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SOCIAL ENTREPRENEURSHIP:

MODELLING THE INNOVATIVENESS OF ENVIRONMENTALLY SUSTAINABLE SOCIAL ENTERPRISES

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Declaration in lieu of an oath

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To Mother Earth and future generations

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Abbreviations

CIS	Community Innovation Survey
EFA	Exploratory factor analysis
EI	Eco-innovation or environmental innovation
EIPI	Eco-innovation performance indicator
EMS	Environmental management system
ESI	Environmentally sustainable innovation
ESSE	Environmentally sustainable social enterprise
MEI	Measuring Eco-Innovation project
PCA	Principal component analysis
R&D	Research and development
SE	Social enterprise
SEF	Social entrepreneurship fit
SME	Small- and medium sized enterprise
SPSS	Statistical Package for Social Sciences

1 Introduction

" Let us choose to unite the power of markets with the strength of universal ideals. Let us choose to reconcile the creative forces of private entrepreneurship with the needs of the disadvantaged and the requirements of future generations."

Kofi Annan, 1999 (Wilson & Post, 2013, p. 730)

Even two decades after former United Nations secretary-general Kofi Annan's call to action during the World Economic Forum in 1999, it is as relevant as it was then, as the rate of change towards a more sustainable world continues to be disturbingly slow (Silvestre & Ţîrcă, 2019). The environmental challenges the world is currently facing are deteriorating the ecosystems whose services sustain all life on Earth, such as cleaning air and purifying drinking water (Cohen & Winn, 2007). Heightened awareness about the severity of global sustainability challenges has reinforced calls to harness the potential of alternative business forms and ecologically sustainable innovations in order to grant future generations the capability to meet their own needs (Vickers & Lyon, 2014). The challenges include, for instance, air and water pollution, deforestation, biodiversity loss, excessive waste generation, ozone layer depletion and as a result, and particularly large-in-scope, global climate change. Climate change itself causes further severe consequences for human life such as sea-level rise, droughts, and extreme weather events in the forms of floods, heatwaves, and hurricanes (Silvestre & Ţîrcă, 2019). In addition, the accelerating depletion of natural resources is another indicator that the world has not fully embraced the concept of sustainable development (Hockerts & Wüstenhagen, 2010). Thus, an increasingly large gap can be observed between human demand and natural resource supply - the Earth's ability to provide ecological services and renewable resources. According to the World Wide Fund For Nature (WWF) (2016), the regenerative capacity of 1.6 planets is needed each year to support human activities. In the face of the forecasted increasing world population, surpassing nine billion in 2050, human demand for food and other goods and services will grow even further (García-Granero, Piedra-Muñoz, & Galdeano-Gómez, 2018, p. 305). This trend, along with the limitation of natural resources, has reinforced calls for new and more efficient ways to use these resources in order to balance future consumption requirements with sustainability (García-Granero et al., 2018).

In this context, special attention is paid to industry and organisations as they are considered to be the main players creating and perpetuating environmental degradation. Yet they have the potential to provide appropriate solutions and thus to minimise and even reverse their negative environmental impact (García-Granero et al., 2018; Schaltegger & Wagner, 2011). The perceived weaknesses of and dissatisfaction with the dominant for-profit enterprise model of neo-liberal capitalism has triggered a rich discourse that suggests Schumpeterian entrepreneurship and innovation are key drivers for making the sustainability transition (Cohen & Winn, 2007; Dean & McMullen, 2007; Hall & Wagner, 2012). Specifically, Cohen and Winn (2007, p. 30) argue that environmental degradation can be slowed down and the Earth's ecosystems can be improved by "harnessing the innovative potential of entrepreneurship with innovative business solutions". The required ecological and social innovations are likely to come from a special breed of entrepreneurs, so-called social entrepreneurs. The emerging branch of literature on social entrepreneurship addresses mission-driven rather than profit-driven entrepreneurial endeavours that contrast with the neo-liberal economics perspective and place social and environmental interests on par with economic interests (DiVito & Bohnsack, 2017; Hall & Wagner, 2012). As a distinct organisational phenomenon, social enterprises (SEs) are described in literature as inherently innovative in simultaneously addressing social, environmental and economic needs (Monroe-White & Zook, 2018; Wilson & Post, 2013).

Social entrepreneurship literature has been acknowledged as an important interdisciplinary field of inquiry, proven by an increased number of studies in economics, social science, and sociology over the past three decades (Balgar, 2011; Ghalwash, Tolba, & Ismail, 2017). According to Hadad (2017), the research on the topic is predominantly of an exploratory and qualitative nature, with conceptual studies and case-based works focused on describing the phenomenon as a whole with additional attention paid to the characteristics, motivations, and success factors of social entrepreneurs. Common across all studies is that the scholars characterise the social enterprises' actions by innovation (Gast, Gundolf, & Cesinger, 2017; Hockerts & Wüstenhagen, 2010; Schaltegger & Wagner, 2011).

The majority of SEs are small-sized and young enterprises (Defourny & Nyssens, 2017b; Doherty, Haugh, & Lyon, 2014). Creech et al. (2014) emphasise the significant contributions that small and medium-sized companies make to the green economy as well as the sustainable development and investigate the barriers these companies

face. Very few studies synthesising social entrepreneurship literature and sustainable development literature address a sub-class of SEs, environmentally sustainable social enterprises (hereafter ESSE), whose business models are designed to tackle environmental challenges. The central themes of these studies include growth strategies (Vickers & Lyon, 2014), sustainability decision making (DiVito & Bohnsack, 2017), and case-based social and ecological initiatives of SEs predominantly in developing countries (Bettiol, De Marchi, & Di Maria, 2018; Picciotti, 2017; Youssef, Boubaker, & Omri, 2018).

Innovation and sustainability are two notions that frequently develop interrelatedly in the literature. The emerging academic discourse on ecologically sustainable innovations, so-called eco-innovations (EIs) or green innovations, combines business innovation research with sustainable development research. EIs have the potential to make products as well as business processes less wasteful, less resource-intensive, and more eco-efficient overall (Leal-Millan, Peris-Ortiz, & Leal-Rodríguez, 2018). Extensive literature exists on the determinants of EIs and drivers for the adoption of EIs (Cai & Li, 2018; Cai & Zhou, 2014; Chen & Chang, 2013; Dangelico, 2016; Horbach, Rammer, & Rennings, 2012; Triguero, Moreno-Mondéjar, & Davia, 2013). Studies on EIs highlight the importance of firm innovativeness as a key driver of sustainability and conversely sustainability as a key driver of innovation (Silvestre & Ţîrcă, 2019; Varadarajan, 2017).

1.1 Problem statement

A critical reading of the SE literature reveals that studies emphasising the innovative actions of SEs are case-oriented and limited to the description of innovative solutions to social problems by individual SEs (Gast et al., 2017; Hockerts & Wüstenhagen, 2010; Schaltegger & Wagner, 2011). However, what exactly makes SEs so innovative? According to Christmann (2011), social entrepreneurship literature lacks a systematic link to business innovation and socio-economic innovation research. This is surprising given the common view that innovation is the essence of entrepreneurship, as coined by Joseph Schumpeter, the father of modern entrepreneurship (Larson, 2000). In this sense, Doherty et al. (2014) depreciate the limited contributions on determinants and processes of SE innovation and SE innovativeness. Furthermore, to date, scholars of social entrepreneurship literature have paid little attention to the ecological dimension of SEs which thus remains theoretically understudied (Picciotti,

2017). According to Hillman, Axon and Morrissey (2018), SEs have not yet been explored as serious instruments for transitioning towards sustainable development.

Recent academic literature on ecologically sustainable innovations focuses predominantly on large, profit-maximising organisations (Bos-Brouwers, 2010; Cai & Li, 2018; Chen & Chang, 2013; Horbach et al., 2012; Triguero et al., 2013). Despite their contributions to sustainable development, mission-driven SEs remain understudied as an object of study in the EI literature. Multiple authors suggest more research on EI in companies of different sizes and industries (Cai & Zhou, 2014; del Río, Peñasco, & Romero-Jordán, 2016b; Triguero et al., 2013). More specifically, Gast et al. (2017) call for studying EI in the under-researched context of value-driven environmentally sustainable SEs.

Analysing the current state of research clears that social entrepreneurship, sustainability and innovation represent concepts that are closely linked to each other. However, interrelations have, to date, only been developed twofold: Innovation in the context of social entrepreneurship and sustainable development tied with innovation. The latter represents a separate branch of research with EIs, whereas no systematic link has been established in the field of social innovation between the social and business innovation research. What seems to be missing is a focus on the interface of the social entrepreneurship - innovation - sustainability nexus. These observations lead to the conclusion that it has yet to be addressed how the context of social entrepreneurship promotes the innovativeness of environmentally motivated small-sized companies. Multiple studies speak of a special form of compassion among social entrepreneurs on which the social enterprise is founded, open organisational structures, collaborative networks or the management of human resources, which make SEs particularly innovative (Doherty et al., 2014; Pittz, Madden, & Mayo, 2017).

Following the aforementioned calls for alternative business forms and ecologically sustainable innovations, this research takes on a social entrepreneurship studies perspective to address the innovativeness of environmentally motivated, or sustainable, SEs (ESSEs). Specifically, this study seeks to explore the internal capabilities of ESSEs with the potential to affect EI. Joining previously separate literatures on social entrepreneurship and EI, this approach will strengthen and deepen the knowledge of social entrepreneurship by contributing to a better understanding of ESSE's potential to disturb the established unsustainable practices of industries touted by literature and

thereby carrying Kofi Annan's legacy forward (DiVito & Bohnsack, 2017; Hockerts & Wüstenhagen, 2010).

1.2 Research question

The importance of this research is corroborated considering the aforementioned gaps in social entrepreneurship and EI studies. Specifically, the following research question is addressed:

Which internal factors at firm-level determine the innovativeness of environmentally sustainable social enterprises?

1.3 Research objectives

The descriptive aim of this study, and thus the major contribution of this work, is to derive a conceptual model of the innovativeness of ESSEs at the micro-level based on a systematic literature review. The empirical-analytical objective is to test the developed model based on a quantitative exploratory study. The prescriptive-normative goal of the study is a refined model that explains the innovativeness of ESSEs at firm-level. In this sense, the contribution of the study for social entrepreneurship literature is the discussion and identification of eco-innovativeness in environmentally motivated SEs.

1.4 Method

The research objective of the study, to develop a refined conceptual model of the internal determinants at the micro-level of ESSE's innovativeness, calls for an explanatory quantitative research method. A two-stage research design is employed. In the first stage, a systematic review of social entrepreneurship and EI literature is conducted to derive a set of internal factors that are said to determine the innovativeness of ESSEs. Based on these identified factors, a conceptual model is developed. In the second stage, a first quantitative exploratory study is conducted on the model on a set of European ESSEs using a standardised online questionnaire. Exploratory factor analysis (EFA) is applied to the data collected to reduce the number of internal factors initially identified to a smaller set of summary factors that can parsimoniously explain the eco-innovativeness of ESSEs (Fabrigar & Wegener, 2012). Such an approach follows suggestions to improve the methodological rigor in social entrepreneurship literature by using multivariate research methods (Hadad, 2017).

1.5 Structure

The study is structured as follows: after this introduction which is comprised of the presentation of the research problem and the research objectives, *section two* represents the theoretical framework regarding ESSEs. Terminology is clarified and delineated, the state of the research field is presented and peculiarities of ESSEs are described.

Section three provides the theoretical framework regarding environmentally sustainable innovations. It includes an elaboration of the central concepts of innovation, EI and firm innovativeness and its measurement.

Section four joins the concepts of ESSEs and innovativeness and presents the conceptual model on the innovativeness of ESSEs. This section details the research methodology procedure applied for the development of the model by demonstrating how its individual elements are derived. The section ends with a proposal of hypotheses derived from the model.

Section five comprises the quantitative exploratory study on the conceptual model. Details about the methodology and the research design are provided and the empirical results of the EFA are presented. It follows a presentation of the adapted conceptual model and a discussion of the hypotheses. Finally, the empirical results are interpreted in light of previous research.

Finally, *section six* concludes the study by providing a summary and critically reflecting on its limitations. Implications for theory, practice, and policy are highlighted, and potential avenues for future research are suggested.

2 Environmentally sustainable social enterprises

This section introduces the research object of this study, and justifies environmentally sustainable social enterprises (ESSEs) as a sub-class of SEs that direct their business activities towards the environmental pillar of sustainability. In the larger nexus of social entrepreneurship, sustainability, and innovation, which builds the underlying construct of this study, this section discusses issues at the interface of the concepts of social entrepreneurship and sustainability by reviewing their respective branches of literature. Section 2.1 provides a stepwise delineation and specification of relevant terminology and concepts surrounding social entrepreneurship and sustainability with the intention of presenting a working definition of the research subject. Section 2.2 presents the state of the research field of social entrepreneurship and sustainable entrepreneurship. Finally, section 2.3 goes beyond a definitional description of the phenomenon and highlights the peculiarities of ESSEs that have the potential to affect the adoption of EIs.

2.1 Terminology

While a completely clear-cut definition of ESSEs may be unattainable, this section develops a working definition in a stepwise fashion. For the purpose of this study, the definition will be developed against the background of the concepts of social entrepreneurship and sustainability. Figure 1 depicts this stepwise approach.

Figure 1. Approach for developing a working definition of ESSEs

2.1.1 Social entrepreneurship

Despite the growing interest in social entrepreneurship, it remains a relatively novel field of research that lacks definitional consensus. Scholarly work in this field is still fragmented and heterogeneous with competing and overlapping definitions having spurred extensive debate (Pittz et al., 2017; Young & Lecy, 2014). This lack of agreement stems, in part, from the interdisciplinary nature of approaches to social entre-

preneurship research bridging organisational theory, management practices, sociology, political science, geography and environmental science and economics (Doherty et al., 2014). The different research perspectives and specific interests of scholarly work of SEs also explain the divergence of definitions. Social entrepreneurship has been approached and defined in terms of the motivation and character traits of social entrepreneurs or alternatively from a focus on the entrepreneurial activities and processes of creating social value (Kraus et al., 2017).

In order to arrive at a working definition of social entrepreneurship for this study, the conceptualisation shall be approached by breaking down the term into its two essential characteristics, “social” and “entrepreneurship” and detach the latter.

Entrepreneurship. While the multiplicity of definitions on entrepreneurship exceeds even the abundant definitions of social entrepreneurship, Venkataraman’s (1997) frequently cited definition has been particularly influential in shaping the entrepreneurship research over the last two decades in the broader body of business literature (Javadian & Singh, 2018). The author argues that entrepreneurship is about understanding how “opportunities to create future goods and services” are “discovered, created, and exploited, by whom, and with what consequences” (Shane & Venkataraman, 2000, p. 218; Venkataraman, 1997, p. 120). This definition is useful for several reasons. According to Cohen and Winn (2007, p. 35) it (1) introduces opportunities as the central issue in entrepreneurship, focuses on (2) their sources, (3) the agents of their exploitation, (4) the entrepreneurs, and (5) the consequences of their exploitation. The authors further state that this definition places entrepreneurship in a larger social context.

Using the words of the French and Austrian economists most closely associated with entrepreneurship, Jean-Baptiste Say and Joseph Schumpeter, entrepreneurship creates value and, as emphasises by Schumpeter, includes both innovation and change (Dees, 1998; Schneider, 2017, p. 442). Say defines value creation as shifting “economic resources out of an area of lower and into an area of higher productivity and greater yield” (Dees, 1998, p. 1). The notion of opportunity is also central to Peter Drucker (1985, p. 28) definition of the entrepreneur who “always searches for change, responds to it, exploits it as an opportunity”. Drucker further argues that a profit motive in the neoliberal capitalism sense is not required for entrepreneurship (Dees, 1998).

In his book “Innovation and Entrepreneurship”, he devotes a whole chapter to entrepreneurship in service institutions. He emphasises that public service institutions such as universities, community and charitable organisations need to be entrepreneurial and innovative like any business (Drucker, 1985).

Social entrepreneurship. The ideas of Say, Schumpeter and Drucker in the business context can also be applied in a social context. Hence, an understanding of social entrepreneurship can be built on this traditional conceptualisation of entrepreneurship. Having made several important contributions to the social entrepreneurship research, Dees (1998, p. 2) states that “social entrepreneurs are one species in the genus entrepreneur. They are entrepreneurs with a social mission”. More precisely, Schneider (2017, p. 423) argues that if all entrepreneurs can be characterised by creating value in innovative and transformative ways, then what is distinct of social entrepreneurs is their impact serving a social function.

Social enterprises. Despite the abundance of varied and contested definitions of SEs, two defining characteristics of the phenomenon of SEs can be drawn out of these and be pinned down to: (1) carrying out some type of commercial activity which generates revenue, and (2) the pursuit of social goals (Doherty et al., 2014, p. 420). Hence, “social enterprise” is a collective term for organisations that seek market-based solutions to address social issues (Hillman et al., 2018). They pursue a dual mission of social purpose and financial sustainability, reinvesting profits generated to achieve multiple bottom lines (Doherty et al., 2014). As self-sustaining businesses, in contrast to profit-maximising ones, there are no dividends for shareholders (Yunus, Moingeon, & Lehmann-Ortega, 2010). By harnessing market dynamics with a clear primary intention around social purpose, SEs embody the marriage of two ideas that have traditionally been seen as antithetical: social and economic value creation (Wilson & Post, 2013). The latter lies at the heart of the prevalent conception of the for-profit business model and the capitalist system of the 20th century which was largely coined by economist Milton Friedman (Wilson & Post, 2013). Friedman (1970) stated that increasing shareholder profit is the only legitimate social responsibility of the firm. Less or no consideration is given to other stakeholders such as the community, customers, employees or the environment.

Typical social objectives pursued by SEs include alleviating poverty, inequality, unemployment (of disadvantaged groups), homelessness, and carbon emissions

(Doherty et al., 2014). A well-known example of SEs is the microcredit institution Grameen Bank in Bangladesh founded in 1983 by Muhammed Yunus, who proposed the primarily mission-driven social business as a new model of organisation in his 2007 book, *Creating a World Without Poverty*. The venture created social value by finding individuals who were denied credit by traditional banks and lending them the equivalent of a few dollars. This enabled the borrowers to engage in small-scale entrepreneurial activities and by doing so to ultimately lift themselves out of poverty (Yunus et al., 2010). Another example of an SE business model is given by Spieth et al. (2018). By providing job placements for blind and visually handicapped people in the early breast cancer detection field, an SE shows that economic and social value creation can run in parallel: “the more people are provided with a qualification and job placement, the more breast cancer consultations are conducted, the earlier indications of cancer are detected, the better the patients' survival chances, and the lower the treatment costs for the health insurance system” (Spieth et al., 2018, p. 8).

Delineation of SEs. SEs operate in the ill-defined space of the emerging “fourth sector” of the economy where both the market and governmental failures leave a gap in the necessary provision of social welfare. The “for-benefit” organisations of this sector combine market-based strategies of the “for-profit” private sector with the social and environmental goals of the public and non-profit sector (Sabeti, 2009). In this sense, SEs are brought forward in the debate surrounding the perceived need for substitutes to neoliberal capitalism and its attributed potentially negative environmental and social impacts (Hillman et al., 2018).

Various classifications and taxonomies of different forms of SEs have been compiled by scholars. One of the most recent works is the typology developed by Defourny and Nyssens (2017b) who distinguish between four types of SEs: (1) entrepreneurial non-profits typically supported by charities and foundations; (2) public-sector SEs typically lead by state organisations, (3) social cooperatives as an adaptation of the multi-stakeholder governance model to improve welfare provision and connect communities, and (4) mission-driven social businesses that engage in entrepreneurial activities for social purpose. Young and Lecy (2014, p. 1307) developed a particularly useful delineation of what they metaphorically term the “social enterprise zoo”, by the overall goals and criteria for success that drive SEs. The authors’ delineation is presented in table 1.

Overall goal and criteria for success	Type of organisation
Strategic profit-maximization	Business corporations with defined programs of corporate social responsibility
Maximization of members' welfare	Cooperatives
Social mission maximization	Non-profit organisations
Explicit balance of social impact and commercial success	Social businesses

Table 1. Delineation of SEs (Young & Lecy, 2014, p. 1322)

2.1.2 Sustainable entrepreneurship

A critical reading of social entrepreneurship literature reveals a common limitation of the various definitions of SEs. There is a need to add more precision to what exactly falls under "social" objectives (Macke et al., 2018). Thought exercises in this direction illustrate that the concept of social entrepreneurship is inherently evaluative, in that it carries normative implications of social value (Schneider, 2017). While some scholars in social entrepreneurship research limit the beneficiaries of SEs' activities to social groups (e.g. Alegre & Berbegal-Mirabent, 2016; Dees, 1998; Mair & Martí, 2006), others with a less narrow sense of social value, implicitly include the environment as a beneficiary (e.g. Hillman et al., 2018; Picciotti, 2017; Wilson & Post, 2013). Due to these varying interpretations and the resulting ambiguity, as well as the rise of the sustainability discourse, sustainable entrepreneurship has developed as a branch of literature parallel to social entrepreneurship research. Schaltegger and Wagner (2011, p. 227) define sustainable entrepreneurship as an "innovative, market-oriented and personality-driven form of creating economic and societal value by means of break-through environmentally or socially beneficial market or institutional innovations". At its core, this definition describes sustainable entrepreneurship as innovation and entrepreneurship for sustainable development, introducing two new concepts to this discourse. While innovation is addressed in detail in section three, sustainable development, as a central notion of this study, shall be defined next.

Sustainability and sustainable development. According to Santillo (2007), a plethora of around three hundred definitions of sustainability and sustainable development exist, demonstrating that definitional consensus has not been reached by scholars in the field (Gast et al., 2017; Santillo, 2007). The idea of "sustainable development" was first introduced in 1987's Brundtland Report from the United Nations (World Commission on Environment and Development) which defined it as "development that meets the needs of the present without compromising the ability of future generations to

meet their own needs." (Santillo, 2007, p. 60). This definition posits that ecology, (the well-being of) society and economy are three interlinked pillars that must be addressed simultaneously if truly sustainable progress is to be made (Santillo, 2007). For this study, the "concentric circles approach" is also acknowledged which replaces the three pillars by three concentric circles portraying the environmental sphere in the outermost circle, the social sphere in the middle circle, while the inner circle represents the economic sphere (Gast et al., 2017, p. 45; Lehtonen, 2004). This illustrates the model's idea that "economic activities should be in the service of all human beings while at the same time safeguarding the biophysical systems necessary for human existence" (Lehtonen, 2004, p. 201). While this represents an important notion, this study relies on the Brundtland report's three-pillar concept as it is seen as a "historical marker for sustainability and sustainable development", and has given rise to scholarly as well as practitioners' discussions about environmental dilemmas (Gast et al., 2017, pp. 45-46). Building on the Brundtland definition, Elkington (1998) introduced the now widespread notion of the "triple bottom line" for sustainable development, recognising that social and environmental issues need to be placed on par with economic objectives (Elkington, 1998; Hall & Wagner, 2012, p. 410).

Regarding the fact that natural resources are finite and ecosystems are vulnerable, Santillo (2007, p. 61) claims that it is necessary to define sustainability with an emphasis on the environment. The author argues that the 'natural' state of planet Earth's ecosystems, which support the totality of human needs in respect of health, well-being, and wealth-creation, needs to be treated as a fixed reference point to frame development activities. Following Santillo's suggestion, the present study builds on this environmental approach to sustainability.

The above discourse on sustainable development served the purpose of adding precision to what is included in the "social" objectives of SE activity, at least for this study. Hence, for the purpose of this work, a broad interpretation of the "social" element in social entrepreneurship is adopted, which includes efforts targeted at environmental sustainability. This enables the development of a working definition of the research subject in the last step.

2.1.3 Environmentally sustainable social enterprises

Hillman et al. (2018, p. 447) highlight the potential of the unique business model of SEs “to be more extensively applied to address contemporary ecological challenges of neo-liberal market economies, moving towards “win-win-win” outcomes across social, economic and ecological domains”. Different terms have been used by scholars to describe SEs with a stronger focus on the environment, such as green SEs, eco-social enterprises (Johanisová & Franková, 2013) and environmentally-motivated SEs (Vickers, 2013). Based on the above understanding of SEs and following the suggestions for an ecological focus of the sustainability imperative and more semantic precision, this study focuses on *environmentally sustainable social enterprise*s (ESSEs). It is important to distinguish the notion of ESSEs from environmental entrepreneurship, also called ecopreneurship, which is more strongly linked to the pursuit of entrepreneurial opportunities, thus, following an "earn money by solving environmental problems" logic (Schaltegger & Wagner, 2011). As opposed to ecopreneurs, ESSES are SEs whose core motivation is to contribute to solving environmental problems hindering sustainable development *through* entrepreneurial activities (Schaltegger & Wagner, 2011). Those mission-driven companies have found innovative solutions to encourage less resource-intensive and wasteful consumption and production patterns, and offer “green” products and services.

2.2 State of the research field

The following section presents and delineates the research field of the social entrepreneurship and sustainable entrepreneurship literature that, together with innovation research, build the backbone of this study.

The emergence of the concept of social entrepreneurship can be placed between 1970 and 1980, however, research efforts significantly spurred with the 1990s (Hadad, 2017). According to a recent literature review by Kraus et al. (2017), despite burgeoning research interest, social entrepreneurship remains a relatively new subject of study, with knowledge and understanding of social entrepreneurs and SEs continually emerging. Exploring the main themes studied by scholars, Hadad (2017) finds that much of the research focuses on defining and describing the phenomenon, SEs, and their social entrepreneurs (e.g. Zahra, Newey, & Li, 2014). Another range of studies has been dedicated to exploring the differences between social and commercial entrepreneurship, corporate social responsibility and non-profit organisations

(Lumpkin et al., 2013), while impact assessment of social entrepreneurs and the identification of predictors regarding the phenomenon is a third major research area (Nicholls, 2010a, 2010b).

However, Kraus et al. (2017) claim that only a few scholars have investigated key questions regarding how and why social entrepreneurship happens. Specifically, Jenner (2016) states that, although arguably implicit in studies on social entrepreneurial traits, little research examines specific capabilities of SEs despite their recognised importance to SE development and success. For any business, organisational capabilities are a prerequisite to be able to exploit resources, and are particularly important and challenging for SEs due to their pursuit of multiple bottom lines (Jenner, 2016). Instead, scholars point to the resource scarcity of SEs, with a lack of financial resources, technical skills, and skilled human resources being the most cited obstacles (Austin, Stevenson, & Wei-Skillern, 2006; Doherty et al., 2014; Gast et al., 2017).

Social innovation is another paradigm that is attracting increasing interest among practitioners and scholars, however, Alegre and Berbegal-Mirabent (2016) argue that literature is scarce on the key factors that contribute to the social innovation process. Likewise, Phillips et al. (2015) and Doherty et al. (2014) find limited research on the innovativeness of SEs and the determinants and processes of SE innovation.

Furthermore, according to Hillman et al. (2018), contributions addressing the ecological domain of social entrepreneurship remain limited. SEs still have to be explored as serious instruments to engage the public with sustainability (Johanisová & Franková, 2013).

In contrast, sustainable, or sustainability-related, entrepreneurship addresses the relationship between entrepreneurship, the environment, and sustainable development, and has become an essential subfield of entrepreneurship research (Gast et al., 2017). According to Schaltegger and Wagner (2011), findings in the literature are inconsistent and fragmented. In the first systematic literature review on ecologically sustainable entrepreneurship, Gast et al. (2017) identified six thematic clusters of the research. Drivers of engaging in ecologically sustainable entrepreneurship, in terms of motivation, are either (market) opportunity based, necessity-based, or stem from the personal values of the entrepreneurs. Studies on the drivers of conducting business in an ecologically sustainable way build the second cluster. They can be grouped in micro-level drivers in terms of the entrepreneur's personal ideals and values, meso-

level drivers related to markets and industries and macro-level drivers that stem from politics and legislation. Furthermore, outcomes, (financial and market) challenges, and enabling factors of ecologically sustainable entrepreneurship (changing role of business schools and adaption of curricula) form three more sub-clusters in the research field. (Gast et al., 2017)

Of relevance to this study's interest in exploring what drives innovation in ESSEs at firm-level, are the contributions in the cluster on strategic actions and business practices. Hiring personnel who share the personal green values of the environmentally sustainable entrepreneur is considered important in human resource management (Gast et al., 2017). A considerable amount of studies address the interactions of ecologically sustainable enterprises with the external environment and emphasises the importance of networking with external stakeholders as it enables access to a variety of resources (Aragón-Correa et al., 2008; Dean & McMullen, 2007).

Despite these contributions, few studies have examined environmentally sustainable enterprises from a resource-based view to develop an understanding of their firm-specific resources and capabilities.

2.3 Characteristics of ESSEs

While section 2.1 establishes the general understanding of ESSEs underlying this study, this section aims to deepen this understanding by addressing the distinct characteristics of ESSEs in more detail. Arguing that the distinctive feature of SEs is reflected in the business model, Spieth et al. (2018) analyse SEs from a business model perspective. As ESSEs represent a specific type of SEs whose social mission is directed towards environment and nature protection, section 2.3.1 will rely on Spieth et al. (2018)'s findings since it is assumed that the characteristics identified by the authors apply as much to ESSEs as they do to SEs. Leaving the business model perspective and adopting a broader view, section 2.3.2 subsequently complements further general characteristics of ESSEs.

2.3.1 Characteristics of ESSEs: A business model perspective

Spieth et al. (2018) classify four dimensions of particularities of social business models depicted in figure 2.

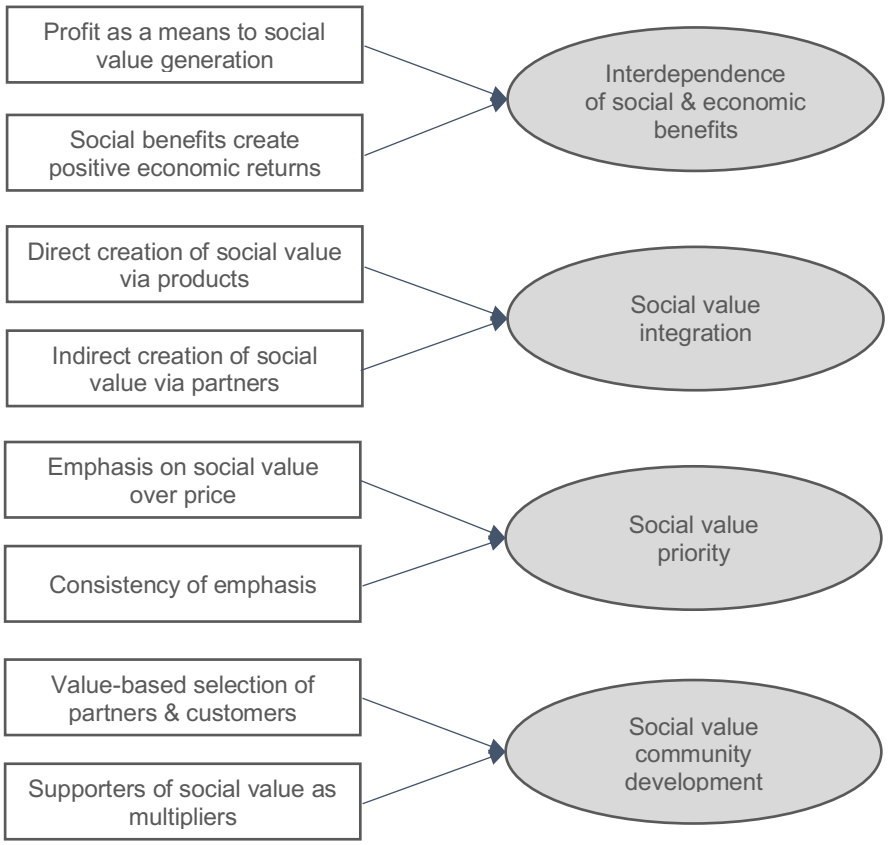

Figure 2. Particularities of social business models (adapted from Spieth et al., 2018, p. 7)

2.3.1.1 Strong interdependence of social and economic benefits

While SEs follow the same institutional logic as traditional businesses in terms of creating a competitive offering, their relationship with economic profits is distinct for the SE business model (Spieth et al., 2018). In contrast to the notion of social value creation and profit generation being mutually exclusive, for “for-profit” SEs economic profits serve as an enabler for their social and/or environmental activities. Hence, it seems more appropriate to view SEs as a “more-than-profits” model (Jenner, 2016) As dual-purpose "hybrid" organisations they do not rely on donations. Their profit is a means to social value generation, in that they must be commercially sustainable to create ongoing social/environmental impact (Jenner, 2016; Spieth et al., 2018). Thus, the appropriateness of commerciality is not contested as long as any surpluses are reinvested in the business instead of using it to support individual wealth creation (Jenner, 2016).

2.3.1.2 Social value integration into the product or service offering

The second characteristic of SE business models is that social and/or environmental value is created directly via the product or service offering (Spieth et al., 2018). European SEs create direct social and environmental benefits throughout their value chain in many ways such as by “providing climate-neutral energy to private and corporate customers or through the Europe-based production of handmade shoes from sustainable materials" (Spieth et al., 2018, p. 8). Several European ESSEs strive to lower the use of single-use plastic by offering, for instance, recyclable coffee cups made from coffee grounds and biopolymers, as renewable resources, or by implementing a cup and food container deposit system to replace single-use takeaway cups and takeaway boxes altogether. Efforts like these make ESSEs frontline environmental services providers that work toward the protection of ecosystems, the reduction of CO_2 and land degradation, and biodiversity preservation (Creech et al., 2014). In addition to this direct value creation, ESSEs also generate social and environmental value indirectly by setting requirements and standards as prerequisites for partnerships with suppliers and other business partners (Spieth et al., 2018).

2.3.1.3 Social value priority

The third particularity identified by Spieth et al. (2018) is the priority SEs assign to social value over financial returns which greatly affects the way SEs conduct business. This is in line with their first characteristic of profit-serving as a means to be self-sustainable (Spieth et al., 2018). Prices for offerings need to meet the self-set requirement of being fair and reasonable, in order to cover the costs of the social value. Likewise, purchasing decisions are not exclusively based on price. As product quality, a resource-conserving production, and fair working conditions are valued more than a low purchasing price by SEs, relationships with partners are built on fair reimbursements for their efforts (Spieth et al., 2018). While ESSEs strive for efficiency gains allowing less resource consumption and waste generation, costs are never cut at the expense of social or environmental value (Spieth et al., 2018). It is responsible efficiency rather than mere efficiency that drives value for SEs. This consistent emphasis on resource efficiency is further reflected in ESSEs efforts to rely on regional partnerships whenever possible. In this regard, high transparency is another distinctive characteristic of ESSEs. This increasing trend in transparency can be observed for SEs in the textile industry with a strong focus on sustainable materials and fair working conditions: Customers are given the opportunity to follow the entire value chain of the product (e.g. a t-shirt or a sneaker) starting from the sourcing of the material through

the entire production process with a strong emphasis on the local people involved at all stages. This transparency portrays reliability and is valued but also expected from customers of SEs. (Spieth et al., 2018)

2.3.1.4 Emphasis on social community development

Fourth, Spieth et al. (2018) identify an emphasis on social value community development as a characteristic of SEs. This includes selecting industries, partners, and investors based on shared values and beliefs, actively shaping the entire value chain by encouraging and supporting partners in an ongoing dialogue to optimize processes and to operate economically independently (Spieth et al., 2018). An example illustrating the latter is an SE in the cosmetic industry that runs a project to produce shea butter in Burkina Faso to ensure fair sourcing of their ingredient. The SE encourages the local people to also sell to other companies to reduce their dependency on the SE (Spieth et al., 2018). Another dimension of this particularity is what Spieth et al. (2018) refer to as an SE's engagement in growing multipliers. Providing detailed information and insights to (potential) customers about what they are doing and how they do it, is part of an SE's mission. SEs "value the impacts of multipliers who relate positively due to their appreciation of social businesses' social impacts" (Spieth et al., 2018, p. 9).

2.3.2 Characteristics of ESSEs: A broader perspective

Besides the above particularities stemming from the distinct business model of SEs, three further general aspects are characteristic of SEs.

2.3.2.1 The majority of ESSEs are SMEs

The majority of SEs are small-sized enterprises. This insight was gained in the course of the "International Comparative Social Enterprise Models" project (ICSEM) run from 2013 to 2017 by 230 active researchers from 50 countries aimed at unifying conceptualisation of SEs (Defourny & Nyssens, 2017b). Consequently, SEs share some common characteristics with small and medium-sized enterprises (SMEs). A distinction between SMEs and large enterprises can be made in quantitative and qualitative terms. The quantitative delineation is based on the EU recommendation 2003/361, according to which a company is considered an SME if it employs fewer than 250 people and its annual turnover does not exceed 50 million euros or its balance sheet total does not exceed 43 million euros (European Commission, 2015). Table 1 shows a breakdown of SMEs according to these three EU thresholds. In addition, SMEs

possess qualitative characteristics that affect their innovativeness. A discussion of those characteristics tailored to ESSEs' innovativeness follows in section 3.5.

Enterprise category	Headcount	Annual turnover	Annual balance sheet total
Medium-sized	< 250	≤ 50 million	≤ 43 million
Small	< 50	≤ 10 million	≤ 10 million
Micro	< 10	≤ 2 million	≤ 2 million

Table 2. EU thresholds for SME definition (European Commission, 2015)

2.3.2.2 ESSEs are change agents

Social as well as sustainable entrepreneurs are touted by literature as agents of change (Dees, 1998; DiVito & Bohnsack, 2017; Hockerts & Wüstenhagen, 2010; Klewitz & Hansen, 2014; Monroe-White & Zook, 2018; Young & Lecy, 2014). This school of thought sees in ESSEs the potential to challenge and disrupt the unsustainable order of industries, and thus to blaze the way for enduring transformation through the innovation of more sustainable consumption and production practices (DiVito & Bohnsack, 2017).

2.3.2.3 ESSEs – inherently innovative?

ESSE's transformational potential is attributed to their frequently asserted innovativeness (Alegre & Berbegal-Mirabent, 2016; Austin et al., 2006; Madill, Brouard, & Hebb, 2010; Mair & Martí, 2006; Mulloth, Kickul, & Gundry, 2016; Spieth et al., 2018). Speaking about SE's innovative behaviour, Mair and Martí (2006) argue that SEs harness innovation systematically to bring about change by combining resources in new ways. On the other hand, according to Spieth et al. (2018, p. 11) SEs are inherently innovative, in that the integration of social and/or environmental value into a company's economic value offering and value creation is in itself the novel particularity characterising innovation. Hence, in line with Madill et al. (2010), the authors place the locus of innovation within the SE. However, Madill et al. (2010, p. 147) emphasise that simply being an SE may not be innovative enough to grow and sustain the company in the long run. In fact, the origins of SEs' and ESSEs' innovativeness are subject of an ongoing scholarly debate. Following Klewitz and Hansen (2014) who see the locus of ESSE's innovations in their distinct organisational structures, resources and capabilities, this study moves past the notion of inherent innovativeness and explores the internal factors at the firm-level of ESSEs that drive innovation for sustainability. Section three ties in with exactly this proposition. Through an innovation lens, rather than

one of social entrepreneurship, it explores the antecedents of sustainability-oriented innovations from a resource-based view.

2.4 Challenges facing ESSEs

Although it has been acknowledged that ESSEs can create win-win-win situations with their business models designed for planet, people and profit, ESSEs face more challenges than traditional companies (Gast et al., 2017). The first, and potentially greatest, challenge lies within the general decision-making of ESSEs. Balancing environmental protection and adherence to social standards with financial sustainability can involve trade-offs that may not align with purely economic heuristics (DiVito & Bohnsack, 2017; Hall & Wagner, 2012). For instance, the intergenerational perspective of sustainable development adopted by ESSEs implies "that non-economic criteria should be incorporated into decision-making", in that resources used should be reduced, renewable and recyclable (Hall & Wagner, 2012, p. 410). According to Doherty et al. (2014, p. 423), as hybrid organisations, ESSEs may experience a mission drift that occurs when environmental and social objectives are sacrificed to achieve financial sustainability, which can in turn undermine ESSEs' legitimacy.

Furthermore, scholars point to resource constraints as being another obstacle faced by ESSEs (Creech et al., 2014; Gast et al., 2017; Hall & Wagner, 2012). ESSEs are said to often lack skilled human resources, technical expertise as well as access to finance and research impeding innovation, product development and market creation (Gast et al., 2017, p. 52). These resource constraints add even more pressure on ESSEs when making business decisions (Hall & Wagner, 2012).

The trade-off between environmental, social, and economic goals has been acknowledged as one of the major challenges ESSEs face. However, in the face of the increasing awareness of, and demand for, more sustainable and ethical businesses in Europe consumers are incorporating the environmental and social implications of how a product is produced into their purchase decision. Therefore this trade-off can actually be seen as a benefit as opposed to a challenge. (European Commission, 2016b). The creation of environmental and social value might be integral to the achievement of economic success, which then generates financial resources that can be used to achieve the environmental and/or social mission (Doherty et al., 2014, p. 422).

3 Eco-innovativeness

In the discourse on sustainable development, innovation is conceived as a vehicle for triggering the sustainability transition (de Jesus & Mendonça, 2018). Whereas this school of thought views sustainability as a key driver of innovation (Adams et al., 2012; Varadarajan, 2017), other scholars argue that sustainability can only be tackled based on innovation-focused approaches and emphasise the role of innovation in enhancing sustainability (Silvestre & Ţîrcă, 2019). Either way, innovation designed for sustainability, so-called sustainability-oriented innovation, environmental innovation or eco-innovation (EI), is an important means in the quest for more environmentally sustainable societies (Carrillo-Hermosilla, del Río, & Könnölä, 2010). The EI literature sees eco-innovations as essential strategic tools for firms to maintain a competitive advantage and as a way to implement sustainability (Chen, Chang, & Wu, 2012). Environmental problems are recognised as sources of entrepreneurial opportunity and strategic change (Aragón-Correa et al., 2008). The EI research thereby adheres to traditional entrepreneurship literature which commonly regards innovation as a prerequisite within the entrepreneurial process and the main driver for economic growth (Leal-Millan et al., 2018; Porter, 1985).

Building the interface between sustainability and innovation in the nexus of social entrepreneurship - innovation - sustainability, environmentally sustainable innovations form the second underlying construct relevant for this study, and thus lie at the core of section three. Section 3.1 will delineate innovativeness from an innovation studies perspective in order to define and describe environmentally sustainable innovations in section 3.5. A brief overview of the resource-based-view and dynamic capability theory is given in section 3.2, that theoretically underpin the concept of innovativeness as well as the empirical analysis covered in sections five. In section 3.3 a closer look is taken into the dimensions of innovativeness before the section closes with a brief overview of how to measure eco-innovativeness in section 3.5.

3.1 Terminology

Just as with the definitions for social entrepreneurship, sustainability, and sustainable entrepreneurship, innovation and innovativeness know many definitions. Nevertheless, this section aims at delineating both concepts and providing working definitions for the purpose of this study.

3.1.1 Innovation

The term “innovation” originates from the Latin word “innovare” which means to renew or alter (Bessant & Tidd, 2011). As research on innovation spans various disciplines, each adopting several different theoretical perspectives, definitions of innovation are abundant (OECD, 2005). Innovation was first characterised by Schumpeter (1908, 1911, 1939, 1942) who argued that economic development is dependent on and driven by innovation through a dynamic process he termed "creative destruction" in which new technologies replace old ones (OECD, 2005; Pacheco et al., 2017). Since Schumpeter’s contributions to theories on innovation, the concept has been the subject of extensive scholarly debate. What has remained consistent within the definitions and elaborations of the concept, however, is the core aspect of novelty as the determinant of change and economic development (de Medeiros, Ribeiro, & Cortimiglia, 2014, p. 76).

For this study, the conventional and frequently cited understanding of innovation as defined in the Oslo-Manual of the OECD (2005) is applied: “*An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations.”* (OECD, 2005, p. 46)

There are several important features of this definition. It takes on a subjective view concerning the degree of novelty, in that the minimum requirement for an innovation is that it is new to the firm, self-developed or adopted, or new to the market or world (OECD, 2005, p. 46; 58). Furthermore, only implemented innovations are considered. They need to be diffused, through market or non-market channels, to different consumers, countries, markets or firms, to achieve economic impact (OECD, 2005, p. 17). Diffusion and adoption are also what distinguishes innovation from invention. An invention refers to the discovery of a new idea or model for a new improved product or process, which needs to be moved from the laboratory setting into production to and be introduced to the market to become an innovation (Garcia & Calantone, 2002; Kemp & Pearson, 2007; Rennings, 2000).

Among the numerous classifications of innovation proposed in literature, four have garnered the most attention: (1) product innovations that relate to the introduction of products and services, (2) process innovations in terms of production or delivery

methods, (3) marketing innovations as in marketing methods concerning product design, packaging, placement, promotion or pricing, and (4) organisational innovations relating to organisational methods in the firm's business practices and structures or external relations (Klewitz & Hansen, 2014; OECD, 2005).

Furthermore, innovations can be differentiated according to their degree of change. Radical innovations are considered to depart from current practices by changing them structurally. They tend to be more novel in contrast to incremental innovations that represent variations and thus rather partial departures from old practices (Longoni & Cagliano, 2018).

3.1.2 Innovativeness

Building on earlier elaborations from Hurley and Hult (1998) and Garcia and Calantone (2002), Rodriguez and Wiengarten (2017, p. 2425) define innovativeness as "*the orientation of an organisation to adopt product, process, or organisational innovations*". Conceptualisations of innovativeness have occurred at the product-, and firm-level (Garcia & Calantone, 2002; Wang & Ahmed, 2004). Innovativeness at the product level refers to the degree to which a product innovation is novel (Garcia & Calantone, 2002). This study adheres to the second conceptualisation, that regards firm innovativeness as the propensity of a firm to innovate (Hult, Hurley, & Knight, 2004).

At firm-level Hurley and Hult (1998) distinguish between two innovation constructs: (1) *innovativeness* and (2) the *capacity to innovate*. The authors draw on the differentiation made by Zaltman, Duncan and Holbek (1973) between initiation and implementation as two distinct stages of the innovation process. Cultural openness to innovation is critical to the initiation stage. Based on this, Hurley and Hult (1998) define innovativeness as "*the notion of openness to new ideas incorporated in a firm's culture*" and elaborate that the *"innovativeness of the culture is a measure of the organisation's orientation toward innovation*" (Hurley & Hult, 1998, p. 44). They argue that several characteristics of a firm's culture influence innovation orientation, such as a learning orientation, participative decision-making as well as collaboration. The capacity to innovate then refers to the firm's ability to adopt or implement new ideas, processes, or products successfully (Hurley & Hult, 1998). In combination with a firm's resources and other capabilities, the innovativeness of a firm's culture results in a

greater capacity to innovate (Hurley & Hult, 1998). This study will rely on a more holistic definition of the innovation capacity construct proposed by Hogan et al. (2011). The authors define what they term innovation capability, as "*a firm's ability, relative to its competitors, to apply the collective knowledge, skills, and resources to innovation activities relating to new products, processes, services, or management, marketing or work organization systems, in order to create added value for the firm or its stakeholders*" (Hogan et al., 2011, p. 1266). This definition considers a range of innovation activities and their performance implications.

A wide range of studies on the constructs of innovativeness and innovation capability rests on the framework of the resource-based view and capability theory (e.g. Hogan et al., 2011; Lawson & Samson, 2001; Ribeiro-Soriano, Annique Un, & Montoro-Sanchez, 2010; Saunila & Ukko, 2014) that will be elaborated upon next.

3.2 Theoretical foundations

The resource-based view (RBV) in combination with dynamic capability theory provide a theoretical underpinning for this study's analysis as they stress the significance of resources and capabilities as sources of competitive advantage. Based on the notion that firms are bundles of resources, the RBV suggests that firm-specific internal resources are sources of sustainable competitive advantage if they are valuable, rare, inimitable and non-substitutable (Amit & Schoemaker, 1993; Barney, 1991; Hogan et al., 2011; Peteraf, 1993). This implies that organisations are heterogeneous with respect to their endowments with resources and that this heterogeneity can be stable over time (firm resource heterogeneity) because resources may be immobile across firms, in that they cannot be easily bought and sold in factor markets (firm resource immobility) (Barney, 1991, p. 101). An organisation's competitiveness does not derive from the development of new products and services, but instead from its ability to leverage and channel internal resources into the development of new products, services and processes (Barney, 1991; Hult et al., 2004; Prahalad & Hamel, 1990). Barney (1991, p. 101) defines resources as "all assets, capabilities, organizational processes, firm attributes, information, knowledge etc. controlled by a firm that enable the firm to conceive and implement strategies that improve its efficiency and effectiveness". Firms can be endowed with tangible assets such as financial and physical resources, as well as those of intangible nature encompassing human resources, reputation, organisational culture, customer relationships and technology (Barney, 1991; del Río et al., 2016a, p. 278; Grant, 1991).

Rooted in the RBV, the dynamic capabilities approach argues that capabilities are the main source of competitive advantage (Grant, 1991). In contrast to resources that are static assets which can be owned and controlled by a firm, capabilities are understood as an organisation's capacity or ability to deploy, combine and transform those resources to create value offerings (Amit & Schoemaker, 1993, p. 35; Barney, 1991; Hogan et al., 2011). As capabilities are embedded in the distinct processes and routines of the firm, they are the most difficult resources to imitate (Hogan et al., 2011). However, capabilities alone are insufficient to maintain a competitive advantage. Firms ultimately compete on their capacity to renew and develop their organizational capabilities to match the uncertain, ever-changing, dynamic, (market) environment (Chen & Chang, 2013; Teece & Pisano, 1994). That is the key implication lying at the core of the dynamic capability theory which is closely linked to the concept of innovation and innovation capacity. Innovation capability is a prerequisite for the development of new products and services and originates from deploying dynamic capabilities (Hogan et al., 2011).

3.3 Dimensions of innovativeness

Having established an understanding of the RBV and the theory of dynamic capabilities underlying the concept of innovativeness, this section will proceed by examining the factors that influence the respective constructs of innovativeness and innovation capability.

3.3.1 Innovativeness

Focusing on employee innovativeness, Parzefall, Seeck and Leppänen (2008, p. 169) see innovativeness as the result of being able (i.e. having the personality characteristics, knowledge, technical skills, and cognitive capabilities) and willing (i.e. being motivated and satisfied) to be innovative. Emphasising that individual, as well as organisational innovativeness, stems from a range of interconnected factors, the authors cluster these factors at the individual, job, team and organisational level (Parzefall et al., 2008).

Individual factors. At the individual level, Parzefall et al. (2008, pp. 169-170) identify openness to new experience, a preference for change and novelty, creativity, flexibility, willingness to take risk, as well as intrinsic motivation in creative work as important personality characteristics influencing the innovativeness of employees.

Job level factors. Further, the contextual characteristics of the workplace and job tasks affect employees' motivation, and thereby their engagement in innovative behaviour (Parzefall et al., 2008, pp. 170-172). One of the most influential factors is autonomy in terms of an employee's control over how tasks are carried out. Also, lack of routines, availability of material resources, sufficient time, clearly defined goals, and a clearly stated mission are positively associated with innovativeness.

Team level factors. As most operative tasks require teamwork, factors supporting teamwork are important to increase innovativeness. According to Parzefall et al. (2008, pp. 172-173), interdisciplinary team compositions, team cohesiveness, good interpersonal relationships, trust, and fairness are particularly desirable.

Organisational level factors. Organisational factors form the context in which daily work is performed by all employees and thus contribute greatly to innovativeness. Being diverse in scope, they are complex to analyse and include the personality of the CEO, risk-tolerant top management, a flexible organisational structure without hierarchies, organisational culture, mission and vision, innovation strategy, firm size as well as cooperation and communication with stakeholders (Parzefall et al., 2008, pp. 174-177).

3.3.2 Innovation capability

Drawing on Hogan et al. (2011, p. 1266), in this study innovation capability is understood as: "*a firm's ability, relative to its competitors, to apply the collective knowledge, skills, and resources to innovation activities relating to new products, processes, services, or management, marketing or work organization systems, in order to create added value for the firm or its stakeholders*". The ability to innovate can be seen as the prerequisite for a firm-wide behaviour to be created that has the potential to result in innovation activities within an organisation, hence, the usefulness to apply capability theory to innovation (Lawson & Samson, 2001). Based on this notion, Lawson and Samson (2001) and Hogan et al. (2011) acknowledge the multidimensional nature of the innovation capability construct that is composed of reinforcing practices and mechanisms within the firm.

In their conceptual study drawing on innovation management literature, Lawson and Samson (2001, p. 389) propose seven groups of elements that, to some degree, influence, the innovation capability of innovative organisations: (1) vision and strategy, (2) harnessing the competence base (e.g. resource management, variety of funding

channels), (3) organisational intelligence (i.e. organisational learning), (4) creativity and idea management, (5) organisational structure and systems, (6) culture and climate (e.g. empowerment of employees, communication, creative time), and (7) the management of technology. Investing in these aspects of innovation capability is said to increase a firm's propensity to generate sustainable innovation outcomes (Lawson & Samson, 2001).

In a more recent systematic review of 51 articles published between 2000 and 2015, Iddris (2016) consolidates eight key dimensions of innovation capability with corresponding measurement items. In order of relative importance and frequency of use by scholars, these dimensions are: (1) knowledge management, (2) organisational learning, (3) organisational culture, (4) leadership, (5) collaboration, (6) creativity, (7) idea management, and (8) innovation strategy (Iddris, 2016, p. 255).

A somewhat different compilation can be found in the most recent Oslo Manual on Innovation by the OECD and Eurostat (2018). So-called business capabilities for innovation are grouped into four types, namely the resources controlled by a firm, general management capabilities, human resource management, and workforce skills, and technological capabilities (OECD & Eurostat, 2018, p. 104). Resources encompass the workforce and their accumulated experience and knowledge, physical and intangible assets and financial resources. Under management capabilities fall the characteristics of business owners and top management as well as internal processes and external relations regarding managing people, knowledge, physical and financial capital (OECD & Eurostat, 2018). Workforce qualifications and how firms organise their human resources form the third type of innovation capabilities. Technological capabilities cover technical expertise, design capabilities and digital competence (OECD & Eurostat, 2018).

3.4 Innovation capacity of SMEs

The elaborations on the particularities of ESSEs in section 2.3.2 highlight that the majority of SEs and ESSEs are small- or medium-sized organisations (Defourny & Nyssens, 2017b). Combining insights from innovation theory and small business characteristics, Bos-Brouwers (2010) argues that SMEs innovate differently from large businesses due to their organisational particularities. An overview of the advantages and disadvantages of SMEs for the innovativeness based on the findings of Bos-Brouwers (2010) and Wong and Aspinwall (2004) is given in table 3.

Innovation capacity of SMEs	
Advantages	
Ownership and management	Dynamic and entrepreneurial owner / manager; Prominent role of entrepreneur / owner in innovation as idea generator; Horizontal leadership style;
Organisational structure	Flexible structure; Flat structure with low levels of hierarchy; Responsiveness to changes (technology and market); Fast, shorter and more direct internal communication;
Organisational culture	Unified culture; Influenced by owner's / manager's ethos; Corporate mindset instead of departmental mindset;
Resources	Low degree of resistance from employees to change
Disadvantages	
Ownership and management	Modest management skills and competency; Lack of formalised and strategic planning; Short-term focus;
Resources	Resource scarcity (capital, time, knowledge, skilled employees); Difficulties in accessing financial capital; Owner / manager as central knowledge holder; Small scale staff training and development; Difficulties attracting skilled personnel;

Table 3. Innovation capacity of SMEs (adapted from Bos-Brouwers, 2010, pp. 419-421; Wong & Aspinwall, 2004, pp. 50-52)

According to Bos-Brouwers (2010), SMEs have behavioural advantages and resource disadvantages for generating innovations. Pivotal to the innovation process is the central role of the owner, especially regarding idea generation (Bos-Brouwers, 2010). However, in this respect, there is idle potential to be unleashed by the development and training of employees. Furthermore, since SMEs are not able to internalise all elements of the innovation process due to their resource shortcomings, they have an incentive for cooperation with external stakeholders (Bos-Brouwers, 2010).

3.5 Environmentally sustainable innovation

Planet Earth is in urgent need of less resource-intensive, less wasteful, instead more eco-efficient business processes, production methods and consumption patterns (Leal-Millan et al., 2018). In the quest of remedies, environmentally sustainable innovations are attributed the potential to transform products and business processes by making them more sustainable (Leal-Millan et al., 2018). This section will first define environmentally sustainable innovations (section 3.5.1) before the state of the research field of EI literature is presented (section 3.5.2). The section closes by analysing sustainable innovations in an SME context (section 3.5.3).

3.5.1 Defining environmentally sustainable innovation

Due to transdisciplinary approaches, the discourse on environmentally sustainable innovations lacks an agreed-upon definition (Bossle et al., 2016; García-Granero et al., 2018). What impedes progress towards definitional consensus is the myriad of terms in academic literature that have been used, often interchangeably, to describe innovations with an environmental sustainability focus (Varadarajan, 2017, p. 14). These terminologies includes, but is not limited to: eco-innovations and environmental innovations (EI), eco-friendly innovations, green innovations, environmentally sustainable innovations, sustainable innovations, sustainability-oriented innovations, sustainability driving innovations, sustainability driven innovations, sustainability enhancing innovations, sustainability focused innovations. It is necessary to stress that the first five of these terms embrace the ecological dimension of sustainability, while the other six take on the holistic view of the three-pillar concept of sustainability embracing an additional social dimension (Ben Arfi, Hikkerova, & Sahut, 2018, p. 211). This study builds on the idea of Santillo (2007) presented in section 2.1.2 that in the face of finite natural resources and ecosystems the ecological dimension of sustainability needs to be emphasised. Accordingly, innovation for sustainability should be aimed at reducing the exploitation of valuable resources and ecosystems (Gast et al., 2017; Santillo, 2007). Consequently, for the purpose of this study the term environmentally sustainable innovation (ESI) is considered most suitable, although EI and ESI will be used interchangeably to describe innovation for environmental sustainability.

The earliest references to the term “eco-innovation” (EI) began in the mid 1990s with Fussler and James (1996) who coined the term and consider it to be new products and process which significantly decrease environmental impacts while still providing business and customer value (Fussler & James, 1996; Pereira & Vence, 2012). Although contributions in the EI literature presented between 1996 and 2009 vary considerably, two themes of the EI concept are recurrent: reduced environmental impact and more efficient use of resources (García-Granero et al., 2018). The number of publications in the EI literature rises in the years following 2009. Most of the studies that are presented in the subsequent years follow the definition proposed by Kemp and Pearson (2007, p. 7) in their "Measuring Eco-Innovation" (MEI) research project funded by the EU:

“Eco-innovation is the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organisation

(developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives."

The above definition has three important features. First, it makes environmental performance the determinant of an EI as opposed to its environmental aim or motivation (Kemp & Pearson, 2007). Hence, included are all innovations leading to the reduction of environmental impacts, without this being an explicit goal. It follows that any innovation classifies as EI as long as it is more environmentally benign than "relevant alternatives". Second, the definition is based on an overall assessment of environmental effects and risks over the entire life cycle of a product from pre-manufacturing to end of life (Kemp & Pearson, 2007). Although not explicit in the definition, a life cycle assessment encourages the recirculation of resources in cycles of reuse, recycling, and renewal (de Jesus & Mendonça, 2018). Third, taking on a subjective view of novelty (i.e. the innovation has to be novel to the firm), the definition is in line with the innovation definition of the Oslo Manual (2005). Thus, EI is not defined in a traditional economic sense based on Schumpeter (1943) in that it needs to create new markets. Instead, the minimum requirement is that the EI is novel to the firm or end user which is important to assess the diffusion and adoption of the innovation (Horbach et al., 2012).

As a last remark, Kemp and Pearson (2007) deliberately deviate from EI definitions that restrict EI to those innovations that "significantly" reduce environmental impacts (e.g. Varadarajan, 2017). According to the authors, this leads to complexities concerning the definition of a minimum threshold for the amount of a reduction in environmental harm an EI must meet. Taking into account the frequency of use of products or services, it has to be noted that frequently used consumer products that only have a small per unit reduction in environmental harm, can result in a significant overall reduction of environmental impact over a specific period of time due to their large customer base (Varadarajan, 2017, p. 20).

In this study, the MEI definition of EI by Kemp and Pearson (2007) is applied for environmentally sustainable innovation (ESI).

3.5.2 Types of environmentally sustainable innovation

Due to the added environmental dimension, ESIs are often understood to be more intricate than "standard" innovations (Ben Arfi et al., 2018). Not only do they cover

different environmental dimensions but also multiple ones (Ghisetti & Pontoni, 2015). The Community Innovation Survey (CIS), a European firm-based survey on innovation activity in enterprises also addressing EI, distinguishes nine types of eco-innovations (see question 13.1 of the 2014 questionnaire) (CIS, 2014). They are classified into two categories. Six types of EI refer to environmental benefits arising from the production process of green goods and services, whereas in the case of the other three, environmental benefits are derived from the after-sale use of the product or service by the end user (Ben Arfi et al., 2018; CIS, 2014). The set of nine typologies of EI are reported in table 4.

Typologies of EI
Environmental benefits derived from production process
1. Reduced material use per unit of output
2. Reduced energy use per unit of output
3. Reduced CO_2 'footprint' (total CO_2 production)
4. Replaced materials with less polluting or hazardous substitutes
5. Reduced soil, water, noise, or air pollution
6. Recycled waste, water or materials
Environmental benefits derived from after-sale use by end user
7. End-user benefits, reduced energy use
8. End-user benefits, reduced air, water, soil or noise pollution
9. End-user benefits, improved recycling of product after use

Table 4. Typologies of EI (taken from CIS, 2014, p. 12)

Some of the EI types presented by the CIS are rather broad and encompass a set of sub-strategies. Renewable, recycled and recyclable materials can be identified as sub-classes of type four "replaced materials with less polluting or hazardous substitutes". The European Commission acknowledges the positive impacts made by "bio-based products", that are wholly or partially derived from materials of biological origin such as plants; these can include a reduction in CO_2, lower toxicity or novel product characteristics, such as biodegradable plastic materials (European Commission, 2019a). The use of enzymes in the production of chemical building blocks, detergents, pulp and paper, textiles, etc., as well as fermentation and bio-catalysis as a replacement for chemical synthesis are examples of how bio-based products are developed (European Commission, 2019a). Through the latter, higher process efficiency can be achieved, resulting in lower energy and water consumption as well as toxic waste (European Commission, 2019a).

3.5.3 State of the research field

Scholarly interest in EI has evolved from the recognition of environmental issues as sources of entrepreneurial opportunities (Aragón-Correa et al., 2008; Klewitz & Hansen, 2014). As part of business-driven innovation research with a focus on ecological factors, academic literature on EI and sustainable innovations are scattered across several disciplines such as innovation management, sustainable entrepreneurship, sustainability management, and cleaner production (Klewitz & Hansen, 2014). While a range of attempts have been made by scholars to aggregate knowledge in the form of systematic literature reviews (e.g. Adams et al., 2012; de Medeiros et al., 2014; Klewitz & Hansen, 2014; Pacheco et al., 2017; Pereira & Vence, 2012; Pham, Paillé, & Halilem, 2019; Silvestre & Ţîrcă, 2019; Varadarajan, 2017), the often interchangeable use of different terms for EI with different focuses on the three dimensions of sustainability impede comparability of the results presented by those studies. Of particular interest to the present study is the voluminous literature on determinants of EI as a central theme in EI research. Often drawing on insights from traditional innovation research, these studies focus on the factors that drive the adoption of EI in organisations (Ghisetti & Pontoni, 2015). Keywords used include determinants, drivers, antecedents and success factors of EI (e.g. Dangelico, 2016; de Medeiros et al., 2014; Horbach et al., 2012; Triguero et al., 2013).

Aggregating contributions of this strand of the literature shows that internal and external factors to the firm can be distinguished. Regarding the external context perspective, recurrent clusters of determinants are “market pull”, “technology push” and “regulatory push/pull” (Horbach et al., 2012). Rennings (2000) identifies regulatory stimulus as an important determinant in the form of environmental regulation (demand-pull) and subsidies (supply-push), a finding shared by later studies by Horbach et al. (2012), de Medeiros et al. (2014), Dangelico (2016), del Río et al. (2016b). Market pull factors encompass customer benefits and demand for eco-products (Cai & Li, 2018; Kammerer, 2009) and past performance (Horbach, 2008). Technological and organisational capabilities such as research and development (R&D) efforts, the organisational knowledge base, and innovation management schemes characterise the technology push cluster (Ghisetti & Pontoni, 2015; Horbach et al., 2012).

Regarding firm-level factors, scholars have acknowledged the RBV in explaining EI behaviour of firms (Cai & Li, 2018; Chen, 2008). Studies investigating those firm-spe-

cific factors, as termed by Horbach et al. (2012), have identified the following determinants internal to the firm: technological capabilities (i.e. knowledge capital) (Cai & Li, 2018; Horbach et al., 2012), environmental organisational capabilities (i.e. environmental management systems (EMS)) (Cai & Li, 2018; Horbach et al., 2012), availability of resources (i.e. people, technology, knowledge, financial reserves) (del Río et al., 2016a; Pacheco et al., 2017), organisational values and culture (Dangelico, 2016) and cooperation and knowledge networks (del Río et al., 2016a).

Despite the contributions made by the aforementioned scholars, internal factors at firm-level such as resources and dynamic capabilities remain underrepresented in empirical studies on ESI (del Río et al., 2016b). Several authors thus call for more research on those enablers for the achievement of EI at the micro-level that distinguish environmentally innovative firms from non-environmentally innovative firms (del Río et al., 2016a; del Río et al., 2016b; Pham et al., 2019; Rodriguez & Wiengarten, 2017).

Furthermore, it can be observed that the mainstream discussion on EI focuses on large organisations and disregards the significant contributions from SMEs (Ben Arfi et al., 2018; Bos-Brouwers, 2010). Triguero et al. (2013), Cai and Zhou (2014), and del Río et al. (2016b) claim the need for further research on determinants of EI in SMEs according to the type of industry. Following this suggestion, Klewitz and Hansen (2014) conducted a systematic review examining the sustainability-oriented innovation practices of SMEs. The study by Pacheco et al. (2017) further discerns the types of SMEs and emphasises manufacturing SMEs. However, what seems to be still missing is an analysis of ESI determinants at firm-level in the context of social enterprises.

Setting the state of the research field of EI has once again corroborated the importance of this study considering the aforementioned gaps pointed out by studies on EI.

3.6 Measuring environmentally sustainable innovation

You cannot manage what you cannot measure. This quote is ascribed to various sources including economist Peter Drucker (García-Granero et al., 2018). It illustrates the need for measuring EI performance. García-Granero et al. (2018) recently conducted a systematic review of literature on EI performance indicators. Synthesising the most current research on this topic encompassing 104 academic articles, their

study identifies the thirty most cited key EI performance indicators (EIPI) by scholars. These indicators measure the implementation of EI at firm-level and are classified from the product, process, organisational and marketing perspective, thereby following the suggestions by Marcon, de Medeiros and Ribeiro (2017). The seven EIPIs at product level refer to the material inputs and product characteristics used that themselves impact the environment (García-Granero et al., 2018). As the manufacturing processes and methods account for a large part of a firm's environmental impact, eleven EIPIs based on improvements in the manufacturing processes were identified (García-Granero et al., 2018). Relating to organisational resources and capabilities needed for implementing EI, nine EIPIs refer to organisational EI. The last three indicators identified by the authors are based on marketing innovation activities, an area that has to date been underrepresented in EI literature (García-Granero et al., 2018). An overview of the thirty EIPIs is given in table 5.

Eco-innovation performance indicators	
Product eco-innovation	
1.1	Use new cleaner material or new input with lower environmental impact
1.2	Use of recycled materials
1.3	Reduce/optimise use of raw materials
1.4	Reduce number of product components
1.5	Eliminate dirty components
1.6	Product with a longer life cycle
1.7	Product ability to be recycled
Process eco-innovation	
2.1	Reduce chemical waste
2.2	Reduce use of water
2.3	Reduce use of energy
2.4	Keep waste to a minimum
2.5	Reuse of components
2.6	Recycle waste, water or materials
2.7	Environmental-friendly technologies
2.8	Renewable energy
2.9	R&D
2.10	Acquisition of machinery and software
2.11	Acquisition of patents and licenses
Organisational eco-innovation	
3.1	Green human resources
3.2	Pollution prevention plans
3.3	Environmental objectives
3.4	Environmental audit
3.5	Environmental advisory
3.6	Invest in research
3.7	Cooperation with stakeholders
3.8	New markets
3.9	New systems (remanufacturing systems and transport systems)

Marketing eco-innovation	
4.1	Use new cleaner material or new input with lower environmental impact
4.2	Green design packaging
4.3	Quality certifications

Table 5. Eco-innovation performance indicators (taken from García-Granero et al., 2018, pp. 309-311)

4 Innovativeness of ESSEs

While section two describes ESSEs as the subject of this study and links social entrepreneurship to sustainability research, section three addresses the concept of eco-innovativeness and ESIs by incorporating the environmental sustainability imperative into innovation management theory. By building the interface of the overall nexus of social entrepreneurship, sustainability, and innovation that lies at the core of the present study, section four introduces the combination of these insights to derive and synthesise the internal factors at firm-level that determine the innovativeness of ESSEs. ESSEs' innovativeness is perceived and constructed as a latent characteristic that can be captured by means of considering certain resources and innovation capabilities that collectively enable ESSEs to develop ESIs. A systematic review of the separate strands of literature on social and sustainable entrepreneurship, eco-innovation as well as innovation in SMEs was carried out comprised of studies from the last twenty years. From the internal factors and their interrelationships acknowledged as important by scholars, a conceptual model on the innovativeness of ESSEs is established that serves as a sound basis for the empirical analysis that follows in section five. Figure 3 depicts the model which is described next.

4.1 Conceptual model of the innovativeness of ESSEs

Adopting a micro-level perspective, this subsection presents the conceptual model on the innovativeness of ESSEs established from relevant academic literature. Rather than reviewing the full range of possible firm-level determinants, the focus is placed on those that appear more frequently in journal articles and publications of the OECD. The sample of studies is concentrated on, but not restricted to, those published between 2008 and 2019, although some exceptions have been made for older frequently cited papers (see Appendix 1 (A-2) for the exhaustive analysis of the factors identified). As only journal articles and studies written in the English language are reviewed, the identified list of factors is not intended to be exhaustive.

It is important to note once again that the proposed model is related to firm-specific internal factors only. Other external determinants, as described in section 3.5.3 such as governmental regulations, also influence the adoption of ESIs, yet those are outside the scope of this study and thus are not captured by the model.

The literature review carried out enabled the identification of 50 factors. For reasons of clarity, the factors are grouped into eight major clusters. The clusters each represent a latent dimension explaining the innovativeness of ESSEs and are labelled based on the seven elements identified by Lawson and Samson (2001).

The eight dimensions are examined next by presenting their respective operationalised indicator factors. Each factor is exemplified by an extract from relevant literature.

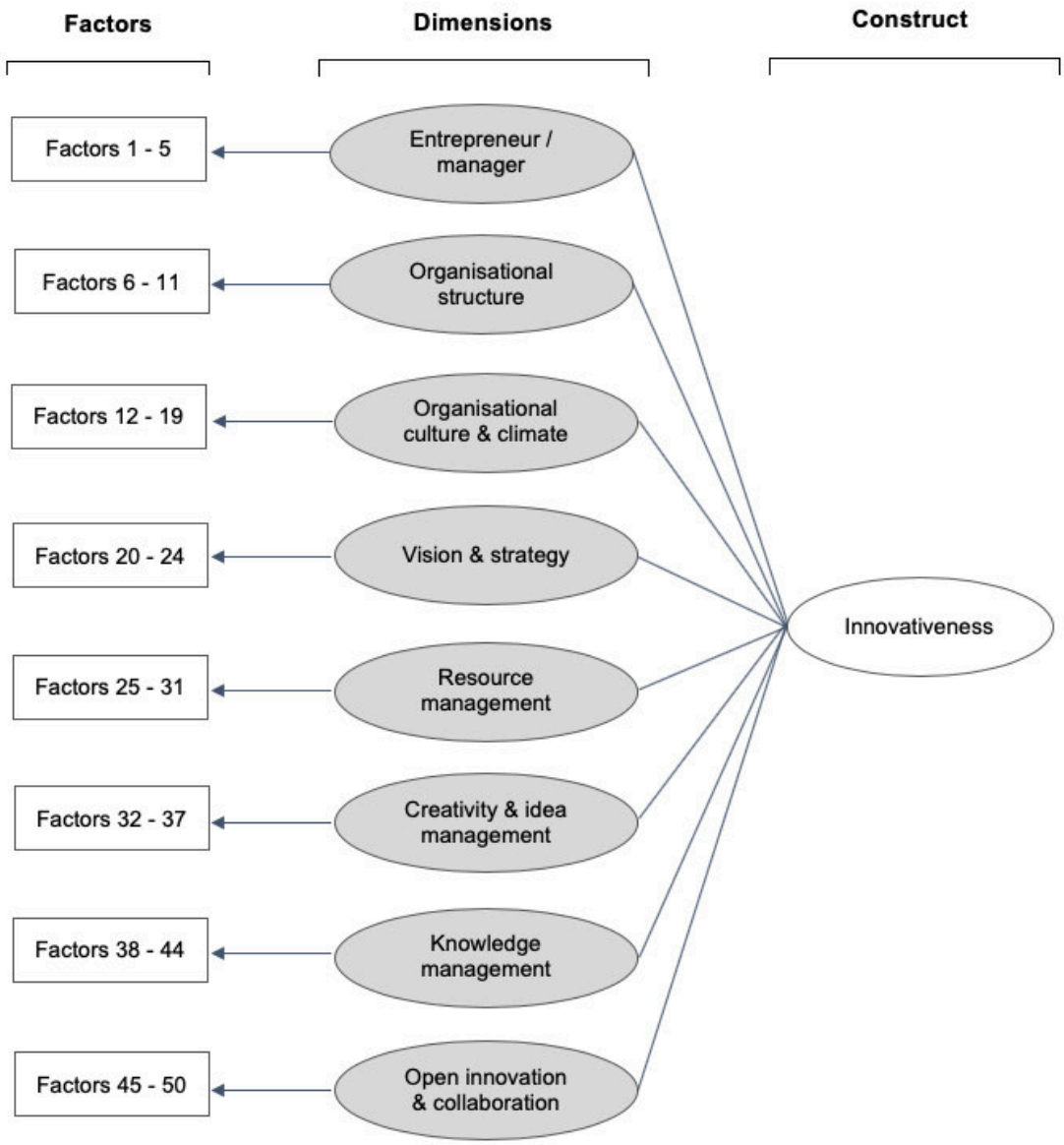

Figure 3. Conceptual model of the firm-level innovativeness of ESSEs (own illustration)

4.1.1 Entrepreneur / manager

Ashoka and the Skoll Foundation, two global organisations that invest in social entrepreneurs, describe those as individuals “with innovative solutions to society’s most pressing social problems” or “pioneers of innovation that benefit humanity” (Madill et al., 2010, p. 139). Studying sustainable innovations in the context of SMEs, Bos-Brouwers (2010, pp. 420-421) highlight “the central and (idea) creating role of the owner/manager in SMEs” to be “pivotal to the [sustainable] innovation process”. Ben Arfi et al. (2018, p. 215) even go as far as to speak of the leader as “the only guarantor of a green innovation approach within the organisation”. Hence, consensus seems to exist regarding the central role of the (social) entrepreneur/owner/leader in the environmentally sustainable innovation process. Consequently, the first latent dimension to determine the innovativeness of ESSEs is labelled "entrepreneur/manager". Based on the literature review, five factors are identified to operationalise the latent dimension:

Factors indicating the dimension entrepreneur / manager		**Citation & source**
F1	Sustainability orientation of the founder	“The sustainability orientation of the owner/manager appears to be of great significance in the number and impact of sustainable innovation activities.” (Bos-Brouwers, 2010, p. 430)
F2	Entrepreneurial orientation of the founder	“Associated with innovation, social enterprises are often described as exhibiting significant levels of social opportunity recognition, proactiveness, as well as risk tolerance.” (Madill et al., 2010, p. 139)
F3	Founder’s personality	“Personal values and passion for sustainability influence the conduct of business in an ecological sustainable way.” (Gast et al., 2017, p. 49)
F4	Managerial experience of the founder	“Management capabilities can influence a firm’s ability to undertake innovation activities, introduce innovations and generate innovation outcomes.” (OECD & Eurostat, 2018, p. 106)
F5	Green transformational leadership style	“[…] green dynamic capabilities and green transformational leadership positively influence green creativity and green product development performance.” (Chen & Chang, 2013, p. 107)

Table 6. Factors that pertain to the dimension entrepreneur / manager

DiVito and Bohnsack (2017, p. 582) identify dual sustainability and entrepreneurial orientations for sustainable entrepreneurs (green, social or both). As for the first factor, the sustainability orientation of the entrepreneur is understood as the owner's "personal inclination to integrate sustainability aspects into business" and is "the main discriminator between truly sustainable innovators and innovators with mere attention for environmental and/or social aspects" (Bos-Brouwers, 2010, p. 430). The sustainability orientation is made up of values that shape the decision-making of the firm (DiVito & Bohnsack, 2017), whereas entrepreneurial orientation refers to the (social) opportunity recognition, proactiveness and risk tolerance associated with innovation and exhibited by social entrepreneurs (Madill et al., 2010, p. 139). Further, the founder's individual traits, values, and vision are also acknowledged as important by scholars (e.g. Dangelico, 2016; Gast et al., 2017) as they, in turn, determine the leadership style (Alegre & Berbegal-Mirabent, 2016). Chen and Chang (2013, p. 109) propose the novel notion of "green transformational leadership style" that stimulates the innovation performance of organisations. It refers to the behaviour of a leader who motivates followers to achieve environmental goals and higher levels of performance by inspiring them to think creatively, see problems from new perspectives, by communicating a vision, and by caring for employees through individual support (Chen & Chang, 2013).

4.1.2 Organisational structure

"Organisational characteristics are shown to bear major influence on a firm's innovative activity" (Martínez-Román & Romero, 2017, p. 549). Despite the ongoing debate by academics and practitioners over the most appropriate organisational structure for spurring innovations, general agreement has been reached on what impedes innovating (Parzefall et al., 2008). Less flexible structures with rigid routines and higher levels of hierarchy, control, bureaucracy, and administration are in contradiction to the trial-and-error character of the innovation process (Parzefall et al., 2008; Schaltegger & Wagner, 2011). To operationalise the latent dimension "organisational structure" the literature review identified the following six factors:

Factors indicating the dimension organisational structure		Citation & source
F6	Flexible organisational structure	"selected companies [of the six green innovation projects investigated] generally have a cer-

		tain ability for reacting to their changing environment; have internal flexibility when it comes to their processes, systems and the way their products or services are delivered" (Ben Arfi et al., 2018, p. 214)
F7	Little bureaucracy & administrative processes	"…little bureaucracy and informal communication lead to efficiency, effectiveness and responsivity to changes in the (commercial) environment sustainable innovation project teams" (Bos-Brouwers, 2010, p. 430)
F8	Permeable business boundaries	"High performing firms motivate and enable innovative behaviour by creating permeable business boundaries helping break down the barriers separating functions, product groups and businesses" (Lawson & Samson, 2001, p. 393)
F9	Lack of hierarchy	"…theoretical observations and empirical evidence favour organic structures…characterized by lack of hierarchies, low levels of bureaucracy, a wide span of control, flexibility and adaptability" (Parzefall et al., 2008, p. 175)
F10	Responsiveness to changes & opportunities	"Another key criteria for sustainable innovation is responsiveness, that is to say the capacity to adapt to unforeseen exogenous shocks, to stakeholders and public demands, and to changing circumstances" (Berkowitz, 2018, p. 423)
F11	Informal & fast communication channels	"Advantages of SMEs over large companies with regard to the innovation process… internal communication faster and more efficient." (Bos-Brouwers, 2010, p. 421)

Table 7. Factors that pertain to the dimension organisational structure

4.1.3 Organisational culture and climate

"Organisational culture is undisputedly considered crucial to an organisation's ability to innovate" (Parzefall et al., 2008, p. 176). Whereas an innovation culture refers to behaviours, values, and beliefs that foster an openness to innovation, the concept of climate describes specific facets of a firm's culture, such as a climate for psychological safety that tolerates mistakes being made, and thus learning-by-failing (OECD & Eurostat, 2018; Parzefall et al., 2008, p. 177). Eight factors are among the most frequently cited by scholars and together operationalise the latent dimension "organisational culture" as shown in table 8:

Factors indicating the dimension organisational culture & climate		Citation & source
F12	Culture of innovation	"[...] for an innovating company, one challenge of the leaders is to innovate the culture to make it compatible with their strategy of innovation" (Pham et al., 2019, p. 1090)
F13	Environmental culture	"Environmental culture can facilitate both of proactive and reactive green innovations" (Chen et al., 2012, p. 379)
F14	Employee empowerment & autonomy	"Organisational culture as one dimension of innovation capability:…Empowered employees, […], autonomy for employees" (Iddris, 2016, p. 247)
F15	Variety of job tasks	"[…] research has consistently shown that lack of routine is positively associated with innovativeness" (Parzefall et al., 2008, p. 171)
F16	Participative decision making	"[…] there are antecedents to innovativeness; that is, various characteristics of a firm's culture, such as an emphasis on learning, participative decision making, support and collaboration, and power-sharing, affect whether the firm has an innovation orientation" (Hurley & Hult, 1998, p. 44)
F17	Availability of creative time for employees	"Organisational culture as one dimension of innovation capability:…Availability of creative time" (Iddris, 2016, p. 247)
F18	Freedom for risk-taking and experimentation	"[…] much research views risk tolerance as an essential feature of the organisational culture of innovative firms" (Martínez-Román & Romero, 2017, p. 550)
F19	Tolerance for mistakes and learning-by-failing	"[…] a risk-tolerant top management that does not abort projects too quickly when first difficulties occur, and that enables employees and managers to reflect and take advantage of learning-by-failing, is important" (Parzefall et al., 2008, p. 174)

Table 8. Factors that pertain to the dimension organisational culture and climate

A positive correlation has been found between given autonomy and control over one's job tasks and the inclination of employees to engage in innovative behaviour, which in turn heightens job satisfaction (Parzefall et al., 2008). A variety of job tasks can foster innovativeness, as non-routine tasks challenge employees to think outside-the-

box, and thus provide an opportunity for learning and personal growth (Parzefall et al., 2008). Cited most frequently, the availability of time to think creatively and to adopt different perspectives when solving tasks determines the generation of new ideas, and ultimately the innovativeness of ESSEs (Parzefall et al., 2008). Additionally, an organisational culture in which the founder's values and passion for (environmental) sustainability are embedded has a positive daily effect on the development of ESIs (Pham et al., 2019).

4.1.4 Vision and strategy

Whereas some scholars regard innovations as an output of strategy (Bessant & Tidd, 2011), for others innovation is the centre of an organisation's strategy (Damanpour & Gopalakrishnan, 1999). In line with the latter school of thought, ESSEs are found to have an explicit organisational strategy emphasising proactive environmental sustainability and innovation orientation that should be disclosed in the vision and mission statement (Dangelico, 2016; Parzefall et al., 2008; Pham et al., 2019). Such a corporate strategy has been found to be one of the most influential factors stimulating ESIs (Triguero, Moreno-Mondéjar, & Davia, 2016). Therefore, the fourth latent dimension is “vision and strategy” that can be operationalised with five factors (table 9).

Factor indicating the dimension vision and strategy		**Citation & source**
F20	Sustainability vision & strategy	“Designing and implementing a sustainability vision based on owner-manager values can develop into a core driver for overall organizational development ” (Klewitz & Hansen, 2014, p. 66)
F21	Environmental company policies & strategies	“The existence of specific policies and strategies also drives GPI [green product innovation] development. These include green company policies (in terms of the level of commitment that a firm demonstrates to initiatives limiting its environmental impact), environmental product policies (in terms of corporate environmental policies explicitly addressing environmental issues in new product development decisions) and environmental strategic approaches (such as green management, material eco-efficiency, energy efficiency and supply chain management)” (Dangelico, 2016, p. 568)
F22	Clear communication of vision	“Successful innovation requires a clear articulation of a common vision and the firm expression of the strategic direction.” (Lawson & Samson, 2001, p. 389)

F23	Innovation strategy	“An explicit innovation strategy or a strategy with a clear focus on innovation is commonly seen as an important factor influencing innovativeness in organizations” (Parzefall et al., 2008, p. 174)
F24	Long-term strategic focus	”Long-term-based eco-innovation orientation [at the strategic level] emerges as a powerful predictor for EI [environmental innovation].” (Pham et al., 2019, pp. 1095-1096)

Table 9. Factors that pertain to the dimension vision and strategy

4.1.5 Resource management

As acknowledged frequently by scholars, ESI requires the availability of diverse resources, such as people, know-how and technology (Pacheco et al., 2017). Thus, “resource management” is identified as the fifth latent dimension determining the innovativeness of ESSEs. Although similar to SMEs, ESSEs are associated with a lack of resources. Lumpkin et al. (2013) argue that it is this lack that forces SEs to be innovative. There is a scholarly consensus that people are the most important resource for innovation as they embody the firm’s knowledge and are the source of creativity and new ideas” (OECD & Eurostat, 2018, p. 115). While the limited resources can impede attracting qualified and skilled personnel, the environmental and/or social mission of SEs and ESSEs has frequently been found to provide intrinsic motivation; thus, making it instrumental in recruiting and mobilising effort from employees (Doherty et al., 2014). According to Parzefall et al. (2008, p. 169), this “internal force” is necessary to overcome the challenges of creative work. Hence, for social entrepreneurs hiring people who share their personal values is more important than the candidate’s professional competencies (Gast et al., 2017). Yet, it appears that ESSEs benefit from having multi-disciplinary teams since innovation activities require diverse tasks to be fulfilled (Keskin, Diehl, & Molenaar, 2013). Seven factors fall under the latent dimension “resource management”:

Factors indicating the dimension resource management		**Citation & source**
F25	Qualified & skilled employees	“[…] high qualification of the employees in environmental firms – as an indicator of technological competence-, promotes the introduction of environmental product innovations..” (Pereira & Vence, 2012, p. 89)

F26	Diverse & interdisciplinary workforce	"[…] qualified HR with a high level of education, self-esteem, diverse backgrounds and motivation was the most important means (in comparison with financial resource, physical resource, slack resource) to improve resource allocation capabilities for innovation." (Pham et al., 2019, p. 1096)
F27	Shared green values of employees	"In human resource management, ecological sustainable entrepreneurs emphasize hiring personnel who share their personal values." (Gast et al., 2017, p. 49)
F28	Intrinsically motivated employees	"The combination of enterprise and social mission has frequently been cited as a motivating force that provides employees with the intrinsic rewards of job satisfaction and as contributing to community impact." (Doherty et al., 2014, p. 425)
F29	Sustainability training & development	"Engaging employees in the development of the sustainable business can be supported by tools such as development and training schemes […]." (Klewitz & Hansen, 2014, p. 66)
F30	Access to financial resources	"A firm's internal financial sources are another major driver for innovation. More profitable firms and firms with a larger share of own capital can find it easier to invest in activities with uncertain outcomes, such as those relating to innovation." (OECD & Eurostat, 2018, p. 106)
F31	Technological expertise	"[…] innovation depends on both the adoption of new technology and the intensity of internal R&D in companies" (Martínez-Román & Romero, 2017, p. 547)

Table 10. Factors that pertain to the dimension resource management

4.1.6 Creativity and idea management

"Eco-innovation cannot exist in isolation from creativity" (Pham et al., 2019, p. 1091). In fact, creativity is considered "the primary impetus of innovation" (Chen & Chang, 2013, p. 110). In simple terms, creativity is viewed as thinking differently, and as expressing ideas in other, new ways (Pham et al., 2019, p. 1091). In this respect, it involves brainstorming and thus requires sufficient time to elaborate on ideas (Pham et al., 2019). Green creativity refers to organisational and marketing practices that drive EI. The latent dimension "creativity and idea management" can be described by six factors, as displayed in table 11.

Factors indicating the dimension creativity and idea management		Citation & source
F32	Employee creativity	"Creativity as one dimension of innovation capability: [...], value individual contributions, .." (Iddris, 2016, p. 248)
F33	Employee idea contribution	"Idea management [as one dimension of innovation capability]: […] employee idea contribution" (Iddris, 2016, p. 248)
F34	Team creativity	"For firms, team creativity is viewed as a main source of innovation." (Chen & Chang, 2013, p. 110)
F35	Rewarding innovative ideas	Idea management [as one dimension of innovation capability]: […] provide feedback and reward for innovative ideas" (Iddris, 2016, p. 248)
F36	Green creativity through eco-design	"The second [characteristics of the development process that are key for a successful GPI development] most often mentioned in the literature relates to the implementation of eco-design and life cycle assessment practices" (Dangelico, 2016, p. 570)
F37	Green creativity through biomimicry	"[…] these SMEs begin to change their innovation process for SOIs through biomimicry and interaction with external actors." (Klewitz & Hansen, 2014, p. 70)

Table 11. Factors that pertain to the dimension creativity and idea management

Eco-design, also known as design for sustainability, presents one overarching concept to accomplish ESI (Klewitz & Hansen, 2014). Taking on a life cycle perspective, eco-design assesses environmental effects and risks over the entire life cycle of a product from pre-manufacturing to end-of-life (Klewitz & Hansen, 2014). It requires companies to think about ways to "repair, reuse, disassemble, remanufacture, and/or recycle a product" to achieve a more environmentally benign product design (Klewitz & Hansen, 2014, p. 67). Biomimicry is also said to inspire green creativity, and ultimately ESI. Biomimicry means "to imitate life", and thus involves designing products "by learning from materials, behaviours and processes observed in the natural environment" (Adams et al., 2012, p. 50). Solar cells that imitate the photosynthesising processes of plants are an example of biomimicry-inspired innovations. Central to biomimicry is the systems view that "nature does not degrade the system it relies on to survive" (Adams et al., 2012, p. 51). In the same way, the use of natural resources should not exceed the regenerative capacity of planet Earth.

4.1.7 Knowledge management

In today's knowledge-based economy, knowledge is widely considered a crucial resource for a firm and its proper management necessary for continuous innovation activities (Ben Arfi et al., 2018; OECD & Eurostat, 2018). Hence, the seventh latent dimension "knowledge management" is closely linked to the previous dimension "resource management". Knowledge management is a capability that entails the different activities of knowledge creation, sharing and utilisation that encompass factors internal and external to the firm (Wong & Aspinwall, 2004). A firm can source knowledge within the organisation from its employees (individual knowledge) as well as through R&D, and learning-by-doing and learning-by-failing effects (organisational knowledge). Major external knowledge sources are customers, suppliers, business partners, special interest groups, and research institutes (Dangelico, 2016). To reflect the dimension "knowledge management" as accurately as possible, the following seven factors are used:

Factors indicating the dimension knowledge management		**Citation & source**
F38	Industry knowledge	"[…] industry knowledge is necessary for acquiring other resources such as more financial capital (venture capital investments or subsidies), networks or reputational assets, without which technological (environmental) innovations are unlikely to progress into commercial offerings" (Halme & Korpela, 2014, p. 559)
F39	Environmental research & development	"Conducting environmental R&D [as one success factor of green product innovation]" (Dangelico, 2016, p. 572)
F40	Internal knowledge sources	"Innovativeness at the firm-level is described as a collective action that coordinates the knowledge and expertise of employees to foster the invention of products, services, and processes" (Rodriguez & Wiengarten, 2017, p. 2425)
F41	Knowledge creation & sharing	"[…] the acquisition of new knowledge and the green knowledge sharing as well as knowledge transfer activities of individuals contribute to the continuous improvement of the organizational source of knowledge, which is essential in the context of pursuing the eco-innovation of the organization" (Pham et al., 2019, p. 1094)
F42	Organisational learning	"Innovation capability refers to a firm's ability to generate innovation through continuous learning,

		knowledge transformation, creativity, and exploitation of internal and external resources available to the firm." (Iddris, 2016, p. 246)
F43	External knowledge sources	"The firm's contact with external knowledge sources has also been shown to have a major influence on firms' innovative behaviour." (Martínez-Román & Romero, 2017, p. 551)
F44	Utilisation of new knowledge	"The process of eco-innovation is actually environmental knowledge accumulation, integration, and utilization." (Cai & Li, 2018, p. 111)

Table 12. Factors that pertain to the dimension knowledge management

4.1.8 Open innovation and collaboration

There is widespread agreement among scholars that innovation for the environment and society is not undertaken in isolation by lone social entrepreneurs, but rather through interactive collaboration and knowledge sharing with a wide range of external stakeholders (Phillips et al., 2015). To compensate for the lack of resources as well as to foster creativity and knowledge creation, building knowledge networks becomes a crucial capability of ESSEs (Picciotti, 2017). It can be distinguished between collaboration with actors of the firm's value chain (customers, suppliers, distributors, competitors), and agents of specific and technical knowledge, such as research centres and universities, special interest groups, the local government, etc. (Martínez-Román & Romero, 2017). The engagement with stakeholders to integrate ideas and information of varied perspectives requires strategic openness (Pittz et al., 2017). Such an open-strategy approach to innovation is termed open innovation and is considered a good tool to enhance ESIs (Pham et al., 2019). The six factors identified to operationalise the latent dimension "open innovation and collaboration" refer to the most relevant external actors for collaboration:

Factors indicating the dimension open innovation and collaboration		**Citation & source**
F45	Collaboration with suppliers	"In the case of suppliers, they can indicate the most protective material or processes to the environment" (Albort-Morant, Martelo-Landroguez, & Leal-Rodríguez, 2018, p. 18)
F46	Collaboration with business partners	"[…] SMEs make use of interaction with their partners from the regulatory, value chain, and knowledge network to acquire different types of information and […],

		ultimately, an SME's innovative capability is influenced by a dynamic triangle of competencies, strategies, and network relations." (Klewitz & Hansen, 2014, p. 67)
F47	Collaboration with customers through user experience	"[…] customers could help companies to meet their needs, and have the capability to implement strategies by being responsive to customers." (Albort-Morant et al., 2018, p. 18)
F48	Collaboration with universities and/or research centres	"[…] entrepreneurs who give importance to collaboration with research institutes, agencies and universities, and to the increase of market demand for green products are more active in all types of eco-innovations" (Triguero et al., 2013, p. 25)
F49	Collaboration with local government	"These include collaborations with suppliers, collaborations with customers, collaborations with environmental groups and NGOs, collaborations with knowledge institutions and local government, collaborations within the company's own enterprise group and collaborations with business partners and research partners." (Dangelico, 2016, p. 570)
F50	Collaboration with environmental groups	refer to F49 source

Table 13. Factors that pertain to the dimension open innovation and collaboration

4.2 Hypotheses formulation

Based on the conceptual model presented in the previous section, two hypotheses are proposed. For each alternative hypothesis (H1, H2), a null hypothesis (H0) is formed, which expresses the opposite of the alternative hypothesis.

The first hypothesis relates to the literature-based conceptual model developed in this study. Section 3.3 in particular highlights the multidimensional nature of innovativeness. Lawson and Samson (2001, p. 389) emphasise the complexity of innovativeness by arguing: "The following elements are proposed to exist, to some degree, within innovative firms. They are vision and strategy, harnessing the competence base, organisational intelligence, creativity and idea management, organisational structure and systems, culture and climate, and the management of technology." Based on the theoretical insights synthesised in this study the following first hypothesis is proposed:

H1	The innovativeness of ESSEs is multidimensional.
H0	The innovativeness of ESSEs is not multidimensional.

Since the conceptual model in its entirety is intended to explain the innovativeness of ESSEs at firm-level a second hypothesis is postulated:

H2	All literature-based internal factors at firm-level determine the innovativeness of ESSEs.
H0	Not all literature-based internal factors at firm-level determine the innovativeness of ESSEs.

5 Quantitative exploratory study

The purpose of this study is to propose an initial model of the innovativeness of ESSEs at firm-level. The systematic literature review yielding a conceptual model in the first stage of the research approach is followed up by an exploratory quantitative study conducted on a set of European ESSEs in order to test and refine the model. The study is considered exploratory in nature since it is the first to empirically explore ESI in the nascent field of social entrepreneurship, and even more specifically, ESI in the context of SEs focused on environmental sustainability. Yet, a quantitative approach is chosen as innovation is commonly explored, captured, and measured quantitatively (Garcia & Calantone, 2002; Longoni & Cagliano, 2018; Parzefall et al., 2008). This section is structured as follows: first, the research method is described and justified in section 5.1. Next, to enable replication, the research design and procedures are presented in detail in section 5.2. Section 5.3 reports the empirical results from which the adapted model is derived and presented in section 5.4. The proposed hypotheses are discussed next (section 5.5). Finally, in section 5.6, the results are interpreted in light of previous literature.

5.1 Quantitative method

In social research, qualitative and quantitative methods are distinguished as two distinctive research methods. Qualitative research is usually associated with an inductive approach where data is collected to explore a phenomenon and to generate a theory. Meanwhile, quantitative research uses a deductive approach to the relationship between theory and research where collected data is used to test a theory. (Bryman & Bell, 2014; Saunders, Lewis, & Thornhill, 2012)

With its roots lying in natural sciences, quantitative research examines the relationship between variables that are measured and analysed using various statistical techniques (Döring & Bortz, 2016; Saunders et al., 2012). Typically aimed at testing theoretically deduced hypotheses, in qualitative research data is collected in a structured and standardised manner. It often results in the further development of a theory. (Saunders et al., 2012)

Survey research is the most common research strategy associated with quantitative research (Denscombe, 2003). Surveys collect information on the respondents' past and present behaviour as well as their beliefs, opinions, and characteristics (Neuman, 2000). The answers given to survey questions measure many variables and can be

used to test several hypotheses in a single survey (Neuman, 2000). In survey strategy, questionnaires are used most widely for data collection (Saunders et al., 2012). Types of questionnaires differ depending on how they are delivered, returned, collected, and on the amount of contact the researcher has with the respondents (Saunders et al., 2012). Written questionnaires can be comprised of open and closed questions. The types of questions used determine whether a questionnaire is structured, unstructured, and semi-structured (Singh, 2007). The high degree of standardisation makes it possible to collect responses from a large sample with a high degree of efficiency. That ensures sample representativeness and allows researchers to draw generalisations about populations from the data collected beyond the confines of the research context (Döring & Bortz, 2016; Saunders et al., 2012).

In quantitative research, the quality criteria of objectivity, replicability, reliability, and validity should be considered when creating the research design. Objectivity is given when the results have been obtained without external influence and is achieved by eliminating the human factor through standardised methodological procedures and measuring with numbers (Neuman, 2000). Replicability is an indicator of the consistency, i.e. repeating the study should generate the same or very similar findings. Reliability refers to the consistency of measures (Bryman & Bell, 2014). Validity, the most crucial quality criterion, is concerned with the integrity of the conclusions of a study (Bryman & Bell, 2014). It can be distinguished between internal validity (the integrity of the proven causal relationships) and external validity (generalisability of the findings beyond the specific research context to a broader range of settings and people) (Döring & Bortz, 2016; Neuman, 2000).

For the empirical study of this work, a structured self-completion online questionnaire is used and directed towards a sample of European ESSEs. The purpose of the survey is to obtain a self-reported assessment of the extent to which the companies consider the identified internal factors to be essential drivers of ESI.

5.1.1 Method justification

In order to conduct a first quantitative exploratory study on the developed conceptual model on a set of European ESSEs, a self-completion online questionnaire is used. Online questionnaires are internet-mediated surveys in written form that are carried out through the world wide web (Saunders et al., 2012).

This data collection method is appropriate for the following reasons (Bryman & Bell, 2014; Denscombe, 2003; Döring & Bortz, 2016; Neuman, 2000; Saunders et al., 2012):

High efficiency: A large amount of data can be collected in a short time; *cost-efficiency*: Low set-up and administration costs; *reach*: Geographically dispersed respondents can be easily reached; *accessibility*: Respondents can complete the questionnaire using various devices including mobile phones, tablets, laptops, and desktop computers; *anonymity*: It offers respondent anonymity and data confidentiality; *absence of interviewer effects*: Researcher bias and interviewer variability in asking questions is avoided; *convenience for respondents*: Questionnaire can be completed when it suits respondents best; *data input and export*: Data is automatically collected in a database; *flexible design*: Questions and answers can be displayed using drop-down menus, drag-and-drop functions, sliders, automated filtering controlling the sequence of questions; *control checks*: Plausibility and completeness checks can be included.

5.1.2 Method limitations

Every research method and strategy is associated with certain disadvantages. One limitation of structured, self-completion online questionnaires is variable response rates (Rose, Spinks, & Canhoto, 2015). Survey fatigue of potential participants of online questionnaires can lead to low response rates, along with lengthy, less relevant, or uninteresting surveys. Also, partial completion can reduce the sample size and create the problem of missing data for the measured variables that the researcher cannot identify; poorly completed responses cannot be clarified until they are detected at the analysis stage (Rose et al., 2015, p. 213). Since the researcher is not present to assist respondents when they are having difficulty answering the questions, it has to be ensured that the questions are clear and unambiguous (Bryman & Bell, 2014). The results of quantitative research are summarised in numerical data sets, so it is not designed for probing to elaborate on the reasons for the responses given. The high level of anonymity lowering the respondents' commitment is a further explanation of low completion rates. Additionally, structured online questionnaires are often criticised for not being representative. The group of people without access to the internet are per se excluded from online surveys (Döring & Bortz, 2016).

5.2 Research design

In this section, the research design and procedures are presented to take account of the quality criterion of replicability. This includes the objective of the research design, the sample selected, and the online questionnaire. Subsequently, the data collection procedure and data analysis method is described, followed by a critical reflection of the research design.

5.2.1 Objective

The objective of the empirical exploratory study conducted is to refine the proposed conceptual model based on the self-reported assessment of the extent to which ESSEs consider the identified internal factors to be essential determinants of ESI.

5.2.2 Sample

In practice, in empirical studies, it is often not possible to collect data from an entire population due to impracticability, budget, and time constraints. Where a census cannot be achieved, a sample has to be selected. In order to be able to generalise findings derived from a sample to the population, the sample has to be representative of the population. (Bryman & Bell, 2014)

In this research, the unit of analysis of the survey is the firm. Specifically, European for-profit ESSEs are addressed. However, no robust data exist on the overall number of ESSEs in the EU (European Commission, 2016a). The European Commission speaks of two million so-called social economy enterprises of different legal forms and various objectives of which social enterprises are acknowledged as a sub-group. The EU's definition of social enterprises encompasses businesses of different legal forms (including non-profit and for-profit) that operate in the fields of work integration, personal social services, local development of disadvantaged areas, and "others" which include, but are not limited to, environmental protection and recycling. This illustrates that ESSEs, as for-profit social enterprises focused on environmental sustainability, represent a niche group of the niche of social enterprises of the two million social economy enterprises in the EU. (European Commission, 2019b)

Due to the limited knowledge about the population, i.e. the total number of European ESSEs, the sample of ESSEs participating in the study are selected using a non-probability convenience sampling approach (Neuman, 2000). A convenience sample is available to the author by virtue of its accessibility through public information, in the case of this study the e-mail address or contact form provided by the companies'

websites (Bryman & Bell, 2014). The specific characteristics of the enterprises determine whether they are relevant to the study and thus included in the sample or not.

Online research was conducted to identify social enterprises meeting the definition of ESSEs utilised in this research. For instance, the database of “Climate-Kic", the EU's largest private-public partnership addressing climate change through innovation, lists European green start-ups which was drawn upon to identify possible participants. As many of them are not registered companies yet, the following websites, databases, or media were also searched to identify ESSEs: Ashoka (a global organisation that identifies and invests in leading social entrepreneurs), Skoll Foundation (a private organisation investing in innovative social entrepreneurs), GoodJobs.eu (Germany's largest platform for social and sustainable jobs and companies, called "GoodCompanies”, in Germany and other European countries), Social Entrepreneurship Forum Austria (currently listing 32 social enterprises of which nine meet the criteria of ESSEs), the German quarterly published magazine “green Lifestyle” (issues 03/2018, 04/2018, 01/2019), as well as the social media platform Instagram that was searched by sustainable hashtags.

Based on each organisations' website, the author assessed whether the identified enterprises had a social mission or purpose emphasising environmental sustainability, or whether they had self-identified themselves as sustainable SEs. Only enterprises that met these criteria were included in the sample leaving 150 ESSEs across various industries in the final sample.

In addition, the snowballing approach to sampling was used, which is useful when researching niche groups (Rose et al., 2015). Potential participants were asked to share the survey with other ESSEs companies of which they are aware. Furthermore, a German sustainability blogger was approached to advertise the survey on the social media platform Instagram.

5.2.3 Questionnaire

A standardised self-completion online questionnaire was designed as the survey instrument using the online survey software Enterprise Feedback Suite (ESF). The questionnaire is comprised of fifteen questions that can be grouped into three thematic parts (see Appendix 2 (A-18) for the full questionnaire). The first part contains closed informant factual questions on the demographics of the enterprise, including industry sector, country of registration, number of employees, and age. The second

part measures the social entrepreneurship fit (SEF) of the enterprise to ensure that it meets the definition of ESSEs utilised in this study. Participants are asked how much consideration they give to social, environmental, and economic objectives in their overall purpose and mission, and when making business decisions. SEF is quantified using percentages on a slider: Respondents are asked to assign 100 points in total among social, environmental, and economic value creation. The third part of the questionnaire collects data for all eight latent dimensions in the proposed conceptual model on the innovativeness of ESSEs. Eight closed questions are asked to get a self-reported assessment on the extent to which the enterprises consider the respective identified internal factors to be influential on ESSEs' innovativeness. The 50 internal factors were measured by means of a four-point Likert scale ranging from "strong influence" to "no influence". By giving the additional non-attitude choice "cannot assess", non-attitudes are separated from middle positions. Respondents who cannot assess the importance of a factor, for instance, because it does not apply to their organisation, are not forced to choose a position that they are unable to assess (Neuman, 2000).

In order to decrease socially desirable responding, which would negatively affect the validity of the survey, especially regarding the questions about the SEF, anonymity and confidentiality is assured to the respondents at the start of the survey (Nancarrow, Brace, & Wright, 2001). Respondents did not have to reveal their names or the company name.

5.2.4 Data collection

To ensure that the study is acceptable in content validity, a pre-test with two ESSEs was conducted to assess the quality and clarity of the research design. The pre-test provided useful guidance towards modifying the questionnaire items in order to eliminate ambiguities and facilitate the answers. Following the pre-test, 150 questionnaires were sent to the identified ESSEs via e-mail in three separate waves. The e-mail invitation explained the purpose of the survey and provided the web link to the online questionnaire. As explained in the e-mail, the survey was directed to the person(s) involved in the strategic decision making of the firm, i.e. the entrepreneur, owner, or someone holding a management position. The invitation e-mails were written in a personalised manner, i.e. using names of employees where possible and acknowledging the company's contribution towards sustainable development. Although more time-consuming, this approach was chosen to increase the response

rate. A follow-up message was e-mailed a week after the questionnaire was sent out to remind non-respondents to participate.

The questionnaire was active and accessible from May 5, 2019, to June 10, 2019. The survey had a total of 215 impressions (gross sample), leading to 101 respondents. As 51 surveys were prematurely terminated, 52 completed valid questionnaires were retained. This corresponds to an effective response rate of 24%.

Page of the questionnaire	No. of completed responses
Welcome page	n=101
Company demographics	n=75
Social entrepreneurship fit	n=69
Dimension 1 & 2	n=63
Dimension 3 & 4	n=58
Dimension 5 & 6	n=55
Dimension 7 & 8	n=52

Table 14. Dropout statistic of the online questionnaire

Table 14 shows the dropout statistics of the online questionnaire. 53% of the people who clicked on the web link leave the survey after the welcome page. Reasons may be that the topic is not of their interest, they do not count themselves to the target group, or they are deterred by the duration (approx. eight minutes). 101 participants completed the first part of the questionnaire on the business demographics. 75 answered the questions about the SEF. Most relevant for the data analysis is the number of respondents for each of the eight dimensions of factors. Losing just four respondents on average per every second dimension, 52 participants completed all questions on the relevance of the internal factors.

5.2.5 Data analysis

The data analysis is conducted in two stages. Firstly, univariate analysis is performed using the spreadsheet package Microsoft Excel to summarise the information collected on the enterprises and the SEF in the form of descriptive statistics. Secondly, exploratory factor analysis (hereafter EFA) was performed on the data collected on the internal factors using IBM Statistical Package for Social Sciences (SPSS).

A multivariate statistical technique, EFA is suitable to analyse the underlying patterns or structure of the interrelationships (correlations) among many variables (Hair et al., 2019). The primary purpose of EFA is to condense the information contained within a

large amount of variables (items) by grouping intercorrelated variables into smaller distinct subsets, called factors or components (Hair et al., 2019). Thus the result of EFA is a parsimonious representation of a large number of variables (Fabrigar & Wegener, 2012). In this study, EFA is applied to reduce the number of internal factors initially identified (a total of 50) to a smaller set of summary factors that can parsimoniously explain the eco-innovativeness of ESSEs. A series of eight EFAs are conducted, one on each identified latent dimension of the proposed conceptual model: (1) entrepreneur / manager, (2) organisational structure, (3) organisational culture & climate, (4) vision and strategy, (5) resource management, (6) creativity and idea management, (7) knowledge management, and (8) open innovation and collaboration. As the unit of analysis are variables, an R-type factor analysis approach is used (Hair et al., 2019).

The conceptual model proposed in section 4.1 supports the critical assumption of EFA that an underlying structure exists among the items in each of the eight dimension. Preliminary analysis is undertaken in three steps to ensure that a base level of statistical correlation exists among the variables necessary to produce representative factors (components) (Hair et al., 2019):

- **Visual examination of the correlation**: The correlation matrices that the EFA is based on are visually inspected, with a sizable number of values higher than .30 indicating sufficient correlation (Hair et al., 2019).
- **Bartlett's test of sphericity:** This test detects the presence of nonzero correlation, with small values of the significant level (sig < .05) indicating sufficient correlation (Hair et al., 2019).
- **Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy:** KMO indicates the proportion of variance in the variables that may be a result of underlying factors. Whereas KMO values of ≥ .70 are desired, anything ≥ .50 is considered acceptable (Watkins, 2018).

Following the tests of violations of the assumptions of EFA, factor extraction is performed using principal component analysis (PCA) and the orthogonal factor rotation method VARIMAX to examine the dimensionality of the eight dimension. According to Hair et al. (2019, p. 147), the purpose of rotating the factor matrix is "to redistribute the variance from earlier factors to later ones to achieve a simpler, theoretically more meaningful factor pattern". This is important because for unrotated factor solutions

the factors are extracted according to the amount of variance they account for, with the first factor explaining the largest amount of variance, the second largest and so forth. However, since this does not mean that the first factor is more important than the subsequent factors, factor rotation is recommended to improve the interpretation of the factor solution. (Hair et al., 2019)

Following the advice of Hair et al. (2019), the decision regarding the number of factors which will be extracted was based on a combination of the conceptual foundation and empirical evidence. Although there is no established quantitative basis for determining the number of factors to extract yet, the following stopping rules for factoring were considered (Hair et al., 2019):

- **Latent root criterion (also Kaiser criterion)**: All factors that have an eigenvalue greater than 1 should be retained, with the eigenvalue being the sum of the squared loadings of variables on the factor. (Hair et al., 2019)
- **Percentage of variance criterion:** To ensure practical significance, factor extraction should be continued until the derived factors explain at least a specified amount of variance. According to Hair et al. (2019) and Zikmund et al. (2010), in social sciences, a factor solution can be regarded as satisfactory when it accounts for approximately 60 percent of the total variance.
- **Parallel analysis:** In an attempt to provide a less arbitrary stopping rule than the latent root criterion, parallel analysis compares the eigenvalues of the sample data with those of a large simulated set of random data (Fabrigar & Wegener, 2012). Retained are those factors for which the eigenvalues of the real data exceeds those of the extracted random data (Watkins, 2018). Since SPSS does not offer parallel analysis options, parallel analysis was conducted using the macro written by O'Connor (2000) for use with SPSS.

In a final process based on the rotated factor matrices, factor structure adequacy was tested using criteria established a priori. Factor loadings ≥ .40 were considered salient (i.e. practically and statistically significant as per Maskey, Fei and Nguyen (2018)). Based on this cut-off value, small factor loadings were suppressed (represented by a blanc space in the factor matrices) so that the rotated factor matrices only display items with values above .40. Significant cross-loadings (items loading on more than one factor > .40) were not shunned by deleting double-loading items as the study is concerned with theory building rather than the development of a pure measurement

scale (Fabrigar & Wegener, 2012). Instead, the item is generally viewed as an indicator of the factor on which it loads with higher loading (Maskey et al., 2018). In addition, factors with a minimum of two salient factor loadings, with internal consistency reliability of ≥ .60 measured by Cronbach's alpha (≥ .70 desirable, but ≥ .60 acceptable in exploratory research as per Hair et al. (2019)), and that were theoretically meaningful (Watkins, 2018) were considered adequate.

5.2.6 Critical reflection on the research design

There are several limitations to the research design of the quantitative exploratory study that warrant consideration. First, the limitations related to the use of structured self-completion online questionnaires, as discussed in section 5.1.2, have to be considered. Second, the non-probability convenience sampling method employed is a source of bias. Since not every ESSE in the EU had the same probability of inclusion in the sample (for several reasons such as language issues when researching potential enterprises), the sample may not reflect the entire population. Although very common in business research, convenience sampling will not allow generalisations from the sample to the population. (Bryman & Bell, 2014)

The third caveat is related to the rather low sample size of 52. The sample size needed to perform EFA adequately remains subject to intensive debate. Nevertheless, factor analysis is generally regarded as "a large-sample procedure" (Norman & Streiner, 2014, p. 223). Recommendations are typically based on an arbitrary absolute number of participants and a variable-to-observations ratio. Whereas a sample of 100 or larger is often cited as adequate with larger numbers of participants cited as more desirable (Fabrigar & Wegener, 2012; Hair et al., 2019; Norman & Streiner, 2014), Hair et al. (2014) quote 50 observations as the minimum absolute sample size for factor analysis. A general rule-of-thumb is further a 3:1 or 5:1 subjects-to-variable ratio (Fabrigar & Wegener, 2012; Hair et al., 2019; Norman & Streiner, 2014).

With five to eight items measured per dimension of the proposed conceptual model, the ratio ranges from approximately 6:1 to 10:1, which even exceeds the recommended acceptable limit. However, regarding the absolute number of participants, the sample size of 52 is close to the lower limit. In order to increase the sample size, the EFAs were performed on the basis of the absolute number of participants that have completed each respective question on a dimension, as shown in table 14, resulting

in n=63 for "entrepreneur/manager", n=63 for "organisational structure", n=58 for "organisational culture & climate", n=58 for "vision & strategy", n=55 for "resource management", n=55 for "creativity & idea management", n=52 "knowledge management", and n=52 for "open innovation & collaboration" dimension.

5.3 Empirical results

The empirical results of the quantitative exploratory study are presented next. First, the company demographics of the sample are described that are obtained from the univariate analysis, followed by the results of the EFA.

5.3.1 Description of the sample

In order to test whether the characteristics of ESSEs discussed in section 2.3 apply to the sampled enterprises, the company demographics for the respondents are described next. The analysis for the business demographics was performed on the basis of the 63 respondents (n=63) who have completed the questionnaire up to, and including, the questions relating to the first two dimensions.

Figure 4 displays the industry sectors represented by the sample. It should be noted that multiple responses were allowed for this question, resulting in 99 responses among 63 respondents. As can be seen in the bar chart, the surveyed enterprises operate in twenty different industries of the economy. Yet, what is striking is the immense representation of the "food, beverages, and healthy eating" and "sustainable, fair fashion" sectors. Accounting for 14% and 13% respectively of the 99 answers given, almost every third respondent operates in one of these two industries. The third-largest group (10%) assigns themselves to the retail and e-commerce sector. Seven companies each report to be active in "natural cosmetics and personal hygiene" (7%), "recycling and circular economy" (7%), and the "renewable energy" (7%) sector. "Sustainable agriculture", "sustainable packaging solutions", "cleantech", "media and journalism", and "consulting" together account for another 25% of industries mentioned.

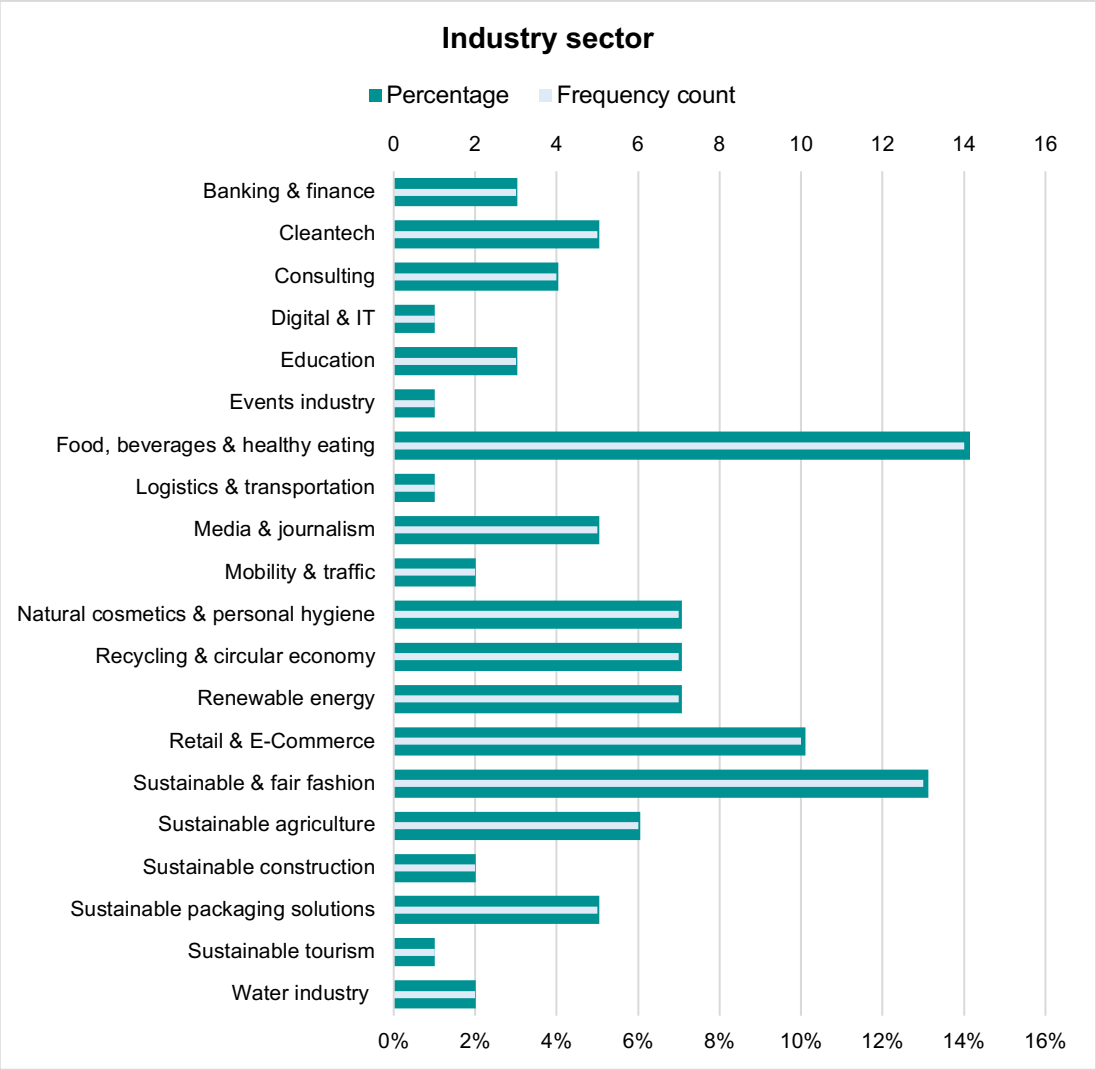

Figure 4. Industry sector

From the twenty-eight member states of the European Union (as for July 2019), ten are represented in the sample. However, as can be seen in figure 5, more than three-quarters of respondents (76%) are German enterprises. With another three and five companies registered in Switzerland and Austria respectively, the so-called DACH region of Europe is overly represented in the sample (89% in total). The remaining seven enterprises are based in Belgium, Bulgaria, the Netherlands, Portugal, Spain, Sweden, and the UK.

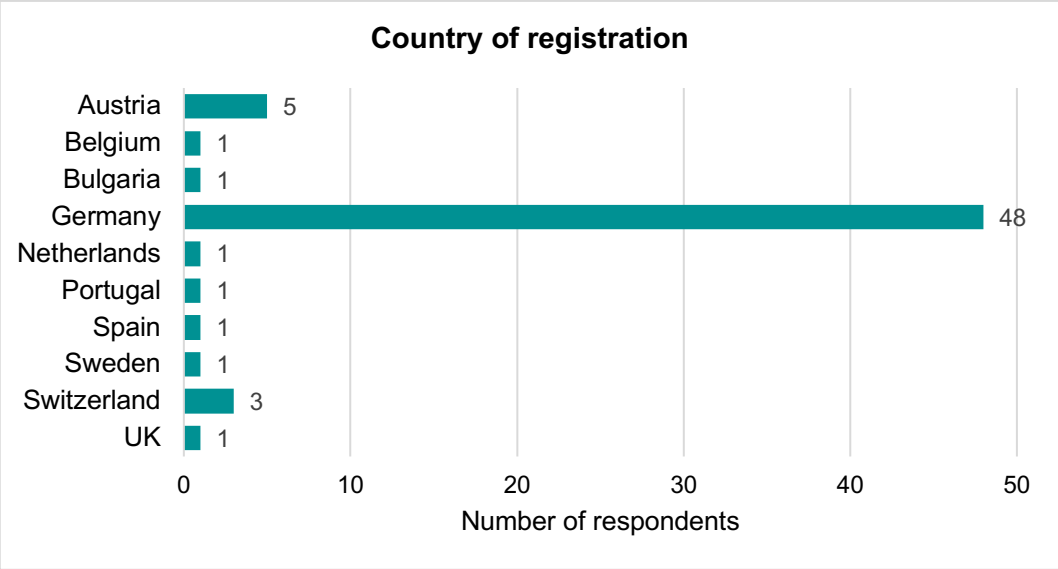

Figure 5. Country of registration, n=63

The company size by number of employees is of particular interest for this study as theory suggests that the majority of SEs are small-sized enterprises. As seen in figure 6, most of the respondents (67%) are micro-enterprises, that is they employ one to nine employees. With a workforce comprising 10 to 49 employees, about one-fifth of the sample (22%) can be classified as small enterprises. Four of the companies surveyed (6%) are medium-sized, employing 50 to 250 people. Only a small percentage of respondents exceed the SME threshold of 250 employees and thus represent large enterprises. Hence, the assumption that ESSEs are SMEs holds for the sample under study.

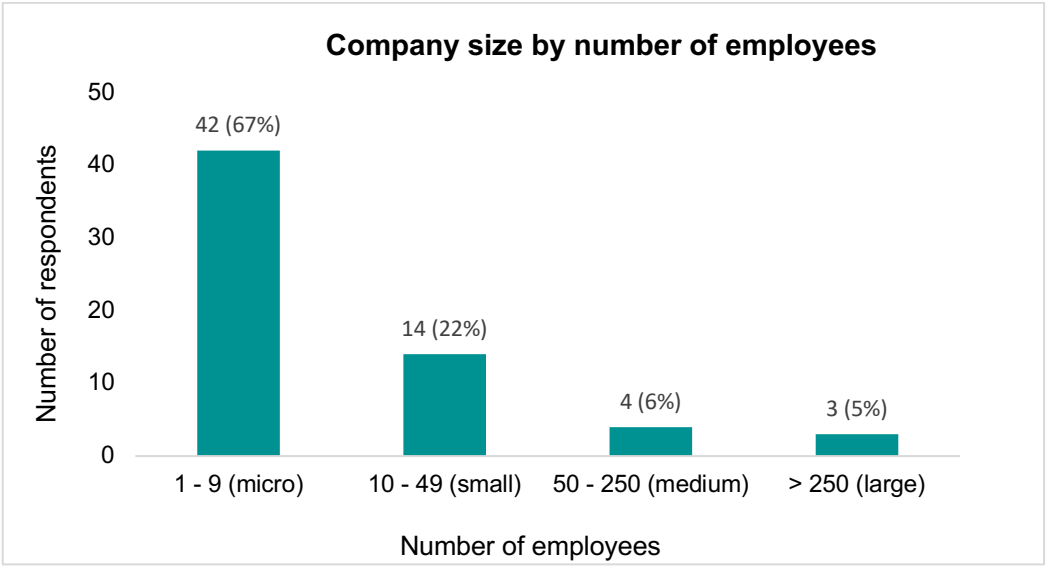

Figure 6. Company size by number of employees, n=63

The age distribution by the number of years of economic activity displayed in figure 7, shows that the sample mostly consists of young enterprises. Almost half (46%) of the companies have been established for only one to four years. The second-largest cluster (19%) is formed by enterprises that have just recently, less than one year ago, started operations. With a frequency count of ten, a similar amount of respondents (16%) report having been economically active for five to ten years. Of the more experienced companies, seven (11%) have been established 11 to 20 years ago, and five (8%) more than 20 years ago.

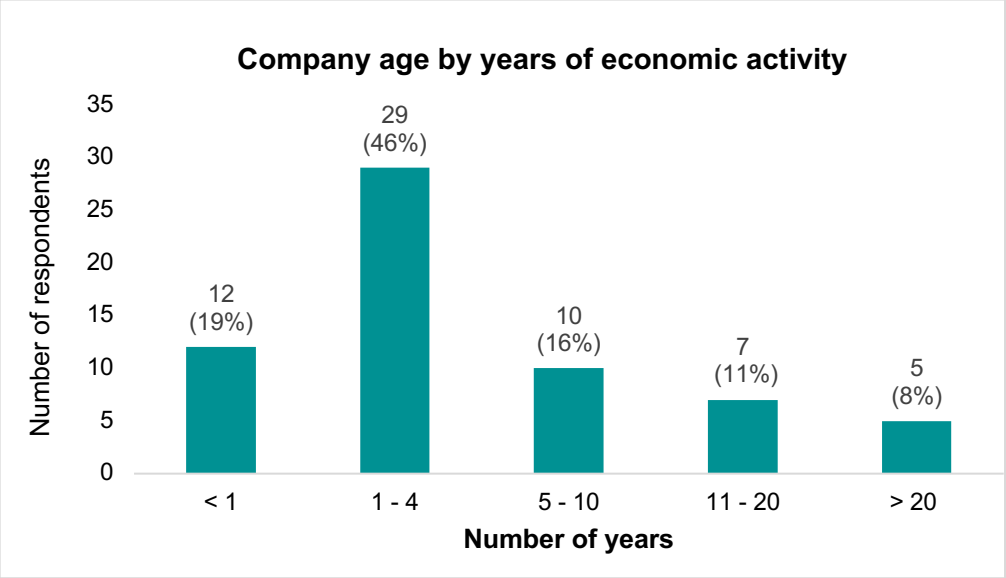

Figure 7. Company age by years of economic activity, n=63

Particularly critical for this study is the scrutiny of the social entrepreneurship fit (SEF). The object of the study are ESSEs, i.e. mission-driven SEs that put environmental and social impact on par with economic success; their efforts are directed to tackle environmental problems. To test whether the respondents are genuinely ESSEs, it was asked how much consideration they give to social, environmental, and economic objectives in their overall purpose and mission, and when making business decisions. As displayed by the boxplot in figure 8, the sample as a whole slightly prioritises environmental over social and economic value creation. The boxplots results provide an indication of the central tendency as well as the rather large dispersion of the three value priorities among the respondents. Across the sample, the most consideration is given to environmental objectives. This can be seen in the median of 40%, represented by the line going across the boxplot, and the lower and upper lines of the

boxplot indicating that half of the respondents attribute at least 33% (first quartile) and at most 45% (third quartile) of consideration to the environmental value creation (standard deviation = 12.4). Social objectives have a median of 30%, and half of the surveyed enterprises attribute 23% to 40% of consideration to social objectives (standard deviation = 11.0). Economic value creation is slightly subordinated to environmental and social value creation. Despite having the same median of 30% as for social objectives, the box representing half of the respondents ranges from 20% to 35% of consideration attributed to financial sustainability (standard deviation = 12.6). Overall, the boxplots indicate that the surveyed companies place similar weight on social, environmental, and economic value creation in the overall purpose, as well as when making general business decisions, but that environmental objectives are prioritised. Hence, the sample can be said to represent true ESSEs, that is they meet the definition for ESSEs utilised in this study.

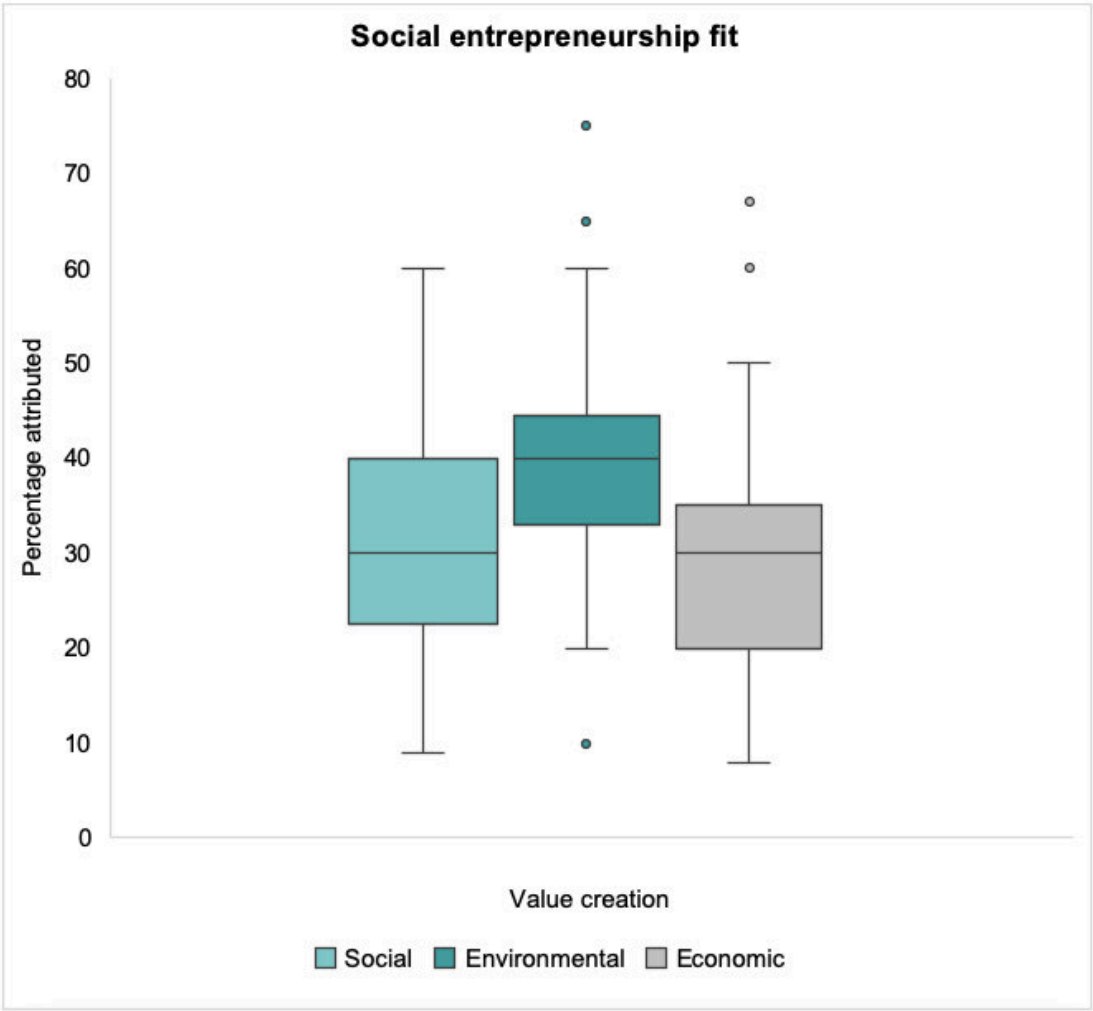

Figure 8. Social entrepreneurship fit, n=63

5.3.2 Results of the exploratory factor analysis

The results of the EFAs performed on each of the eight dimensions of the proposed conceptual model are presented next. Reference is made to the respective final rotated factor matrices. The extensive results of the analyses run as part of the EFA, including the correlations matrices, can be viewed in Appendix 3 (A-27).

Preliminary analysis of the statistical assumptions of EFA determined that the correlation among the variables was appropriate for factor analysis. Table 15 shows the results of Bartlett's test of sphericity and the KMO measure of sample adequacy for each of the latent dimensions. The Bartlett tests were all significant (p=.000), and apart from two, the KMO statistics were all above the desired value of .70 for conducting a factor analysis. Being close to .70, the KMO values of .645 and .672 still fall within the acceptable level (> .50).

Dimension	KMO	Bartlett
Entrepreneur / manager	.732	.000
Organisational structure	.776	.000
Organisational culture & climate	.733	.000
Vision & strategy	.740	.000
Resource management	.701	.000
Creativity & idea management	.645	.000
Knowledge management	.768	.000
Open innovation & collaboration	.672	.000

Table 15. KMO and Bartlett test

5.3.2.1 Entrepreneur / manager

Rotated Component Matrix

	Component	
	1	2
Founder's personality	.845	
Entrepreneurial orientation of the founder / manager	.812	
Sustainability orientation of the founder / manager	.694	
Managerial experience of the founder / manager		.905
Green transformational leadership style of the founder / manager	.425	.716
Cronbach's alpha	.744	.627

Table 16. Rotated component matrix "entrepreneur / manager"

Although the latent root criterion, as well as parallel analysis, suggested a one-factor solution, two factors were retained for the latent dimension "entrepreneur / manager." The practical and theoretical merit of a one-factor solution is questionable and carries the risk of underfactoring. Underfactoring should be avoided as it is likely to result in a distortion of the factor solution (Schönrock-Adema et al., 2009; Wood, Tataryn, & Gorsuch, 1996). In addition to reasons of interpretability and meaningfulness, the percentage of variance criterion also suggests a two-factor solution which accounts for 70% of the total variance, compared to just 52% as for the one-factor solution. An examination of the factor loadings of the rotated factor matrix presented in table 16 suggests that the first factor reflects the *characteristics of the entrepreneur*. Saliently loaded by three items, the factor includes the personality of the founder as well as the degree of his / her sustainability and entrepreneurial orientation. The second factor *experience & leadership style* describes the managerial experience and green transformational leadership style of the entrepreneur. Cronbach's alphas for the two factors are .744 and .627, respectively, which is above the recommended lower limit of .60 for exploratory studies (Hair et al., 2019) suggesting good internal consistency reliability.

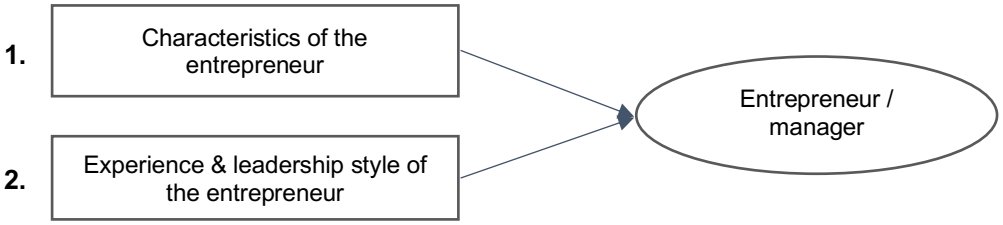

Figure 9. Extracted factors "entrepreneur / manager"

5.3.2.2 Organisational structure

Rotated Component Matrix

	Component	
	1	2
Lack of hierarchy	.837	
Little bureaucracy & administrative processes	.720	
Permeable business boundaries	.669	
Responsiveness to changes & opportunities		.865
Informal & fast communication channels		.694
Flexible organisational structure		.653
Cronbach's alpha	.688	.683

Table 17. Rotated component matrix "organisational structure"

Among the studied factor solutions for the dimension "organisational structure", a two-factor solution yielded the most theoretically sensible and interpretable solution, although the latent root criterion and parallel analysis again suggest a one-factor solution. Explaining 63% of the total variance, the individual items of the two-factor solution load highly on the factor they indicate. Hence, a "simple structure" of the factor solution is achieved (Hair et al., 2019). The first factor is labelled *organic and flat structure*, i.e. lack of hierarchy and bureaucracy, whereas the second reflects *flexibility and responsiveness* of the organisational structure. Both factors have good internal consistency reliability, as shown in the Cronbach alphas of .688 and .683, respectively.

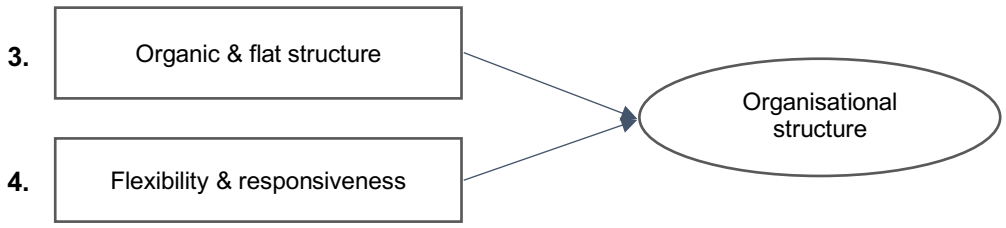

Figure 10. Extracted factors "organisational structure"

5.3.2.3 Organisational culture & climate

Rotated Component Matrix

	Component		
	1	2	3
Freedom for risk taking & experimentation	.842		
Tolerance for mistakes & learning-by-failing	.733		
Employee empowerment & autonomy	.497		
Variety of job tasks		.803	
Participative decision making	.422	.631	
Environmental culture		.588	.495
Culture of innovation			.853
Availability of creative time for employees			.640
Cronbach's alpha	.683	.605	.509

Table 18. Rotated component matrix "organisational culture & climate"

For "organisational culture & climate" parallel analysis as well as the latent root criterion yielded empirical justification for retaining two factors which would have explained only 53% of the total variance. Explaining 65% of the variance, a three-factor solution instead finds the percentage variance criterion met. Despite the not entirely clean set of factor loadings of the rotated factor matrix (i.e. two items have cross-loadings) as well as the Cronbach's alpha of the third component being below the acceptable limit of .60, the extraction of three factors was accepted as the practically most adequate, and conceptually sensible solution. The first factor is labelled *culture of experimentation & learning-by-failing* and reflects employee empowerment and a tolerance for making mistakes. The second component is straightforwardly termed *employee participation & job variety* and refers to precisely that. The third factor reflects the *eco-*

innovation orientation of the organisation that is characterised by an innovative culture of environmental sustainability.

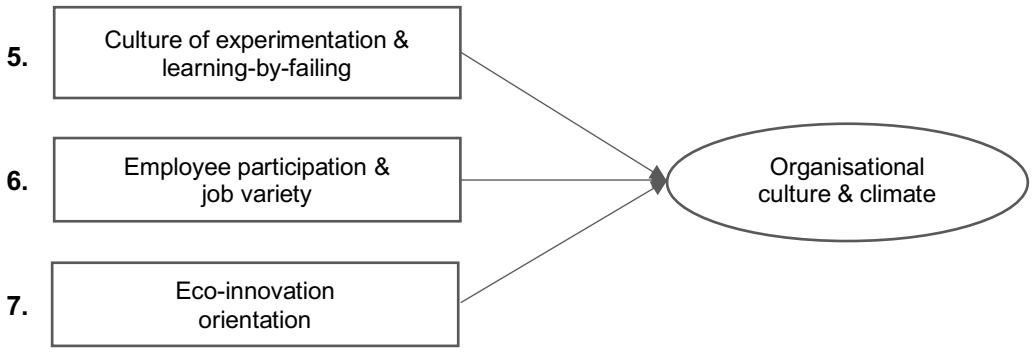

Figure 11. Extracted factors "organisational culture & climate"

5.3.2.4 Vision & strategy

Rotated Component Matrix

	Component	
	1	2
Environmental company policies & strategies	.822	
Sustainability vision & strategy	.811	
Long-term strategic focus	.647	
Clear communication of vision	.545	.442
Innovation strategy		.936
Cronbach's alpha	.674	.427

Table 19. Rotated component matrix "vision & strategy"

As per the percentage variance criterion, two factors were extracted for the dimension "vision & strategy", together accounting for 65% of the total variance. With an unacceptable 46% of variance explained, the one-factor solution suggested by the latent root criterion and parallel analysis was dismissed for reasons of interpretability and lack of meaningfulness. The first component is summarised under the label *long-term sustainability vision & strategy.* Emphasising transparency, the second factor highlights a *clear communication of innovation and sustainability vision & strategy*. It has to be noted that Cronbach's alpha for the second component is below the recommended acceptable lower limit of .60, indicating low internal consistency reliability.

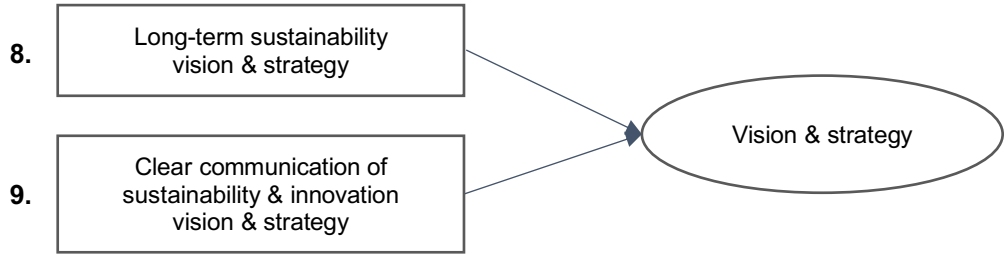

Figure 12. Extracted factors "vision & strategy"

5.3.2.5 Resource management

Rotated Component Matrix

	Component		
	1	2	3
Qualified & skilled employees	.829		
Technological expertise	.706		
Diverse & interdisciplinary workforce	.688		
Sustainability training & development		.858	
Access to financial resources		.738	
Intrinsically motivated employees			.833
Green shared values of employees		.525	.619
Cronbach's alpha	.655	.648	.329

Table 20. Rotated component matrix "resource management"

A two- and three-factor solution was examined for the dimension "resource management", with the latter yielding the most interpretable solution from a theoretical point of view. Retaining three factors finds the percentage variance criterion met with a value of 66%. Each factor is saliently loaded by its indicator items as can be seen in the rotated factor matrix in table 20. The first component captures the qualification, skill, and interdisciplinarity of the employees and is named *qualification & diversity of workforce*. The second factor *availability of resources & green training* relates to the availability of financial and human resources as well as the green training and development of the latter. The third extracted component labelled *green motivation of em-*

ployees reflects the motivation of the employees spurred by their green shared values. Despite being theoretically and conceptually sensible and in contrast to the first two components, the third factor has a very low Cronbach's alpha of .32, indicating low internal consistency reliability.

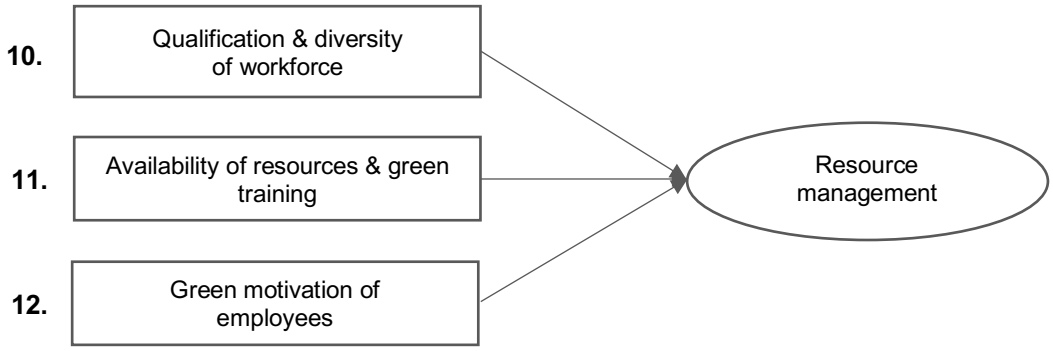

Figure 13. Extracted factors "resource management"

5.3.2.6 Creativity & idea management

Rotated Component Matrix

	Component	
	1	2
Employee idea contribution	.892	
Employee creativity	.844	
Team creativity	.761	
Green creativity through biomimicry		.882
Green creativity through eco-design		.819
Rewarding innovative ideas (removed)		.482
Cronbach's alpha	.807	.730

Table 21. Rotated component matrix "creativity & idea management"

For the latent dimension "creativity & idea management" parallel analysis, as well as the latent root and the percentage variance criterion, yielded empirical justification for retaining two factors which account for 67% of the total variance. The clean factor matrix in table 21 shows that three and two items, respectively saliently load on the two factors. Based on the characteristics of the items underlying the first factor, it was labelled *employee & team creativity* and emphasises the idea contribution by individual employees and teams. The second factor *green creativity approaches* relates to the strategies used for green product and service development, eco-design

and biomimicry. Despite its moderate loading on the second factor, the item "rewarding innovative ideas" was eliminated for reasons of conceptual interpretability and statistical reliability. After the removal, Cronbach's alphas of .807 for the first factor and .730 for the second could be obtained, and thus, excellent internal consistency reliability is secured.

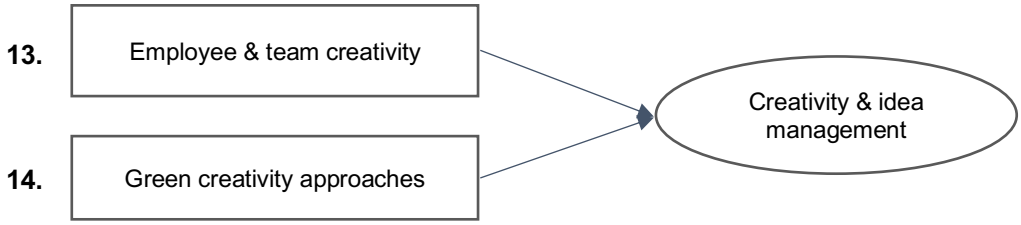

Figure 14. Extracted factors "creativity & idea management"

5.3.2.7 Knowledge management

Rotated Component Matrix

	Component	
	1	2
Environmental Research & Development	.828	
Industry knowledge	.791	
Internal knowledge sources	.592	.519
Utilisation of new knowledge	.557	.487
Organisational learning		.767
Knowledge creation & sharing		.694
External knowledge sources	.465	.530
Cronbach's alpha	.747	.526

Table 22. Rotated component matrix "knowledge management"

Regarding "knowledge management" a two- and a three-factor solution was sequentially examined. Retaining two factors yielded the most interpretable solution from a theoretical and conceptual stance, although it slightly violates the percentage variance criterion by one percentage point with 59% of total variance explained. The first component is summarised as *internal knowledge development & utilisation*, which describes how the organisation uses the knowledge held by its employees, and generates new knowledge through environmental R&D. Focusing on external knowledge sources, but also stressing the importance of an organisational learning orientation,

the second factor is labelled *external knowledge acquisition & organisational learning*. The Cronbach's alpha for the first factor is .747, suggesting excellent internal reliability, whereas the value for the second factor is rather low at .526. One explanation of this can be found in the rotated factor matrix (table 22). The rotated factor loadings do not show a clean pattern with three items loading similarly moderate on both factors. This makes sense since these items conceptually relate to both factors. According to knowledge management theory, a knowledge cycle exists within an organisation that is directional of the following knowledge processes (depending on the study more or less increments of those processes can be found): creation and acquisition, storing, sharing, utilisation and application, and evaluation of knowledge (uit Beijerse, 2000; Wong & Aspinwall, 2004). The items internal and external knowledge sources are both forms of knowledge creation (internal) and acquisition (external). Thus, the double-loading items are not problematic for conceptualising the factor; instead they can be viewed as helpful in clarifying their nature.

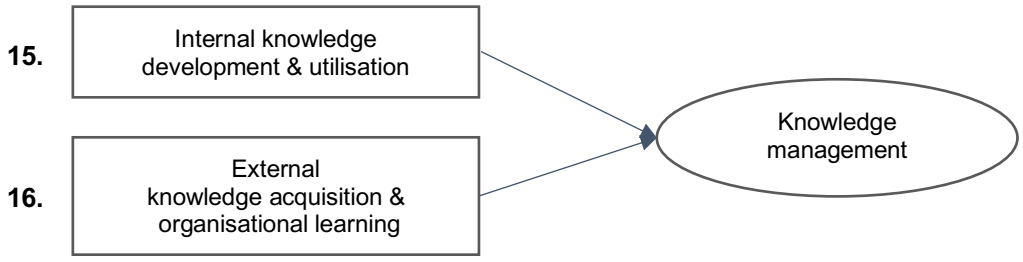

Figure 15. Extracted factors "knowledge management"

5.3.2.8 Open innovation & collaboration

Rotated Component Matrix

	Component	
	1	2
Collaboration with local government	.909	
Collaboration with universities and/or research centres	.858	
Collaboration with environmental groups	.803	
Collaboration with suppliers		.857
Collaboration with customers through user experience		.797

Collaboration with business partners		.635
Cronbach's alpha	.838	.680

Table 23. Rotated component matrix "open innovation & collaboration"

Regarding "open innovation & collaboration", a two-factor solution, accounting for 70% of the total variance, was obtained as suggested by all three criteria for factor extraction. As can be seen in table 23, the rotated factor matrix shows a clean pattern with high factor loadings and no cross-loadings. The first factor captures collaborative networks with local governments, universities, and environmental groups, and is labelled *collaboration with external actors*. The second component reflects *collaboration with partners from the value chain,* including business partners, suppliers, and customers. Both extracted factors have high internal consistency reliability indicated by Cronbach's alphas of .838 and .680.

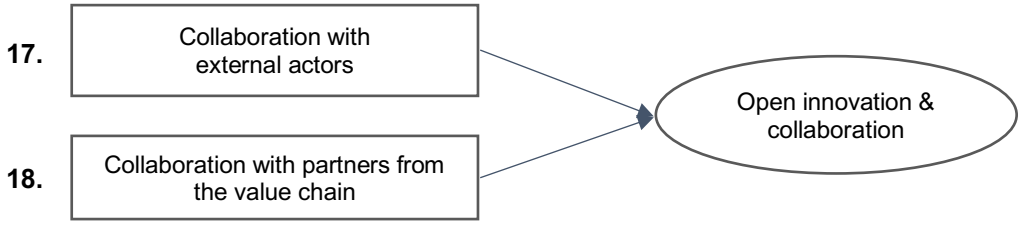

Figure 16. Extracted factors "open innovation & collaboration"

5.4 Adapted conceptual model

This study aims to identify the internal factors at firm-level that determine the innovativeness of ESSEs. A two-stage design is employed. In the first stage, a systematic literature review of social entrepreneurship, sustainability, and innovation literature is conducted. The insights are summarised into a fifty-item conceptual model from a RBV. In the second stage, the proposed model is refined based on the empirical results of a quantitative exploratory study using EFA. The process leads to the development of a more parsimonious eight-dimensional, eighteen-item innovativeness model that reflects the unique characteristics of environmentally focused SEs. The proposed adapted conceptual model is displayed in figure 17.

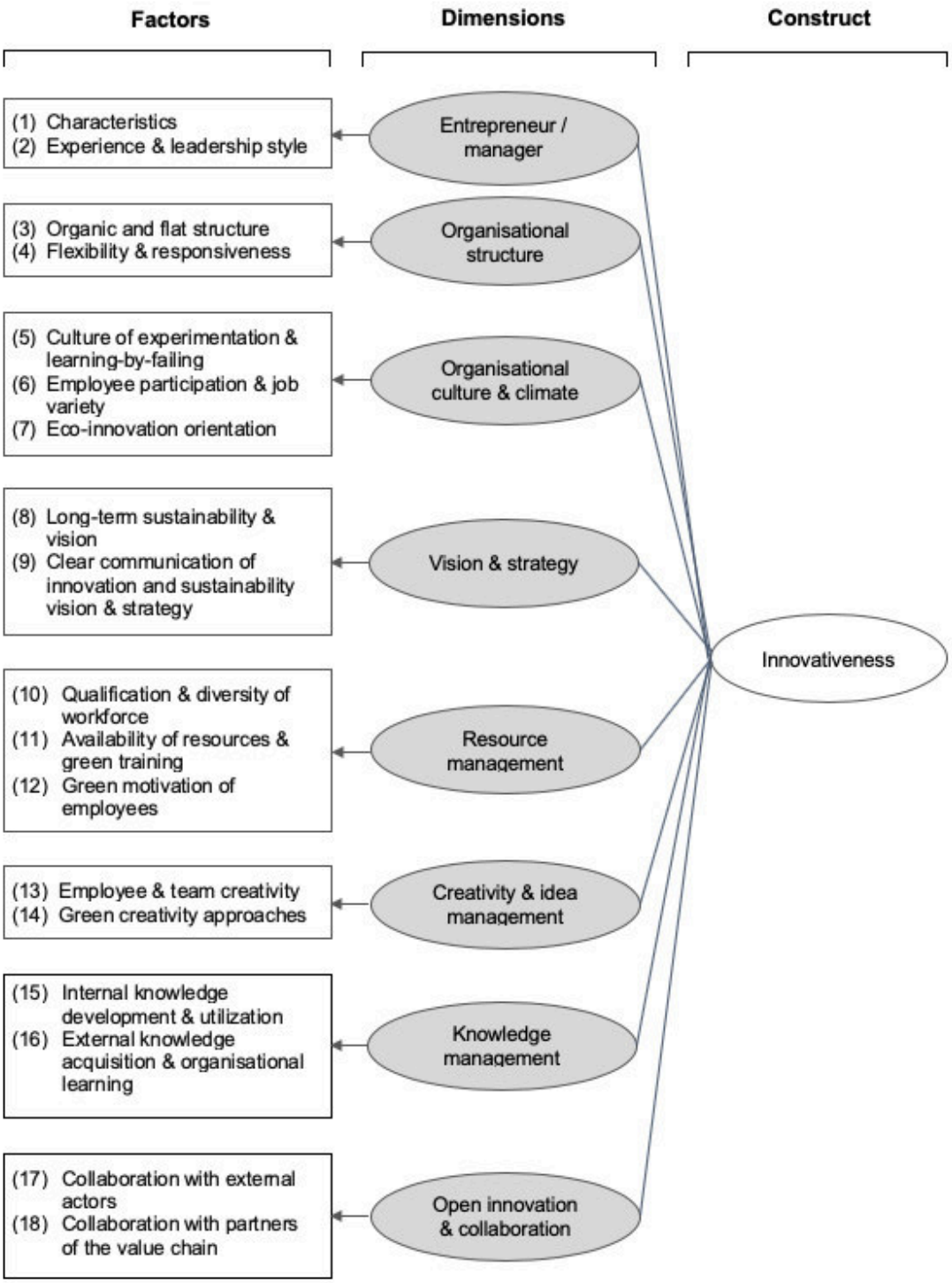

Figure 17. Adapted conceptual model of the innovativeness of ESSEs (own illustration)

5.5 Hypotheses discussion

In section 4.2, two hypotheses are derived from the literature-based conceptual model. Based on the adapted model presented in section 5.4, those propositions are discussed next.

H1: The innovativeness of ESSEs is multidimensional.

As can be seen in the adapted model in figure 18, all eight identified latent dimensions are retained, resulting in an eight-dimensional model of the innovativeness of ESSEs. Therefore the empirical results of the quantitative exploratory study confirm the multi-dimensional nature of the innovativeness of ESSEs that is primarily inferred from the studies by Lawson and Samson (2001), Hogan et al. (2011), and Iddris (2016). Focusing on innovation in traditional large organisations, the authors argue that innovation capability is composed of reinforcing practices and mechanisms within a firm that are multidimensional. The findings of the authors are incorporated in the development of the initial conceptual model proposed in section 4.1 leading to the identification of eight dimensions that are not identical, yet similar those presented by the scholars. Form the empirical results of this study it can be inferred that the multidimensional nature of innovativeness found in general innovation management literature applies to ESSEs; thus, it holds true in the social entrepreneurship context. Hence, H1 is supported in this study.

H2: All literature-based factors at firm-level determine the innovativeness of ESSEs.

Synthesising relevant literature results in the identification of fifty determinants of the innovativeness of ESSEs at firm-level. The EFAs performed in the empirical study lead to the extraction of eighteen determinants (section 5.3), and thus a more parsimonious representation of the innovativeness. Although the 49 factors (one item is removed in the process of EFA) are indicators of the eighteen determinants, and thus technically included, the eighteen determinants can be seen as new constructs. Therefore, the assumption that all of the fifty internal factors explain the innovativeness of ESSEs needs to be rejected. H2 is thus rejected in this study.

5.6 Interpretation

This research set out to explore the internal factors at firm-level that determine the innovativeness of ESSEs, and to then summarise those into a conceptual model. As a result of the first stage of the two-stage research design, this study hypothesises that the innovativeness is driven by eight latent dimensions, explained by fifty specific factors that shape the enterprises' approach to environmental innovation. The EFA carried out in the subsequent quantitative empirical study enables the development of a more parsimonious eight-dimensional, eighteen-item innovativeness model that reflects the unique characteristics of environmentally focused SEs. The model conceptualises the following eight dimensions as antecedents of innovativeness: entrepreneur / manager, organisational structure, organisational culture and climate, vision and strategy, resource management, creativity and idea management, knowledge management, and open innovation and collaboration.

The results of the empirical study can be discussed in light of previous literature. The identified and refined dimensions represent organisational resources and capabilities that are critical for the development of ESI. This confirms the positive effect of resources and dynamic capabilities on the adoption of innovation proposed by Hogan et al. (2011). The RBV and the theory of dynamic capabilities argue that innovation activities of an organisation depend on resources and capabilities that are valuable, rare, inimitable and non-substitutable (Barney, 1991; del Río et al., 2016a). Accordingly, the results of this study suggest that ESSEs' innovativeness is of internal origin.

Firstly, the **entrepreneurs / managers** of ESSEs are found to have specific *characteristics* that stimulate ESI. Driven by strong personal values and passion for sustainability, those social entrepreneurs have dual entrepreneurial and sustainability orientations. Innovative and creative solutions to the complex current environmental problems require greater levels of environmental opportunity recognition, proactiveness, and risk tolerance. These findings are in line with studies of social entrepreneurship by Lumpkin et al. (2013), Madill et al. (2010), and DiVito and Bohnsack (2017). Besides, this study shows that the *experience and leadership style* of the entrepreneur favour the innovative action of an ESSE. The positive influence of leadership in driving innovation has been established in the literature (Lawson & Samson, 2001; Saunila & Ukko, 2014). Specifically, the empirical results of this study confirm the stimulating effect of a green transformational leadership style on ESI, as found by Chen and Chang (2013). Accordingly, entrepreneurs of ESSEs can be regarded as the spark

that ignites the employees' innovative behaviour by passing on their passion for sustainability, and by motivating and inspiring them to find creative solutions to environmental problems.

Secondly, the results indicate that ESSEs build **organisational structures** that foster employee innovativeness. As such, they employ *organic and flat structures* with low levels of hierarchy, and little bureaucracy that stimulate intercommunication within the diverse workforce, and allow individual expression. This finding is in line with general innovation research on innovation capability, such as the study by Lawson and Samson (2001). Consistent with the results of Bos-Brouwers (2010), who addresses sustainable innovation in SMEs, *flexibility and responsiveness* to opportunities and changes are suggested as important regarding the organisational structure of ESSEs. They operate in uncharted territory that is associated with significant uncertainty when trying to find innovative sustainable products and services.

As pointed out in previous research by Parzefall et al. (2008), this study further underscores the importance of an **organisational culture and climate** that provides the stimulus for employee innovativeness. Taking account of the trial-and-error character of the innovation process, ESSEs are found to promote employee empowerment and autonomy and to encourage *experimentation,* and with it *learning-by-failure*. ESSEs show appreciation for their employees by emphasising *employee participation and job variety,* as in non-routine tasks. This is instrumental in motivating employees as it offers an opportunity for learning and personal growth by challenging them to think outside-the-box. With its roots lying in the founder's values and passion for (environmental) sustainability, the *eco-innovation orientation* of ESSEs is characterised by allowing employees sufficient time to elaborate on ideas, explore different perspectives, and to think creatively.

Regarding the fourth dimension, **vision and strategy**, the results suggest that eco-innovative behaviour of ESSEs is strongly intertwined with their *long-term sustainability vision and strategy*. Through the *clear communication* of those in the companies' vision and mission statement, a shared green vision among employees is established that everyone is working towards. As such, a shared green vision can serve as an anchor point, giving orientation in the daily operations of the business. ESSEs measure any ideas and projects against this vision, whereas the innovation and sustainability strategy determines the mobilisation and allocation of resources towards feasible

projects. These results confirm the findings of Pham et al. (2019) who study determinants of EI and stress the importance of a shared green vision.

Resource management represents the fifth dimension that emerged from this study as being of particular importance to the innovativeness of ESSEs. In particular, ESSEs are found to adopt a human resource management that provides a stimulus for innovation activities. Acknowledging that people are the most crucial resource for innovation, ESSEs place high value on assembling a *qualified and diverse workforce*. Besides looking for a high level of education and self-esteem in candidates, the recruitment of ESSEs often aims for adding to the diversity of the workforce concerning professional backgrounds and expertise. The benefit of a multi-disciplinary team for the development of innovations is twofold. First, a team with broad expertise is well equipped to fulfil the diverse tasks emerging in the design phase of innovation, so that those tasks do not need to be outsourced. Second, diversity can prompt interaction and knowledge exchange among employees. These findings confirm those of Keskin et al. (2013) and prove the applicability to the social entrepreneurship context of the results obtained by Pereira and Vence (2012), and Pham et al. (2019) who studied EI in traditional organisations. The dimension of resource management is further conditioned by the *availability of resources and green training*. The results of this study confirm prior research by Jenner (2016) with the participants stressing the importance of access to financial resources to drive innovation, and ultimately, to operate and compete in the marketplace. Furthermore, ESSEs provide sustainability training and development for their employees, which increases the companies' eco-mindedness. Lastly, *the green motivation of employees* is found to be one of the main advantages of ESSEs in developing innovation. In line with Doherty et al. (2014), and Gast et al. (2017), the environmental and social mission is found to provide intrinsic motivation, and thus to be instrumental in attracting skilled personnel. It can be argued that for ESSEs shared personal values of potential candidates are even more important than their professional competencies.

Closely linked to resource management, **creativity and idea management** emerges as the sixth dimension explaining the innovativeness of ESSEs from this study. Regarded as the driving force for innovation by Chen and Chang (2013), *employee and team creativity* is fostered by the sampled ESSEs by creating a favourable environment and culture, that encourages individual idea contribution which converts into new products and services. Furthermore, the results suggest that ESSEs adopt eco-

design and biomimicry in their innovation process, as proposed by Klewitz and Hansen (2014) and Adams et al. (2012). Termed *green creativity approaches* in this study, they enable ESSEs to develop more environmental benign product (or service) designs by assessing the environmental effects and risks of a product from a life-cycle perspective (eco-design), and by learning from materials, behaviour, and processes observed in nature (biomimicry) (Adams et al., 2012; Klewitz & Hansen, 2014).

With organisational knowledge embodied in individual employees, the dimension **knowledge management** (i.e. leveraging existing, and compensating lacking knowledge) is closely linked to resource management, especially the composition and diversity of the workforce. The results of this study indicate that ESSEs build innovation capability in this dimension through *internal knowledge development and utilisation*, and *external knowledge acquisition and organisational learning*. This is in line with Cai and Li (2018, p. 111), who state that "the process of eco-innovation is actually environmental knowledge accumulation, integration, and utilization". To induce environmental innovation within their organisation, as described above, ESSEs design their structure and culture in a way that prompts interaction and knowledge sharing among employees and accumulate specialised knowledge necessary for innovation through internal environmental R&D. Consistent with the positive influence of learning on innovation capability established in innovation management literature (Hult et al., 2004; Lawson & Samson, 2001), the studied ESSEs are further found to leverage the advantages associated with an organisational learning orientation. This orientation is grounded in their learning-by-failure culture that emphasises experimentation and tolerates mistakes and risks. Confirming the findings of Martínez-Román and Romero (2017), and Dangelico (2016), another important outcome of this study is that ESSEs make full use of external knowledge sources. They apply their industry knowledge to identify access to external information and knowledge, learn from others, and thereby improve their ESI ability.

Taking up the external knowledge sharing capability of ESSEs, the eighth and last dimension of the innovativeness of ESSEs reflects **open innovation and collaboration**. Lumpkin et al. (2013) and Pittz et al. (2017) identify collaboration among social enterprises and other actors striving to solve common social or environmental problems as a distinct feature of social entrepreneurship. Consistently, this study reveals that the studied ESSEs actively seek collaborative networks. As ESSEs are often

faced with resource shortcomings, those networks can be the missing link in developing ESIs, which further adds to the understanding of the advantages of external knowledge. In this study, the ESSEs are found to attribute great importance to the open strategy-approach to innovation (open innovation). Through their engagement with external actors who have similar value commitments, they incorporate different perspectives during the opportunity recognition process (Pittz et al., 2017). Two aspects of collaboration are found for ESSEs. Firstly, they report to *collaborate with external actors*, such as universities, and research institutes, environmental groups as well as with the local governments. Secondly, through *collaborating with partners from the value chain*, i.e. business partners and suppliers, they aim to learn about environmental materials and processes. By collecting user experience, ESSEs are responsive to customers, which has a positive effect on customer loyalty (Albort-Morant et al., 2018).

The above discussion of the dimensions of the refined conceptual model on the innovativeness of ESSEs presented in section 5.4 allows the research question to be answered as follows: the internal factors at firm-level that determine the innovativeness of ESSEs are: entrepreneur / manager, organisational structure, organisational culture and climate, vision and strategy, resource management, creativity and idea management, knowledge management, and open innovation and collaboration. Their respective underlying indicators are summarised in table 24.

Internal determinants of the innovativeness of ESSEs

Latent dimension	Manifest factors
Entrepreneur / manager	1. Characteristics of the entrepreneur 2. Experience & leadership style of the founder
Organisational structure	3. Organic and flat structure 4. Flexibility & responsiveness
Organisational culture & climate	5. Culture of experimentation & learning-by-failure 6. Employee participation & job variety 7. Eco-innovation orientation
Vision & strategy	8. Long-term sustainability vision & strategy 9. Clear communication of sustainability and innovation vision & strategy
Resource management	10. Qualification & diversity of workforce 11. Availability of resources & green training 12. Green motivation of employees
Creativity & idea management	13. Employee & team creativity 14. Green creativity approaches

Knowledge management	15. Internal knowledge development & utilisation 16. External knowledge acquisition & organisational learning
Open innovation & collaboration	17. Collaboration with external actors 18. Collaboration with partners of the value chain

Table 24. **Internal determinants of the innovativeness of ESSEs**

6 Conclusion

This section summarises the findings of the study and presents the limitations in interpreting the results. Implications for practitioners, scholars, and policymakers are discussed next. This study terminates with a suggestion for potential avenues for future research.

6.1 Summary

The world and its citizens are at a critical crossroads. Scientific data, as well as first-hand observations, consistently provide evidence of the rampant environmental degradation that deteriorates the ecosystems that sustain all life on Earth (European Commission, 2016a). Simultaneously, the accelerating depletion of natural resources and the rapid world population growth has reinforced calls for sustainable development with new efficient ways to balance future consumption requirements. The required ecologically sustainable innovations (ESIs) are likely to come from environmentally sustainable social enterprises (ESSEs). This particular subclass of social enterprises develops innovative "green" products and services that encourage less resource-intensive and wasteful consumption and production patterns among both consumers and producers.

This study explores how the context of social entrepreneurship promotes environmental innovativeness, an area of enquiry that has, to date, received little scholarly attention. Specifically, this study aims at advancing the academic discussion on social entrepreneurship by (i) identifying the internal factors that determine the innovativeness of ESSEs at the micro-level, and by (ii) synthesising the identified factors in a conceptual model. Through the dual lenses of the resource-based view (RBV) and the theory of dynamic capabilities, a systematic literature review of social entrepreneurship, eco-innovation (EI), and innovation management literature is conducted in the first stage, yielding a set of factors that are said to determine eco-innovativeness. Based on the conceptual model developed from these factors, this study hypothesises that the innovativeness of ESSEs is driven by eight latent dimensions and fifty underlying factors that shape the enterprises' approach to environmental innovation. In the second stage, a quantitative exploratory study is conducted on European ESSEs using exploratory factor analysis (EFA). This process results in the development of a more parsimonious eight-dimensional, eighteen-item innovativeness model that reflects the unique characteristics of environmentally focused SEs. The refined model captures eight principal dimensions of ESSEs' capability to eco-innovate, and conceptualises

those as internal antecedents of eco-innovativeness: (1) entrepreneur / manager, (2) organisational structure, (3) organisational culture and climate, (4) vision and strategy, (5) resource management, (6) creativity and idea management, (7) knowledge management, and (8) open innovation and collaboration. Two or three specific factors represent each dimension.

6.2 Limitations

Due to the exploratory nature of this study, the results of this study should be considered in light of several limitations affecting the generalisability and validity. First, the proposed model does not claim to be comprehensive in explaining the overall eco-innovativeness of ESSEs. Instead, it focuses on the internal capability of ESSEs to develop ESIs and thus captures firm-specific internal factors only. Other external determinants, such as governmental regulations, demand for eco-products, past performance, so-called "regulatory push/pull" and "market pull factors", also influence the adoption of ESIs; yet those are outside the scope of this study.

The second limitation relates to the selection of the antecedent factors for eco-innovativeness that were analysed. Lying at the interface of the social entrepreneurship, innovation and sustainability nexus, an analysis of the eco-innovativeness of ESSEs requires a review and synthesis of the separate strands of literature on social and sustainable entrepreneurship, EI, as well as innovation in SMEs. The resulting large amount of eligible studies was sizeable but was cut down by focusing on journal articles and studies written in the English language and published between 2008 and 2019 only, with some exceptions made for older frequently cited papers. The remaining studies are screened and the most frequently cited factors retained for further analysis. Yet, despite this systematic approach, a more systematic literature review, employing for instance analysis techniques such as numerical taxonomy and multidimensional scaling, might yield different internal factors with their particular importance (Lumpkin et al., 2013, p. 779).

The third limitation reflects the non-probability convenience sampling method employed, which represents a source of bias. Although the quantitative exploratory study addresses European ESSEs, with just ten countries reflected in the final sample, it is not representative of the European social entrepreneurship landscape. As countries of registration of the surveyed ESSEs Germany, Austria, and Switzerland account for

75%, 8%, and 5% of the overall sample; the remaining seven countries are represented by only one enterprise each. Similarly, although the study aimed to be cross-sectoral, only three of the twenty industries represented in the sample account for 60% of respondents (food, beverage, and healthy eating; sustainable, fair fashion; retail & e-commerce). It can be inferred that the results are country-specific for Germany and subject to some industry bias. Hence, the results of the quantitative study do not allow generalisation and may not reflect the European context.

Fourth, the sample size of 52 completed questionnaires can be regarded as rather low for the "large-data-procedure" of EFA employed in this study. The sample size is too small to meet the minimum requirement of a 5:1 variable-to-observation ratio which prevented an EFA to be run on the initially identified set of fifty factors (Fabrigar & Wegener, 2012). In order to gain interpretable results nonetheless, instead, EFAs are performed on the eight dimensions of the conceptual model encompassing four to eight items each. This procedure results in a 6:1 to 10:1 variable-to-observation. However, applying EFA to the fifty initial factors might result in a different set of dimensions than the eight presented in the final model of this study.

Moreover, due to the subjective aspects of EFA, subjectivity can be alleged to the results obtained (Hair et al., 2019). Deciding how many factors to extract, which factor rotation method to use, on the significance cut-off for the factor loadings, as well as the names of the final factors requires the judgement of the author. Although the author was guided by the most widely used techniques for EFA as presented in detail in section 5.2.5, a different procedure may have produced different results of the analysis. Hence, the problem of reliability associated with EFA in general also applies to this study.

Fifth and finally, it is worth noting that the conceptual model presented in this study only *explains* the internal factors that determine the innovativeness of ESSEs. The model does not give statistical evidence of the *influence* the eight dimensions have on ESSEs' innovativeness. The examination of the strengths and direction of the relationship between the eight dimensions and the construct innovativeness exceeds the scope of this study. Hence, the results do not allow for the drawing of inferences about correlation and causality.

Although the above limitations are acknowledged, they do not lessen the significance of the study findings, but instead, provide opportunities for future research.

6.3 Implications

Despite the limitations that warrant consideration, this study provides results that are grounded in an in-depth analysis and synthesis of the knowledge gained so far in the fields of social entrepreneurship, EI, and innovation management. As such, it makes several contributions that have theoretical and practical implications for practitioners, scholars, and policymakers alike.

6.3.1 Implications for theory

Conceptualising eco-innovativeness of SEs with an environmental focus as a multidimensional construct has contributed to theory development in three ways. First, it answers calls in the social entrepreneurship literature by Doherty et al. (2014) for research into the determinants of SE innovation, as well as into the ecological domain of social entrepreneurship (Hillman et al., 2018; Picciotti, 2017). In EI literature that predominantly focuses on large, profit-maximising organisations, little work examines mission-driven SEs as objects of study. Hence, this study bridges the literature of social entrepreneurship, EI, and innovation management and this can be regarded as the second contribution. Addressing the interface of the social entrepreneurship, innovation, and sustainability literature, this study develops and presents a theoretical conceptual model of the eco-innovativeness of ESSEs, which is its third contribution. By developing the model through the dual lenses of the RBV and the theory of dynamic capabilities, it reflects ESSEs internal ability to eco-innovate and delineates eight firm-related antecedents of eco-innovativeness. The findings of the study provide a contextually insightful, and focused understanding of the eco-innovation capability, specific to ESSEs. As exploratory research, this study's proposed conceptual model has to be considered a first comprehensive step towards a model of overall eco-innovativeness of ESSEs accounting for external determinants. Thus, this study provides the theoretical basis for subsequent research in the field. A brief research agenda is presented in the concluding section 6.4.

6.3.2 Implications for management

For social entrepreneurs and managers of ESSEs, the proposed refined conceptual model serves as a self-assessment tool for their eco-innovativeness. They can pinpoint their firm's strengths and weaknesses in each of the eight dimensions: (1) the **entrepreneur / manager** with (a) specific *characteristics* and strong entrepreneurial and sustainability orientation, and (b) *experience* and a green transformational *lead-*

ership style; (2) an **organisational structure** that (a) is *organic and flat*, and (b) *flexible and responsive* to opportunities and challenges; (3) an **organisational culture and climate** that (a) encourages *experimentation and learning-by-failing*, and that has (b) a robust *eco-innovation orientation*; (4) a **vision and strategy** of (a) *sustainability with a long-term focus*, and (b) a *clear communication of the innovation and sustainability vision and strategy* both within and outside of the firm; (5) a **resource management** that stimulates innovation activities by (a) assembling a *qualified and diverse workforce*, and that is characterised by (b) *sufficient (financial) resources and green training schemes* for employees, and (c) the intrinsic *green motivation of employees*; (6) a **creativity and idea management** that (a) fosters *employee and team creativity* by valuing individual idea contribution, and that (b) adopts *green creativity approaches* for the development of ESIs, such as eco-design and biomimicry; (7) a **knowledge management** that (a) prompts *internal knowledge development and utilisation* and that (b) makes full use of external *knowledge acquisition and organisational learning*; and finally (8) **an open innovation strategy** that actively seeks **collaboratio**n with (a) *external actors*, e.g. universities, research institutes, environmental groups, and local governments, as well as with (b) *partners of the value chain*, e.g. business partners, suppliers, and customers.

If social entrepreneurs and managers of ESSEs find themselves deficient in any of these dimensions, they can take corrective action and invest in building and fostering the lacking resources and capabilities. Likewise, for social entrepreneurs aspirants, the proposed conceptual model serves as a guideline that will prove helpful in the forming of their ESSE, and beyond. As such, the model provides leaders of for-profit social enterprises a map for navigating the rough seas and uncharted territory of social entrepreneurship's effort to fight innovatively against the climate crisis.

Moreover, social impact investors, such as private and professional investors, but also foundations, can be guided by the proposed model of eco-innovativeness when making investment decisions. They seek to combine social and environmental benefits with a financial return on investment. In their search for potential ESSEs in which to invest, they place high value on ESI of the enterprises as a strategic tool to gain and maintain a competitive advantage and to generate environmental benefits. As such, the proposed model can be used by impact investors when assessing and comparing the eco-innovativeness of different ESSEs as potential target investments.

6.3.3 Implications for policy

The findings of this study underline the ability of ESSEs to address environmental challenges innovatively. As such, they have clear and significant implications for policy. Those implications are fourfold from a macro-perspective. Firstly, the European Commission and local European governments should acknowledge the critical efforts, role, and the potential of SEs in tackling environmental problems currently facing Europe and the rest of the world. With their innovative approaches, ESSEs have the potential to pave the way towards the much needed sustainable development of a society that prioritises people and planet instead of only profits. Moreover, for-profit self-sustaining SEs and ESSEs are desirable from a macro-perspective for three reasons: they are taxpayers, job creators, and climate crisis fighters. With governments facing public budget constraints, this potential should be harnessed as it can complement governmental effort in these areas (European Commission, 2016a).

Secondly, although the European Commission and local governments seem to be aware of SEs and ESSEs' vital role, they need to increase recognition, and visibility of their efforts amongst society, along with the social entrepreneurship model in general. Creating awareness through targeted campaigns will help spread the ideals and benefits of social entrepreneurship by profoundly transforming the socio-economic landscape to align it with the requirements of current and future generations.

Thirdly, the European Commission should accept its responsibility and embrace its crucial role in creating a favourable environment that facilitates growth amongst the sector to allow the niche of SEs and ESSEs to breakthrough to the regime level. The results of this study suggest that government support should be targeted to aid SEs and ESSEs in developing the resources and capabilities needed to eco-innovate and to ultimately assert themselves on the market. Special attention can be devoted to resource management. For instance, increasing visibility and recognition of ESSEs among the general public will not only positively impact the sale of their products and services, but also attract skilled personnel. Besides, ESSEs' need for better access to finance must be recognised. Public funding should be expanded, and private funding mobilised. Practical approaches to achieve the latter and to create a system that rewards financing ESSEs could be the setup of social investment funds and tax incentives for investing in ESSEs. Moreover, to harness the collaborative potential of ESSEs and to forge strategic partnerships, networks and platforms should be

strengthened or built that connect social ventures with individuals (e.g. experts, consultants, impact investors) and other actors with similar value commitments.

Fourth, in the face of the current environmental and social challenges, more enterprises with the social and environmental "DNA" of ESSEs and SEs are needed; thus the EU and its member states should promote social entrepreneurship through education and training programmes. As the results suggest that social entrepreneurs of ESSEs need to be open and innovative, and have an entrepreneurial and sustainability orientation, education and training programmes should be designed and executed institutionally to foster these attitudes of social entrepreneurship aspirants and social entrepreneurs experiencing difficulties in managing their social ventures (Shin, 2018). Moreover, the EU and local governments should encourage schools and universities to promote social entrepreneurship. Nurturing entrepreneurs with social entrepreneurship will help the expansion SEs and ESSEs. Hence, schools and universities should be encouraged to provide undergraduate, master, and doctorate programmes in sustainable social entrepreneurship, and to include compulsory courses and modules on sustainability and social entrepreneurship in the first semester or term of in any business-related degree.

6.4 Future research

This study serves as a first approach to understanding eco-innovativeness in environmentally-focused social entrepreneurship. Future research in this niche area is encouraged that should be designed to overcome the limitations of this analysis as well as to expand the academic discussion in the field. Firstly, to replicate this study with richer data from a larger sample would help refine and enhance the presented conceptual model. Secondly, large-scale quantitative studies could aim at developing a robust scale for measuring the eco-innovativeness of mission-driven enterprises, for instance, in the form of a structured questionnaire. Thirdly, the nascent field would benefit from more in-depth qualitative studies. Especially for the development of a scale measurement, interviews with ESSEs could be used to gain detailed and contextual information of the dimensions of internal determinants of eco-innovativeness. Item-refinement could be achieved through an expert panel of scholars, and subsequent large-scale surveys with ESSEs.

Another opportunity for research is to uncover potential differences in eco-innovativeness determinants of ESSEs regarding industries and countries. It would be advantageous to replicate this study at the EU level using quota sampling to ensure a representative sample for industry and member states. A comparison with results from more focused research, such as the present study, might generate interesting insights. Moreover, examinations of the relationships among the dimensions of determinants, the eco-innovativeness, as well as both the environmental and economic performance of the firms, represent further promising avenues for future research. Studies set out to uncover causal, and relational variable performance could add valuable insights as well as implications for practitioners, scholars, and policymakers alike.

A final fruitful line of future research could be to identify the most suitable policy instruments (e.g. education and training programmes, subsidies and tax incentives, social impact investment incentives, voluntary schemes) to support ESSEs to nurture and acquire the resources and capabilities needed for the development of ESI.

With the livelihood of current and future generations at stake, scholarly effort to develop theory and practical implications in the nascent field of social entrepreneurship with a focus on environmental sustainability can help drive forth the vital, yet challenging, paradigm shift urgently needed for society to move towards sustainable development. This study is an initial step in understanding the potential of environmentally-motivated social enterprises to disrupt the established unsustainable order of industries, and wants to conclude by reinforcing Kofi Annan's twenty-year-old appeal:

> *“ Let us choose to unite the power of markets with the strength of universal ideals. Let us choose to reconcile the creative forces of private entrepreneurship with the needs of the disadvantaged and the requirements of future generations.”*
>
> *Kofi Annan, 1999 (Wilson & Post, 2013, p. 730)*

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Appendix

Appendix 1 Collection of factors (chronological order)

Quote	Term	Manifest factor	Source
Entrepreneur / manager			
"The 'fit' between the entrepreneur and the opportunity, central in the theory of entrepreneurship, was good. The individual had the experience and the financial and analytic skills to **see the opportunity, analyse its feasibility and mobilize the resources required to successfully pursue the opportunity**."	Entrepreneurial orientation	**Entrepreneurial orientation**	(Larson, 2000, p. 314)
"The case study also points to the combined **necessity of visionary leadership** and goal setting at the helm on the one hand and simultaneous careful attention to detail and relationships on the other."	Visionary leadership	**Green transformational leadership style**	(Larson, 2000, p. 314)
"[…] the **central and (idea) creating role of the owner/manager** in SMEs is pivotal to the innovation process."	Owner / manager	**Entrepreneur / manager**	(Bos-Brouwers, 2010, pp. 420-421)
"The **role of the owner/manager** in innovation is highlighted in the literature as one of the advantages of SMEs over large companies. […] The **sustainability orientation** of the owner/manager appears to be of great significance in the number and impact of sustainable innovation activities."	Sustainability orientation	**Sustainability orientation**	(Bos-Brouwers, 2010, p. 430)
"It seems that the **personal inclination to integrate sustainability** aspects into business is the **main discriminator** between truly sustainable innovators and innovators with mere attention for environmental and/or social aspects."	Personal sustainability values	**Sustainability orientation**	(Bos-Brouwers, 2010, p. 430)
"Their **dynamic, entrepreneurial and long-term oriented** leadership style favours their innovative action."	Entrepreneurial, long-term oriented leadership	**Green transformational leadership; long-term strategic focus**	(Bos-Brouwers, 2010, p. 430)
"Associated with innovation, social enterprises are often described as exhibiting significant levels of **social opportunity recognition, proactiveness, as well as risk tolerance."**	Social opportunity recognition; Proactiveness; Risk tolerance	**Entrepreneurial orientation**	(Madill et al., 2010, pp. 138-139)
"Social values and pro-environmental behaviors are often intertwined with the vision of the owners and the operation of the business, though one may dominate."	Sustainability values	**Sustainability orientation**	(Holt, 2011, p. 241)

"Environmental leadership: A dynamic process in which one individual influences others to contribute to the achievement of environmental management and environmental innovations."	Environmental leadership	**Green transformational leadership**	(Chen et al., 2012, p. 377)
"We propose a novel notion, **'green transformational leadership'**, and […] define it as ''behaviors of leaders who motivate followers to achieve environmental goals and inspire followers to perform beyond expected levels of environmental performance". Transformational leadership could enhance innovation by motivating toward higher levels of performance and encouraging employees **to think creatively.** […] transformational leadership could facilitate the introduction of new ideas by providing **vision, motivation, and intellectual simulation to followers**."	Green transformational leadership; Vision; Creativity	**Green transformational leadership; Green shared vision; Creativity**	(Chen & Chang, 2013, p. 109)
"In this sense, the **founder's individual traits and vision** are essential in defining the leadership style."	Founder's individual traits and vision	**Founder's personality**	(Alegre & Berbegal-Mirabent, 2016, p. 1160)
"Other internal antecedents are linked to **values and culture**, such as **entrepreneurs' personal values, ecological responsibility** (deriving from company concerns for social obligations and values), **corporate environmental ethics and culture."**	Entrepreneur's personal values; Environmental ethics and culture	**Sustainability orientation; Environmental culture**	(Dangelico, 2016, p. 568)
"Leadership as one dimension of innovation capability: Motivating the rest of the company instead of controlling"	Leadership	**Green transformational leadership**	(Iddris, 2016, p. 247)
"sustainable entrepreneurs (inclusive of social and green entrepreneurs) have persistent **dual entrepreneurial and sustainability orientations**."	Dual entrepreneurial and sustainability orientation	**Entrepreneurial orientation; sustainability orientation**	(DiVito & Bohnsack, 2017, p. 582)
"Personal values and passion for sustainability influence the conduct of business in an ecological sustainable way."	Personal sustainability values	**Sustainability orientation**	(Gast et al., 2017, p. 49)
"[...] entrepreneurs with extrinsic motivations are less prone to innovation than those who are moved by **intrinsic motivations."**	Intrinsic motivation	**Sustainability orientation**	(Martínez-Román & Romero, 2017, p. 548)
"Firm innovation can be prompted by the **entrepreneur's ambition to grow and to take risks."**	Ambition to grow and to take risks	**Entrepreneurial orientation**	(Martínez-Román & Romero, 2017, p. 549)

"[…]t he indicator **"managerial environmental awareness**" in order to measure green innovation."	Managerial environmental awareness	**Sustainability orientation**	(García-Granero et al., 2018, pp. 312-313)
"[…] the importance of **green human resources** as an indicator which shows the innovative effort of a firm."	Green human resources	**Shared green values of employees**	(García-Granero et al., 2018, pp. 312-313)
"Management capabilities can influence a firm's ability to undertake innovation activities, introduce innovations and generate innovation outcomes. "	Management capabilities	**Managerial experience**	(OECD & Eurostat, 2018, p. 106)
"Other articles have addressed the importance of **managerial green attitudes** and modern **transformational leadership** as the drivers for the strategic capability of innovation."	Managerial green attitudes; Transformational leadership	**Sustainability orientation; Green transformational leadership**	(Pham et al., 2019, pp. 1095-1096)
Organisational structure			
Quote	**Term**	**Manifest factor**	**Source**
"High performing firms motivate and enable innovative behaviour by creating **permeable business boundaries** helping break down the barriers separating functions, product groups and businesses […]. **The more permeable and organic the structure, the greater the potential for innovative ideas to spring."**	Permeable business boundaries	**Permeable business boundaries**	(Lawson & Samson, 2001, p. 393)
"**Organic structures** allow diversity and individual expression, and are therefore better suited to foster employee innovativeness and entrepreneurship within the organization."	Organic structures	**Flexible organisational structure**	(Parzefall et al., 2008, p. 176)
„As an alternative, both theoretical observations and empirical evidence favour organic structures such as the matrix structure or the venture structure, characterized by **lack of hierarchies, low levels of bureaucracy, a wide span of control, flexibility and adaptability"**	Lack of hierarchy; Low levels of bureaucracy; Wide span of control; Flexibility; Adaptability	**Lack of hierarchy; Little bureaucracy & administrative processes; Flexible organisational structure; Responsiveness**	(Parzefall et al., 2008, p. 175)
"Another advantage of SMEs is their **flexibility of organization**. This was found in all companies in the sample, but foremost in the smaller ones: here, **little bureaucracy and informal communication** lead to efficiency, effectiveness and responsivity to changes in the (commercial)	Flexibility; Little bureaucracy; Informal communication; Responsivity to changes	**Flexible organisational structure; Little bureaucracy & administrative processes**	(Bos-Brouwers, 2010, p. 430)

environment sustainable innovation project teams."			
"[Advantages of SMEs over large companies with regard to the innovation process]: **Internal communication faster and more efficient"**	Fast & efficient internal communication	**Informal and fast communication channels**	(Bos-Brouwers, 2010, p. 421)
"Reasons for the challenges that radical innovation poses for firms are partly **rigid routines** and **higher levels of administration**."	Less rigid routines; Low levels of administration	**Little bureaucracy & administrative processes**	(Schaltegger & Wagner, 2011, p. 232)
"Organisational characteristics are shown to bear major influence on a firm's innovative activity."	Organisational characteristics	**Organisational structure**	(Martínez-Román & Romero, 2017, p. 549)
"Selected companies [of the six green innovation projects investigated] generally have a certain **ability for reacting to their changing environment**; have **internal flexibility** when it comes to their processes, systems and the way their products or services are delivered"	Ability to react to changing environment; Internal flexibility	**Flexible organisational structure; Responsiveness to changes & opportunities**	(Ben Arfi et al., 2018, p. 214)
"[…] the **company structure may influence the performance and speed of green innovation practices**, as well as **knowledge management practices**."*I think big companies have a great deal of difficulty innovating because they are implementing **administrative processes** related to their initial business. As a result, they are much **less flexible** because they are **more limited within activity limits**. Bringing down ways of doing things from the executive hierarchy to the operational level means that there is a detachment of the field*.""	Less administrative processes; Flexibility	**Flexible organisational structure; Little bureaucracy & administrative processes**	(Ben Arfi et al., 2018, p. 214)
"Another key criteria for sustainable innovation is **responsiveness,** that is to say the capacity to adapt to unforeseen exogenous shocks, to stakeholders and public demands, and to changing circumstances."	Responsiveness; Adaptability	**Responsiveness to changes & opportunities**	(Berkowitz, 2018, p. 423)
"Smaller firms are also better able to **respond to changing circumstances** and opportunities, as well as being able to take more risks."	Responsiveness to changing circumstances	**Responsiveness to changes & opportunities**	(Hillman et al., 2018, p. 453)
Organisational culture & climate			
Quote	**Term**	**Manifest factor**	**Source**
"We argue that there are antecedents to innovativeness; that is, various characteristics of a firm's culture, such as an **emphasis on learning**, **participative deci-**	Learning orientation; Participative decision making; Power sharing; Collaboration	**Participative decision making; Collaboration**	(Hurley & Hult, 1998, p. 44)

sion making, **support and collaboration, and power sharing**, affect whether the firm has an innovation orientation."			
"Innovativeness of the firm's culture, when combined with resources and other organizational characteristics, creates a greater capacity to innovate. Firms that have a greater capacity to innovate are able to develop a competitive advantage and achieve higher levels of performance."	Innovativeness of organizational culture	**Culture of innovation**	(Hurley & Hult, 1998, p. 44)
" A critical part of the initiation stage [of innovation] is cultural ''**openness to the innovation''**	Cultural openness to innovation	**Culture of innovation**	(Hult et al., 2004, p. 430)
"Organizational culture is undisputedly considered crucial to an organization's ability to innovate."	Organisational culture	**Organisational culture**	(Parzefall et al., 2008, p. 176)
"Autonomy and control over one's job have been found to correlate positively with employee engagement in innovative work behaviours, and contribute to employee work satisfaction."	Employee autonomy; Personal control over one's job	**Employee empowerment & autonomy**	Parzefall et al., 2008, p. 170)
"[…] research has consistently shown that **lack of routine** is positively associated with innovativeness […]. In comparison to routine work, **non-routine tasks** and jobs are more challenging, require more thought and provide opportunities for learning and personal growth, which in turn promote innovativeness."	Lack of routine; non-routine tasks	**Variety of job task**	Parzefall et al., 2008, p. 171)
"[…] one of the most frequently cited factors necessary for innovativeness is **sufficient time to think creatively and to explore different perspectives**, to play with ideas."	Availability of creative time	**Availability of creative time**	(Parzefall et al., 2008, p. 171)
"[…] **a risk-tolerant top management** that does not abort projects too quickly when first difficulties occur, and that enables employees and managers to reflect and take advantage of **learning-by-failing**, is important."	Risk-tolerant top management; Learning-by-falling	**Freedom for risk taking and experimentation; Tolerance for employee mistakes; Organisational learning**	(Parzefall et al., 2008, p. 174)
"A critical success factor for innovation is a **horizontal management style, with increased decision making at lower levels."**	Decision making at lower levels	**Participative decision making**	(Bos-Brouwers, 2010, p. 421)
"Organizational culture can facilitate the development of innovations in a dynamic environment based on the organizational identity view."	Organisational culture	**Organisational culture**	(Chen et al., 2012, p. 378)
"Environmental culture can facilitate both of proactive and reactive green innovations."	Environmental culture	**Environmental culture**	(Chen et al., 2012, p. 379)

"The innovation-oriented learning […] involves […] the development of a set of **green competences, the development of the capacity for critical reflective analysis by the managers and decision makers and the imbuement of proactivity, communication, creativity and flexibility abilities on company's work force**."	Culture of innovation	**Culture of innovation**	(de Medeiros et al., 2014, p. 84)
[…] undertaking continuous **experimentation** is crucial to envision new ways of doing things."	Experimentation for idea generation	**Freedom for risk-taking & experimentation**	(Alegre & Berbegal-Mirabent, 2016, p. 1160)
"Organizational culture as one dimension of innovation capability […]: Empowered employees; Availability of creative time; Good channel of communication; Support for change in the organization; Autonomy for employees and middle level management; Freedom for risk taking and experimentation; Tolerance for employee mistakes"	Employee empowerment & autonomy; Availability of creative time; Good channels of communication; Freedom for risk taking and experimentation; Tolerance for employee mistakes	**Employee empowerment & autonomy; Availability of creative time; Freedom for risk-taking and experimentation; Tolerance for mistakes and learning-by-failing**	(Iddris, 2016, p. 247)
"[…] much research views **risk tolerance** as an essential feature of the organisational culture of innovative firms […]. This favours the innovative level in organisations."	Risk tolerance	**Freedom for risk-taking and experimentation**	(Martínez-Román & Romero, 2017, p. 550)
"Environmentally-oriented culture is another green performance indicator that should be taken into account by the literature for measuring EI. […] this indicator, i.e. environmentally-oriented culture, is measured using the number of **environmental objectives** included in production plans and operations."	Environmental-oriented culture; Environmental objectives; Environmental plans	**Environmental culture; Environmental company policies & strategies**	(García-Granero et al., 2018, p. 313)
"[…] for an innovating company, one challenge of the leaders is **to innovate the culture to make it compatible with their strategy of innovation** […]. A **corporate culture of eco-innovation** will embed the core strategies into the implementation level, permit innovative behaviours and generate eco-initiatives. The diffusion of such culture has a positive daily effect on the promotion of EI."	Culture of innovation; Strategy of innovation; Environmental culture	**Culture of innovation; Environmental culture; Innovation strategy**	(Pham et al., 2019, p. 1090)

Vision & strategy			
Quote	**Term**	**Manifest factor**	**Source**
"Innovation is regarded as a **focal point** of an organization's strategy and a crucial element for its long-term strength and survival."	Corporate strategy of innovation	**Innovation strategy**	(Damanpour & Gopalakrishnan, 1999, p. 57)
"Successful innovation requires **a clear articulation of a common vision** and the firm expression of the **strategic direction**."	Clear articulation of common vision	**Clear communication of vision**	(Lawson & Samson, 2001, p. 389)
"No organization has resources to waste in that scattergun fashion – **innovation needs strategy**."	Corporate strategy	**Innovation strategy**	(Bessant & Tidd, 2011, p. 429)
"[…] a **clearly stated mission** enabled teams to focus on the development of new ideas and subsequently predicted successful innovation."	Clearly stated mission	**Clear communication of vision**	(Parzefall et al., 2008, p. 171)
"An **explicit innovation strategy** or a strategy with a clear focus on innovation is commonly seen as an important factor influencing innovativeness in organizations."	Explicit innovation strategy	**Innovation strategy**	(Parzefall et al., 2008, p. 174)
"This highlights the importance of **long-term commitment to innovation** processes."	Long-term commitment to innovation	**Long-term strategic focus**	(Parzefall et al., 2008, p. 174)
"The companies with a **long-term focus did implement radical innovations**, most importantly the substitution of (raw) materials by bio-based resources."	Long-term focus of sustainability	**Long-term strategic focus**	(Bos-Brouwers, 2010, pp. 430-431)
"Designing and implementing a **sustainability vision based on owner-manager values** can develop into a core driver for overall organizational development"	Sustainability vision of owner	**Sustainability vision**	(Klewitz & Hansen, 2014, p. 66)
"The existence of **specific policies and strategies** also drives GPI development. These include **green company policies** (in terms of the level of commitment that a firm demonstrates to initiatives limiting its environmental impact), **environmental product policies** (in terms of corporate environmental policies explicitly addressing environmental issues in new product development decisions) and **environmental strategic approaches** (such as green **management, material eco-efficiency, energy efficiency** and supply chain management)"	Green company policies; Environmental product policies; Environmental strategic approaches	**Environmental company policies & strategies**	(Dangelico, 2016, p. 568)

"Rather than business competences, the **corporate environmental orientation** (the firm's corporate environmental strategy) happens to be one of the most influential factors stimulating some firms further in environmental innovation than others."	Corporate environmental orientation	**Sustainability vision & strategy**	(Triguero et al., 2016, p. 31)
"[…] a **green shared vision** positively affects green exploration and exploitation learning, which later result in green radical and incremental innovation performance. The authors concluded that the **top management team's leadership** and effective management facilitate the development of green shared vision."	Green shared vision; Green (team) leadership style	**Green shared vision**	(Pham et al., 2019, pp. 1095-1096)
"Long-term-based eco-innovation orientation [at the strategic level] emerges as a powerful predictor for EI [environmental innovation]. This orientation, as a **proactive sustainability strategy** […] embodies the organization's corporate **environmental management** […] and organizational creativity orientation […] which must be **clearly disclosed in organizational statements (e.g., vision, mission, declaration**)."	Long-term focus; Sustainability strategy; Environmental management; Clear disclosure	**Sustainability vision & strategy, Long-term strategic focus; Clear communication**	(Pham et al., 2019, pp. 1095-1096)
Resource management			
Quote	**Term**	**Manifest factor**	**Source**
"The following elements are proposed to exist, to some degree, within innovative firms. They are […] and the **management of technology**."	Management of technology	**Technological expertise**	(Lawson & Samson, 2001, p. 389)
"Much innovation knowledge is embodied in **people and their skills**, and appropriate skills are needed to make intelligent use of external sources or codified knowledge."	Employees skills	**Qualified & skilled employees**	(OECD, 2005, p. 43)
"The role of **human capital** in innovation is important at both the firm and the aggregate level."	Human capital	**Qualified & skilled employees**	(OECD, 2005, p. 43)
"[...] **interdisciplinary teams** are more likely to produce innovative solutions than teams that are very homogenous."	Interdisciplinary teams	**Diverse & interdisciplinary workforce**	(Parzefall et al., 2008, p. 172)
"[…] importance of **intrinsic motivation** in **creative work** (Collins & Amabile 1999, Jung 2001). Innovativeness requires a certain level **of internal force** that pushes the individual to persevere in the face of challenges in creative work."	Intrinsic motivation	**Intrinsically motivated employees**	(Parzefall et al., 2008, p. 169)
"Although SMEs seem to be less equipped for sustainable innovation, they have behavioural advantages that can compensate their resource shortcomings.	Informal and entrepreneurial leadership style; Flexible	**Leadership style; Flexible organiza-**	(Bos-Brouwers, 2010, p. 431)

In particular, an **informal and entrepreneurial leadership style**, flexible organization capacities and **motivated personnel benefit** SMEs over large companies."	organizational capacities; Motivated personnel	**tional structure; Intrinsically motivated employees**	
"[…] the **high qualification of the employees** in environmental firms – as an indicator of technological competence-, promotes the introduction of environmental product innovations."	High qualification of employees	**Qualified & skilled employees**	(Pereira & Vence, 2012, p. 89)
"The **composition of teams** and managing the innovation (e.g., compensating lacking knowledge, outsourcing and detail development) are closely linked to each other."	Composition of teams	**Diverse & interdisciplinary workforce**	(Keskin et al., 2013, p. 56)
"Limited resources [access to resources / funding] force social ventures to be innovative."	Limited resources	**Availability of resources**	(Lumpkin et al. 2013, p. 771)
"[…] the **availability of environmentally concerned/trained human resources** (managers and employees) enhances environmental process innovations."	Environmentally concerned / trained human resources	**Green shared values of employees**	(Triguero et al., 2013, p. 27)
"[…] found the social component of the **dual mission to be instrumental in enabling SE leaders to recruit** […] and mobilize effort from employees, volunteers and supporters […]. The combination of enterprise and social mission has frequently been cited as a **motivating force** that provides employees with the **intrinsic rewards of job satisfaction** and as contributing to community impact."	Intrinsic motivation and job satisfaction	**Intrinsically motivated employees**	(Doherty et al., 2014, p. 425)
"Engaging employees in the development of the sustainable business can be supported by tools such as **development and training schemes**."	Sustainability development & training	**Sustainability development & training**	(Klewitz & Hansen, 2014, p. 66)
"Drivers and motivation for the adoption of eco-innovation: Human resources – **employee participatio**n in the innovation and **training for employees**, the company can count on **high quality staff"**	Employee participation; Employee training; High quality staff	**Sustainability training & development; Qualified & skilled employees**	(Bossle et al., 2016, p. 868)
"Recruiting people with **environmental skills and expertise** as external integrative capabilities for green product development."	Environmental skills and expertise	**Qualified & skilled employees**	(Dangelico, 2016, p. 572)
"In human resource management, ecological sustainable entrepreneurs emphasize **hiring personnel who share their personal values** […]."	Green shared values of employees	**Green shared values of employees**	(Gast et al., 2017, p. 49)

"[…] innovation depends on both the **adoption of new technology** […] and the **intensity of internal R&D** in companies."	Adoption of new technology; internal R&D	**Technological expertise**	(Martínez-Román & Romero, 2017, p. 547)
"[…] the **availability of resources (e.g. people, technology and knowhow**) was the most cited item, standing out as a critical determinant. This is so because eco-innovation demands some degree of investments, expressed as **qualified people or acquisition of technology or knowledge**."	Availability of resources; Qualified People; Technology; Knowledge	**Availability of resources; Qualified & skilled employees**	(Pacheco et al., 2017, p. 2283)
"Innovativeness at the firm-level is described as a collective action that coordinates the **knowledge and expertise of employees to foster the invention** of products, services, and processes […]"	Knowledge and expertise of employees	**Qualified & skilled employees**	(Rodriguez & Wiengarten, 2017, p. 2425)
"People are the most important resource for innovation as they are the **source of creativity and new ideas**."	People as source of creativity and new ideas	**Qualified & skilled employees; Employee creativity**	(OECD & Eurostat, 2018, p. 115)
"The **skills and abilities of a firm's workforce** are a particularly critical part of innovation-relevant capabilities."	Abilities & skills of workforce	**Qualified & skilled employees**	(OECD & Eurostat, 2018, p. 104)
"A firm's **internal financial sources** are another major driver for innovation. More profitable firms and firms with a larger share of own capital can find it easier to invest in activities with uncertain outcomes, such as those relating to innovation."	Financial resources	**Access to financial resources**	(OECD & Eurostat, 2018, p. 106)
"The **diversity of a firm's workforce** can influence innovation performance. As innovation activities usually involve communication and interaction among employees, diversity can both stimulate and hamper the exchange of knowledge."	Diversity of firm's workforce	**Diverse & interdisciplinary workforce**	(OECD & Eurostat, 2018, p. 116)
"[…] **qualified HR with a high level of education, self-esteem, diverse backgrounds** and motivation was the most important means (in comparison with financial resource, physical resource, slack resource) to improve resource allocation capabilities for innovation."	Qualified HR; High level of education, self-esteem; Diverse backgrounds	**Qualified & skilled employees; Diverse & interdisciplinary workforce**	(Pham et al., 2019, p. 1096)
"Furthermore, **green training & development** increases a **firm's eco-mindedness**, while green organizational learning facilitates the green knowledge sharing and knowledge transfer within the organization."	Green training & development; Green organisational learning	**Sustainability training & development; Organisational learning**	(Pham et al., 2019, p. 1096)

Creativity & idea management			
Quote	**Term**	**Manifest factor**	**Source**
"The most advanced sustainable innovation activities are on the **application of bio-based materials** […] and the focus on function and design of products in the innovation process."	Bio-based materials	**Green creativity through eco-design**	(Bos-Brouwers, 2010, p. 431)
"Search for product innovation ideas in new areas: e.g. use **biomimicry** and engage with bottom-of-the-pyramid customers."	Biomimicry	**Green creativity through biomimicry**	(Adams et al., 2012, p. 51)
"Other managerial measures, such as take back activities of products, **life cycle assessment of own products and eco-labelling** are specifically aimed to improve products, so it is expected and confirmed that they foster eco-innovation."	Life cycle assessment activities; Eco-labelling	**Green creativity through eco-design**	(Pereira & Vence, 2012, p. 92)
"We propose a novel notion, '**green creativity'**, and […] define it as ''the development of new ideas about green products, green services, green processes, or green practices that are judged to be original, novel, and useful'."	Green creativity	**Green creativity**	(Chen & Chang, 2013, p. 109)
"To develop innovative solutions, organizations have to develop **organizational creativity** which is the **primary impetus of innovation** […]. Prior literature argues that one of the key determinants of new product success is **team creativity** that could facilitate the development of new products characterized by novelty and usefulness."	Organisational creativity; Team creativity	**Employee creativity; Team creativity**	(Chen & Chang, 2013, p. 110)
"[…] these SMEs begin to change their innovation process for SOIs through **biomimicry** and **interaction with external actors**."	Biomimicry; Interaction with external actors	**Green creativity through biomimicry, Collaboration**	(Klewitz & Hansen, 2014, p. 70)
"The second [characteristics of the development process that are key for a successful GPI development] most often mentioned in the literature relates to the implementation of **eco-design and life cycle assessment practices**. "	Eco-design; Life cycle analysis practices	**Green creativity through eco-design**	(Dangelico, 2016, p. 570)
"Conducting **eco-design** and **life cycle assessment studies** as technological capabilities for green product development."	Eco-design; Life cycle analysis	**Green creativity through eco-design**	(Dangelico, 2016, p. 572)
"Creativity as one dimension of innovation capability […]: Reward and recognition of creative ideas; **Value individual contributions;** Setting of achievable objectives; Work group support; Availability of resources including materials, funds, facilities and information; Allowing staff to work on challenging task; Mistakes are allowed when experimenting with new ideas; Free time for creative exercise;	Individual contributions	**Employee creativity**	(Iddris, 2016, p. 248)

Flexible working schedule; Freedom to engaging in innovative activities"			
"Idea management as one dimension of innovation capability […]: […]; **Employee idea contribution;** Generating ideas from bottom-up; **Provide feedback and reward for innovative ideas"**	Employee idea contribution; Reward for innovative ideas	**Employee idea contribution, Rewarding innovative ideas**	(Iddris, 2016, p.248)
"[…] **creativity** as a **starting point for innovation**."	Creativity	**Creativity**	(García-Granero et al., 2018, p. 313)
"Eco-innovation cannot exist in isolation from **creativity** in its endless journey because new ideas are always encouraged for solutions and decision-making."	Creativity	**Creativity**	(Pham et al., 2019, p. 1091)
Knowledge management			
Quote	**Term**	**Manifest factor**	**Source**
"An innovation capability is therefore defined as the ability **to continuously transform knowledge and ideas into new products, processes and systems** for the benefit of the firm and its stakeholders."	Transforming knowledge and ideas	**Knowledge utilisation**	(Lawson & Samson, 2001, p. 384)
"Much of the firm's innovativeness hinges on the extent to which **managers acquire and act on market intelligence**."	Knowledge accumulatio; Market intelligence	**Industry knowledge; Knowledge creation & sharing**	(Hult et al., 2004, p. 430)
"Innovation involves the **utilisation of new knowledge** or a new use or **combination of existing knowledge**."	Knowledge utilisation	**Knowledge utilisation**	(OECD, 2005, p. 31)
"[…] an innovation strategy should also make use of the previous engagements in innovative projects in order to benefit from **learning-by-doing** and **learning-by-failing effects**."	Learning-by-doing; Learning-by-failing	**Organisational learning**	(Parzefall et al., 2008, p. 174)
"R&D shows up as one of the **primary drivers of most innovation outputs**. When analyzing which factors influence the possibility to carry out investments in R&D related to environmental innovation, they highlight the network activities with other firms and research institutes. According to the authors, this suggests a certain causal relationship: **networks/cooperation → R&D → innovations**."	Environmental R&D; networks/cooperation	**Environmental R&D; Collaboration**	(Pereira & Vence, 2012, p. 88)
"Investment in R&D is one of the main conditions to obtain new knowledge and to develop innovations."	R&D investment	Environmental R&D	(Pereira & Vence, 2012, p. 87)

"SMEs wanting to address a sustainability problem with an environmental technology innovation need to possess **industry knowledge**."	Industry knowledge	**Industry knowledge**	(Halme & Korpela, 2014, p. 559)
"Countering the view of organizations as solitary, innovating entities, the systems of innovation approach emphasizes the significance of **interactive learning** in shaping innovations through the diffusion and **sharing of knowledge** between a variety of organizations and institutions."	Interactive learning; Knowledge sharing; External knowledge sources	**Organisational learning; External knowledge sources; Collaboration**	(Phillips et al., 2015, p. 450)
"The development of a new product service concept requires **new knowledge** and expertise, which may not be compatible with the existing knowledge accumulated by the firm. Hence, the involvement in **new and external stakeholder networks** can be highly valuable in offering this new knowledge and expertise (Ecocement)."	External knowledge sources; Collaboration network	**External knowledge sources; Collaboration**	(Dangelico, 2016, p. 570)
"Innovation capability refers to a firm's ability to generate innovation through **continuous learning, knowledge transformation, creativity, and exploitation of internal and external resources** available to the firm."	Continuous learning; Knowledge transformation; Creativity; Exploitation of internal and external resources	**Organisational learning, Knowledge creation & sharing, Knowledge utilisation**	(Iddris, 2016, p. 246)
"Conducting **environmental R&D** [as one success factor of green product innovation]"	Environmental R&D	**Environmental R&D**	(Dangelico, 2016, p. 572)
"Knowledge flows from and towards external actors have also been identified as success factors for GPI development. In particular, these include extensive communication between the firm and its stakeholders (customers, suppliers, employees, stockholders, special interest groups and top management) […] exploitation of the local knowledge base and creation of local innovation clusters."	Knowledge flows; External knowledge flows; Internal knowledge flows	External knowledge sources; Internal knowledge sources	(Dangelico, 2016, p. 570)
"The firm's contact with **external knowledge sources** has also been shown to have a major influence on firms' innovative behaviour."	External knowledge sources	**External knowledge sources**	(Martínez-Román & Romero, 2017, p. 551)
"The internal origin of **knowledge creation** lies in the effort **in R&D activities** […] and in continuous learning while performing tasks."	Knowledge creation through R&D; Organisational learning	**Knowledge creation & sharing, Environmental R&D; Organisational learning**	(Martínez-Román & Romero, 2017, p. 550)

"R&D department focused on sustainability"	R&D	**Environmental R&D**	(Pachecho et al., 2017, p. 2284)
"Innovativeness at the firm-level is described as a collective action that coordinates the **knowledge and expertise of employees** to foster the invention of products, services, and processes."	Knowledge and expertise of employees	**Internal Knowledge sources**	(Rodriguez & Wiengarten, 2017, p. 2425)
"The process of eco-innovation is actually **environmental knowledge accumulation, integration, and utilization**."	Environmental knowledge accumulation; Knowledge utilization	Knowledge creation & sharing; Knowledge utilisation	(Cai & Li, 2018, p. 111)
"Knowledge is one of the most strategically significant resources for firms. How it is accessed and deployed is particularly important for firms engaged in innovation activities."	Knowledge management	**Knowledge management**	(OECD & Eurostat, 2018, p.127)
"Research and experimental development (**R&D**) […] is one of a range of activities that can generate innovations, or through which useful **knowledge for innovation can be acquired.**"	R&D	**Knowledge creation & sharing; Environmental R&D**	(OECD & Eurostat, 2018, p. 46)
"R&D activities and the involvement of **creative human capital** have recently emerged as a tendency for the improvement of both green products and green process innovativeness. Both **internal R&D and external R&D**, in **cooperation** with suppliers, universities and research institutions, have a significant effect on the process innovativeness."	R&D activities; Creative human capital; Cooperation	**Employee creativity; Environmental R&D; Cooperation**	(Pham et al., 2019, p. 1094)
"[…] the **acquisition of new knowledge and the green knowledge sharing** […] as well as **knowledge transfer** activities of individuals contribute to the continuous improvement of the organizational source of knowledge, which is essential in the context of pursuing the eco-innovation of the organization."	Green knowledge acquisition; Green knowledge sharing; Green knowledge transfer	**Knowledge creation & sharing; External knowledge sources**	(Pham et al., 2019, p. 1094)
"[…] [open innovation] is assumed to be more likely significant for incremental innovation than radical innovation because **radical innovation is based on commercialization of the innovator's unique idea**."	Innovator's unique idea	**Internal knowledge sources**	(Pham et al., 2019, p. 1091)
Open innovation & collaboration			
Quote	**Term**	**Manifest factor**	**Source**
"Empirical studies have suggested that **co-operation and communication with customers and other companies within**	Co-operation and communication with	**Collaboration**	(Parzefall et al.,

and across industries can significantly improve and contribute innovative performance."	customers and other companies		2008, p. 175)
"Involving and engaging with a wider range of **external stakeholders** with potentially competing interests to work toward systemic change, such as extending sustainability thinking to suppliers and customers who may lack experience, knowledge and confidence in SOI [sustainability-oriented innovations]."	Engagement with external stakeholders	**Collaboration with external stakeholders**	(Adams et al., 2012, p. 13)
"Based on the literature review the **importance of relations and cooperation with external actors** is also clear."	Cooperation with external actors	**Collaborations**	(Pereira & Vence, 2012, p. 92)
"Our results show that those entrepreneurs who give importance to **collaboration with research institutes, agencies and universities**, and to the increase of market demand for green products are more active in all types of eco-innovations."	Collaboration with universities and research institutes	**Collaboration with universities and research centres**	(Triguero et al., 2013, p. 25)
"To strengthen the innovative capacity for SOIs, SMEs can remodel their **innovation process to interact more frequently with external actors**, that is, engage in **collaboration** practices beyond the firm level."	Collaboration with external actors	**Collaborations**	(Klewitz & Hansen, 2014, p. 70)
"Perspectives on democratising innovation and social innovation suggest that ESEs embedded within specific communities may have particular capabilities related to **open-source methods** of deriving creative ideas, and developing co-production through relational learning with user communities and other actors."	Open-source methods innovation	**Open innovation**	(Vickers & Lyon, 2014, pp. 452-543)
"Social innovations arise as a result of **interactions between different actors** operating within the same social system and are developed through collective learning."	Interactions with different actors in the social system	**Collaborations**	(Phillips et al., 2015, p. 444)
"Collaborations with different types of actor have been identified as success factors for green product innovation. These include collaborations with **suppliers**, collaborations with **customers**, collaborations with **environmental groups** and NGOs, collaborations with **knowledge institutions** and **local government**, collaborations within the company's own enterprise group and collaborations with **business partners** and **research partners**."	Collaborations with suppliers, customers, environmental groups, local governments, business partners, research partners	**Collaborations with suppliers, customers, environmental groups, local governments, business partners, research centres**	(Dangelico, 2016, p. 570)
"[…] the **involvement in new and external stakeholder networks** can be highly	External stakeholder networks	**Collaborations**	(del Rio et al.,

valuable in offering this new knowledge and expertise [for eco-innovation]"			2016a, p. 286)
"**Collaborative networks** with **research institutes**, agencies and **universities** are essential to trigger all types of eco-innovation in SMEs."	Collaboration networks with research institutes, universities	**Collaboration with universities & research centres**	(Pachecho et al., 2017, p. 2282)
"If compassion identifies a social entrepreneur, then **engagement with stakeholders through strategic openness** identifies the social entrepreneurial organization. Plainly stated, the organization that **includes varied input from diverse stakeholders is more prone to generating social innovation.**"	Strategic openness; Engagement with stakeholders	**Open innovation**	(Pittz et al., 2017, p. 37)
"Knowledge brought through **R&D cooperation from public research institutions** is directly bundled into environmental innovativeness capability."	Cooperation with public research institutions	**Collaboration with research centres**	(Rodriguez & Wiengarten, 2017, p. 2432)
"R&D cooperation with suppliers has the highest indirect effect on environmental innovativeness capability."	R&D cooperation with suppliers	**Cooperation with suppliers**	(Rodriguez & Wiengarten, 2017, p. 2432)
"To develop successful green innovations, **suppliers and customers** must collaborate with companies. In the case of suppliers, they can indicate the most protective material or processes to the environment. On the other hand, the customers could help companies to meet their needs, and have the capability to implement strategies by being responsive to customers."	Collaboration with suppliers & customers	**Collaboration with suppliers; Collaboration with customers**	(Albort-Morant et al. 2018, p. 18)
"It has been shown that **innovation cooperation** (e.g. in R&D) is more effective for green innovations than for non-environmental innovations […]. For example, **business suppliers** and **universities** have turned out to be among the most relevant partners in terms of green innovation impact."	Innovation cooperation; Collaboration with suppliers and universities	**Collaborations with suppliers; Collaboration with universities & research centres**	(Ben Arfi et al., 2018, p. 213)
"[…] **open innovation is a good tool to enhance EI** [environmental innovativeness] provided that the organization knows the right actors and the right moment to exchange ideas."	Open innovation	**Open innovation**	(Pham et al., 2019, p. 1091)

Appendix 2 Standardised Online Questionnaire

MANAGEMENT CENTER INNSBRUCK

Dear participants,

As part of my master thesis at the Management Center Innsbruck (MCI), I am conducting an empirical study on the topic "**Innovativeness of environmentally sustainable social enterprises**".

This survey is aimed towards companies that have found innovative solutions to encourage more sustainable consumption and production and offer green products or services. They pursue traditional economic benefits while simultaneously addressing environmental and social challenges. The aim of this study is to identify internal factors that make these companies innovative.

I would be very grateful for your support and contribution to my research study.
For this I ask you to spare just **5 - 8 minutes** of your time to take part in my survey. The survey is anonymous. The data collected will be used exclusively for the master thesis and will not be passed on to third parties.

Thank you very much in advance for your participation and your valuable contribution!

Best regards
May Britt Hoefer

Please don't hesitate to contact me if you have any further questions: mb.hoefer@mci4me.at

The collection and processing of the data takes place in compliance with the EU General Data Protection Regulations (DSGVO).

Industry sector: What industry sector is your company in?

Please select the sector(s) that best reflect your company's core activity. Multiple selection possible.

- [ ] Banking & finance
- [ ] Cleantech
- [ ] Consulting
- [ ] Digital & IT
- [ ] Education
- [ ] Food, beverages & healthy eating
- [ ] Logistics & transportation
- [ ] Media & journalism
- [ ] Mobility & traffic
- [ ] Natural cosmetics & personal hygiene
- [ ] Sustainable packaging solutions
- [ ] Recycling & circular economy
- [ ] Renewable energy
- [ ] Retail & E-Commerce
- [ ] Sustainable agriculture
- [ ] Sustainable construction
- [ ] Sustainable & fair fashion
- [ ] Sustainable & fair furniture
- [ ] Sustainable tourism
- [ ] Other:

Country of registration: In which country is your company registered?

Please select one country from the drop-down list.

Please select

Number of employees: How many people do you employ?

Full-time employees count as one head, part-time employees as 0.5 heads.

- ○ 1 - 9
- ○ 10 - 49
- ○ 50 - 250
- ○ > 250

For how many years has your company been economically active?

If the year of your company's legal formation and the year in which it started business activities differ, please refer to the latter.

- ○ < 1 year
- ○ 1 - 4 years
- ○ 5 - 10 years
- ○ 11 - 20 years
- ○ > 20 years

MANAGEMENT CENTER INNSBRUCK

How much consideration does your company give to social, environmental and economic objectives:

- in its overall purpose & mission, and
- when making business decisions

Please assign 100 points in total among the three objectives.

Social value creation		0
Environmental value creation		0
Economic value creation		0
Total		0

MANAGEMENT CENTER INNSBRUCK

On the following pages you will find lists of factors that may have an influence on the innovativeness of environmentally sustainable social enterprises. Please evaluate the factors according to their influence for YOUR company.

Entrepreneur / manager: In your opinion, how influential are the following factors on the innovativeness of environmentally sustainable social enterprises like YOUR company?

	strong influence	rather strong	rather weak	no influence	CANNOT ASSESS
Sustainability orientation *(i.e. founder / manager's values and passion for sustainability & the environment)*	○	○	○	○	○
Entrepreneurial orientation *(i.e. founder / manager's willingness to create something new via creativity and experimentation; opportunity seeking, forward-looking perspective; risk tolerance through willingness to venture into uncertain environments)*	○	○	○	○	○
Founder's personality	○	○	○	○	○
Managerial experience of the founder / manager	○	○	○	○	○
Green transformational leadership style *(i.e. leader who motivates employees to achieve environmental goals by inspiring them to see problems from new perspectives, by communicating a vision, and by caring for employees through individual support)*	○	○	○	○	○

Organisational structure: In your opinion, how influential are the following factors on the innovativeness of environmentally sustainable social enterprises like YOUR company?

	strong influence	rather strong	rather weak	no influence	CANNOT ASSESS
Flexible organisational structure	○	○	○	○	○
Little bureaucracy & administrative processes	○	○	○	○	○
Permeable business boundaries	○	○	○	○	○
Lack of hierarchy	○	○	○	○	○
Responsiveness to changes & opportunities	○	○	○	○	○
Informal & fast communication channels	○	○	○	○	○

Organisational culture & climate: In your opinion, how influential are the following factors on the innovativeness of environmentally sustainable social enterprises like YOUR company?

	strong influence	rather strong	rather weak	no influence	CANNOT ASSESS
Culture of innovation	○	○	○	○	○
Environmental culture	○	○	○	○	○
Employee empowerment & autonomy *(i.e. employees having control over and responsibility for their job and tasks)*	○	○	○	○	○
Variety of job tasks	○	○	○	○	○
Participative decision making	○	○	○	○	○
Availability of creative time for employees *(i.e. sufficient time to think creatively and to explore different perspectives)*	○	○	○	○	○
Freedom for risk taking & experimentation	○	○	○	○	○
Tolerance for mistakes & learning-by-failing	○	○	○	○	○

Vision & strategy: In your opinion, how influential are the following factors on the innovativeness of environmentally sustainable social enterprises like YOUR company?

	strong influence	rather strong	rather weak	no influence	CANNOT ASSESS
Sustainability vision & strategy	○	○	○	○	○
Environmental company policies & strategies *(demonstrating the commitment to initiatives limiting the environmental impact and addressing environmental issues in new product development decisions)*	○	○	○	○	○
Clear communication of vision	○	○	○	○	○
Innovation strategy	○	○	○	○	○
Long-term strategic focus	○	○	○	○	○

Resource management: In your opinion, how influential are the following factors on the innovativeness of environmentally sustainable social enterprises like YOUR company?

	strong influence	rather strong	rather weak	no influence	CANNOT ASSESS
Qualified & skilled employees	○	○	○	○	○
Diverse & interdisciplinary workforce	○	○	○	○	○
Green shared values of employees *(sustainability awareness & concern)*	○	○	○	○	○
Intrinsically motivated employees	○	○	○	○	○
Sustainability training & development	○	○	○	○	○
Access to financial resources	○	○	○	○	○
Technological expertise	○	○	○	○	○

Knowledge management: In your opinion, how influential are the following factors on the innovativeness of environmentally sustainable social enterprises like YOUR company?

	strong influence	rather strong	rather weak	no influence	CANNOT ASSESS
Industry knowledge	○	○	○	○	○
Environmental Research & Development	○	○	○	○	○
Internal knowledge sources	○	○	○	○	○
Knowledge creation & sharing	○	○	○	○	○
Organisational learning *(learning-by-doing, learning-by-failing)*	○	○	○	○	○
External knowledge sources *(e.g. customers, suppliers, partners, environmental groups etc.)*	○	○	○	○	○
Utilisation of new knowledge	○	○	○	○	○

Creativity & idea management: In your opinion, how influential are the following factors on the innovativeness of environmentally sustainable social enterprises like YOUR company?

	strong influence	rather strong	rather weak	no influence	CANNOT ASSESS
Employee creativity	○	○	○	○	○
Employee idea contribution	○	○	○	○	○
Team creativity	○	○	○	○	○
Rewarding innovative ideas	○	○	○	○	○
Green creativity through eco-design *(i.e. designing for sustainability with an consideration of environmental effects and risks over the entire life cycle of a product from pre-manufacturing to end-of-life)*	○	○	○	○	○
Green creativity through biomimicry *(i.e. designing products by learning from materials, behaviours and processes observed in the natural environment)*	○	○	○	○	○

Open innovation & collaboration: In your opinion, how influential are the following factors on the innovativeness of environmentally sustainable social enterprises like YOUR company?

	strong influence	rather strong	rather weak	no influence	CANNOT ASSESS
Collaboration with **suppliers**	○	○	○	○	○
Collaboration with **business partners**	○	○	○	○	○
Collaboration with **customers through user experience**	○	○	○	○	○
Collaboration with **universities and/or research centres**	○	○	○	○	○
Collaboration with the **local government**	○	○	○	○	○
Collaboration with **environmental groups**	○	○	○	○	○

MCI MANAGEMENT CENTER INNSBRUCK

You have reached the end of the survey!

Please leave your email address below if you wish to receive the results and recommendations of this study at the end of July 2019. The survey will remain anonymous and will not be tracable back to your email address.

MANAGEMENT CENTER
INNSBRUCK

Thank you very much for your support and valuable contribution!

Should you know of any other sustainable companies, I would appreciate if you could share my survey with them.

Link to survey

Best regards,

May Britt Hoefer

mb.hoefer@mci4me.at

Appendix 3 Exploratory Factor Analysis SPSS Results

Dimension 1: Entrepreneur / manager

Results based on missing values replaced by mean, n=63

Preliminary analysis – Assumptions:

a) Visual inspection of intercorrelation

Correlation Matrix[a]

		em_1	em_2	em_3	em_4	em_5
Correlation	em_1	1.000	.444	.468	.273	.464
	em_2	.444	1.000	.560	.238	.481
	em_3	.468	.560	1.000	.235	.317
	em_4	.273	.238	.235	1.000	.457
	em_5	.464	.481	.317	.457	1.000
Sig. (1-tailed)	em_1		.000	.000	.015	.000
	em_2	.000		.000	.030	.000
	em_3	.000	.000		.032	.006
	em_4	.015	.030	.032		.000
	em_5	.000	.000	.006	.000	

a. Determinant = .271

→ not strongly correlated but enough correlation to proceed with an EFA

b) Bartlett test of sphericity: < .05
c) KMO: > .5

KMO and Bartlett's Test

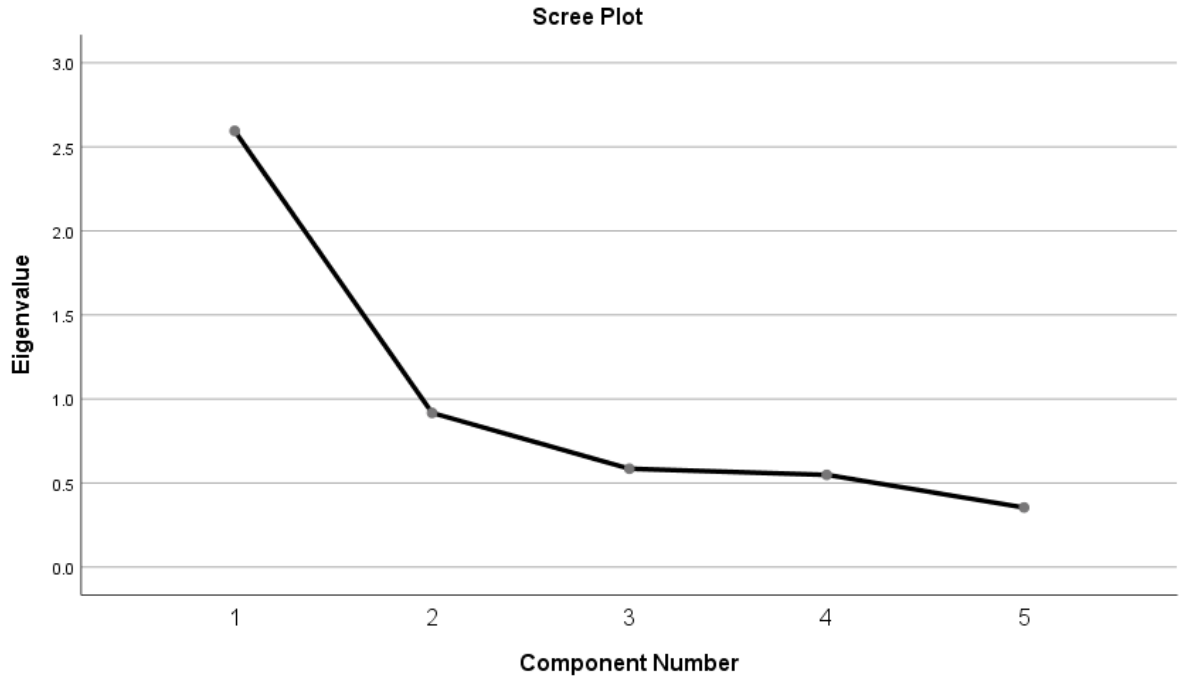
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.732
Bartlett's Test of Sphericity	Approx. Chi-Square	77.774
	df	10
	Sig.	.000

Factor extraction and rotation:

→ Extraction method used: orthogonal (Varimax) (same results with oblique (obli-min))
→ Latent root criterion: Eigenvalue > 1 criterion → 1 factor (component extracted)
→ Same result with parallel analysis
→ No rotation possible

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		Extraction Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.595	51.897	51.897	2.595	51.897	51.897
2	.917	18.346	70.243			
3	.585	11.703	81.945			
4	.549	10.971	92.916			
5	.354	7.084	100.000			



Component Matrix[a]

	Component
	1
em_2	.778
em_5	.760
em_1	.748
em_3	.727
em_4	.569

Extraction Method: Principal Component Analysis.[a]

a. 1 components extracted.

Alternative Percentage of variance criterion:
→ Min. 60% of total variance explained
→ Hence, 2 factor solution

Rotated Component Matrix[a]

	Component	
	1	2
em_3	.845	
em_2	.812	
em_1	.694	.314
em_4		.905
em_5	.425	.716

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 3 iterations.

Reliability test using Cronbach's alpha

Factor 1: .744
em_1: Sustainability orientation of the founder / manager
em_2: Entrepreneurial orientation of the founder / manager
em_3: Founder's personality

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.744	.743	3

Item Statistics

	Mean	Std. Deviation	N

em_1	1.35	.626	63
em_2	1.48	.669	63
em_3	1.69	.686	63

Factor 2: .627
em_4: Managerial experience of the founder / manager
em_5: Green transformational leadership style of the founder / manager

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.627	.627	2

Item Statistics

	Mean	Std. Deviation	N
em_4	2.46	.834	63
em_5	1.79	.806	63

Parallel analysis:

```
Principal Components & Random Normal Data Generation

Specifications for this Run:
Ncases      63
Nvars        5
Ndatsets  1000
Percent     95

Raw Data Eigenvalues, & Mean & Percentile Random Data Eigenvalues
         Root     Raw Data        Means     Prcntyle
     1.000000     2.594835     1.359123     1.534988
     2.000000      .917298     1.143502     1.258614
     3.000000      .585135      .985284     1.075870
     4.000000      .548537      .837827      .934270
     5.000000      .354195      .674264      .789904
```

Dimension 2: Organisational structure

Results based on missing values replaced by mean, n=63

Preliminary analysis – Assumptions:

a) Visual inspection of intercorrelation

Correlation Matrix[a]

		os_1	os_2	os_3	os_4	os_5	os_6
Correlation	os_1	1.000	.394	.298	.315	.397	.421
	os_2	.394	1.000	.464	.405	.243	.471
	os_3	.298	.464	1.000	.403	.355	.332
	os_4	.315	.405	.403	1.000	.150	.299
	os_5	.397	.243	.355	.150	1.000	.440
	os_6	.421	.471	.332	.299	.440	1.000
Sig. (1-tailed)	os_1		.001	.009	.006	.001	.000
	os_2	.001		.000	.000	.028	.000
	os_3	.009	.000		.001	.002	.004
	os_4	.006	.000	.001		.120	.009
	os_5	.001	.028	.002	.120		.000
	os_6	.000	.000	.004	.009	.000	

a. Determinant = .244

→ not strongly correlated but just enough correlation to proceed with an EFA (criterion >.30)

b) Bartlett test of sphericity: < .05
c) KMO: > .5

KMO and Bartlett's Test

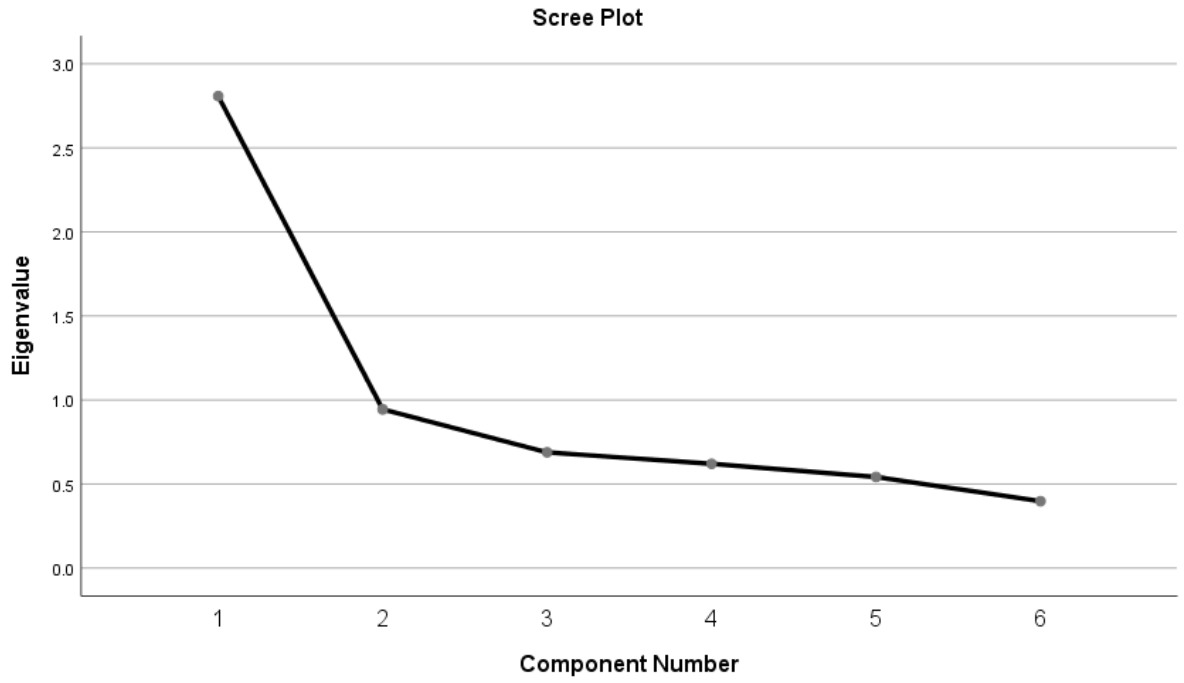
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.776
Bartlett's Test of Sphericity	Approx. Chi-Square	83.470
	df	15
	Sig.	.000

Factor extraction and rotation:

→ Extraction method used: orthogonal (Varimax) (same results with oblique (obli-min))
→ Latent root criterion: Eigenvalue > 1 criterion → 1 factor (component extracted)
→ Same result with parallel analysis
→ No rotation possible

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		Extraction Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.808	46.792	46.792	2.808	46.792	46.792
2	.944	15.737	62.529			
3	.688	11.473	74.001			
4	.620	10.338	84.340			
5	.542	9.031	93.371			
6	.398	6.629	100.000			



Component Matrix[a]

	Component
	1
os_2	.741
os_6	.734
os_3	.697
os_1	.690
os_5	.617
os_4	.614

Extraction Method: Principal Component Analysis.[a]

a. 1 components extracted.

Alternative percentage of variance criterion:
→ Min. 60% of total variance explained
→ Hence, 2 factor solution

Rotated Component Matrix[a]

	Component	
	1	2
os_4	.837	
os_2	.720	.325
os_3	.669	.314
os_5		.865
os_6	.346	.694
os_1	.325	.653

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 3 iterations.

Reliability test using Cronbach's alpha

Factor 1: .688
os_2: Little bureaucracy & administrative processes
os_3: Permeable business boundaries
os_4: Lack of hierarchy

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items

.688	.688	3

Item Statistics

	Mean	Std. Deviation	N
os_2	1.92	.703	63
os_3	2.34	.751	63
os_4	2.24	.727	63

Factor 2: .683
os_1: Flexible organisational structure
os_5: Responsiveness to changes & opportunities
os_6: Informal & fast communication channels

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.683	.684	3

Item Statistics

	Mean	Std. Deviation	N
os_1	1.74	.670	63
os_5	1.53	.663	63
os_6	1.53	.734	63

Parallel analysis

Principal Components & Random Normal Data Generation

Specifications for this Run:
Ncases 63
Nvars 6
Ndatsets 1000
Percent 95

Raw Data Eigenvalues, & Mean & Percentile Random Data Eigenvalues

Root	Raw Data	Means	Prcntyle
1.000000	2.807502	1.436413	1.622666
2.000000	.944211	1.216373	1.335499
3.000000	.688365	1.054880	1.149247
4.000000	.620307	.913237	.999765
5.000000	.541865	.768864	.877692
6.000000	.397750	.610234	.729938

Dimension 3: Organisational culture & climate

Results based on missing values replaced by mean, n=58

Preliminary analysis – Assumptions:

a) Visual inspection of intercorrelation

Correlation Matrix[a]

		oc_1	oc_2	oc_3	oc_4	oc_5	oc_6	oc_7	oc_8
Correlation	oc_1	1.000	.254	.251	.098	.215	.375	.282	.255
	oc_2	.254	1.000	.037	.243	.242	.186	-.033	.127
	oc_3	.251	.037	1.000	.331	.437	.284	.305	.302
	oc_4	.098	.243	.331	1.000	.434	.219	.300	.320
	oc_5	.215	.242	.437	.434	1.000	.479	.373	.433
	oc_6	.375	.186	.284	.219	.479	1.000	.234	.295
	oc_7	.282	-.033	.305	.300	.373	.234	1.000	.624
	oc_8	.255	.127	.302	.320	.433	.295	.624	1.000
Sig. (1-tailed)	oc_1		.027	.029	.232	.053	.002	.016	.027
	oc_2	.027		.393	.033	.034	.081	.404	.171
	oc_3	.029	.393		.006	.000	.015	.010	.011
	oc_4	.232	.033	.006		.000	.049	.011	.007
	oc_5	.053	.034	.000	.000		.000	.002	.000
	oc_6	.002	.081	.015	.049	.000		.039	.012
	oc_7	.016	.404	.010	.011	.002	.039		.000
	oc_8	.027	.171	.011	.007	.000	.012	.000	

a. Determinant = .143

→ not strongly correlated but just enough correlation to proceed with an EFA (criterion >.30)

b) Bartlett test of sphericity: < .05
c) KMO: > .5

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.733
Bartlett's Test of Sphericity	Approx. Chi-Square	104.174
	df	28
	Sig.	.000

Factor extraction and rotation

→ Extraction method used: orthogonal (Varimax) (same results with oblique (obli-min))

→ Latent root criterion: Eigenvalue > 1 criterion → 2 factor (component extracted)
→ Same result with parallel analysis

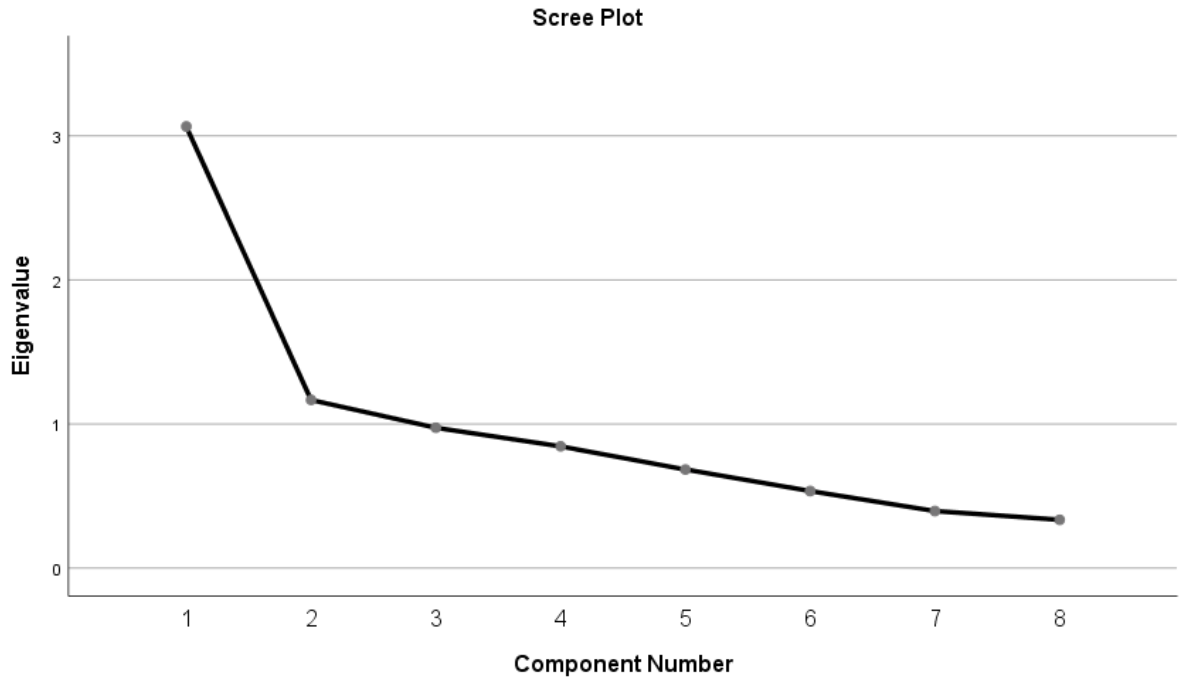
Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	3.065	38.311	38.311	3.065	38.311
2	1.167	14.586	52.897	1.167	14.586
3	.974	12.174	65.071		
4	.845	10.560	75.632		
5	.684	8.552	84.183		
6	.535	6.683	90.866		
7	.396	4.947	95.813		
8	.335	4.187	100.000		

Total Variance Explained

Component	Extraction Sums of Squared Loadings	Rotation Sums of Squared Loadings		
	Cumulative %	Total	% of Variance	Cumulative %
1	38.311	2.495	31.188	31.188
2	52.897	1.737	21.709	52.897
3				
4				
5				
6				
7				
8				

Extraction Method: Principal Component Analysis.



Rotated Component Matrix[a]

	Component	
	1	2
oc_7	.837	
oc_8	.784	
oc_5	.606	.474
oc_3	.596	
oc_4	.486	.351
oc_2		.820
oc_6	.370	.582
oc_1		.560

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 3 iterations.

Reliability test using Cronbach's alpha

Factor 1: .758
oc_3: Employee empowerment & autonomy

oc_4: Variety of job tasks
oc_5: Participative decision making
oc_7: Freedom for risk taking & experimentation
oc_8: Tolerance for mistakes & learning-by-failing

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.758	.759	5

Item Statistics

	Mean	Std. Deviation	N
oc_3	1.52	.621	58
oc_4	2.06	.759	58
oc_5	1.91	.708	58
oc_7	1.84	.744	58
oc_8	1.58	.698	58

Factor 2: .509
oc_1: Culture of innovation
oc_2: Environmental culture
oc_6: Availability of creative time for employees

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.509	.528	3

Item Statistics

	Mean	Std. Deviation	N
oc_1	1.42	.528	58
oc_2	1.57	.596	58
oc_6	1.88	.796	58

Alternative percentage of variance criterion:
→ Min. 60% of total variance explained
→ Hence, 3 factor solution

Rotated Component Matrix[a]

	Component		
	1	2	3
oc_7	.842		
oc_8	.733		
oc_3	.497	.381	
oc_4		.803	
oc_5	.422	.631	
oc_2	-.376	.588	.495
oc_1			.853
oc_6			.640

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 8 iterations.

Reliability test using Cronbach's alpha

Option a)
Factor 1: .683
oc_3: Employee empowerment & autonomy
oc_7: Freedom for risk taking & experimentation

oc_8: Tolerance for mistakes & learning-by-failing

Factor 2: .605
oc_4: Variety of job tasks
oc_5: Participative decision making

Factor 3: .509
oc_1: Culture of innovation
oc_2: Environmental culture
oc_6: Availability of creative time for employees

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.683	.676	3

Item Statistics

	Mean	Std. Deviation	N
oc_3	1.52	.621	58
oc_7	1.84	.744	58
oc_8	1.58	.698	58

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.509	.528	3

Item Statistics

	Mean	Std. Deviation	N
oc_1	1.42	.528	58
oc_6	1.88	.796	58
oc_2	1.57	.596	58

Option b)
Factor 1: .683
oc_3: Employee empowerment & autonomy
oc_7: Freedom for risk taking & experimentation
oc_8: Tolerance for mistakes & learning-by-failing

Factor 2: .575
oc_2: Environmental culture
oc_4: Variety of job tasks
oc_5: Participative decision making

Factor 3: .513
oc_1: Culture of innovation
oc_6: Availability of creative time for employees

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.575	.570	3

Item Statistics

	Mean	Std. Deviation	N
oc_2	1.57	.596	58

oc_4	2.06	.759	58
oc_5	1.91	.708	58

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.513	.545	2

Item Statistics

	Mean	Std. Deviation	N
oc_1	1.42	.528	58
oc_6	1.88	.796	58

Parallel analysis:

Principal Components & Random Normal Data Generation

Specifications for this Run:
Ncases 58
Nvars 8
Ndatsets 1000
Percent 95

Raw Data Eigenvalues, & Mean & Percentile Random Data Eigenvalues

Root	Raw Data	Means	Prcntyle
1.000000	3.064843	1.597325	1.791289
2.000000	1.166898	1.356315	1.494651
3.000000	.973953	1.182612	1.293718
4.000000	.844827	1.036925	1.132197
5.000000	.684156	.904445	.993186
6.000000	.534620	.775644	.876488
7.000000	.395737	.643238	.741907
8.000000	.334966	.503495	.610803

Dimension 4: Vision & strategy

Results based on missing values replaced by mean, n=58

Preliminary analysis – Assumptions:

a) Visual inspection of intercorrelation

Correlation Matrix[a]

		vs_1	vs_2	vs_3	vs_4	vs_5
Correlation	vs_1	1.000	.500	.454	.245	.460
	vs_2	.500	1.000	.308	.103	.341
	vs_3	.454	.308	1.000	.271	.273
	vs_4	.245	.103	.271	1.000	.239
	vs_5	.460	.341	.273	.239	1.000
Sig. (1-tailed)	vs_1		.000	.000	.032	.000
	vs_2	.000		.009	.222	.004
	vs_3	.000	.009		.020	.019
	vs_4	.032	.222	.020		.036
	vs_5	.000	.004	.019	.036	

a. Determinant = .402

→ not strongly correlated but just enough correlation to proceed with an EFA (criterion >.30)

b) Bartlett test of sphericity: < .05
c) KMO: > .5

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.740
Bartlett's Test of Sphericity	Approx. Chi-Square	49.711
	df	10
	Sig.	.000

Factor extraction and rotation:

→ Extraction method used: orthogonal (Varimax) (same results with oblique (obli-min))
→ Latent root criterion: Eigenvalue > 1 criterion → 1 factor (component extracted)
→ Same result with parallel analysis
→ No rotation possible

Total Variance Explained

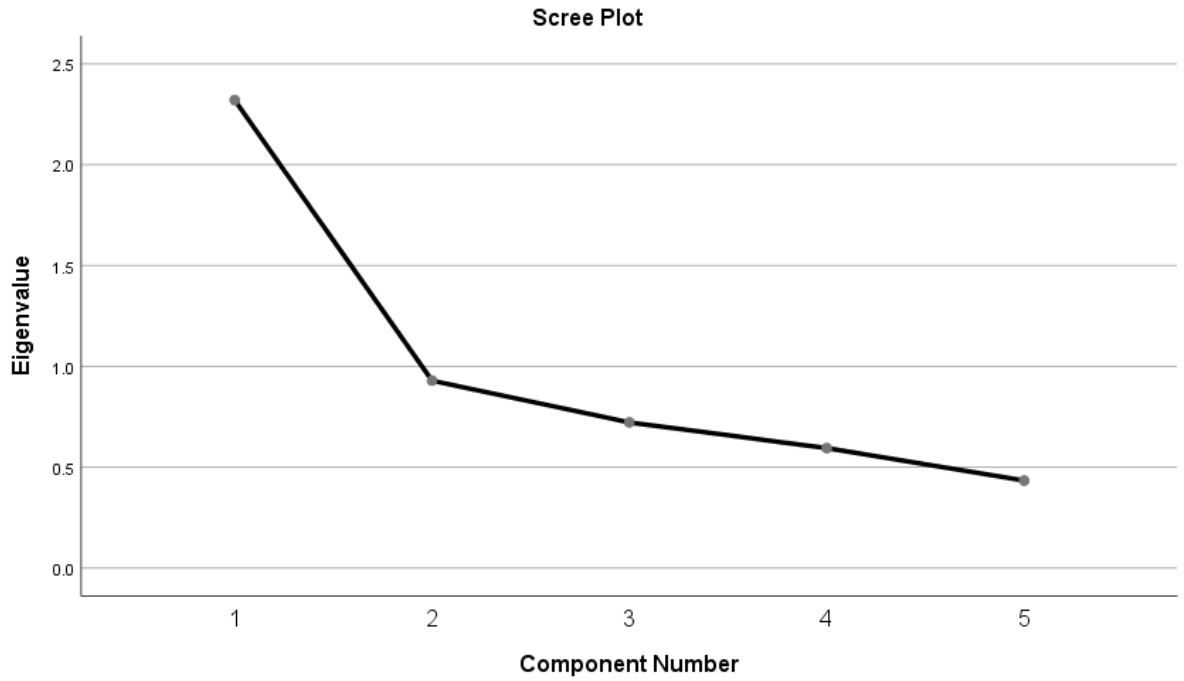
Component	Initial Eigenvalues	Extraction Sums of Squared Loadings

	Total	% of Variance	Cumulative %	Total	% of Variance
1	2.320	46.402	46.402	2.320	46.402
2	.929	18.583	64.986	.929	18.583
3	.722	14.442	79.428		
4	.595	11.897	91.324		
5	.434	8.676	100.000		

Total Variance Explained

	Extraction Sums of Squared Loadings	Rotation Sums of Squared Loadings		
Component	Cumulative %	Total	% of Variance	Cumulative %
1	46.402	2.053	41.064	41.064
2	64.986	1.196	23.921	64.986
3				
4				
5				

Extraction Method: Principal Component Analysis.



Alternative percentage of variance criterion:

→ Min. 60% of total variance explained

→ Hence, 2 factor solution

Rotated Component Matrix[a]

	Component	
	1	2
vs_2	.822	
vs_1	.811	
vs_5	.647	
vs_3	.545	.442
vs_4		.936

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 3 iterations.

Reliability test using Cronbach's alpha

Factor 1: .674
vs_2: Environmental company policies & strategies
vs_1: Sustainability vision & strategy
vs_5: Long-term strategic focus

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.674	.697	3

Item Statistics

	Mean	Std. Deviation	N
vs_1	1.38	.524	58

vs_2	1.76	.683	58
vs_5	1.88	.774	58

Factor 2: .427
vs_3: Clear communication of vision
vs_4: Innovation strategy

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.427	.427	2

Item Statistics

	Mean	Std. Deviation	N
vs_3	1.55	.654	58
vs_4	1.83	.652	58

Parallel analysis:

```
Principal Components & Random Normal Data Generation

Specifications for this Run:
Ncases      58
Nvars        5
Ndatsets  1000
Percent     95

Raw Data Eigenvalues, & Mean & Percentile Random Data Eigenvalues
         Root     Raw Data        Means     Prcntyle
     1.000000     2.320111     1.381320     1.569511
     2.000000      .929171     1.153676     1.274942
     3.000000      .722099      .985505     1.075533
     4.000000      .594842      .825974      .932368
     5.000000      .433778      .653526      .778136
```

Dimension 5: Resource management

Results based on missing values replaced by mean, n=55

Preliminary analysis – Assumptions:

a) *Visual inspection of intercorrelation*

Correlation Matrix[a]

		rm_1	rm_2	rm_3	rm_4	rm_5	rm_6	rm_7
Correlation	rm_1	1.000	.411	.028	.246	.070	.253	.434
	rm_2	.411	1.000	.138	.259	.166	.296	.336
	rm_3	.028	.138	1.000	.198	.355	.208	.147
	rm_4	.246	.259	.198	1.000	.112	.141	.175
	rm_5	.070	.166	.355	.112	1.000	.479	.176
	rm_6	.253	.296	.208	.141	.479	1.000	.240
	rm_7	.434	.336	.147	.175	.176	.240	1.000
Sig. (1-tailed)	rm_1		.001	.419	.035	.305	.031	.000
	rm_2	.001		.158	.028	.113	.014	.006
	rm_3	.419	.158		.074	.004	.064	.143
	rm_4	.035	.028	.074		.209	.152	.100
	rm_5	.305	.113	.004	.209		.000	.100
	rm_6	.031	.014	.064	.152	.000		.039
	rm_7	.000	.006	.143	.100	.100	.039	

a. Determinant = .328

→ Weakly correlated (criterion >.30)

b) Bartlett test of sphericity: < .05
c) KMO: > .5

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.701
Bartlett's Test of Sphericity	Approx. Chi-Square	56.669
	df	21
	Sig.	.000

Factor extraction and rotation:

→ Extraction method used: orthogonal (Varimax) (same results with oblique (oblimin))
→ Latent root criterion: Eigenvalue > 1 criterion → 2 factor (component extracted)
→ Same result with parallel analysis

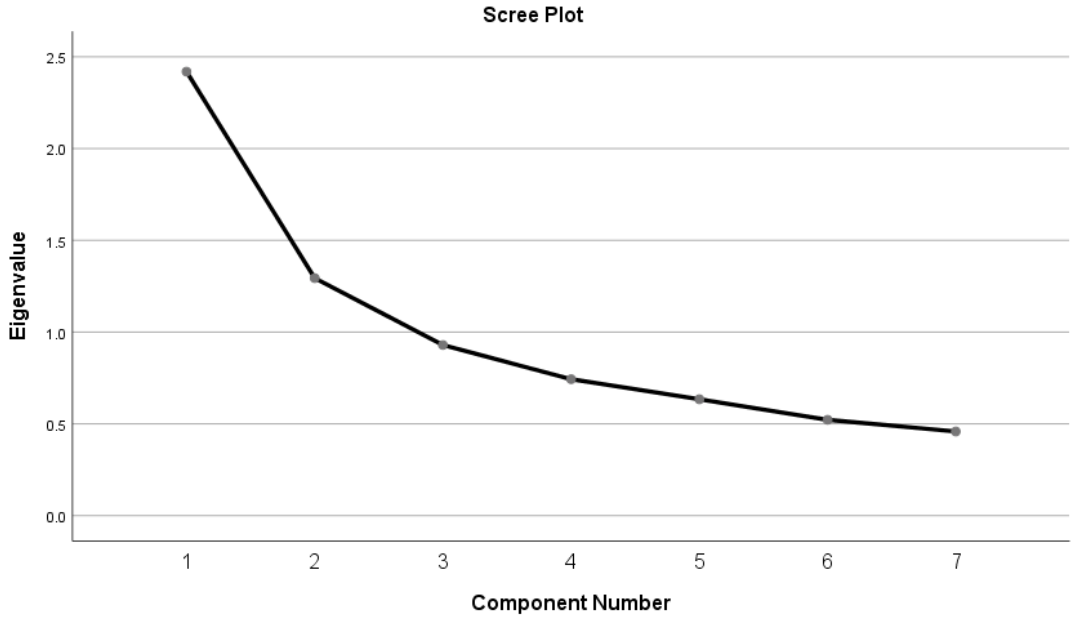
Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	2.419	34.557	34.557	2.419	34.557
2	1.294	18.486	53.043	1.294	18.486
3	.929	13.278	66.322		
4	.743	10.616	76.938		
5	.634	9.057	85.995		
6	.522	7.457	93.452		
7	.458	6.548	100.000		

Total Variance Explained

Component	Extraction Sums of Squared Loadings	Rotation Sums of Squared Loadings		
	Cumulative %	Total	% of Variance	Cumulative %
1	34.557	2.014	28.776	28.776
2	53.043	1.699	24.268	53.043
3				
4				
5				
6				
7				

Extraction Method: Principal Component Analysis.



Rotated Component Matrix[a]

	Component	
	1	2
rm_1	.821	
rm_2	.715	
rm_7	.698	
rm_4	.472	
rm_5		.842
rm_3		.701
rm_6	.337	.652

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 3 iterations.

Reliability test using Cronbach's alpha

Factor 1: .646
rm_1: Qualified & skilled employees
rm_2: Diverse & interdisciplinary workforce
rm_4: Intrinsically motivated employees
rm_7: Technological expertise

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.646	.643	4

Item Statistics

	Mean	Std. Deviation	N

rm_1	1.95	.931	55
rm_2	1.78	.785	55
rm_4	1.59	.653	55
rm_7	2.31	.683	55

Factor 2: .620
rm_3: Green shared values of employees
rm_5: Sustainability training & development
rm_6: Access to financial resources

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.620	.615	3

Item Statistics

	Mean	Std. Deviation	N
rm_3	1.67	.721	55
rm_5	2.23	.853	55
rm_6	2.28	.826	55

Alternative percentage of variance criterion:
→ Min. 60% of total variance explained
→ Hence, 3 factor solution

Rotated Component Matrix[a]

Component		
1	2	3

rm_1	.829		
rm_7	.706		
rm_2	.688		
rm_5		.858	
rm_6	.360	.738	
rm_4			.833
rm_3		.525	.619

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 6 iterations.

Reliability test using Cronbach's alpha

Factor 1: .655
rm_1: Qualified & skilled employees
rm_2: Diverse & interdisciplinary workforce
rm_7: Technological expertise

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.655	.661	3

Item Statistics

	Mean	Std. Deviation	N
rm_1	1.95	.931	55
rm_2	1.78	.785	55
rm_7	2.31	.683	55

Factor 2: .648
rm_5: Sustainability training & development

rm_6: Access to financial resources

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.648	.648	2

Item Statistics

	Mean	Std. Deviation	N
rm_5	2.23	.853	55
rm_6	2.28	.826	55

Factor 3: .329

rm_3: Green shared values of employees

rm_4: Intrinsically motivated employees

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.329	.330	2

Item Statistics

	Mean	Std. Deviation	N
rm_3	1.67	.721	55
rm_4	1.59	.653	55

Parallel analysis:

```
Principal Components & Random Normal Data Generation

Specifications for this Run:
Ncases      55
Nvars        7
Ndatsets  1000
Percent     95

Raw Data Eigenvalues, & Mean & Percentile Random Data Eigenvalues
         Root     Raw Data        Means     Prcntyle
     1.000000     2.419023     1.547908     1.753349
     2.000000     1.294005     1.304875     1.451271
     3.000000      .929487     1.124401     1.236836
     4.000000      .743153      .972482     1.060731
     5.000000      .633992      .829049      .929805
     6.000000      .521956      .687976      .799168
     7.000000      .458384      .533308      .657649
```

Dimension 6: Creativity & idea management

Results based on missing values replaced by mean, n=52

Preliminary analysis – Assumptions:

a) *Visual inspection of intercorrelation*

Correlation Matrix[a]

		cim_1	cim_2	cim_3	cim_4	cim_5	cim_6
Correlation	cim_1	1.000	.670	.482	.132	.306	-.035
	cim_2	.670	1.000	.595	.216	.204	-.016
	cim_3	.482	.595	1.000	.386	.352	.137
	cim_4	.132	.216	.386	1.000	.247	.219
	cim_5	.306	.204	.352	.247	1.000	.574
	cim_6	-.035	-.016	.137	.219	.574	1.000
Sig. (1-tailed)	cim_1		.000	.000	.176	.014	.404
	cim_2	.000		.000	.062	.074	.456
	cim_3	.000	.000		.002	.005	.167
	cim_4	.176	.062	.002		.039	.060
	cim_5	.014	.074	.005	.039		.000
	cim_6	.404	.456	.167	.060	.000	

a. Determinant = .149

→ not strongly correlated but enough correlation to proceed with an EFA (criterion >.30)

b) Bartlett test of sphericity: < .05
c) KMO: > .5

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.645
Bartlett's Test of Sphericity	Approx. Chi-Square	91.754
	df	15
	Sig.	.000

Factor extraction and rotation:

→ Extraction method used: orthogonal (Varimax) (same results with oblique (obli-min))
→ Latent root criterion: Eigenvalue > 1 criterion → 2 factor (component extracted)
→ Same result with parallel analysis

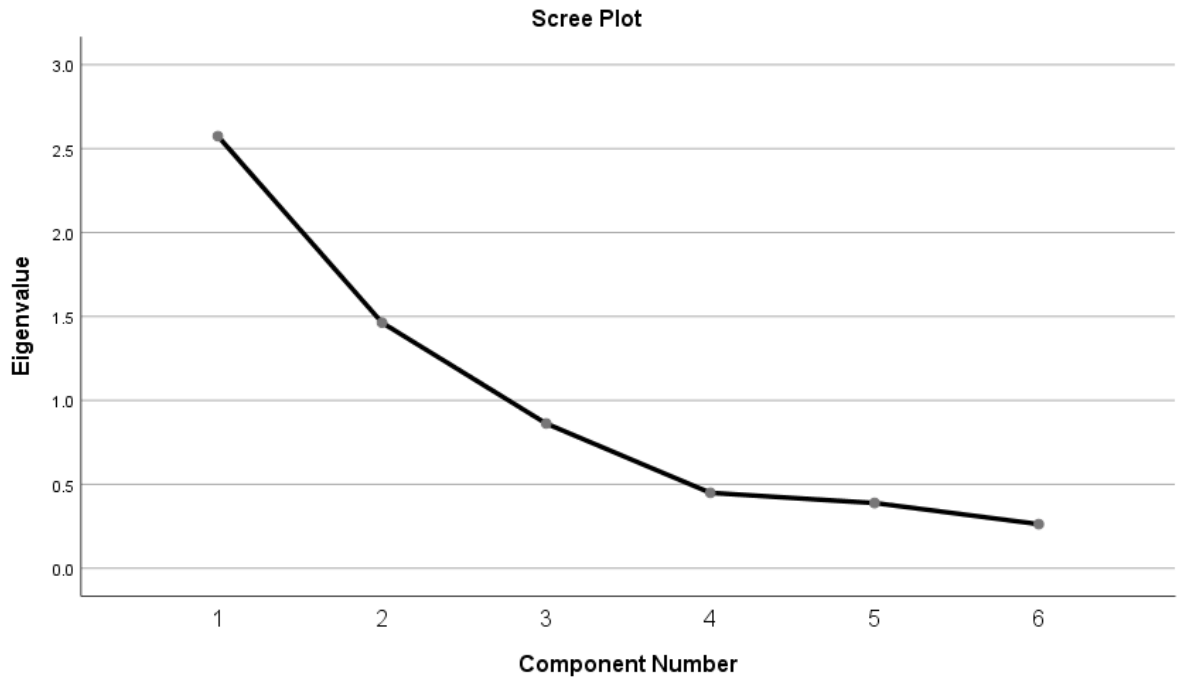
Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	2.574	42.903	42.903	2.574	42.903
2	1.463	24.387	67.291	1.463	24.387
3	.862	14.370	81.661		
4	.449	7.487	89.148		
5	.389	6.476	95.624		
6	.263	4.376	100.000		

Total Variance Explained

Component	Extraction Sums of Squared Loadings	Rotation Sums of Squared Loadings		
	Cumulative %	Total	% of Variance	Cumulative %
1	42.903	2.252	37.529	37.529
2	67.291	1.786	29.762	67.291
3				
4				
5				
6				

Extraction Method: Principal Component Analysis.



Rotated Component Matrix[a]

	Component	
	1	2
cim_2	.892	
cim_1	.844	
cim_3	.761	.319
cim_6		.882
cim_5		.819
cim_4	.302	.482

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 3 iterations.

Alternative percentage of variance criterion:
→ Min. 60% of total variance explained
→ Hence, 2 factor solution

Reliability test using Cronbach's alpha

Factor 1: .807
cim_1: Employee creativity
cim_2: Employee idea contribution
cim_3: Team creativity

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.807	.807	3

Item Statistics

	Mean	Std. Deviation	N

cim_1	1.58	.637	52
cim_2	1.60	.603	52
cim_3	1.43	.598	52

Factor 2: .596
cim_4: Rewarding innovative ideas
cim_5: Green creativity through eco-design
cim_6: Green creativity through biomimicry

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.596	.614	3

Item Statistics

	Mean	Std. Deviation	N
cim_4	1.94	.873	52
cim_5	1.69	.728	52
cim_6	2.07	.733	52

Factor 2 – when cim_4 is excluded: .730
cim_5: Green creativity through eco-design
cim_6: Green creativity through biomimicry

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items

.730	.730	2

Item Statistics

	Mean	Std. Deviation	N
cim_5	1.69	.728	52
cim_6	2.07	.733	52

```
PARALLEL ANALYSIS:

Principal Components & Random Normal Data Generation

Specifications for this Run:
Ncases      52
Nvars        6
Ndatsets  1000
Percent     95

Raw Data Eigenvalues, & Mean & Percentile Random Data Eigenvalues
         Root     Raw Data        Means     Prcntyle
     1.000000     2.574210     1.480823     1.671995
     2.000000     1.463249     1.238821     1.382673
     3.000000      .862197     1.057945     1.163471
     4.000000      .449238      .901547     1.000830
     5.000000      .388572      .745336      .855498
     6.000000      .262534      .575528      .703994
```

Dimension 7: Knowledge management

Results based on missing values replaced by mean, n=55

Preliminary analysis – Assumptions:

a) *Visual inspection of intercorrelation*

Correlation Matrix[a]

		km_1	km_2	km_3	km_4	km_5	km_6	km_7
Correlation	km_1	1.000	.523	.358	.126	.097	.387	.339
	km_2	.523	1.000	.446	.258	.007	.272	.374
	km_3	.358	.446	1.000	.511	.169	.411	.509
	km_4	.126	.258	.511	1.000	.262	.288	.320
	km_5	.097	.007	.169	.262	1.000	.266	.202
	km_6	.387	.272	.411	.288	.266	1.000	.477
	km_7	.339	.374	.509	.320	.202	.477	1.000
Sig. (1-tailed)	km_1		.000	.004	.181	.242	.002	.006
	km_2	.000		.000	.029	.479	.022	.002
	km_3	.004	.000		.000	.109	.001	.000
	km_4	.181	.029	.000		.027	.016	.009
	km_5	.242	.479	.109	.027		.025	.070
	km_6	.002	.022	.001	.016	.025		.000
	km_7	.006	.002	.000	.009	.070	.000	

a. Determinant = .172

→ not strongly correlated but enough correlation to proceed with an EFA (criterion >.30)

b) Bartlett test of sphericity: < .05
c) KMO: > .5

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.768
Bartlett's Test of Sphericity	Approx. Chi-Square	89.444
	df	21
	Sig.	.000

Factor extraction and rotation:

→ Extraction method used: orthogonal (Varimax) (same results with oblique (obli-min))
→ Latent root criterion: Eigenvalue > 1 criterion → 2 factor (component extracted)
→ Same result with parallel analysis

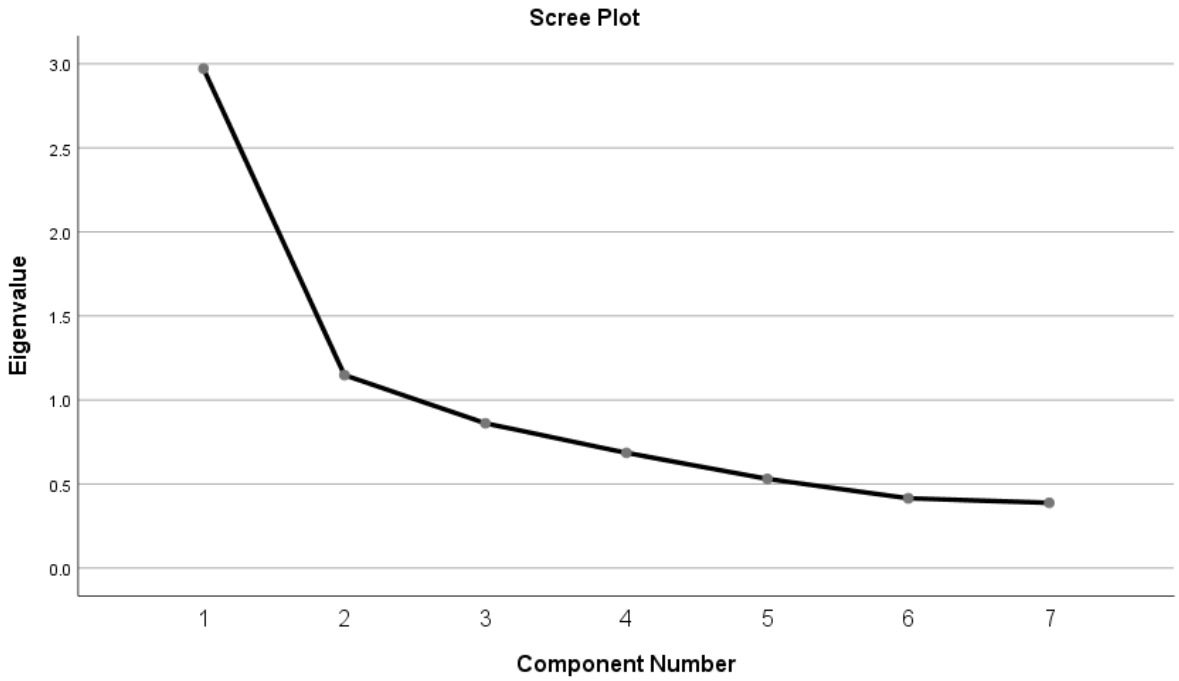
Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	2.971	42.450	42.450	2.971	42.450
2	1.148	16.401	58.851	1.148	16.401
3	.861	12.304	71.156		
4	.685	9.792	80.948		
5	.530	7.577	88.525		
6	.415	5.932	94.457		
7	.388	5.543	100.000		

Total Variance Explained

Component	Extraction Sums of Squared Loadings	Rotation Sums of Squared Loadings		
	Cumulative %	Total	% of Variance	Cumulative %
1	42.450	2.260	32.288	32.288
2	58.851	1.859	26.563	58.851
3				
4				
5				
6				
7				

Extraction Method: Principal Component Analysis.



Rotated Component Matrix[a]

	Component	
	1	2
km_2	.828	
km_1	.791	
km_3	.592	.519
km_7	.557	.487
km_5		.767
km_4		.694
km_6	.465	.530

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 3 iterations.

Reliability test using Cronbach's alpha

Factor 1: .747
km_1: Industry knowledge
km_2: Environmental Research & Development

km_3: Internal knowledge sources
km_7: Utilisation of new knowledge

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.747	.747	4

Item Statistics

	Mean	Std. Deviation	N
km_1	2.33	.720	55
km_2	1.97	.769	55
km_3	2.00	.694	55
km_7	1.73	.732	55

Factor 2: .526
km_4: Knowledge creation & sharing
km_5: Organisational learning
km_6: External knowledge sources

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.526	.529	3

Item Statistics

	Mean	Std. Deviation	N
km_4	1.64	.677	55
km_5	1.60	.627	55
km_6	1.91	.776	55

Alternative percentage of variance criterion:
→ Min. 60% of total variance explained
→ Hence, 3 factor solution

Rotated Component Matrix[a]

	Component		
	1	2	3
km_1	.861		
km_2	.746	.326	
km_7	.518	.429	.312
km_4		.889	
km_3	.426	.737	
km_5			.882
km_6	.529		.552

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 5 iterations.

Parallel analysis:

```
Principal Components & Random Normal Data Generation

Specifications for this Run:
Ncases      55
Nvars        7
Ndatsets  1000
Percent     95

Raw Data Eigenvalues, & Mean & Percentile Random Data Eigenvalues
         Root     Raw Data        Means     Prcntyle
     1.000000     2.971498     1.547908     1.753349
     2.000000     1.148087     1.304875     1.451271
     3.000000      .861311     1.124401     1.236836
     4.000000      .685454      .972482     1.060731
     5.000000      .530401      .829049      .929805
     6.000000      .415206      .687976      .799168
     7.000000      .388044      .533308      .657649
```

Dimension 8: Open innovation & collaboration

Results based on missing values replaced by mean, n=52

Preliminary analysis – Assumptions:

a) *Visual inspection of intercorrelation*

Correlation Matrix[a]

		oic_1	oic_2	oic_3	oic_4	oic_5	oic_6
Correlation	oic_1	1.000	.407	.495	.131	.052	.178
	oic_2	.407	1.000	.339	.338	.259	.406
	oic_3	.495	.339	1.000	.257	.184	.070
	oic_4	.131	.338	.257	1.000	.758	.523
	oic_5	.052	.259	.184	.758	1.000	.614
	oic_6	.178	.406	.070	.523	.614	1.000
Sig. (1-tailed)	oic_1		.001	.000	.176	.358	.104
	oic_2	.001		.007	.007	.032	.001
	oic_3	.000	.007		.033	.096	.310
	oic_4	.176	.007	.033		.000	.000
	oic_5	.358	.032	.096	.000		.000
	oic_6	.104	.001	.310	.000	.000	

a. Determinant = .116

→ not strongly correlated but enough correlation to proceed with an EFA (criterion >.30)

b) Bartlett test of sphericity: < .05
c) KMO: > .5

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.672
Bartlett's Test of Sphericity	Approx. Chi-Square	103.570
	df	15
	Sig.	.000

Factor extraction and rotation

→ Extraction method used: orthogonal (Varimax) (same results with oblique (obli-min))
→ Latent root criterion: Eigenvalue > 1 criterion → 2 factor (component extracted)
→ Same result with parallel analysis

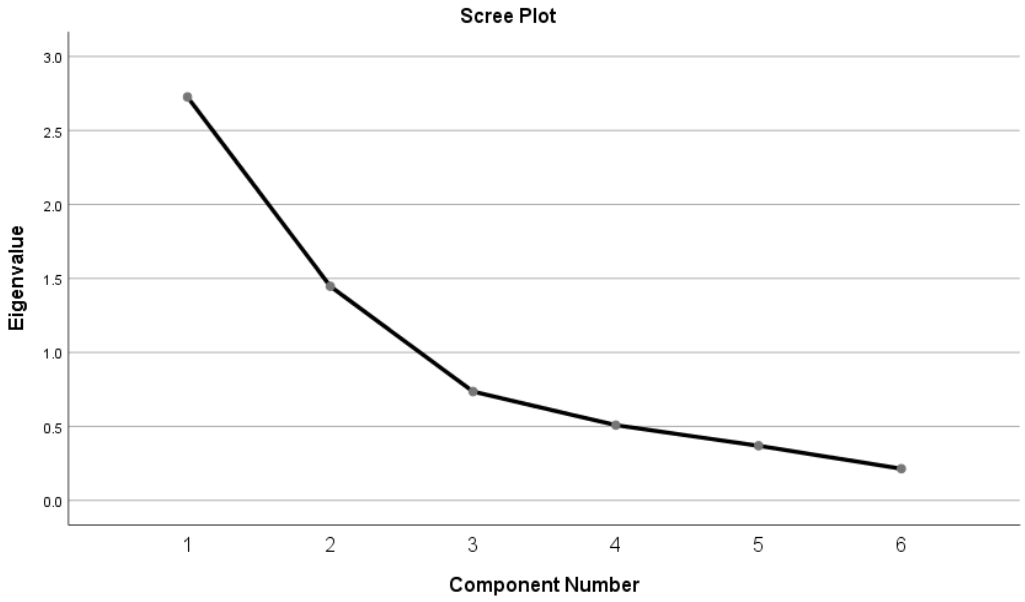
Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	2.726	45.436	45.436	2.726	45.436
2	1.447	24.119	69.555	1.447	24.119
3	.735	12.254	81.809		
4	.508	8.475	90.284		
5	.369	6.149	96.433		
6	.214	3.567	100.000		

Total Variance Explained

Component	Extraction Sums of Squared Loadings	Rotation Sums of Squared Loadings		
	Cumulative %	Total	% of Variance	Cumulative %
1	45.436	2.354	39.236	39.236
2	69.555	1.819	30.319	69.555
3				
4				
5				
6				

Extraction Method: Principal Component Analysis.



Rotated Component Matrix[a]

	Component	
	1	2
oic_5	.909	
oic_4	.858	
oic_6	.803	
oic_1		.857
oic_3		.797
oic_2	.375	.635

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 3 iterations.

Reliability test using Cronbach's alpha

Factor 1: .680
oic_1: Collaboration with suppliers
oic_2: Collaboration with business partners
oic_3: Collaboration with customers through user experience

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.680	.679	3

Item Statistics

	Mean	Std. Deviation	N
oic_1	1.73	.687	52

oic_2	1.71	.637	52
oic_3	1.60	.721	52

Factor 2: .838
oic_4: Collaboration with universities / and / or research centres
oic_5: Collaboration with local government
oic_6: Collaboration with environmental groups

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.838	.837	3

Item Statistics

	Mean	Std. Deviation	N
oic_4	2.36	.892	52
oic_5	2.75	.860	52
oic_6	2.34	.795	52

Parallel analysis:

```
Principal Components & Random Normal Data Generation

Specifications for this Run:
Ncases      52
Nvars        6
Ndatsets  1000
Percent     95

Raw Data Eigenvalues, & Mean & Percentile Random Data Eigenvalues
         Root     Raw Data        Means     Prcntyle
     1.000000     2.726186     1.480823     1.671995
```

2.000000	1.447124	1.238821	1.382673
3.000000	.735258	1.057945	1.163471
4.000000	.508480	.901547	1.000830
5.000000	.368946	.745336	.855498
6.000000	.214006	.575528	.703994