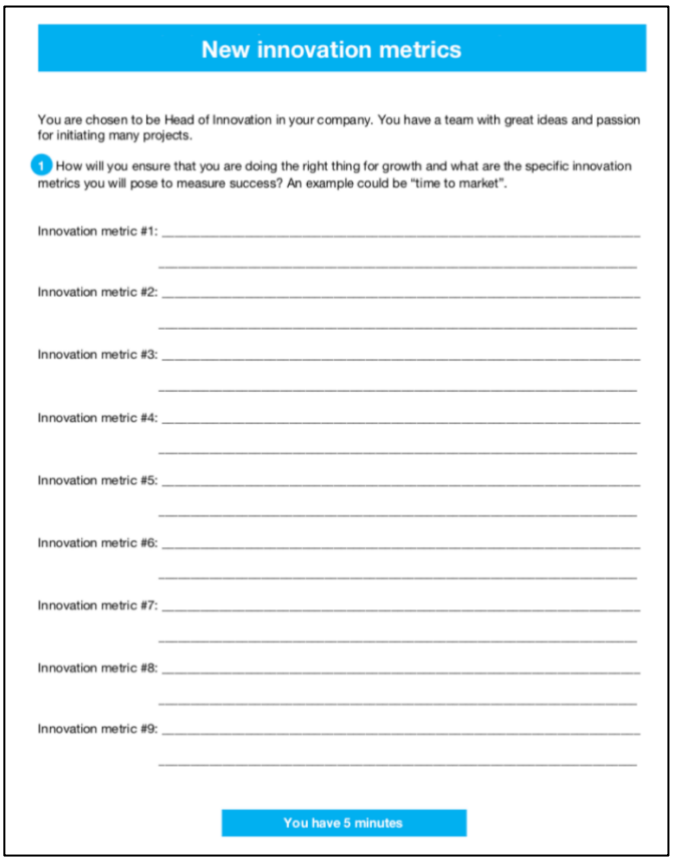
Because you have shown great potential in this process, your CEO has given you the opportunity to pitch a new idea to invest in.

2 Come up with an idea for a product or service that will revolutionise your industry in 10 years from now. Try to be as precise and descriptive as possible so that the CEO will buy-in on your project.

You have 5 minutes

Illustration 2: Example of a hypothetical company-specific task.

The task ‘New innovation metrics’ (see **Error! Reference source not found.**) is an example of a conceptual task, as it is related to the subject’s general knowledge of intrapreneurial concepts and driving innovations to successful conclusions. It is designed to assess whether the subject seeks to reduce risks through diversification (‘Risk taker’) by applying a hypothesis-testing mindset (‘Experimentational problem solver’). Also, this task is designed to assess a subject’s general business understanding (‘Business planner’). Subjects can provide up to nine different answers in the blank lines within five minutes. This task does not contain any sub-tasks.



New innovation metrics

You are chosen to be Head of Innovation in your company. You have a team with great ideas and passion for initiating many projects.

1 How will you ensure that you are doing the right thing for growth and what are the specific innovation metrics you will pose to measure success? An example could be "time to market".

Innovation metric #1: _____

Innovation metric #2: _____

Innovation metric #3: _____

Innovation metric #4: _____

Innovation metric #5: _____

Innovation metric #6: _____

Innovation metric #7: _____

Innovation metric #8: _____

Innovation metric #9: _____

You have 5 minutes

Illustration 3: Example of a conceptual task.

Task review

Using expert groups to review items (or, in this study, tasks) is highly effective (DeMaio and Landreth 2004; Presser and Blair 1994). Therefore, a group of four experts was assembled to qualitatively review how the developed tasks related to the nineteen intrapreneurial characteristics by Brøndum (2019). Two subject-matter experts were invited to focus primarily on task accuracy and task bias. An expert in test design was invited to focus on developing a good design of the tasks. Furthermore, an experienced intrapreneur was invited to focus especially on the comprehensibility of the tasks to the population and to identify potentially biased or objectionable tasks. The group also looked for tasks that overlapped the same characteristics, and they evaluated the relevancy of each task as well as easiness to comprehend on a general level. Thirty-three tasks were excluded in this task review, leaving a pool of twenty-two intrapreneurial-based tasks.

Pilot tests

It was decided to conduct two pilot tests with master's students enrolled in a thirty ECTS course on corporate entrepreneurship before test piloting with the target group. Eleven tasks were selected for these pilot tests, which were equivalent to a ninety minute test. The inclusion criteria were that the tasks should cover hypothetical non-company-specific tasks, hypothetical company-specific tasks as well as conceptual tasks. Additionally, the included tasks should altogether cover the nineteen intrapreneurship characteristics more than once as well as include elements of both figural (drawing – optional) and verbal (written – not optional). The duration of ninety minutes (compared to the TTCT of seventy minutes) was a necessary compromise to cover all nineteen characteristics more than once. Nevertheless, making the test a bit longer could also make it appear even more serious in the eyes of companies.

The eleven tasks were assembled in one booklet using a paper-and-pencil format. The order of the tasks was randomly chosen but alternating between the type of task (hypothetical non-company-specific task, hypothetical company-specific task and conceptual tasks) so they were never repeated twice. The test was timed by an administrator (the author). For each task, the subjects were told when they reached the half-way mark and again when one minute remained. The first test pilot involved three students, while the second involved four students. The students were given a short introduction to the test and its requirements, including no talking, no computers and no phones. During the test, observational notes were taken by the author. These notes included observations about how long it took before the participants started filling in their answers; notes about when they stopped writing and drawing; their expressions when they read the scenarios; if they got distracted and so on.

After the test pilot was finished, group interviews were conducted. Group interviews were chosen as they are data-rich, can stimulate the respondents and support them in remembering events, and can generate responses beyond the answers of a single interviewee (Flick 2009). A semi-structured interview format (Kvale 1996) was applied around the following themes: the overall experience during the test, the meaningfulness of the test, its relatedness to intrapreneurship theory, the test design (number of activities, the time duration of each activity and the total duration of the test), technicalities (tricky wording) and suggestions for further improvements. The main focus was, however, to facilitate discussions among the participants around specific topics, in line with recommendations made by Berg and Lune (2012). The first student group interview had a duration of twenty-four minutes, while the second lasted thirty-two minutes. The audio was recorded in each interview, so that the author could focus entirely on facilitating the discussion and mediating between the participants.

Field tests

Before the company field tests, an initial data analysis, conducted by the author and a peer, indicated that the hypothetical non-company-specific tasks were superior in terms of assessing the output concerning the nineteen characteristics. The peer was invited to participate in the review process to increase validity. As a result, it was decided to only include hypothetical non-company-specific tasks that, combined, covered the nineteen intrapreneurship characteristics two times or more and included elements of both figural (drawing – optional) and verbal (written – not optional). Also, to increase the average time for each task, it was decided to go from a total of eleven to ten tasks.

The two company field tests were conducted in the innovation department of a large international organisation based in Denmark. Ten tasks were selected for the two 90-minutes field tests (see appendix A for an overview of the included tasks). In the first company field test, twelve employees participated: four were managers, five were product and process designers and three were scientists, with an average age of 36.9. Six other employees participated in the second field test: two were managers and four were scientists, with an average age of 38.

All participants in the company field tests were given a short introduction to the test and its requirements. The author took observational notes while the subjects did the test. Afterwards, focus group interviews were conducted using the same semi-structured interview format as described above. The interviews were seventeen minutes, fifteen minutes and eighteen minutes, respectively, for the first and second company field test groups.[55]

Scale construction

To initially test whether or not the characteristics could be identified when analysing the responses from the field tests, it was decided to use the consensual assessment technique (CAT), developed by Amabile (1982), as a guiding principle. The CAT method relies on a panel of expert judges that are asked to rate the creativity of a certain output[56] with the highest transparency and objectivity (Hennessey et al. 2011). Still, judges are basing the criteria on their own subjective opinion. This method was originally developed to assess outputs in the field of creativity; nevertheless, it was found to be applicable to this context as well, because:

a) creativity is related to intrapreneurship and CE; and

[55] As the first field test had twelve participants, these were divided into two six-person groups for the focus group interviews, following the recommendation by Patton (2002).

[56] In the original work by Amabile (1982), a product-centred operational definition is used. The term ‘product’ is used to describe the subject of assessment, which is distinctive from the process or the person. It could be an actual product (for example, a silly design made of paper and cardboards, a collage or a poem) but could also be a written response.

b) the objective in this step was to evaluate a given output and spot differences in levels of specific intrapreneurial characteristics.

While the CAT prescribes the judges to score independently without talking to one another afterwards, the author decided to make some deviations. As the aim of this study is to explore whether it is possible to design a qualitative production-based test in the context corporate entrepreneurship where differences in levels of specific characteristics can be identified, judges were required to select and define the level of classification (i.e. low, medium, and high) for each task and the related characteristics – but not on an general level. It was, therefore, necessary to include a more qualitative investigation answering all the 'why's' behind the judges' subjective and correlated assessments. For instance, why is one answer rated as high on one characteristic and low on another? The implicit thought process behind the actual judgement of each judge was found to be highly valuable. Also, the discussion between the judges was useful for this study.

The author gathered a group of expert judges to subjectively analyse the test answers and evaluate whether the characteristics related to a specific task could be recognised or not and if it was possible to spot any difference in level, following the guidelines proposed by Amabile (1982) and Hennessey et al. (2011). The expert judges consisted of one experienced intrapreneur, one corporate entrepreneurship consultant and one experienced manager of intrapreneurs. Before the actual session, the author digitalised all answers from the two company field tests and together with a peer, analysed and scored these in relation to their associated intrapreneurial characteristics, using a 3-point Likert scale (low, medium, high). At the scoring session, the judges were provided with an envelope for each task, containing the task description as well as several different subject answers (ranging from five to ten answers). These subject answers were handpicked by the author to somehow ensure representation of low, medium and high scoring answers to each task. This step was found necessary to make the session as efficient as possible. The ID numbers of subject answers were anonymized by the author and changed into 'Person A', 'Person B', 'Person C' and so forth for each task. Also, as the author handpicked the subject answers, 'Person A' in the first task and 'Person A' in the second never represented the same subject. This step was also done to decrease the risk of experts favouring (or disfavouring) one respondent throughout the scoring process, for example, if a subject made an excellent answer to the first task, the experts might expect the same quality answers in the next and be biased in the scoring of these.

The scoring session with expert judges was done in the following way:

- Firstly, the expert judges individually read all the subject answers for a task and started to rate these against each other using their own subjective opinion. They were told to mark the text either green (high) or red (low) if they felt a particular part of the answer indicated a low or high score. To decrease the level of inter-

judge reliability, the judges assessed the answers in a different random order for each task. To speed up the learning curve, the expert judges had had a walk-through of the entire test before-hand.

- Secondly, they were told to share their low and high scoring answers with each other and explain why they marked an answer low or high to reach a consensual agreement.
- Thirdly, the experts were asked to discuss which of the nineteen characteristics the high scoring answers featured and the same for the low scoring answers. They did this without knowing which characteristics the specific task was intended to measure. This step was done to test the validity in each task qualitatively, that is, whether or not the task measured what it claimed to measure.
- Fourthly, the author revealed which of the nineteen characteristics the specific task was designed to measure. If there were any disagreements, this was discussed afterwards.

The session with the expert judges lasted 4.5 hours in total. The arguments for using the CAT as a guiding principle in this study is twofold. Firstly, the assumption in the CAT is that an appropriate group of judges[57] can achieve reliable judgments of product/output/response creativity. Secondly, CAT relies on the assumption that degrees of creativity exist. Judges should, therefore, at a satisfactory level, be able to range different products, outputs or responses based on the degree of creativity. Even though this method was developed for creativity, it was found plausible that intrapreneurial experts were:

- able to make reliable judgments of responses to intrapreneurial-based tasks; and
- range responses on the degree of different intrapreneurial characteristics.

Analysis and results

The data processing and analysis included analytical pattern recognition to ensure validity and reliability. Data was coded into the following themes: comparing test methods, relatedness to intrapreneurship, scale construction, test content, test duration and task duration, and general experience of the test.

Scoring

From the focus group interviews, some subjects mentioned a concern about the scoring of their answers. ‘I don’t know how you will score it’, one company subject responded during the interviews. One of the student subjects also reflected, ‘What

[57] Expert judges should have familiarity with the domain in question. If used within creativity, this means that the judges are not required to have developed highly creative outputs themselves (Hennessey et al. 2011). Rather, it is their field of expertise that is important.

surprised me the most was the content of these tasks. I would have guessed it would be a more direct way of testing this – this feels more indirect'.

From the test pilots, it was difficult to obtain good scores from the conceptual tasks. The student interviews also implied potential problems with this specific task type: 'Some tasks are maybe biased for the ones that know the related theory – for example, the one about innovative metrics'.[58] Furthermore, preliminary discussions with the expert judges indicated that the hypothetical company-specific tasks would need experts from the specific companies in question to evaluate these appropriately. As a result of this, the conceptual tasks and the hypothetical company-specific tasks were not included in the two company field tests.

For the hypothetical non-company-specific tasks, the expert judges were able to identify associated characteristics as well as a difference in the level of the answers in eighteen out of the nineteen characteristics (a matrix of the different tasks and their related characteristics can be found in appendix).

An example of three different answers to a specific task can be found in **Error! Reference source not found.**[59]. In task number nine, the subjects are put in charge of an important project with a large budget within the field of robotics, where they have no expertise, knowledge or experience. They are then asked to elaborate on what actions they would take and why. As shown in **Error! Reference source not found.**, there is a big difference in the number of actions these subjects would take. By default, the number of characters used in an answer should not be the basis of the scoring. Person C only presented three different answers but describes how they would take the opportunity (high in 'Opportunity recogniser'), which shows signs of confidence and a strong belief in oneself (high in 'Self-confident) as well as willingness to take risks (high in 'Risk taker'). Person A, on the other hand, is more elaborate in their three inputs but shows signs of being unconfident (low in 'Self-confident'), not willing to learn new skills (low in 'Flexible open-minded') nor seek new opportunities (low in 'Opportunity recogniser'). Person B manages to develop twelve different outputs in the same time as the two other subjects with several concrete actions they would take (high in 'Proactive Initiator') and not just using 'empty' statements throughout the answer. In contrast, Person C showed signs of knowing a concept in theory but not how to operationalise in reality. This is exemplified with the statement: 'Make some engagement in story', instead of actually describing the story they would make (low in 'Proactive Initiator'). Person B is, furthermore, very structured in their arguments and addresses many different aspects (high in 'Business Planner') and is curious to learn new things to get up to speed

[58] The subjects were referring to the task called 'New Innovation Metrics', which is visualized in illustration 3.

[59] Also, see appendix related to this article for an easily readable version.

(high in ‘Flexible open-minded), while Person A and C are very narrow in their arguments (low in ‘Business Planner’). Both Person B and C put a high emphasis on developing a team (high in ‘Team organiser’), whereas Person A do not mention anything about teams; as such, we cannot judge if Person B is team-oriented or not in this task. Finally, Person B also takes on the opportunity with confidence (high in ‘Opportunity recogniser’, ‘Self-confident’ and ‘Risk taker’). Still, unlike the two others, they also focus on involving externals, for example, universities and potential suppliers as well as proposes innovative ways of communication across organisational boundaries (high in ‘Organisational networker’).

Interestingly, the expert judges were able to spot elements in an output that got a high score in some characteristics as well as low in other characteristics. As seen in the example above, one respondent was found to be scoring high in the characteristics ‘Team organiser’, ‘Self-confident’, and ‘Opportunity recogniser’ (marked with a green box in **Error! Reference source not found.**), but low on ‘Proactive initiator’ as well as ‘Business planner’ (marked with a red box). Another example was in task number eight, where a respondent scored high on the characteristics ‘Experimental problem solver’, 'Customer-focused’ and ‘High achiever’, but low on ’Self-confident’.

In some of the tasks, it was challenging for the judges to separate several characteristics. For example, in task numbers three, five, nine and ten, the judges had a hard time differentiating the characteristics ‘Risk Taker’ and ’Self-confident’ in some of the answers. For example, one subject stated “I will do it myself”, when asked what they would do to motivate colleagues to get on board of a new exciting opportunity backed by the organisation with a large budget, after failing to do so for several weeks. The answer shows signs of confidence in oneself (‘Self-confident’), but also a sign of someone willing to take risks (‘Risk taker’).

A final result from the scoring was that the judges failed to spot one of the characteristics in the answers by the subjects from the sample. This characteristic is the one labelled ‘Autonomous’ in Table 13.

From this analysis, it is possible to conclude that the expert judges were able to spot numerous characteristics for each of the ten selected hypothetical non-company-specific tasks. Also, they were able to identify a difference in the level of the answers in all of the nineteen characteristics, except for one characteristic (‘Autonomous’). This element gave the experts a feeling that a somewhat convincing in-depth evaluation of each could be concluded from this test. One of the expert judges (the manager) even stated that ‘If I had to do some corporate entrepreneurial initiatives in my organisation and got three of these fully-completed answers, then I am pretty sure that I – with this test – could find the right profile. It would be a really good starting point to make the right choices and choose the right profile. Of course, I also wanted to meet in-person with this individual. But these answers give me a lot as a manager’.

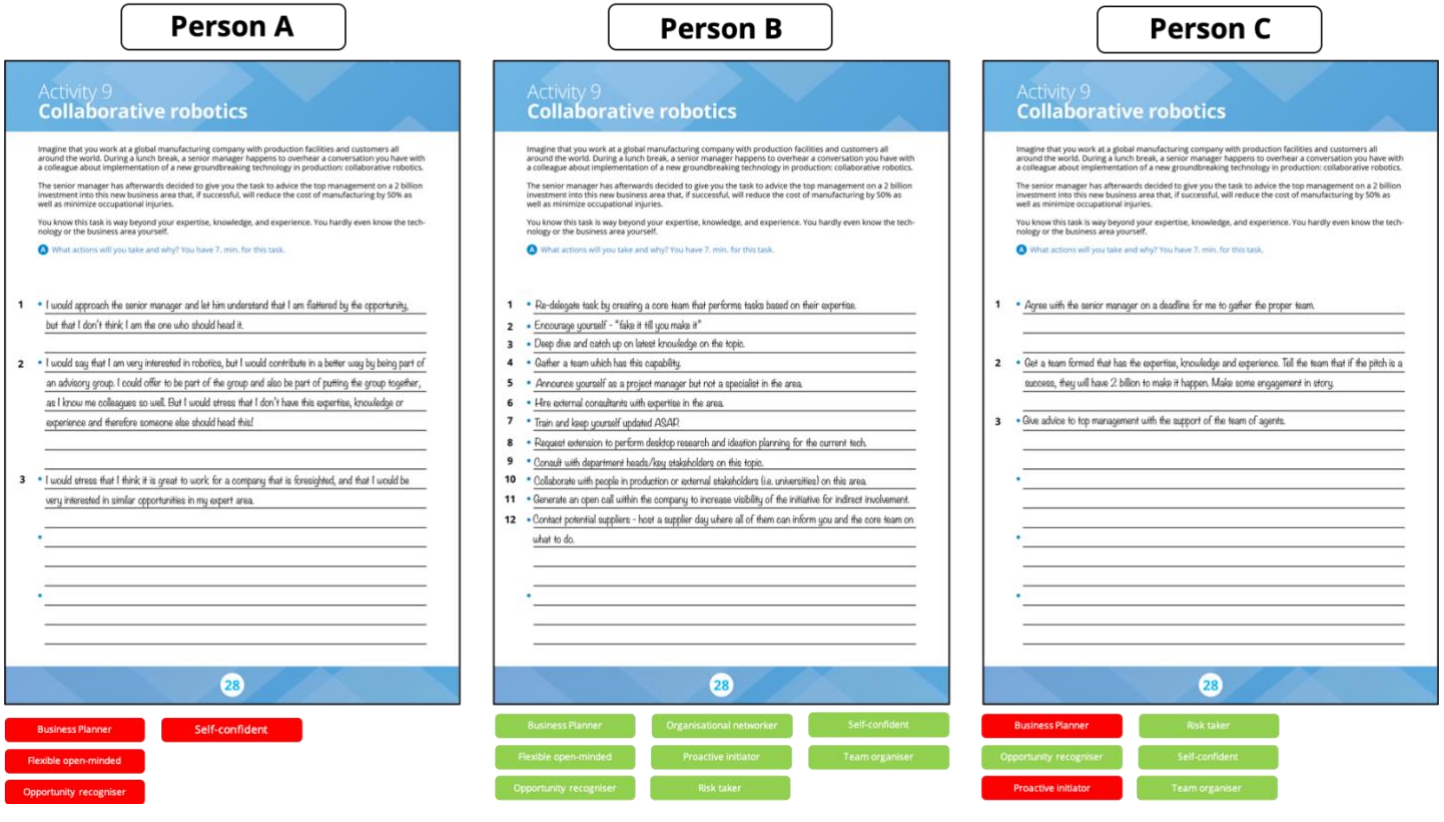


Illustration 4: Examples of three different outputs for task nine.

Comparing test methods

A common topic in the focus group interviews were a comparison between this type of test and typical assessment instruments used in organisations. Some subjects stated that this qualitative production-based approach was more interesting than more traditional tests (multiple-choice, surveys, self-reporting), but also that this type of test was harder to do. Yet, the open-ended qualitative design was highly valued, and subjects liked the fact that they answered through brainstorming without a filter. One company subject said: 'You feel freer. In the personality tests, you sometimes have to agree with things that that you don't necessarily agree with 100%. "You need to say yes or no". Here, you write what you would do'. Another subject followed: 'Yeah, you can read a lot of things of this – the thinking process or the creativity, the understanding'. One student stated that 'this way is for me, personally, much more comfortable. I feel like I can be me and not just a number in an excel spreadsheet. This is a way nicer tool than a questionnaire or IQ Test'.

From this analysis, it is possible to state that a qualitative production-based test is found to be more interesting, but also more exhausting to perform. Also, the qualitative design allowed the individuals to express exactly what they wanted, which they found to be an advantage in terms of assessing them as an individual.

Relatedness to intrapreneurship and CE

A topic that was also frequently discussed in the focus group interviews was the relatedness of the tasks to real-life intrapreneurship, CE and innovation processes. Everyone agreed that there was a high correlation, 'One hundred per cent', one of the company tests said. In general, all involved experts as well as test subjects, felt that the tasks were relevant in terms of intrapreneurship and CE. One of the subjects from the first company field test further elaborated that, 'this is what we do [in our innovation team] and I think you can find that in a lot of [innovation] teams'. The similarities to real life was a topic frequently mentioned in the company interviews. 'I think it is much closer to reality … even though these are made up problems', one subject stated from the company tests. Another followed, 'I think we are faced with these challenges … on an everyday basis'. For the students, the similarities of the scenarios to real life was mentioned as a significant motivational factor.

One concern mentioned in the company interviews was that the similarities to real life of the tasks could make them harder for new graduates: 'It might depend on how much work experience you have. I could imagine that if you come directly from … education … it can be hard to think about some of them [the tasks]', one subject said. 'There is a lot of organisational understanding that you need to have in order to answer some of the questions at least', another subject disclosed. At least some subjects mentioned that their past experiences played a certain part in their answers; '… in these cases … I have been thinking about situations I have been going through or ideas I have had … you can have people that have never gone through this'. One

of the younger subjects from the company field tests expressed that, ‘it was a bit hard sometimes, especially with the people management [problems in tasks]’.

Also, the trustworthiness was a topic that were up to debate in the focus group interviews. One company subject declared that, ‘it was also a bit confronting when you say: “and the board doesn’t like this approach”. Will you drop it or risk it? It makes you feel like “oh, what would I actually do if that was in a real-life situation. Would I let it go or would I still fight for what I believe in?”’. When explicitly asked about the trustworthiness of their answers, another company subject replied, ‘I would put what I would do in reality’.

From this analysis, it is possible to state that the lifelikeness of the scenarios in the different tasks was a motivational factor that all subjects valued. On the other hand, the similarities to real life could also be a potential limitation for new graduates if they do not have the tacit knowledge of being part of an organisation or experience with people management. In general, the trustworthiness of the subject’s answers was found to be high, even though some of the scenarios were a bit provoking.

Test content

A secondary topic of the focus group interviews was the design of the tasks. Some said that the variation kept them focused and motivated all the way through: ‘the variation was nice. It is not like you just do another version of the same task’. The fact that they needed to go through several different scenarios was seen as an advantage and motivating factor, compared to having, for example, only one recurring case. Or, as one subject said: ‘It was a good thing that there was a lot of variation in the tasks, so it did not become boring. One single case would have been something else and certainly not better’. Generally, subjects liked the drawing part; ‘you are often thinking faster than you write, so it can get boring or frustrating if you just write and write and write, but when you at some point get a totally new task and actually draw something, and when you draw it, it is sometimes actually at the same speed as when you think about it. So, it is a different way of speeding up (or down) your way of thinking, which is nice, I think’.

A well-discussed topic was the actual number of tasks to perform. The students found that eleven tasks were too many: ‘I might have preferred that it was maybe seven or eight scenarios with more sub-tasks, because every time you are working on a scenario, then I did not think about the time at all. But when I finished earlier and when I was flipping for a completely new assignment, then I felt “okay, yet another one”’. From the company field tests, the results were the same, ‘We don’t need as many, like … if you did seven, I think it was fine …. you don’t need to do ten, because it starts reminding of each other – a little bit, for me. Or, otherwise, my thinking is just, sort of, coming into one’.

A design-specific issue related to the actual number of available blank lines in each task was mentioned in the student interviews. One student said that, ‘when you see that there are seven boxes that be filled out, you automatically would like to fill out all seven’. Additionally, the observational notes from the test pilots showed that subjects were in lack of writing space for some tasks. As a result, all tasks were extended with twice the amount of blank lines or boxes for the company field tests. The observational notes from the field tests later showed this was more appropriate, as no subjects lacked space.

Test and task duration

A related topic to the total number of tasks was the overall test duration. The observational notes showed that the subject in the test pilots started to look tired around sixty-two to sixty-seven minutes into the test. However, the student subjects agreed during the interview that ninety minutes for this type of assessment seemed about right. The observational notes were about the same for the company subjects also doing a ninety-minute test (but with only ten tasks and slightly more time for some of the tasks). Around forty minutes in, subjects asked for a potential break. When the time passed sixty-four minutes, subjects started to show signs of tiredness when starting a new task. This was later confirmed in the interviews, as all company subjects thought it was too long. Furthermore, they felt that the quality in their answers might have decreased in the end due to the extent of the test.

When discussing the duration of each tasks, all subjects agreed that they felt time pressured. One subject said: ‘I did not experience that we had too much time for any of the tasks … because, at least for me, I could just continue with all of them – and I wasn’t sitting and waiting before you said stop’. Another subject had a different view, ‘I actually think that it is good that you are almost in lack of time because it forces you to just get it out’. This was confirmed in the observational notes, as some of the subjects from the pilot tests managed to finish before time was called on several occasions doing the conceptual tasks. In contrast, in the company field tests, only a few subjects completed before time was called (no conceptual tasks were included in that version of the test).

From this analysis, it is possible to state that subjects started to look tired around sixty minutes into the test, thus the test may be a bit too long. Students felt that a ninety-minute test was appropriate, but company representatives wanted a shorter version. No clear results could be drawn about the duration of each task.

General experience of the test

When discussing the task-based approach, some felt, ‘I think it was fun, but it was also hard. I feel tired in my head now and in my arm, but I think it was fun’. Some test subjects found that the scenario descriptions (five to ten lines of text) were too technical and lengthy. In contrast, others wanted an even longer description to get better emerged into the situation, and thereby increase the degree of involvement in

the specific issue at hand. 'I think in each scenario there was not a lot of details, so a lot of what you are writing as a suggestion is based on a lot of assumptions', one subject from the company field tests expressed. Another replied that, '… a lot of the tasks were more around your approach than the actual task, so it was more "what is your decision-making process, how would you tackle this", then it didn't matter that much around what it actually was, but that you were in some kind of dilemma or conflict'.

Predominantly, subjects thought the test was easy to understand. A few tricky words were mentioned during the test piloting and company field test interviews, but in each case, the subjects understood the general idea about the task even if they missed a word.

From this analysis, it is possible to state that the subjects liked this task-based approach as a test instrument. No clear conclusion could be drawn in terms of the length and nature of the scenario text pieces, only that subjects – in general – felt that the test was easy to understand.

Discussion and conclusion

In this paper, a qualitative production-based test was designed, reviewed and tested by following a series of proven procedures from the psychometric literature, adjusted to this setting. The data processing and analysis included various methods to ensure validity and reliability, including semi-structured interview guides, audio/video recording of the interviews, transcriptions, field notes and analytical pattern recognition in the empirical work.

Results showed that production-based tasks could indeed provide an in-depth assessment of an individuals' potential in relation to intrapreneurial characteristics. The subjects from the test pilots and company field tests argued that this method of enquiry felt more personal and that the answers would tell much more about them, as an individual, than some numbers in a spreadsheet (for example in traditional self-reporting tests or personality tests). The results from the preliminary scoring confirm this (see 'Scoring' section). Nevertheless, a potential bias that needs to be addressed is the trustworthiness of answers given by subjects in this test. The risk of subjects applying game-like behaviour in their answers is a credible concern because the tasks are hypothetical. Yet, results from the group interviews indicated a high level of reliability in their answers. Further research could look into this matter by interviewing selected subjects after the scoring and discussing 'red flags' to uncover if people are, in fact, stating what they would do in real situations.

Another approach would be to redesign some of the tasks so that they prompt more personal engagement. For example, in task number three, the subjects were asked to defend an imaginary idea that receives incomprehensible scepticism from the CEO. A way to stimulate more personal engagement from the subjects in their answers

would be to change to scenario so that the subject would first be asked to come up with the idea that they, in the next sub-task, learned that the CEO did not like and thus should defend. In a paper-and-pencil format, this might not be as lifelike as required. Nevertheless, if the test was changed into being either computer-administrated or a role-playing game, it might stimulate more personal engagement if such changes were made. This test is, however, initially designed to identify intrapreneurial potential, that is, latent abilities that may be developed and lead to future success or usefulness, and not actual intrapreneurial achievements. This means that if a person is capable of thinking up things in a certain way, the chances of this happening in the future are higher than if that person were not able to think in this way.

One of the key findings from this study is that the expert judges were able to identify differences in the level of the answers in eighteen out of the nineteen characteristics for hypothetical and non-company-specific tasks using an adjusted version of the CAT (Amabile 1982). On the contrary, it was difficult to derive useful evaluations from the conceptual tasks. The scoring of hypothetical non-company-specific tasks and hypothetical company-specific tasks both require expert judges, which is rather resourceful and time-consuming. It is, however, plausible to develop a more standardised scoring guide for hypothetical non-company-specific tasks, which would make it possible to assess individuals without experts. The same is not feasible for hypothetical company-specific tasks, as they would require at least one judge from the actual company in question. Therefore, hypothetical non-company-specific tasks may prove to be the most feasible approach for production-based tests within the field of intrapreneurship and CE. Further research could investigate how such a guided scoring system based on generic examples and statistical infrequency could be developed, but it would require a larger sample size.

The one characteristic that the judges did not manage to identify in the test answers was the one called ‘Autonomous’ (see Table 13). There are several plausible reasons for this. One is that none of the respondents were low or high on this characteristic. This is a valid explanation, as the sample size was relatively low (n=18). Another explanation is that the ten tasks included in the company field tests were not properly designed to include aspects of this characteristic, even though some of the tasks (task numbers five and nine) were initially intended to spot elements of this characteristic among several others. A third plausible explanation is that the ‘Autonomous’ characteristic (defined by the desire for autonomy and seeking freedom to create) has several overlaps with elements in other characteristics, for example, ’Self-confident’ (self-efficacy), ‘Proactive initiator’ (acting opportunistically without waiting for someone to put them in charge), and ‘Organisational networker’ (playing the corporate game to get empowerment). Further research is needed to explore if it is possible to design (or redesign) a task that can uncover the ‘Autonomous’ characteristic, or if it is possible to identify this characteristic if the sample size increases.

The scoring also showed challenges with separating some of the answers into different characteristics, for example, 'Risk taker', 'Self-confident' and 'High achiever'. A plausible explanation for this is the fact that there are several overlaps between elements of some characteristics. A potential workaround would be to group the related characteristics into categories. Further research could look into this matter by collecting more data and do confirmatory factor analysis, as suggested by Irwing and Hughes (2018). Such a statistical analysis would, however, require a sample of at least 200 (Stevens 2009), but a sample of 500–1000 is preferred by several scholars (Irwing and Hughes 2018).

Another interesting finding from the scoring was that some subjects ended up by using 'empty' statements and terms in their answers that were not actionable. One explanation for this phenomenon is the fact that the subjects were under time pressure in each task. As such, the time allocated for each task could be increased, especially if the total number of tasks were reduced. Another solution could be to redesign the tasks so that they never ask the subjects to reveal what they would do, but how they would do it. However, several subjects in the sample managed to also describe how they would do what they stated in their answers. So maybe the right way to tackle empty statements would be to discuss these in a subsequent interview. In such a follow-up interview, the interviewee could ask: 'how would you create engagement in the story', to reveal the how rather than the what.

Should such an intrapreneurial production-based test be computer-assisted administration instead of paper and pen based? The group interviews showed contradictory opinions about this matter; students favoured a digital version, while company subjects liked the paper-and-pencil format and advised to keep it paper-based. Computer-based administration has several advantages: higher availability, automatic data capturing and less processing time for subjects as writing by hand takes longer time (Noyes and Garland 2008; Karay et al. 2015). Still, some scholars point out that a subject's experience with computers could affect test performance (Chapelle and Douglas 2006). Even so, the more traditional self-reporting tests, like the 'Are You an Intrapreneur?' questionnaire by Pinchot (1985), might still be more appropriate when an organisation needs to assess a high number of subjects, for example, 500 employees. Production-based tests might have their strength when a smaller number of employees or candidates are being evaluated, say, one to sixty employees.

In terms of the overall duration of the test, signals from the interviews as well as observational notes indicated that a duration of sixty minutes would be most optimal for a corporate setting, with a maximum of seven or eight different tasks to perform. However, more company field tests are needed to confirm these indications. Given that each task can measure two to ten different intrapreneurial characteristics, it might

be challenging to assess all nineteen intrapreneurial characteristics more than once in a single test for the corporate world, if the test only consists of six to eight tasks. Conversely, it should not be a problem to increase the number of tasks or add more sub-tasks in an educational setting and thereby assess all nineteen characteristics even more thoroughly in a single test. Students are used to doing tests for more than one hour, which was supported in the test pilot interviews. The production-based tasks developed in this study might potentially be biased if used in an educational context, though. Most of the tasks were grounded in real business situations within an organisational setting – an environment most students have never operated in professionally. A concern also mentioned in the focus group interviews with company representatives. Consequently, a valid proposition would be to only include everyday-life situations that students can better relate to, if similar production-based tasks were to be developed for students. Further research could investigate this.

The similarities of the tasks to real life and their close relatedness to intrapreneurship and CE are seen as a considerable advantage, which was also supported in the focus group interviews with company representatives. Subjects could recognise actual situations from their professional life that were firmly related to the scenarios in the tasks. A possible explanation for this finding is that the tasks were explicitly tailored for practitioners in this particular domain. One of the most significant claims on the TTCT is that it is too domain-general and abstract, which affects the predictive validity (Baer 2012). Hence, a valid proposition is that the predictive validity of a further developed intrapreneurial production-based test could be relatively high due to the domain specificity as well as the closeness to the nineteen characteristics defining an intrapreneur (Brøndum 2019). Longitudinal studies are, however, needed to test the predictive validity of production-based tests within the field of intrapreneurship and CE.

The qualitative production-based test analysed in this paper does not show to which degree the subject is currently intrapreneurial in their everyday work; rather, it provides insight into the potential intrapreneurial behaviour the subject may perform if given the right milieu, encouragement, support or the appropriate training (Deloitte Digital 2015). Production-based tests could, therefore, be one possible aid to managers searching for individuals likely to be successful in the essential organisational role as intrapreneurs. Several scholars have requested such a support tool (Davis 1999). Nevertheless, this instrument should not act as a stand-alone tool. It should, instead, be seen as a solid starting point for a more qualitative follow-up interview, as already mentioned.

The application of this qualitative production-based test is, however, multiple. For example, it can be used for recruitment purposes, where the test would be the foundation for an additional in-depth qualitative interview. Another way of applying this test would be for team composition purposes. Here, the test could act as the primary foundation for spotting competency “holes” (black holes) and find

individuals with the potential to fill these holes. A third way of applying this tool would be to use it as a basis for differentiated counselling of employees in terms of personal development. Cropley (2000) actually advises that the TTCT should be used for this exact purpose. A fourth way of applying this tool would be for course development. The test could be used as the primary foundation for spotting competency "holes" (black holes) and thereby identifying where to focus the training of individuals.

So, does it make sense to design, perform and analyse production-based tests on an individual level in the field of intrapreneurship and CE? Yes, definitely. Self-reporting has given us insight into intrapreneurship and CE; yet, this paper has explored another way of assessing intrapreneurial potential, which is complementary to self-reporting tests. It has opened up a new way to assess intrapreneurial potential with a qualitative production-based test. Thus, it is one possible answer to both Åmo and Kolvereid's (2005) and Kuretko's (2017) proposal for additional models, metrics and instruments to assess intrapreneurship and CE on an individual level. The use of production-based tests could improve our understanding of employees' intrapreneurial potential and thereby help managers identify the most suitable people to back for innovation to happen. Thus, companies can refocus their innovation strategy by selecting the right people to support, instead of merely focusing on choosing the right ideas. Nevertheless, more research is needed in this endeavour.

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Appendix related to Article II

Overview of the ten selected tasks, their duration in minutes as well as the associated characteristics identified by the expert judges in the company field test sample.

Duration (min)	**12**	**07**	**07**	**12**	**12**	**07**	**07**	**07**	**07**	**12**
Task number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1. Creative Innovator	x	x		x		x				
2. High Achiever			x		x			x	x	
3. Proactive Initiator		x			x	x			x	x
4. Risk taker	x		x	x	x		x		x	x
5. Organisational Networker		x	x		x			x		x
6. Self-confident			x		x				x	x
7. Flexible Open-minded				x		x				x
8. Enthusiastically Perseverant	x		x		x			x		
9. Opportunity Recogniser	x			x	x		x		x	
10. Experimental Problem Solver	x	x	x	x	x			x	x	
11. Persuasive Influencer			x	x			x			
12. Autonomous										
13. Team Organiser		x				x			x	x
14. Change Agent					x	x				x
15. Idea Generator	x	x				x				
16. Business planner			x	x					x	x
17. Visionary	x		x	x						

18. Customer-focused	**x**	**x**	**x**	**x**			**x**	**x**		
19. Decision Maker					**x**			**x**		

Overview of the answers provided to task nine by three different individuals and the characteristics identified by the expert judges specific to these answers.

Person A

Activity 9
Collaborative robotics

Imagine that you work at a global manufacturing company with production facilities and customers all around the world. During a lunch break, a senior manager happens to overhear a conversation you have with a colleague about implementation of a new groundbreaking technology in production: collaborative robotics.

The senior manager has afterwards decided to give you the task to advice the top management on a 2 billion investment into this new business area that, if successful, will reduce the cost of manufacturing by 50% as well as minimize occupational injuries.

You know this task is way beyond your expertise, knowledge, and experience. You hardly even know the technology or the business area yourself.

A What actions will you take and why? You have 7. min. for this task.

1 • I would approach the senior manager and let him understand that I am flattered by the opportunity, but that I don't think I am the one who should head it.

2 • I would say that I am very interested in robotics, but I would contribute in a better way by being part of an advisory group. I could offer to be part of the group and also be part of putting the group together, as I know me colleagues so well. But I would stress that I don't have this expertise, knowledge or experience and therefore someone else should head this!

3 • I would stress that I think it is great to work for a company that is foresighted, and that I would be very interested in similar opportunities in my expert area.

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Business Planner

Self-confident

Flexible open-minded

Opportunity recogniser

Person B

Activity 9
Collaborative robotics

Imagine that you work at a global manufacturing company with production facilities and customers all around the world. During a lunch break, a senior manager happens to overhear a conversation you have with a colleague about implementation of a new groundbreaking technology in production: collaborative robotics.

The senior manager has afterwards decided to give you the task to advice the top management on a 2 billion investment into this new business area that, if successful, will reduce the cost of manufacturing by 50% as well as minimize occupational injuries.

You know this task is way beyond your expertise, knowledge, and experience. You hardly even know the technology or the business area yourself.

A What actions will you take and why? You have 7. min. for this task.

1 • Re-delegate task by creating a core team that performs tasks based on their expertise.
2 • Encourage yourself - "fake it till you make it"
3 • Deep dive and catch up on latest knowledge on the topic.
4 • Gather a team which has this capability.
5 • Announce yourself as a project manager but not a specialist in the area.
6 • Hire external consultants with expertise in the area.
7 • Train and keep yourself updated ASAP.
8 • Request extension to perform desktop research and ideation planning for the current tech.
9 • Consult with department heads/key stakeholders on this topic.
10 • Collaborate with people in production or external stakeholders (i.e. universities) on this area.
11 • Generate an open call within the company to increase visibility of the initiative for indirect involvement.
12 • Contact potential suppliers - host a supplier day where all of them can inform you and the core team on what to do.

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Business Planner	Organisational networker	Self-confident
Flexible open-minded	Proactive initiator	Team organiser
Opportunity recogniser	Risk taker	

Person C

Activity 9
Collaborative robotics

Imagine that you work at a global manufacturing company with production facilities and customers all around the world. During a lunch break, a senior manager happens to overhear a conversation you have with a colleague about implementation of a new groundbreaking technology in production: collaborative robotics.

The senior manager has afterwards decided to give you the task to advice the top management on a 2 billion investment into this new business area that, if successful, will reduce the cost of manufacturing by 50% as well as minimize occupational injuries.

You know this task is way beyond your expertise, knowledge, and experience. You hardly even know the technology or the business area yourself.

A What actions will you take and why? You have 7. min. for this task.

1 • Agree with the senior manager on a deadline for me to gather the proper team.

2 • Get a team formed that has the expertise, knowledge and experience. Tell the team that if the pitch is a success, they will have 2 billion to make it happen. Make some engagement in story.

3 • Give advice to top management with the support of the team of agents.

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Business Planner | Risk taker

Opportunity recogniser | Self-confident

Proactive initiator | Team organiser

Appendix C. Article III

BUSINESS MODEL CREATIVITY: A HORIZONTAL INSIGHT MODEL

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Abstract

This paper presents a model for feasibility testing of novel ideas for business model innovators. It suggests a five-step systematic involvement of non-domain-related knowledge intended to deliver more unique ideas that are feasible in the decision-making phase of business model innovation.

Keywords: *Business Model Innovation, Creativity, Horizontal Knowledge.*

Introduction

During the last decades, the study of business models has grown attention from both academics and practitioners. As a consequence, companies have started to focus not only on product or process innovation. By innovating operational business models and processes, companies can reinvent themselves in an ever-changing and complex market (Taran et al. 2016). Business model innovation has become a complement to the more conventional innovation types (Amit and Zott 2012).

Creativity seems to play a number of roles as part of innovating and establishing a successful new business (model) (Govindarajan, 2010). In particular, creativity is closely linked to the activities before decision making in innovative processes. A key rationale for investing resources in creativity as part of business model innovation is that it results in more alternative ideas to choose from, hence more knowledge to base decisions on. As a result, leaders of business model innovation will be able to make better decisions if they invest resources in creativity prior to decision making.

Another rationale is that the creativity is likely to lead to more novel solutions. Hereby the business model innovator will be able to choose solutions that can drive the company into blue oceans or gain unique competitive advantages in red oceans (Kim and Mauborgne, 2005). However, the problem with novel ideas is that they often seem unfeasible at first sight because it may be difficult to understand how to produce, process, or organize these ideas. Imagine having the idea of 'paper packaging for beers'. This idea has some novel aspects in terms of value offering including far simpler recycling, cheaper material and more flexible shapes than with glass and metal. This idea, however, seems unfeasible because paper loses its strength when wet and under pressure. Established companies in the beer equipment industry may have difficulty handling such novel and seemingly unfeasible ideas because they have created elimination systems for ideas that are '*[…] financially unattractive for the leading incumbent to pursue, relative to its profit model and relative to other investments that are competing for the organizations' resources*' (Christensen, 2006: 49).

This paper suggests a Horizontal Insight Model that provides a systematic creative approach for testing novel ideas for feasibility, to increase the number of novel ideas that are feasible into the decision-making process for inventing or reinventing business models.

Approach

There are a variety of creativity methods to apply in the business model innovation process including Brain-storming (Osborn, 1953), Lateral Thinking (De Bono, 1992), Synectics (Gordon, 1961), TRIZ (Altshuller *et al.*, 1997), Mind Mapping (Wycoff, 1991), Creative Problem Solving (Parnes, 1992), Creative Checklists (Davis and Roweton, 1968), Analogical Reasoning and Conceptual Combination (Martins *et al.*,

2015), Business Model Recipes (Baden-Fuller and Morgan, 2010; Sabatier et al, 2010), Business Model Patterns (Gassmann *et al.*, 2014), and Design Thinking (Brown 2008).

Most of these creative methods focus the creative effort on the ideation phase. Also, Wirtz and Daiser (2018) suggest seven phases of a business model innovation process, and they identify creativity as a key ingredient in just one of these phases – the ideation phase. This paper suggests that creativity may play a key role also in the feasibility testing phase.

Design Thinking may currently be the most popular creativity method among practitioners. It seems to suggest that novel ideas may be tested for feasibility by gaining insights from potential users or domain-related experts. For some ideas, this kind of subject-related (vertical) insights may provide a clear answer about whether a novel idea is feasible or not. However, for a feasibility test on an idea like for example "paper packaging for beers", insights from users and domain-related experts are not likely to give any clear answer. The potential users would probably say that they like the idea because it offers new values not seen in the industry before. However, the domain related experts will reject the idea because their knowledge is based primarily on glass, metal and plastic, and may not include paper construction and paper packaging for food. In other words, they cannot make the necessary new knowledge combinations needed to further develop the idea for how a paper keg may be constructed and function as a packaging.

When taking a knowledge perspective on creativity, new ideas can be produced by combining knowledge in new ways (Ward and Kolomyts, 2010). This perspective is often considered as a cognitive process related primarily to the ideation phase. However, it may also provide a valuable understanding of how to test novel ideas for feasibility. Horizontal insights, i.e. knowledge and experiences not directly related to the problem or situation, might be crucial in that process. This type of knowledge typically comes from non-domain-related experts but can also come from other knowledge sources. For example, an expert in "paper sacks for cement suitable for outdoor storage" is horizontally related to the idea for a "paper packaging for beers". Therefore, this is a horizontal expert that may provide us with insights to test the idea for a "paper packaging for beers" for feasibility and to further develop it into a feasible concept.

Key Insights

The Horizontal Insight Model is made up of five steps. Before step 1 there may have been some systematic idea production or a collection of ideas from employees or team members.

Step 1 is a sorting activity where all ideas are categorized according to novelty and feasibility. The purpose of this step is to identify the ideas that are relevant to the following steps. There will be four groups of ideas: (A) ideas that are both novel and feasible; (B) ideas that are novel but unfeasible; (C) ideas that are non-novel yet feasible; and (D) ideas that are non-novel and unfeasible. The ideas in category B are relevant for the later steps and can move on to the next step in parallel or independently. An example of such an idea may be a "taxi company without a taxi fleet". This idea was novel at the time, and most people in the taxi business domain would probably have found it unfeasible.

Step 2 is an abstraction activity where the selected idea is translated into an inter-domain principle. The purpose of this step is to make it possible to search for relevant horizontal insights. A method for translating an idea into an inter-domain principle is to take out the domain related themes like the system being a taxi company, and the resource being a taxi fleet. Now we may have an inter-domain principle of a "system that does not own its core resource", and it is possible to take this on to the next step.

Step 3 is a searching activity where the inter-domain principle is the search key for identifying horizontal domains where experts who have already tested a similar idea for feasibility in domains not directly related to the taxi industry. The literature on business model narratives, anecdotes, cases or business model recipes can be used as databases to search for existing business models that corresponds to your specific inter-domain principle. However, you may find far more potential horizontal insights when analyzing all kinds of businesses, NGO's, and public organizations yourself.

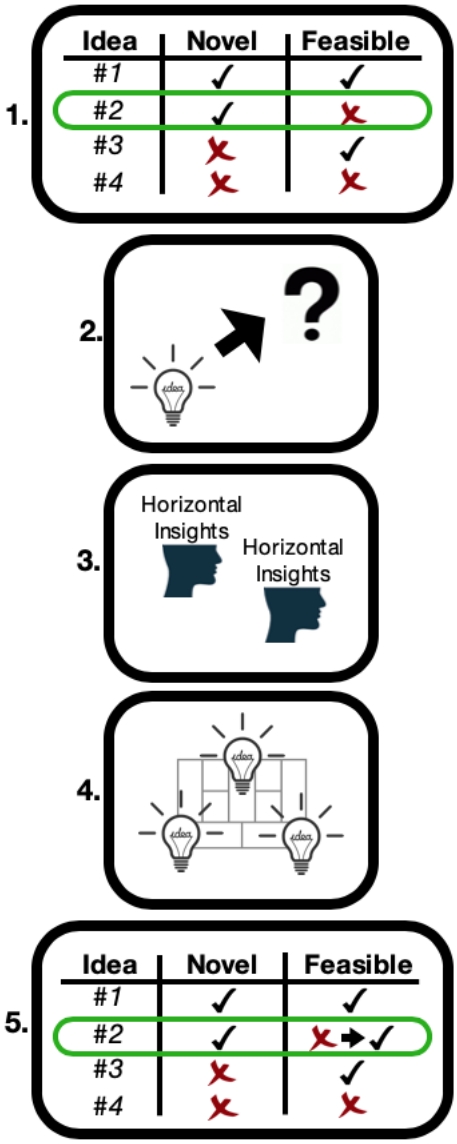

Figure 17: The Horizontal Insights Model

The principle of a "system that does not own its core resource" may lead us to the knowledge domain of distributed computing, where horizontal experts have designed SETI@home as a similar idea and tested it for feasibility. When Berkeley SETI Research Center needed to analyze a huge amount of data from radio telescopes in

the search for life in the universe, they found that building the necessary supercomputers to analyze this amount of data was simply not an option at the time. SETI came up with the idea of an Internet-based public volunteer computing system, and they developed a software that could send the millions of chunks of data to be analyzed by volunteer laymen using their private computers as the resource. Their inter-domain idea may be a "distributed system supporting and integrating laymen and laymen resources". This example of a "system that does not own its core resource" can be used in the next step.

Step 4 is a knowledge combining activity where the new horizontal insights are integrated into the idea development. The purpose is to use the existing insights from a similar horizontal domain to further develop the concept of a "taxi company without a taxi fleet" and make it feasible. This step may be performed at different levels of engagement. The lowest level may be to simply read about the specific horizontal knowledge from existing sources about SETI@home (e.g. details from the business model narrative, anecdote, case or recipe). An intermediate level may be to familiarize with the horizontal expertise, for example from trying out the SETI@home software. The highest level may be to gain access to the real horizontal experts, i.e. the specific business model innovators, who participated in key phases of the design and implementation of SETI@home.

The application of the horizontal knowledge in this step is a creative activity that requires all involved parties to have an open, curious, playful, imaginative and visionary mind. As a result, it may be necessary to facilitate this step as a full creative process, where individual elements of the SETI@home business model narrative, anecdote, case or recipe are explored and combined with the idea of a "taxi company without a taxi fleet".

The insights from involving the SETI@home concept may lead us to an understanding that the idea of "running a taxi company without any vehicles" could be based on a distributed system (an App) supporting and integrating laymen (as taxi drivers) and laymen resources (their private vehicles as the taxi fleet). The idea of a taxi company without a taxi fleet is easier to accept as feasible now that we can see that a "similar idea" has already been successfully tested in an indirectly related domain.

Step 5 is an adjustment activity where the categories from step 1 are updated based on the new insights gained through step 2 to 4. The purpose is to prepare a list of ideas for decision making that takes into account any changes in the variables of novelty and feasibility. From the example, we will be able to move the idea of a "taxi company without a taxi fleet" from category (B) to category (A). As a result, we now have one more novel and feasible idea to choose from in the decision-making phase.

Discussions and Conclusions

This paper offers a systematic model for using horizontal insights in a creative process to test novel ideas for feasibility. The hope is that this model will provide more novel and feasible ideas prior to decision making in business model innovation processes.

A key practical implication is related to the reduction of risk and uncertainty for business model innovators. The Horizontal Insight Model may help reduce risk and uncertainty for innovators who desire novel ideas, by making more of these ideas feasible prior to decision making. As a result, the decision-maker will have more novel and feasible ideas to choose from for inventing new or reinventing existing business models.

A key theoretical implication is related to the models for inventing new and reinventing business models. It may be possible to include the Horizontal Insight Model as one step or perspective as part of a more comprehensive process or model for understanding how to design and develop new business models. Also, the notion of "experts" as something domain related may be challenged by this new model. We may need to reconsider the users and the domain related experts as the key source of new insights for testing novel ideas for feasibility. It may be that each of these sources of insight play a unique (however, sometimes overlapping) role in the development and testing of ideas.

Finally, a philosophical implication is related to the notion of the role creativity plays in business model innovation processes. We may need to reconsider the general notion that creativity is merely related to the production of ideas – the ideation phase. Creativity may provide far more quality to the complex innovative processes of inventing new and reinventing established business models. Is there a need for a concept of business model creativity for the attempts to understand this role of creativity?

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Appendix D. Article IV

BOOSTER CARDS: A PRACTICAL TOOL FOR UNLOCKING BUSINESS MODEL INNOVATION

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Abstract

Business model innovation is an interesting yet challenging teaching area. Both teachers and students encounter barriers, such as dominant logic and a limited level of capabilities. In this paper, we present an analogy-based approach to enhance the teaching process and elevate student motivation using business model stimulus cards.

Keywords: *Business models, Business model innovation, Teaching.*

Introduction

Many different fields of teaching and researching business models (BMs) and BM innovation (BMI) exist. The diversity of the research fields raises questions on how to teach BMI to students and enable them to unlock the complexity of applying BMI. Massa and Tucci (2013) suggested splitting the notion of BMI into two categories: BM design and BM reconfiguration. The first is related to inventing new businesses and BMs, whereas the latter concerns restructuring and generating new ideas within existing BMs. The notion of BMI (both designing and configuration) is a challenging and complicated art (Teece, 2007). Although research within this area has been quite heterogeneous, Wirtz and Daiser (2018) derived a generic seven-step BMI process in their systematic review, namely analysis, ideation, feasibility, prototyping, decision-making, implementation, and sustainability. This paper will contribute by identifying a way to enable BMI in teaching, especially in the earlier stages of BMI, such as ideation.

When addressing the issue of teaching BMI, one needs to understand some of the inherent barriers in addressing innovation. The typical barriers that teachers face are related to the dominant logic and level of capabilities of their students. The dominant logic comprises how the firm creates and captures value, which can be difficult to assess due to prejudice and other subjective matters (Bettis and Prahalad, 1995; Chesbrough, 2003). The level of capabilities in this sense refers to the restrained repertoire of a person's ability to see new ideas (Pisano, 2006). These issues are, in our experience, common when students try to develop new BM ideas in a BMI process. Often, the restraints are less challenging when addressing new business designs but become more complex and challenging when doing BM reconfiguration (Teece, 2007; Massa and Tucci, 2013; Lüttgens and Diener, 2016).

Thus, teachers often must overcome these barriers of underlying assumptions in the dominant logic and restrained capabilities. If not appropriately addressed, the result will be a limitation of the potential variety of inputs to the BMI process (Rumble and Minto, 2017), as students will often replicate and conform to the known norms (e.g. de Jong and van Dijk, 2015), arguably compromising the idea of teaching innovation in the first place. Nonetheless, there are several techniques to overcome these barriers, enabling the teacher and class to stimulate novel and creative ideas through BMI.

In the literature, there have been various suggestions on how to improve the ability to innovate BMs. One of the topics concerns the idea of using experiments to generate different solutions (Ahokangas and Myllykoski, 2014) and ultimately identify the optimal solution (Chesbrough, 2010). However, this quickly turns into a 'catch-22'

paradox[60] because the experiment designs are often restricted by the dominant logic present in the individuals and by their (limited) capabilities. This is why we have invented a set of booster cards to help students create experiments and develop better and more original BM designs and BM reconfigurations. In line with the work by Smith (1998) on creative triggers, we intended the booster cards to act as a stimulus to amplify the idea generation process. Smith (1998) distinguished between the following three types of stimuli:

- Concrete stimuli (Higgings, 1994): Use physical items or pictures in idea generation sessions.
- Related stimuli (VanGundy, 1988): Provide stimuli that are connected to the problem-solving task.
- Remote stimuli (Rickards, 1974): Provide stimuli that are unrelated to the problem-solving task.

The booster cards essentially combine all three types but are mainly based on related and remote stimuli. We do this by only providing topic-specific stimuli (hence, the BM configuration typology), while simultaneously forcing the students to assess and reflect upon the individual and sometimes unrelated BM configurations. The latter refers to BM configurations that immediately appear illogical or distant to the case at hand. In other words: the booster cards will constitute 'provocations' to enable the students to think 'outside of the box'.

Converting BM typologies into playing cards is not a new invention (e.g. the BMI Lab at St. Gallen University developed BMI Pattern Cards; see Gassmann et al., 2013, 2014). However, we did not find these cards comprehensive to our satisfaction in terms of typology and categorisation. A decision was made to develop a deck of playing cards designed according to an already defined BMI framework: the 5V framework by Taran et al. (2016). This will be elaborated on in greater detail later in the article.

The booster cards are built on the principle of creating analogical reasoning. Analogical reasoning is understood as applying insight from one setting to another, which is a method found to be useful for creating novel BM ideas (Gavetti and Rivkin, 2005; Martins et al., 2015; Rumble and Minto, 2017).

A known example of applying analogies is Nespresso. Traditional coffee machine manufacturers focus on selling machines with high margins, which is essentially the core of their BM. In contrast, Nespresso coffee machines are sold with a low margin, but the company compensates by earning high margins on the coffee pods. At the core of the BM, Nespresso is creating a lock-in effect towards the consumer, as the

[60] A catch-22 is a paradoxical situation from which an individual cannot escape because of contradictory rules (e.g. a bank will never issue someone a loan if they need the money).

machines only can be used with Nespresso pods. Nespresso developed and succeeded with this BMI by adopting elements (or analogies) from the razor-and blade model known from Gillette (Matzler et al., 2013), and many have since tried to copy them in the industry.

The story of Nespresso shows the strength of using analogies by removing the constraints of dominant logic (coffee machines are the core) within the same industry or sets of assumptions. Furthermore, a set of different BM patterns or recipes (Baden-Fuller and Morgan, 2010; Osterwalder and Pigneur, 2010; Taran et al., 2016) can help overcome the limited capabilities of students, for example (Rumble and Minto, 2017).

The booster cards help break the barriers of dominant logic and the limited capabilities by enabling students to experiment with various ideas through different analogies of the cards. These analogies support students to overcome their dominant logic from a given context and further provide a range of diverse alternatives, reducing the barrier of limited capabilities.

The cards are based on 71 different BM configurations identified in the work by Taran et al. (2016). Each card in the deck represents a specific configuration and contains a short description of the configuration and real-life example to strengthen the analogy further. The description might give room to gain context-free ideas, but if the students are having issues with generating ideas or understanding the concept, the real-life examples often spur them in the right direction. An example can be found in Figure 18, where the configuration ‘Free for advertising’ provides both a short explanatory text of the general concept and empirical references (in this case of Facebook and Google).

Figure 18: Examples of Booster Cards

Thus far, the cards have been tested in different contexts ranging from more than 125 business administration students at the bachelor's level in a workshop-teaching format to more than 30 international business master's students in a traditional classroom setting for three years. The cards have also been tested with professionals and business developers. Through various trials, the booster cards have proven to act well as a facilitator of discussing different business opportunities and future scenarios by providing new ideas on how to design or reconfigure BMs. We will elaborate on these outcomes later in the paper.

Approach

Initial Understanding and Requirements

The booster cards can be implemented in various settings, such as a workshop with practitioners and lectures with students. The latter will be exemplified in the paper. It is essential to add that the cards function primarily as a facilitator or add-on to use in the teaching context. The participants will need a basic understanding of BMs, and it is also preferable to have experience in working with a BM framework, such as Osterwalder and Pigneur's (2010) BM canvas (BMC). The notion of a framework (e.g. BMC) helps to illustrate how the cards affect a given BM, which is an essential

element in BM reconfiguration. However, as mentioned earlier, this paper will focus on the earlier stages of BMI.

Following the original work of Taran et al. (2016), the 71 cards are divided into five different categories. These five categories address key areas found throughout both empirical and theoretical BM research in the following ways:

- Value proposition (VP): What is the company offering (pink cards)?
- Value segment (VS): To whom is the company offering it (green cards)?
- Value capture (VC): How much and in what way does the company generate revenue (brown cards)?
- Value network (VN): With whom does the company collaborate to develop, distribute, and/or sell the offering (blue cards)?
- Value configuration (VCo): How does the company develop and distribute this offering cost-effectively (yellow cards)?

The number of configurations (i.e. cards) is not evenly distributed across the above-mentioned categories. As such, there are 23 VP, 8 VS, 14 VC, 10 VN, and 16 VCo cards.

The Taran et al. (2016) framework was chosen because it offers an increased number of categories and configurations compared to other frameworks. Previous to this study, the only academic work on BMI cards was found in Gassmann et al. (2013). In comparison, the Taran et al. (2016) framework 1) employs five categories instead of four (resulting in a clear separation between the BM elements of customers and distribution), 2) entails the most exhausting list of configurations (71 compared to the original 55), and 3) offers the most recent review. We have also found other BMI cards, all of which comprise 50 to 68 cards (e.g. boardofinnovation.com, businessmakeover.eu, and methodkit.com). Nevertheless, none of these are scientifically derived but rather are based on practical work, experience, and consultancy tasks. In short, the 71 configurations offered by Taran et al. (2016) comprise the most extensive, scientifically developed, and updated list we were able to find. For further information about the configurations, we refer to Taran et al. (2016).

In the teaching setting, the initial approach would include one or several lectures introducing BMs in general and potentially the BMC. Using the terminology of the BMC helps to frame the experiments that the booster cards facilitate. Figure 19 exemplifies how the configuration of ‘leasing’ not only affects its main category (VC) but also how designing or reconfiguring a BM to the leasing configuration would affect other parts of the BM. The effects are not explained in the cards, as they are different from case to case; hence, the participants will need to reflect upon these in each situation.

Figure 19: Configuration of leasing

Having established the basic knowledge regarding BMs, it becomes essential to frame the notion of BMI and how experimenting with the cards is meant to improve the students' ideas. In entrepreneurial courses, the cards are more relevant in the lines of BM ideation, where they can be explored as inspiration to generate novel BM design ideas for new business opportunities, problems, or projects. In settings where students work with real-life cases (e.g. established companies with existing BMs), the cards provide new inspiration to stimulate BM reconfiguration. In both instances, the cards enhance the experimentation with ideas that might not have been produced without this stimulation, thereby overcoming the cognition biases of the dominant logic and limited competences of the students. Following Byrge and Hansen (2014), we found that the approach of first working individually, then in pairs, and lastly all together in the group (presented in Steps 5-9 in Table 15) will enhance the ideation process by bringing more knowledge into play. If time is short, Steps 3 and 6 could be skipped.

Steps / *duration*	**Action** / *aim*
1 *15 min.*	Form groups consisting of approx. four students *Aim: form dynamic working groups*
2 *10-15 min.*	The students are then asked to browse through all 71 configuration cards to get a brief understanding. Set aside 10 min. for browsing and a few minutes for questions that need to be discussed in the plenum *Aim: Basic introduction and understanding to the configurations*
3 *(depends)*	This step is optional. The teacher or students could here identify areas, where they want to focus and hence select the group of cards associated to this focus. For example, if the students want to work primarily with the revenue streams or value capture, the students can choose to primarily use the brown (value capture) cards. *Aim: Narrow the idea generation process.*
4 *5 min*	Each group member hereafter draws five booster cards from the deck to start the ideation process. *Aim: Stimulate/provoke through random and unrelated inputs.*
5 *15 min.*	Individually, the students should now try to generate BM ideas based on the cards he/she has for 10-15 min., without talking to each other. *Aim: Idea generation, problem solving, prototyping.*
6 *30 min.*	In pairs of two, the students should now exchange their ideas to be co-developed even further (5 min. per participant for all ideas). This round continues until all possible pairs in a group have been created and co-developed together. *Aim: Stimulate/provoke through random and unrelated inputs.*
7 *10-15 min.*	Each student should individually assess which idea is the best, based on an assessment criterion made by the teacher. It could be the most novel idea, the most viable etc. (1-2 min.) *Aim: Idea assessment.*
8 *25 min.*	The students will individually prepare a short presentation of their best ideas (one to three) either as a short narrative or using the BMC as a storyboard going through each building block one by one. *Aim: Idea refinement and communication.*

9 *25-30 min.*	Each student presents to the rest of the group. A short amount of time (approx. 5-10 min.) should be devoted for feedback and discussion of each idea. *Aim: Idea communication, idea refinement and prototyping.*
10 *15 min.*	Each group should determine which one or two ideas they think are the best, based on the criteria previously presented. *Aim: Idea assessment and selection.*
11 *15-20 min.*	Give each group 15-20 min. to discuss the idea even further and prepare a group presentation of the configuration(s) they have recognised as the best. *Aim: Idea refinement and communication.*
12 *(depends)*	Each group performs a 5-minute presentation of their configuration in front of either an opponent group, company representatives or the whole class. Set aside 5-10 min. for feedback on the idea from either the opponent group, company representatives or plenum. *Aim: Idea pitching and idea refinement.*
13 *(depends)*	As a final step, have a discussion in plenum about the learnings and what further steps to consider when going from BM ideas to BM implementation. *Aim: Frame the key learnings.*

Table 15: Booster Cards manual

Using a Real-life Case

The approach described above has also been tested several times with real-life cases where a business representative (e.g. owner, manager, or an employee) presents their company in front of the class, potentially stating an innovation dilemma. As stated in the introduction, the company is often restrained by the dominant logic or/and capabilities; hence, they are prepared to seek inspiration from other sources, such as students. To ensure the students are not predominantly influenced by the logic and constraints of the company representatives, the use of analogies through the booster cards aids the students to have an open mind and generate novel ideas continuously In this setting, it is essential to have the students map the company's current BM using the BMC (or other BM frameworks) as an initial phase before the steps mentioned above; otherwise, the students will have a hard time understanding the underlying basis of the company case. The students can also use the booster cards to identify the current patterns or configurations of the company to understand and

interpret the current setting[61]. Subsequently, the students are asked to either generate new ideas or innovate in the current setting. The process could evolve around various objectives, such as targeting specific customer problems, innovation issues, or technological challenges, or it could merely be an open task.

As stated earlier, the students often rely heavily on the logic or context presented by the company if the process is not facilitated. If a real-life case gives away too much information about the vision for the future, the students end up developing ideas that are not new to the company or novel or interesting in any way. We experienced this when a company accidentally told the students that their next market would be wholesalers. Afterwards, around 80% of all the ideas developed by the students addressed wholesalers as the 'new innovative strategy' for the company. The example shows how quickly students absorb dominant logic and experience difficulties, diverting from it.

From our experience, fostering novel ideas and new insight occurs more frequently when the cards are incorporated as a medium in the ideation process right after the mapping of the existing BM. The booster cards provoke new thought patterns and thereby amplify the pool of ideas the students are creating. The analogies and stimulation through the cards help the students develop relevant ideas that are directly transferable from the cards. Other times, the students have 'wild' ideas that are not related to the cards, but the line of thought was initiated using the cards. Although these initial 'wild' ideas are unrealistic, we have seen many examples where they eventually spur new ideas that are viable.

An example of the above was observed during a real-life case workshop where the company in question had too-high costs. From the card representing the configuration 'external sales force', one group had the idea of only having salespeople from low-income countries. This idea was pretty 'wild' and unrealistic, but together with the booster card representing the configuration 'target the poor', they started wondering why the company did not address low-income countries. As the company made modular products, the relatively high production cost could be lowered by the economy of scale, making the market of developing countries attractive as a new source of income. In essence, the original idea would have little chance of success, but the evolution or development from the initial 'crazy' idea proved to be an important novel idea that the company wanted to investigate further and eventually implement as part of their future strategy. In all the workshops and lectures that we have facilitated in this manner, the company representative has always left with new inspiration and often reasonably implementable BM ideas and innovation routes.

[61] Interpreting is also an often-found phase in analogy models (e.g. see Rumble and Minto, 2017, for more details).

Key Insights

Through the use of analogies, the booster cards seemingly provide a practical and understandable method of breaking down some of the barriers in the often-impeded BMI process. Repeatedly, students or companies become stuck within their inherent limitations and dominant logic, which rarely spurs original ideas. With a relatively minimal amount of preliminary knowledge, students, companies, entrepreneurs, and business developers can gain new inspiration on how to either design or reconfigure BMs.

Furthermore, the booster card analogies and their configurations are built on both generic text explanations and case examples, which often makes the process very intuitive for students at all levels. The cards provide a hands-on and tangible approach rather than the more 'fluffy' theoretical approaches. The use of the booster cards is especially relevant in courses that undertake a practical approach to understand, innovate, and test BMs. Moreover, the booster cards and pertaining processes have continuously led to new innovative ideas and inspiration on how to innovate BMs, which was the overall ambition of introducing the booster cards.

Reflecting on the learning outcomes of using the booster cards, we have likewise seen positive results. We have not performed statistical experiments but have some experience that shows how students adopt and apply the analogical use of the booster cards after a workshop or lecture. Through written exam essays on the topic of BMI, we have found that students apply the knowledge from the booster cards and analogical learning to explain different BM concepts and existing BMs of case companies. Consequently, this shows that students gain a deeper understanding of the topic and learning objectives of the course. Additionally, students that are using the booster cards often manage to develop a greater variety of BM ideas. While not statistically proven, the development of more BM ideas was agreed upon by both the internal lecturers and external examiners of the assignments. The same type of evidence can be found in the vast number of oral exams we have done over the years. Students who have been introduced to the booster cards (and actively used these in their project work, written assignments, etc.) demonstrate better insight into the subject and can have more complex discussions during the exam compared to students without this knowledge. Moreover, the workshops have successfully generated novel, inspiring, and applicable new BM ideas; hence, the case companies, without request, have all expressed their interest in participating again.

Discussion and Conclusion

The idea of using inspiration from generic BMs is not new in a BM setting. The booster cards are similar to gaining inspiration from BM patterns (Osterwalder and Pigneur, 2010; Gassmann et al., 2014), analogies (Rumble and Minto, 2017),

analogical reasoning and conceptual combinations (Martins et al., 2015), BM recipes (Baden-Fuller and Morgan, 2010; Sabatier et al., 2010), and so on. Nonetheless, the booster cards offer the students a more hands-on experience, which often supports the experimentation or ideation phase of BMI, compared to directing them to a book or webpage. The analogies of the cards help to break down the main barriers to BMI, that is, the dominant logic around how firms create and capture value (Bettis and Prahalad, 1995; Chesbrough, 2003) and the missing ability to generate new ideas (Pisano, 2006).

The fact that the booster cards are not a standalone solution might potentially also constitute their main limitation. Students need a certain understanding of the BM concept, and it is also preferable to have experience in working with a BM framework to use the cards most efficiently. However, if this basic knowledge is achieved, the booster cards are reasonably intuitive. Furthermore, an advanced class could also address related matters, such as the effect a new configuration might have on the supply chain, management accounting, performance measurement, and other topics on how to operationalise the suggested changes to a specific BM. However, due to limitations of the short paper format, these are not addressed here.

Another limitation worth mentioning is the time factor. In general, we recommend at minimum a threehour workshop for using the booster cards, including a short introduction to BM configurations, the booster cards, and then the hands-on approach. Dedicating enough time is vital for the students to understand the booster cards and reflect upon their ideas and designs. If rushed, the result will typically be half-finished unoriginal ideas, which they will be more reluctant to present. Ultimately, this will naturally negatively affect the learning output.

The most impressive part of using the booster cards as an analogy stimulus is the variety of BM ideas generated by the students. Even when applying the same business case in different workshops with diverse students, we have observed radically diverse BM ideas each time. In addition, the students appear to enjoy ‘playing’ with the booster cards even after the workshop session is over. For the students, it is not only a fun exercise, but they also gain more comprehensive knowledge and competencies in understanding and working with BMs. Ultimately, these skills will help the students fulfil learning objectives related to an innovation course. Hence, the adoption of the booster cards enables the students to not only reach the learning objectives of the course but also build valuable BMI skills for future employment.

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Appendix E. Article V

TESTING THE EFFECTS OF DIGITAL GAMIFIED CREATIVITY TRAINING

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Abstract

This paper presents an experimental study that tests the effects of a new digital gamified creativity training program. Four techniques are used to assess the creativity level of a group of university students by taking measurements before and after the experiment. The instruments used are a domain-specific creativity test, a creative self-efficacy test, a belief in creativity training test and a domain-general creativity test. The study is performed among 100 undergraduate Communication students, divided into an experiment (N=51) and a control group (N=49). The experiment group participates in self-conducted training sessions and the control group is submitted to the same assessment procedure without participating in the training. Students in the experiment group performed online exercises for ten hours on a digital gamified creativity training program within a duration of four weeks. The results show that trainees in the experimental group increased their creative performance significantly in both domain-specific and domain-general creativity as well as their creative self-efficacy. No significant increase was found for their belief in creativity training. Furthermore, the implications of this study for digital gamified creativity training are discussed.

Keywords: *Distance education and online learning, Games, Evaluation methodologies, Post-secondary education, 21st century abilities.*

Introduction

Creativity is a key ingredient for business innovation (Sarooghi, Libaers, & Burkemper, 2015; Goodman & Dingli, 2017) and ranks in the top three most important skills of the future workforce (World Economic Forum, 2018). Training of creative skills is currently a hot topic in education. Fabricatore and López (2013) find that educational programs should rely on approaches and learning environments that foster creativity. Studies on classroom creativity training programs have consistently found evidence that trainees become significantly more creative from their training (Rose & Lin, 1984; Scott, Leritz, & Mumford, 2004; Torrance, 1972). However, we know little about the effect of digital creativity training programs.

Future job tasks will most likely become even more digital and online, so it makes sense to start practising creativity in a digital environment. Dingli et al. (2018) even suggest that digital creativity training can have positive effects on both competence development, motivation and transfer of learning. To our knowledge, no previous studies have focused on digital gamified creativity training. This study aims to examine digital gamified creativity training by studying the effects of an existing training program called Academy for Creativity.[62]

Academy for Creativity is one of the first digital gamified creativity training programs designed for higher education. In August 2019, the program reached 100,000 users. It is a free plug-and-play web-based training system for deliberate practising of originality, fluency, flexibility, elaboration of ideas, visualising future scenarios (imagination) and persuasion (Brøndum et al., 2019). The training program uses badges, progress trackers, difficulty levels, instant feedback on performance, experience points and an avatar in order to ensure a gamified experience during the training. It consists of 11 research-based training games, an assessment method as well as profiles for both teachers and students. The game narrative uses a storyline of the avatar working in a company where creative solutions are required and after each set of games, the system provides instant feedback on the players' performance. The games have three levels of difficulty and users can adjust the training duration as they wish, but constant exercise is required to advance from easy to medium and high-level performance of each game. The game platform includes flexible teachers' options and permits the planning of diverse training sessions for each student group (from 15 minutes to 50 hours), selecting starting and deadline dates and providing a link to be sent to the student group. The system also provides automatic data on the student participation, and to evaluate students. This assessment is based on the relation between students actual training time and the time (or workload) set by the teacher, student gests a fail/pass. The platform enables teachers to track the number

[62] www.academyforcreativity.com

of ideas produced by students, level of idea descriptiveness, detail index, ideas generated by hour as well as the training time spent on each of the variables.

The following four examples illustrate the games' dynamics and some of the game access interfaces are shown in Figure 20.

Game 1: *Trend Spotter*. This creativity training exercise primarily practices fluency and originality. It does so by simulating that the avatar has to produce ideas for future products at work by combining trending products in new ways. The trainee needs to create original new products by combining completely unrelated products. Also, the trainee must be fluent in producing as many new product ideas as possible.

Game 2: *Sounds Like An Idea*. This game mainly focuses on developing imagination and originality. It does so by simulating that the avatar has to help find out what causes some disturbing sounds at the office. The trainee needs to use his/her imagination to help the avatar connect a weird sound to one of three objects. Afterwards, the trainee should produce an original explanation of how this particular object produced the odd sound.

Game 3: *Poster Perfect*. This creativity training task basically contributes to practicing elaboration and persuasion, as well as flexibility. It does so by simulating that the avatar needs to help the advertising team at work by finishing a new campaign poster. The poster has already been started, and the trainee needs to be open-minded and elaborative to transform the started sketch into a finished poster that makes sense. After completing the poster, the trainee will have to make a persuasive catchphrase and adjust the poster to a specific campaign objective.

Game 4: *Race For The Raise*. This game primarily practices originality and imagination. It does so by simulating that the avatar has to compete with colleagues at work by spotting the ideas that general publics and creativity experts would find most creative. The trainee needs to use his/her sense of originality and imagine scenarios where each idea is meaningful in order to identify the most original ideas.

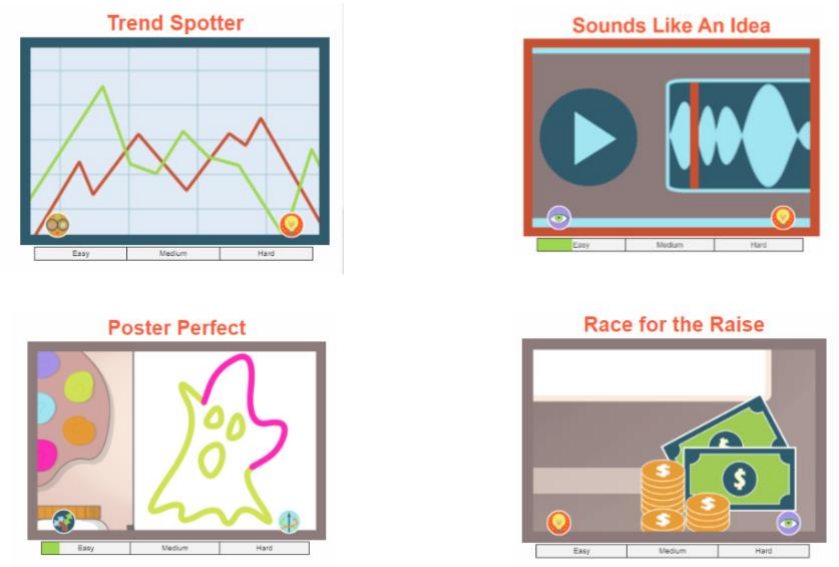

Figure 20: Screenshots of the game access designs

An automatic assessment is available for students, providing feedback on their progression. They receive experience points for completing each round in the game. These points relate to the key creative skills trained in each game (fluency, flexibility, imagination, creative self-efficacy, and elaboration & persuasion).

After each gaming session, trainees can see their scorings in the different games and also, see their global performance in terms of the six creative qualities addressed by the games. The skills circle shows the proportion corresponding to the training efforts of each quality and alters according to the scores obtained in each individual game.

Figure 21: Screenshot of the skills overview that users can access after each gaming session.

Once the students have completed a minimum of 10 hours training, they can request a certificate of achievement, which is given to everyone regardless of experience points or levels of difficulty achieved, rewarding this way the learning effort.

Study Design

This study used the following tests: a domain-specific creativity test; a creative self-efficacy test; a belief in creativity training test; and a domain-general creativity test.

The trainees consisted of one hundred third-year advertising and public relations (PR) undergraduates from the Faculty of Communication Science, Complutense University of Madrid. All students who joined the study received student credits for their participation. All participants were of Spanish nationality. The trainees were randomly divided into an experimental group (N=51) and a control group (N=49).

The intervention for the experimental group consisted of the following procedures:

1. Trainees received a brief face-to-face lecture-style introduction to the study, as well as a rationale for creativity training and digital gamified creativity training.

2. Trainees were instructed and observed during all pre-tests. These were performed in the following order: 1) domain-general creativity test; 2) domain-specific creativity test; 3) creative self-efficacy test; and, 4) belief in creativity training test.

3. Trainees attended a workshop-style introduction to the digital gamified creativity training program. During the workshop, all trainees created an account and performed a minimum of one hour of training.

4. Trainees were instructed to perform approximately half an hour of actual training per day, reaching a total of ten hours of training during the following four weeks (twenty workdays). Trainees could follow their actual training time on the screen through the software. The actual training time calculated only the active time training, not the time navigating through the software. Trainees received a reminder every day (via WhatsApp and e-mail) during the twenty workdays.

5. Trainees were instructed and observed during all post-tests. These were performed in the following order: 1) domain-general creativity test; 2) domain-specific creativity test; 3) creative self-efficacy test; and, 4) belief in creativity training test. All trainees performed their post-tests in the week following the end of the four-week training period.

The control group participated in procedures 1, 2 and 5.

Domain-specific Creativity

In this study, we focus on the transfer effect of the creative skills acquired through a specific training program, a so-called domain-specific creativity test. Byrge and Hansen (2013) used reflection reports to gain insights into how training affected trainees in general life. Birdi, Leach, and Magadley (2012) studied how training affected the creative skills directly related to their work (e.g., idea generation at work, idea implementation at work and job performance). Glover (1980) instructed psychology student-trainees to write assignments related to educational psychology. Glover (1980) used two rating scales to score the level of creativity in assignments handed in before creativity training and assignments handed in after creativity training. Similar designs have been used by other researchers to study the transfer effect from creativity training to the domain of the trainees (e.g., Cropley & Cropley, 2000).

In this study, the domain-specific creativity test was an advertisement task designed by two domain-specific experts (two of the authors). It consisted of one pre-test task and one post-test task, adjusted to the domain and culture of the trainees: advertising in Spain. The tasks were performed individually, and the trainees were asked to write their student ID on their response sheet before starting.

The pre-test task instructions were:

1. "Turrón"[63] is a well-known Christmas candy in the Spanish market. Please give as many creative ideas as you can to motivate people to consume it in other seasons. You have ten minutes to do this task."

The post-test task instructions were:

2. "Tinto de verano"[64] is a typical Spanish drink for the summer season. Please give as many creative ideas as you can to motivate people to consume it in other seasons. You have ten minutes to do this task."

The domain-specific creativity test was scored using a modified version of the consensual assessment technique (Amabile, 1982). Two domain experts scored each response for originality and usefulness using their own judgment criteria. They scored each response from 1-5 points, where 5 points were given to highly novel/useful responses and 1 point was given to responses with little or no novelty/usefulness.

Creative Self-efficacy and Belief in Creativity Training

Merton (1948) studied the interpersonal manifestation of the self-fulfilling prophecy phenomenon, according to which positive expectations about performance and capabilities produce better performance. This construct can be transferred to the field of self-perception of our creative capacities, where positive expectations play a crucial role. Creative self-efficacy relates to self-belief in your ability to produce creative outcomes (Tierney & Farmer, 2002). Bandura (1997) found that strong self-efficacy was a necessary condition for creative productivity. Whereas self-esteem and confidence are broad generalised feelings, creative self-efficacy can be understood as a judgement made on capacity in a narrower arena (Bandura, 1997), such as creative production. Furthermore, because it is creativity-specific, it also differs from general self-efficacy, related to capabilities across domains (Chen, Gully, & Eden, 2001). In this study the self-efficacy test was a three-question questionnaire adapted from Tierney and Farmer (2002).

The degree to which the trainee believes that their creativity could be advanced through creativity training may affect their motivation and future investments in creativity training. From a continuous educational point of view, this is highly relevant since future investments in creativity training are needed for students to achieve higher levels of creative skills. It is particularly interesting for digital out-of-class educational training materials that require high levels of self-motivation to have high effects. In this study, the belief in creativity training test was designed as a two-

[63] A southern European nougat confectionery.

[64] A cold, wine-based drink similar to sangria.

question questionnaire that was administered together with the creative self-efficacy questionnaire.

These combined tests consisted of pre-test and post-test questionnaires. The questionnaire was performed individually. The trainees were asked to write their student ID on the questionnaire sheet before answering the questions. They were then asked to answer to what degree they agreed or disagreed to the questions using a Likert 7-point scale, with one representing 'strongly disagree' and seven representing 'strongly agree.'

The pre- and post-questionnaire included the following questions related to creative self-efficacy:

- Originality: I feel that I am good at generating novel ideas.
- Creative problem solving: I have confidence in my ability to solve problems creatively.
- Elaboration: I have a knack for further developing the ideas of others.

The pre- and post-questionnaire included the following questions related to belief in creativity training:

- Nurture: I believe my creativity will advance through the deliberate practice of creativity.
- Digital nurture: I believe my creativity will advance through the deliberate practice of creativity designed as online games.

The trainees were instructed to spend about five minutes answering the questionnaire.

Domain-general Creativity

The Torrance Test for Creative Thinking is one of the most widely used creativity tests (Davis, 1997), one of the most referenced creativity tests (Lissitz & Willhoft, 1985) and it has shown high validity in assessing creative performance. It was developed to identify creative potential (Torrance, 1974) by instructing subjects to produce responses to a series of creative tasks. An advanced scoring guide helps people to evaluate the responses for creativity. The Abbreviated Torrance Test for Adults (ATTA) is a shortened version of the highly time-consuming original Torrance Test. ATTA is suitable for studies with a large number of trainees.

In this study, the domain-general creativity test was designed as an adapted digital version of ATTA, provided by Dr Erik Guzik and VAST Learning System[65]. It consisted of four pre-test tasks and four post-test tasks. The tasks were performed individually, and the trainees were asked to log into their account using their student ID.

The pre-test task instructions were:

1. "What is blue? Enter your ideas one at a time, trying to generate as many different ideas as possible in two minutes."

2. "How many different and unique uses can you think of for a tin can? You have two minutes to complete this task."

3. "Complete the provided drawing to create a picture or pictures (you can create whatever you would like). Try to be as creative as possible with your drawings. You are not being scored for artistic ability. Add titles to your drawings using the text button. You have five minutes to complete this task." (see Figure 22).

4. "Use the repeating figures to create a picture or pictures. You can create whatever you would like. Try to be as creative as possible with your drawing. You are not being scored for artistic ability. Add titles to your picture[s] using the text button. You have five minutes to complete this task." (see Figure 23).

Figure 22: Drawings for pre-test task three.

[65] https://www.vastlearningsystems.com/

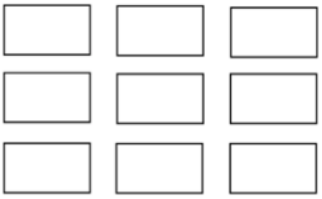

Figure 23: Repeated figures for pre-test task four.

The post-test tasks instructions were:

1. "What is red? Enter your ideas one at a time, trying to generate as many different ideas as possible in two minutes."

2. "How many different and unique uses can you think of for a paper clip? You have two minutes to complete this task."

3. "Complete the provided drawing to create a picture or pictures (you can create whatever you would like). Try to be as creative as possible with your drawing. You are not being scored for artistic ability. Add titles to your drawing[s] using the text button. You have five minutes to complete this task." (see Figure 24).

4. "Use the repeating figures to create a picture or pictures. You can create whatever you would like. Try to be as creative as possible with your drawing. You are not being scored for artistic ability. Add titles to your picture[s] using the text button. You have five minutes to complete this task." (see Figure 25).

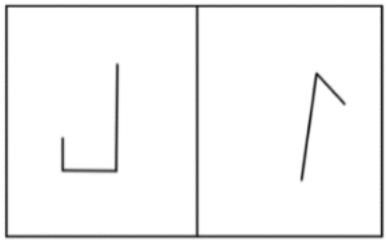

Figure 24: Drawings for post-test task three.

Figure 25: Repeated figures for post-test task four.

Two professional graders scored each response for originality, fluency, flexibility and elaboration.

Results

A Cronbach Alpha analysis was conducted to test for inter-rater reliability. It revealed a weak inter-rater reliability in post-task 4 of the domain-general creativity test. As a consequence, this task was not further analysed.

Paired T-tests were conducted to test for significant differences between pre- and post-scores/responses for both the control group (N=49) and the experimental group (N=51).

The control group exhibited no significant increase in task 2 and task 3 for the domain-general creativity test and no significant increase in the domain specific creativity test nor in the creative self-efficacy test. There was a significant increase

for the control group in task 1 for the domain-general creativity test. As a consequence, this task was not further analysed.

For the experiment group, the domain-specific creativity test showed a significant effect from the online training both for originality and usefulness**.**

Also, the creative self-efficacy test showed a significant effect from the training for the experimental group. Students that did the online training expressed augmented confidence in their capacity to generate novel ideas, to solve problems creatively and to further develop the ideas of others.

The experiment group showed no significant increase in the test for belief in creativity training.

For the experiment group, a significant increase was found in the domain-general creativity test from the training for total creativity score in task 3. There was no significant increase for task 2 in the same test, finding different uses for a common object.

Variable	M	SD	T	P	Cohen's	95%CI	
PRE creative self-efficacy	5.10	.677	-2.127	.039	0.306	-.378	-.011
POST creative self-efficacy	5.29	.723					
PRE domain specific, originality	1.90	.918	-3.349	.002	0.478	-.751	-.188
POST domain specific,	2.37	.755					
PRE domain specific, usefulness	1.82	.782	-2.451	.018	0.349	-.483	-.048
POST domain specific, usefulness	2.08	.640					
PRE domain-general, task 3	9.56	.605	-2.552	.014	0.341	-5.754	-.692
POST domain-general, task 3	12.79	.651					

Table 16: Paired sample T-test for experimental group.

Conclusion and discussion

Overall, the results demonstrate some positive effects as a result of the use of the digital gamified creativity training. The trainees advanced both their creative skills related to their domain (advertising), their general creative skills as well as their creative self-efficacy. This supports the notion that creative abilities can be positively improved through creativity training (Rose & Lin, 1984, Scott et al., 2004; Torrance, 1972) and gives new insights into how it can also be improved through digital gamified creativity training. As expected, the results show that the control group did not generally perform significantly more creatively in the post-test. This is in line with previous studies showing that the creativity of trainees in control groups have no significant change (Cliatt, Shaw, & Sherwood, 1980; Karakelle, 2009; Memmert, 2007).

The results did not demonstrate any significant effect in belief in creativity training. This test was designed to examine whether the performance of the digital gamified creativity training would have an effect on the trainees' believe that creativity training leads to an advancement in personal creative skills. However, the results did not support the idea that digital gamified creativity training leads to a stronger belief that such training advances personal creative skills. It may be that the level of belief in creativity training is more affected by theoretical insights rather than practical experiences. Also, some students in this sample may relate the concept of creativity to design capacity, particularly because they have academic courses on such subjects. Or, it may be that the post-test should have been performed much later after the training ended in order to allow the trainees time to experience how the training may have affected their everyday and domain related creative problem solving. It should also be noted that the initial pre-test scorings for this belief were relatively high, which means the students had positive expectations, though these were not significantly increased by the training experience.

The trainees were all studying advertising and PR. Scott et al. (2004) found that creativity training had a significant effect across various kinds of trainees and domains. Still, since advertisement students may have a strong "digital mindset," it would be interesting to further study digital gamified creativity training across several domains. Moreover, it would be interesting to include an international and intercultural perspective in future studies, in order to obtain a better understanding of whether there may be differences in how trainees are affected by digital gamified creativity training.

The creativity assessment used in this study includes a triangulation of methods. Still, it would be interesting to use even more methods in future studies in order to gain a deeper understanding of why we see these effects, in particular, why we see no effects in belief of creativity training. Long's (2014) review of 612 empirical studies on creativity showed that creativity research was mainly quantitative, using predominantly psychometrics and experimental methodologies with correlation

techniques, and judges were frequently employed to assess creative outcomes. In terms of qualitative approaches, the case study was the most common technique used. As pointed out by Johnson, Onwuegbuzie, & Turner (2007), mixed-methods research forms a middle ground between the two methodologies, allowing both to be combined "…for the broad purposes of breadth and depths of understanding and corroboration" (p. 123).

It is unclear why there was no effect for task 2 in the domain-general creativity test for the experimental group and why there was a positive increase in task 1 for the control group. One explanation could be that advertising students found the task less challenging as it is about simply shooting ideas (fluency), whereas the other tasks score for originality, flexibility and elaboration. Furthermore, why did the raters disagree on the scoring of task 4 in the domain-general creativity test? Further studies on digital creativity tests need to be conducted to better understand this unusual outcome. With these limitations in mind, the authors still believe this study improves our understanding of an emerging and novel area related to creativity training: the area of digital gamified creativity training.

This study focuses on the product and self-perception elements of creativity. However, we are conscious of the importance of individual traits and related psychological aspects, and acknowledge that the contextual, social aspects of creativity are outside the scope of the present study. Since Guilford's (1950) early work examining creativity from the viewpoint of creative dispositions and his psychological trait theory, several scholars have mapped characteristics, attributes and traits that underlie creative performance (Treffinger, Young, Selby, & Shepardson, 2002; Kaufman & Sternberg, 2010; Root-Bernstein & Root-Bernstein, 1999). Digital gamified creativity training offers a unique opportunity for self-facilitated long-term creativity training. Therefore, it also opens up interesting questions on how creativity training may affect such creative traits and dispositions. Further studies will be needed to understand this novel opportunity for creativity training research.

Guidelines for Applying Research to Practice

Digital gamified creativity training does have significant effects on creative performance. It can help develop those creative competencies that are becoming more important in education and industry. Practitioners in the field of education, management and human resources can now:

- Implement digital gamified creativity training into their curriculum and employee development programs.
- Be confident that the training will have a significant effect, thus it will be possible to evaluate the training by completion rather than using scores.
- Advance the creative self-efficacy as well as the domain related creative production and the domain general creative production.

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Appendix F. Article VI

ONLINE GAMIFIED TRAINING FOR BUSINESS INNOVATION: EXAMINING AN EMBODIED GAMIFIED E-LEARNING MODULE ON CREATIVITY

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Abstract

This article examines the use of a novel method of delivery of creativity training: a gamified embodied e-learning module for teaching the creative skills fundamental for practical business innovation. The e-module "Academy for Creativity" is examined as an out-of-class study activity for creativity training using interviews with focus groups of students, questionnaires on a larger group of students and individual interviews with teachers. The results reveal embodied gamified e-learning on creativity as a potential for increasing student motivation and engagement as well as a potential for advancing and increasing focus and student time spent on the deliberate practice of creativity as part of business innovation studies. The results also present recommendations for how to implement embodied gamified e-learning on creativity as a natural part of classes on business innovation.

Keywords: Creativity training, Business innovation, Gamified teaching, Educational technology for creativity, Creativity e-learning.

Introduction

According to policymakers and industry stakeholders, the future economic wellbeing of European societies depends on peoples' innovative skills. The ability to innovate is found to correlate strongly with the performance of the company (e.g. Tidd & Bessant, 2009). However, for other types of organisations (public, governmental etc.), innovation is also a prerequisite for answering the challenges of tomorrow as well as coming up with new ideas, approaches and processes to respond to the ever-increasing expectations of the public (Bloch & Bugge, 2013). Hence, educational institutions must educate students to have the capabilities to be innovative.

While no single definition exists on the term "innovation" (e.g. Adams *et al.*, 2006), there seems to be a consensus on the fact that creative thinking is the foundation of innovation. All innovation begins with the creative act of individuals (alone or together in small teams) to improve existing designs or create entirely new concepts that are significantly different from the existing ones (Freeman *et al.*, 1982). The former is often described as incremental innovation, while the latter is characterised as radical innovation of products, services, processes or business models. Common for both of these distinctions of innovation is the creative application of knowledge applied to a specific domain, making creativity a pervasive part of innovation. A recent meta-study finds that the relation between creativity and innovation in existing organisations is strong, in particular at the individual level (Sarooghi, 2015). As such, a fundamental part of any business innovation class should also include a deliberate practice of creativity skills.

Previous studies have found significant effects on creative skills using teaching approaches like theoretical discussions on creativity (Byrge and Hansen, 2013); creative role models (Hennessey *et al.*, 1989); creativity tools (Speedie *et al.*, 1971); creative strategies (Ridley and Birney, 1967), creative processes (Baer, 1988); counseling (Cropley and Cropley, 2000); written assignments on creativity (Robbins and Kegley, 2010); induced positive atmosphere (Clapham and Schuster, 1992); improvisational rhythm (Nelson and Lameli, 1991) and creative role-playing (Karakelle, 2009). It also seems relevant to pay interest to the notion of creative self-efficacy when focused on the development of creativity skills for business innovation. Creative self-efficacy is the self-perception of own creative potential. It can be developed through teaching experiences that makes the student feel comfortable being creative in all kinds of situations and on all sorts of problems (Byrge and Tang 2015).

However, integrating creativity training as a natural part of business innovation courses may be a rather complicated matter for most teachers. Reasons for this include a lack of competence in the field of creativity, a lack of in-class time to perform the training, and in particular, a lack of student motivation in general out-of-class study activities, which continuous creativity training would normally require.

In 2015, a research consortium supported by The European Union's Erasmus+ program[66] was established to develop a solution that could make up for some of the previously mentioned challenges for integrating creativity training. The research partnership developed and published a free plug-and-play web-based solution called Academy for Creativity. It is a digital gamified creativity training system that helps teachers integrate creativity training into their business innovation courses easily and in a meaningful way for young students. The e-module has been created in collaboration between the School of Management at the Chinese Academy of Sciences, China; the Edward de Bono Institute for the Design and Development of Thinking at University of Malta, Malta; the Department of Communication at Complutense University, Spain; and the Department of Business and Management at Aalborg University, Denmark.

This paper examines the e-module concerning key creativity skills required for practical business innovation as well as critical insights on how to best apply this tool in teaching settings.

Digital Creativity Training

The cognitive aspects in creative thinking are mostly related to divergent thinking skills, emphasised in Guilford's (1959; 1967) work as well as in Torrance's (1972, 1993) numerous works. From these, the pivotal creative skills related to business innovation include originality, fluency, flexibility, visualising future scenarios (imagination), and elaboration & persuasion. *Originality* represents the skill to challenge existing notions within an industry, organisation, business or technology as well as producing and identifying novel ideas, e.g. for rejuvenating market offerings or developing a new profit model. *Imagination* expresses the skill to think up and visualising future scenarios as well as the perseverance to defy logic and causality in the search for exciting and inspiring ideas, e.g. new combinations or arrangements of existing resources to generate (new) value through a new product system or service. *Fluency* symbolize the skill to resist the temptation to stop a creative production when a good idea appears in a creative thought process as well as the curiosity to continue the production of ideas to see if an even better idea is about to appear, e.g. for a new type of customer relationship or interactions creating new customer engagement. *Flexibility* is the skill to use cognitive stimulation to change perception at will and to develop new directions of thinking that will lead to

[66] A funding scheme to support activities in the fields of Education, Training, and Youth. It offers opportunities for individuals to spend a mobility or volunteering period abroad and to receive linguistic training as well as organizations to collaborate in project partnerships in the fields of academic and vocational training.

a wider variety of ideas (not just more ideas), e.g. to develop a better product-channel fit or change internal core processes or enabling structures. *Elaboration & persuasion* depict the skill to further develop ideas with an open mind towards pre-inventive ideas without the use of judgement as well as to make these ideas understandable and appealing to others, e.g. for persuading network partners to join alliances and create value in a new way, or customers to buy your product through new branding communication.

These skills (as well as other skills related to creativity) can be advanced through training. In fact, numerous studies have shown significant effects on the training of creativity (Rose and Lin, 1984; Scott *et al.*, 2004; Torrance, 1972). However, these studies have focused on face-to-face in-class or process-like training. This paper examines a new method of delivery for creativity training: Online embodied gamified e-learning. Academy for Creativity (www.academyforcreativity.com) is an e-module designed for higher educational institutions. It uses gamified elements (Werbach and Hunter, 2012) such as badges (bronze, silver and gold), progress tracker, difficulty levels, instant feedback on performance, experience points as well as an avatar in a virtual world of a typical office. It consists of 11 research-based training games, an assessment method as well as a teacher and a student profile.

The storyline focuses on a robot disguised as a human working in an office. In each game, the robot is presented with tasks at the office that requires creativity. The player (trainee) will have to help their avatar produce creative ideas for these tasks, as robots do not possess creativity skills. Also, trainees need to keep co-workers convinced that the avatar is a human by continuously demonstrating creative contributions to any tasks given.

Training games

Each of the 11 games practices several skills related to creativity and business innovation in different ways: some tasks use verbal stimuli, some figural, while a few use both domains. An analysis shows that each game primarily practices two skills, and each game has between 30 and 90 rounds that cover three levels of difficulty (easy, medium, hard). The 11 games are described in Table 17.

Game name and type	**Game description**	**Key creative skills trained**
Trend Spotter *(verbal)*	The avatar has to produce ideas for future products for the office by combining trending products in new ways. The trainee needs to create original new products by combining completely unrelated products (and sometimes for a specific market or segment). Also, the	• Fluency • Originality

	trainee needs to be fluent in producing as many new product ideas as possible.	
Draw in One Stroke *(figural)*	The trainee needs to help the graphics team make some drawings of specific items and situations. The avatar has a malfunctioning arm, so it can only draw in one stroke. As a result, the trainee will have to change perception entirely on how he/she usually would draw, for example, a shoe or harbour scenery, as it should now be done with one stroke. This requires the use of the imagination, in particular as the difficulty level goes up.	• Imagination • Flexibility
Cue Up *(verbal)*	The avatar needs to help a colleague with cue cards during his speech. After the speech is over, the trainee will have to support the avatar making the connections between each cue card, creatively and persuasively. With this, the trainee will have to produce a lot of ideas for cue cards quickly and make creative and persuasive elaboration for each set of cue cards.	• Fluency • Elaboration
Poster Perfect *(verbal and figural)*	The avatar needs to help the advertising team by finishing a new campaign poster. The poster has already been started, and the trainee needs to be open-minded and elaborative to finish the sketch into a finished poster that makes sense. After completing the poster, the trainee will have to make a persuasive and elaborative catchphrase and make the poster fit within a specific objective for the campaign.	• Elaboration & Persuasion • Flexibility
Figure it Out *(figural)*	The avatar needs to help the product design team by putting together a bunch of pre-made random elements in a way that makes sense and is useful. The trainee must use the imagination by moving, rotating and scaling the pre-fabricated shapes to turn them into the specific predefined products. To do so, the trainee must change perception on the designs all the time since the forms available may change during the game or may only be available for one-time-use.	• Imagination • Flexibility

Crazy Connection *(verbal)*	The avatar is about to be revealed as a robot by a colleague at the coffee machine. The trainee needs to produce a lot of creative abstract or concrete connections between random objects to "prove" that it is not a robot, but rather a human. The trainee will need to perceive the objects from many different perspectives and produce as many connections as possible.	• Fluency • Flexibility
Sounds Like an Idea *(verbal and figural)*	The avatar has to help find out what causes some disturbing sounds at the office. The trainee needs to use his/her imagination to help the avatar connect a weird sound to one of three objects. Afterwards, the trainee should produce an original explanation of how this particular object produced this odd sound.	• Imagination • Originality
Language Lab *(verbal)*	The avatar has to help a new intern understand the unique words and terminology used at the office. The trainee needs to produce original definitions of novel words and terms. Also, the trainee must elaborate on the usage of this particular word, by writing persuasive sentences in which the word is used.	• Originality • Elaboration & Persuasion
Race for the Raise *(figural)*	The avatar has to compete with colleagues by spotting ideas that general people and creativity experts would find most creative. The trainee needs to use his/her sense of originality and imagine scenarios to identify the most original ideas.	• Originality • Imagination
The Archive *(verbal – reflective)*	After two hours of training, this reflection-based practice becomes available. It requires the trainee to reflect on the experiences from the training in the other games in a maximum of 200 written words.	• Creative Self-efficacy

Table 17: Overview of the different games available at www.academyforcreativity.com.

Assessment

An automatic assessment is available to provide students with instant feedback on their progression while providing teachers with a simple tool for evaluating student performance. The fundamental notion for assessment is based on task completion because studies have shown consistent significant effects since the 1960s for this kind of training (Rose and Lin, 1984; Scott *et al.*, 2004; Torrance, 1972). Instead, it seems enough to "test" whether students perform the exercises prescribed by the teacher. As a result, the automatic assessment is designed to include the following elements:

1. Based on the relation between students actual training time and the minimum training time (workload) set by the teacher, students get a *pass/fail*. If the teacher defines the workload to be 2 hours, then all students performing 2 hours of training will pass.

2. Students receive *experience points* for completing each round in a game. These experience points are related to the key creative skills trained in each specific game (fluency, flexibility, imagination, originality, creative self-efficacy, and elaboration & persuasion). For the total experience points accumulated across all games and all skills, students also get a *creative experience score*.

3. There are three levels of difficulty in each game, visualised by a bronze coin (easy), a silver coin (medium), and a gold coin (hard). Upon completion of all rounds at a specific level, it will open up the next level of difficulty.

4. After completing a minimum of 10 hours training, students can request a *certificate of achievement*, regardless of course requirements, experience points as well as regardless of the amount of bronze, silver and gold coins.

Teachers have a dedicated profile where they can access all data related to the student's creative performance making it possible to assess each game output produced by their students thoroughly.

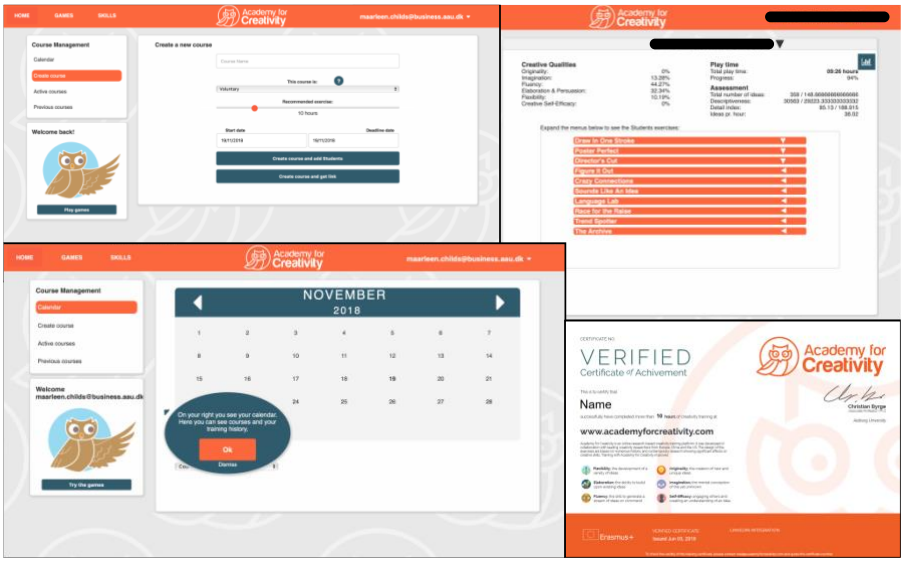

Illustration 5: Screen-dumps from the teacher profile at www.academyforcreativity.com.

Teacher Profile

Teachers can set up courses for their students and design these by providing a course name, setting the total workload (between 15 minutes to 50 hours), select starting and deadline date as well as choose whether the course is an obligatory or extracurricular study activity. There are no requirements for prior knowledge about creativity for the teacher to use this e-module.

Teachers can send a link to the students from which they can sign up and automatically enrol into the intended course. It is also possible to track students for total training time, the total number of ideas produced, level of idea descriptiveness, detail index, ideas generated per hour as well as the distribution of training time on each of the skill variables. Finally, it is also possible to browse through all individual ideas produced by each student.

Teachers can create as many courses as needed (one every semester, one for different classes, a number for differentiated learning in a class, etc.). A calendar provides an overview of all courses showing starting date, deadline and average student progress.

Student Profile

There are no requirements for prior knowledge about creativity for the student to use this e-module. When students sign up, the avatar will inform them about the story-line of the game. Furthermore, during playing time the avatar will provide the student with information, such as suggestions to what tasks to perform each day, noticing when a new level is reached in a specific game and so on.

When invited to a course, the calendar gives students an overview of their progress concerning course completion and performed training. A 'Skills' page provides an overview of the experience-based points gained through training. When setting up a new account, only three games are available. The other games become available as the student reach specific goals from playing. These goals are visible for the student at all time and are designed in this way to increase the gamification aspect.

Illustration 6: Screen-dumps from the student profile at www.academyforcreativity.com.

Key Insights

A study on the use of Academy for Creativity was conducted, involving two focus group interviews with a total of 59 students as well as a questionnaire with 49 other student respondents. The results revealed that a progression based on completion of game rounds is more motivating for continuing training than an individual evaluation based on personal creative production. It seems that the mere expectation of assessment diminishes the motivation to perform this kind of out-of-class study

activity. Furthermore, the gamification elements were found to be great motivators for engagement in training. Some students even referred to the e-module as *entertaining*. Other external motivation factors for engagement in the e-module included receiving a certificate of completion, an expected future work requirement for creative skills (93% considered creativity as one of the most important skills for their future career), higher marks in final exam, innovative business development (97% of the respondents consider creativity to be essential for new entrepreneurial ventures), and to gain personal creative powers. Seventy-three per cent found that the e-module advanced their skills related to the production of novel and interesting ideas. Interestingly, 6% (after using the e-module) considered creativity an ability that cannot be practised through training.

A study was later conducted involving individual interviews with five teachers that integrated the e-module into their teaching. The results revealed a series of recommendations for other teachers. Firstly, teachers should try to introduce the e-module in the classroom and together set up accounts so that students get a good experience of how it will be to use the e-module as an out-of-class study activity. Secondly, the creativity training should be made obligatory, have a strict deadline, and the overall workload should reflect approximately 15 minutes of practice per day in the given period. Thirdly, the e-module should be introduced in-class involving preferably both a short introduction to creativity theory, examples of some "off-line" creativity training exercises as well as allowing the students to get familiar with the e-module by letting them try out some of the games on laptops during class (individually or in pairs). Finally, the e-module should be related to the course objectives through a classroom discussion. In a business innovation course, it would be essential to discuss how the creative skills may be relevant for example to the innovation types in Doblin's taxonomy: configuration (profit model, network, structure, process); offering (product performance, product system); and experience (service, channel, brand, customer engagement) (Keeley *et al.*, 2013). Alternatively, it may be relevant to discuss the level of importance of creative skills in the different phases of an innovative process, e.g. from ideation to planning and development and later commercialisation and diffusion (e.g. Rogers, 1983) or initiation, development and implementation (e.g. Van de Ven *et al.*, 1999).

Núñez *et al.* (2019) used a combination of skin reaction detectors and a questionnaire to test comparatively for attention, emotional response and likability among students using Academy for Creativity. The scholars found significantly more stable levels of attention and a higher emotional response at the beginning of the training compared to a control group that performed off-line adoptions of the Academy for Creativity games. They also found high levels of likability related to innovativeness and dynamics of the games as well as game playing time. The training using Academy for Creativity had a positive effect on attention and emotional response compared to the control group, and students generally liked the gamification aspect of the e-module.

Hänninen *et al.* (2019) later performed a comparative study on communication students (bachelor level) to discover the effects of using Academy for Creativity as a supplement to a traditional teaching module in creativity. Their test included an adjusted digital version of the Abbreviated Torrance Test. The researchers found a significant effect for the students that used the e-module in addition to the mandatory classes compared to the control group that only attended classes.

Discussion and Conclusions

This paper presents an examination of a novel e-module for gamified online out-of-class study activities for teaching the creative cognitive skills fundamental for practical business innovation. The examination shows some exciting possibilities for increasing student motivation as well as student engagement, which is of particular interest because there seems to be a general student disengagement in out-of-class study activities (Betihavas *et al.*, 2016). Maybe this kind of e-modules can help students become more engaged in out-of-class study activities, as also pointed out by Dingli *et al.*, 2018.

The creative cognitive skills mentioned as a prerequisite for business innovation requires a period of deliberate practice. However, most teaching settings do not allow much time for deliberate practice. Instead, they tend to focus on "knowledge of", i.e. introducing methods, practices and theories about business innovation. Deliberate practice is often limited to one or a few real or theoretical cases where students are expected to produce ideas for a new configuration, offering or experience at a theoretical level. This level of deliberate practice is far from enough to develop the prerequisite creative skills needed for business innovation among students. The results from this paper open up for the possibility to introduce (more) deliberate practice-oriented study activities of the necessary vital creative skills into a business innovation curriculum for teachers lacking competencies in the field of creativity. Maybe this kind of e-module is a solution for introducing the deliberate practice to the teachings of innovation and in particular courses that take a more practical approach to business innovation.

Implementing online digital study activities is not an issue-free task. There may be a general issue to whether "online learning" and "gamification" fit the learning culture of the educational institution, program or the students enrolled. There may also be a more specific issue related to the group of students that are not experienced with (online) gaming from their private life or comfortable with this type of study activity (Landers and Armstrong, 2017). This is especially relevant to consider in third world countries with low "digital native" rates as well as in educational institutions where computers are not common practice in the classroom. Although studies show that online gamified courses can be experienced as both effective and engaging, this may not be the case for all students. However, during our focus group interviews, one student challenged this perception, explaining that "[…] normally, I dislike all kinds of digital games, however, this game somehow caught my attention".

The study by Hänninen *et al.* (2019) proved that Academy for Creativity had a significant effect on the improvement of student's creative competencies. Theoretically, this implies that students would also improve their capacity to innovate; yet, further research could study how strong the transfer effects are from digital creativity training to off-line versus online business innovation. It may be that digital creativity training has a better effect on creative skills applied in a digital domain.

Guidelines for Applying Research to Practice

According to a recent McKinsey study, only 6% of corporate CEOs are satisfied with the innovation processes in the company. An effective approach to fast-track innovation in organisations is to invest in the existing resources; more specifically, the employees. While the deliberate practice of employee's creative skills does not guarantee more innovators, it is, however, a guarantee of increasing the odds of innovation.

This research was developed for and tested with higher educational institutions subjects (students and teachers). Yet, practitioners such as business consultants, managers and executive CEOs could use Academy for Creativity to integrate creativity training in organisations, as some of the main issues mentioned in this paper are quite relevant in the business world as well (lack of competencies, lack of time, lack of motivation).

These are the guidelines for applying Academy for Creativity in organisations:

- Start by investigating the e-module yourself to get an experience of what the employees will encounter. Go to www.academyforcreativity.com, see the user guides, read about the research behind and set up a teacher, consultant or leader account. You will thereby have access to all training games at all times.

- Select the employees that should be practising their creativity skills. The selection process can be done in several ways, based on whether or not participation can be made obligatory for the whole organisation, department or team. Remember that innovation (and the practice of creative skills) should not be restricted to the R&D department, innovation department or similar; employees at all levels need to develop their innovation skills. The results presented in this paper suggests that creativity training should be obligatory in a teaching setting. In theory, obligatory participation of all employees would be the best to increase the odds of innovation but might not be possible to implement in most organisations for various reasons. A smaller group of participating employees would be more realistic as a starting point. If you cannot freely choose yourself, you can use one of the following approaches:

  - Make an open invitation to all employees for a workshop on innovation and how to improve personal creativity skills. Make it something special – an innovative community, maybe even give it a name. The people that show up are the ones that are internally motivated.

  - Hand-pick individuals based on their position. This approach ensures that you have the right gatekeepers involved, but you risk that they are not intrinsically motivated to participate or have the time.

  - Have HR identify individuals based on their personality traits and invite them to a meeting. Look for employees scoring high on the 'openness' trait from the Big Five personality dimensions (or similar) as these are most likely to participate in new activities. Furthermore, research have found this trait to be highly correlated with creative achievement.

  - Ask team or divisional leaders to point out people that have free capacity to participate. This will ensure that the participants have the required time available for continuous training, but their motivation and engagement might be low.

- Introduce the e-module to the involved employees to set up accounts so that they get a good experience of how it will be to use the e-module. If legitimacy is an issue, you could start out by focusing on why innovation is important and how creative skills are related to innovation capacity and that these skills can be trained.

- Set up a training schedule with a deadline (14 days or one month) and invite the participates. Advise the employees to train 15 minutes daily.

- Follow up on each employee's progress using your own profile. You could write individual emails with some of the statistics from their creative production compared to the average of the involved employees. Write weekly emails to everyone where you acknowledge their effort; you could present the top three weekly performers (based on total amount of training or the progression in relation to total training program).

- After the training period has ended, gather everyone for a meeting to discuss how the training have affected them (in their working life, personal life etc.). Get the participants to share stories about how they have used their creativity skills (new product, service, process, or

business model ideas). Set a realistic goal for the next period of time (one month, two or six months). Talk about ways to involve other employees.

- Share all results with the whole organisation (progression of participants, number of produced ideas in the beginning compared to the end etc.).

You should pay specific attention to older employees, as elderly workers might not be familiar with (online) gaming or comfortable with this type of activity. However, that is not a reason to exclude them from using Academy for Creativity; they might just need additional support in the beginning of the training period.

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