

ESSAYS ON THE COMPETITIVE ADVANTAGE FROM ENVIRONMENTAL MANAGEMENT IN SMES

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EXECUTIVE SUMMARY

Organisations are increasingly integrating the concerns for the natural environment into their strategies, operations and processes. And Small and Medium-Sized Enterprises (SMEs) have been of interest to researchers since such firms are recognised as central contributors to the global economy and as having a significant aggregate impact on the natural environment. Traditionally literature has pointed to the SMEs lack of resources making them unable to initiate improvements in environmental management but studies in recent years suggest that SMEs in fact have a ‘greening’ potential because owner-managers motivated by the potential cost savings, new customers, and improved public image actively engage in solving environmental problems. In other words: there seems to be a business case for sustainability.

This dissertation aims to shed light on the strategic significance of environmental management in SMEs. The overall research question is: *How can SMEs be able to commit with environmental protection and improve their competitive advantage at the same time?* In addressing this research question, this dissertation explores SMEs’ engagement in environmental protection is implemented through environmental management practices. This PhD research also studies some organisational attributes developed among SMEs that establish complex relationships with the portfolios of environmental management practices when pursuing the business case for environmental protection. Hence, this dissertation subscribes to the growing research that is moving away from determining ‘whether’ it pays to be green, and attempts instead to address nuanced alternatives such as ‘when’, ‘how’ and ‘why’ it pays to be green.

This dissertation comprises of three empirical articles, all of which interrelated and addressing the overall research question. **Article 1** explores the SMEs’ development at strategic level when environmental initiatives are adopted in relation to (i) the impact of motivators (i.e., the managerial attitudes and strategic intent, and (ii) the effects on the competitive advantage (e.g. in terms of lower costs and differentiation). Through a quantitative analysis of four repeated surveys among Danish SMEs, the article shows that such firms have reached an overall maturity where the integration of environmental issues has become part of the strategy - meaning that there has been an incremental adoption of environmental initiatives at the strategic level. The results also show that despite that the managerial attitudes as well as the strategic intent are determinant for which initiatives are adopted, then the strategic intent remains the strongest driver for organisational response and change. This indicates that SMEs consider environmental commitment as a source of business and market opportunities more than a manifestation of moral values and mind-sets of owner-managers. Moreover, the adoption of environmental initiatives at the strategic level positively and substantially influences two dimensions of the competitive advantage: lower costs and the possibility of differentiation. This accounts for the strategic relevance of such initiatives among SMEs. Thus, this article provides a better understanding of the process of corporate strategic greening through the study of the competitive outcomes that follow from motivators that influence environmental initiatives.

The aim of **article 2** is to identify and characterise the complementary assets that allow SMEs to materialise competitive advantages by means of the implementation of environmental management

practices. Drawing on Teece's innovation-value-capture-framework, the article shows that SMEs are able to handle weak appropriability regimes with regard to their environmental management practices. That is, improvements in the competitive advantage, stemming from such practices, may not be long-lasting and thus complementary assets are required to the competitive benefits obtained. Based on the analysis of qualitative data from 15 Danish SMEs operating in the printing and graphic industry, the article reveals that two main complementary assets are developed among such firms, i.e., technology and process innovation, and environmental communication. Technology and process innovation are categorised as generic complementary assets, whereas two variants of environmental communication, i.e., reactive and proactive, are respectively related to generic and specialised complementary assets. The study contributes to an in-depth understanding of the importance of internal organisational attributes in determining variations in SMEs' competitive behaviour when they establish complex relationships with strategies to deal with environmental challenges.

Finally, **article 3** investigates which role the environmental communication, understood as organisational capabilities, plays in the relationship between environmental management practices and perceived competitive advantages. Through an analysis of quantitative data from 112 printing and graphic SMEs in Denmark, the study shows that such firms implement portfolios of environmental management practices that target management-related, process-related, and product-related aspects. Further, organisational capabilities for environmental communication mediate the relationship between environmental management practices and perceived competitive advantages in terms of lower costs and better reputation. That is, environmental management practices improve the competitive advantage through the development of organisational capabilities materialised in the form of environmental communication. Particularly, organisational capabilities for environmental communication are deployed so as to make the SMEs' environmental management practices visible to external stakeholders. The article contributes to a better understanding of how and why organisational responsiveness to environmental challenges creates value in SMEs rather than just determining whether it 'pays' or not.

RESUMÉ

Organisationer integrerer i stigende omfang miljøhensyn i deres strategi- og driftsprocesser, herunder små og mellemstore virksomheder (SMVer). Sidstnævnte er vigtige, da disse virksomheder ikke alene er centrale bidragsydere til den globale økonomi men også bidrager med en væsentlig indflydelse på miljøet i den store sammenhæng. I litteraturen er SMVernes manglende ressourcer til miljøformål traditionelt blevet påpeget som en hindring for, at de kan initiere forbedringer i deres miljøledelse. Men i de senere år er det blevet understreget i flere undersøgelser, at SMVer har et væsentligt potentiale for miljøforbedringer som følge af omkostningsreduktioner, nye kunder og et forbedret offentligt omdømme. Eller sagt på en anden måde: der forekommer at være mulighed for en oplagt business case.

Med denne afhandling vil jeg forsøge at kaste lys over, hvilken betydning miljøledelsen i SMVerne har på det strategiske plan. Det overordnede forskningsspørgsmål i afhandlingen er: *Hvordan kan SMVer engagere sig i miljøbeskyttelse, samtidig med at de forbedrer deres konkurrencefordel?* For at besvare dette spørgsmål, undersøges i afhandlingen, hvordan SMVernes miljøbeskyttelse udmøntes ved, at de implementerer miljøledelsesmæssige tiltag. Afhandlingen undersøger også nogle organisatoriske forhold i SMVerne, som etablerer komplekse relationer med porteføljer af miljømæssige tiltag for at nå forretningsmæssige fordele i forhold til miljøbeskyttelse. Dermed tilslutter denne afhandling sig den voksende forskning, der bevæger sig væk fra at finde, 'om' det betaler sig at være grøn, altså miljøbevidst. Den forsøger i stedet, at besvare nuancerede alternativer såsom 'når', 'hvordan' og 'hvorfor' det betaler sig at være grøn.

Denne afhandling indeholder tre uafhængige empiriske artikler, der alle sigter efter at besvare det overordnede forskningsspørgsmål. I **artikel 1** undersøges, hvordan SMVerne har udviklet sig i forbindelse med miljømæssige tiltag på det strategiske niveau, i forhold til (i) hvilken betydning de motiverende faktorer har (fx ledelsens holdning og ønskede strategi), og (ii) de afledte virkninger, hvad angår konkurrencefordele (fx lavere omkostninger og differentiering). Gennem en kvantitativ analyse af fire gentagne spørgeskemaundersøgelser blandt danske SMVer påvises det, at sådanne virksomheder overordnet set har nået et modenhedsniveau, hvor miljømæssige tiltag er blevet en del af strategien - dvs. der har været en stigende implementering af miljømæssige initiativer på det strategiske niveau. Resultaterne viser også, at på trods af, at ledelsens holdning og strategiske hensigt er afgørende for, hvilke initiativer der gennemføres, så forbliver den strategiske intention den klart vigtigste drivkraft for organisationens miljøadfærd. Dette antyder, at SMVer anser miljøforpligtelser som en mulighed for forretningsmæssige og markeds-mæssige muligheder snarere end blot et udtryk for ejer-ledernes moralske værdier og mindsets. Yderligere har gennemførelse af miljømæssige tiltag på det strategiske niveau en positiv og vigtig indflydelse på to aspekter af konkurrenceevnen: lavere omkostninger og mulighed for differentiering. Dette understreger den langsigtede forretningsmæssige betydning, som sådanne initiativer kan have i SMVerne. Således bidrager denne artikel til en dybere forståelse af processen omkring strategisk miljøbevidsthed i erhvervslivet, der er afgørende for miljømæssige initiativer, på baggrund af de konkurrencemæssige resultater, der bunder i forskellige motiverende faktorer.

Formålet med **artikel 2** er at identificere og karakterisere de aktiver, der gør det muligt for SMVer at opnå konkurrencefordele gennem implementering af miljøledelsesmæssige tiltag. Ved hjælp af Teece's model vedrørende innovation-værdiskabelse påvises det i artiklen, at SMVer er i stand til at håndtere selv svag appropriabilitet, når det drejer sig om deres miljøledelsesmæssige tiltag. Det indebærer imidlertid, at forbedringer i konkurrenceevnen afledt af sådanne tiltag, næppe vil være længerevarende og derfor er yderligere tiltag påkrævet for at fastholde de opnåede konkurrencemæssige fordele. Baseret på analysen af kvalitative data fra 15 danske SMVer inden for den grafiske industri påvises det i artiklen, at to vigtige komplementære aktiver kan udvikles i sådanne virksomheder, nemlig teknologi- og procesinnovation samt miljøkommunikation. Teknologi- og procesinnovation kategoriseres som generiske komplementære aktiver. To varianter af miljøkommunikation - en reaktive hhv. en proaktive, er hver for sig relateret til generiske og specialiserede komplementære aktiver. Undersøgelsen bidrager til at give en dybere forståelse for vigtigheden af interne organisatoriske tiltag i forbindelse med forskellige typer af konkurrencemæssige adfærd i SMVerne, når de etablerer komplekse relationer med strategier, der kan håndtere miljømæssige udfordringer.

Endelig undersøges det i **artikel 3**, hvilken rolle miljømæssig kommunikation, forstået som organisatoriske kapabiliteter, har i relationen mellem miljøledelsesmæssige tiltag og den heraf afledte konkurrencefordel. Gennem analysen af kvantitative data fra 112 SMVer indenfor den grafiske branche i Danmark påvises det, at sådanne virksomheder implementerer en række miljøledelsesmæssige tiltag rettet mod forskellige ledelsesrelaterede, procesrelaterede og produktrelaterede aspekter. Yderligere har organisatoriske kapabiliteter relateret til miljømæssig kommunikation en forstærkende effekt mellem miljøledelsesmæssige tiltag og virksomhedens konkurrencesituation (i form af lavere omkostninger og bedre omdømme). Det betyder, at miljøledelsesmæssige tiltag forbedrer konkurrenceevnen ved, at der udvikles nogle organisatoriske kapabiliteter, der manifesterer sig i form af miljømæssig kommunikation. Sidstnævnte benyttes specielt til at synliggøre SMVernes miljøledelsesmæssige tiltag over for eksterne interessenter. Artiklen bidrager til en bedre forståelse af, hvordan og hvorfor organisatorisk lydørhed over for miljømæssige udfordringer skaber værdi i SMVerne ud over blot at fastlægge, om 'det kan betale sig' eller ej.

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CHAPTER 1:

INTRODUCTION –

BACKGROUND RESEARCH, RESEARCH QUESTIONS, CENTRAL CONSTRUCTS, RESEARCH DESIGN AND METHODS, AND ARTICLE OVERVIEW

Human activity towards continuous industrial growth and progress entail prosperity and wealth to society. This, however, has been forcing a rapid and irreversible global transition that threatens the ability to sustain living species (Fombrun and Shanley, 1990). Since the 1960s a ‘green wave’ or ‘modern environmental movement’ have been calling the attention to the portfolio environmental problems, initially focused on water and air issues (Esty and Winston, 2006; Hoffman and Bansal, 2012). Over the last years, the list of environmental concern has expanded into other areas. Estimated boundaries of parameters that are proxies for climate change, rate of biodiversity loss, and nitrogen removal from the atmosphere have been overly surpassed heavily due to industrial activity (Grewatsch and Kleindienst, 2015). Understanding these trends of the natural environment is thus critical for business managers and leaders to the same extent as social, economic, technological and market trends (Shrivastava, 1995b; Esty and Winston, 2006; UNEP, 2013).

The abovementioned areas of concern in relation to the natural environment have been included in governmental programs, institutions and rules of the business game. Correspondingly, firms have recognised the implications of deteriorated environmental conditions for their own business: raw material availability and resource scarcity, increased costs of operations and energy, supply chain disruptions, conflicts with stakeholders over limited supply and reputational damages (UNEP, 2013). Although industrial firms have been seen as the source of the problem, they have been increasingly considered as the source of the solution (Hoffman and Bansal, 2012). Initial approaches to the intersection of business activity and environmental protection included the compliance of regulatory demands and some actions towards pollution prevention and total quality environmental management (Hart, 1995; Sharma, 2000). However, the demands for a ‘greening’ of firms’ operations, inputs and outputs has shifted to more aggressive measures such as market shifts favouring lower-carbon products and recovered/reused e-waste, resource-efficient products, and the pursuit of innovative clean technologies (Hart and Dowell, 2011; Hoffman and Bansal, 2012; UNEP, 2013).

Academic research has consistently developed with the increased attention to environmental protection in managerial practice. The field of organisations and natural environment (ONE) has been consolidated as a stream of research interested in examining the decision-making and corporate behaviour in connection with the management of environmental issues in businesses (Hoffman and Bansal, 2012; Hoffman and Georg, 2013). Among other contributions, scholars in the ONE field have advocated that managers and business leaders can deal with the interface

between business and the natural environment strategically and not just as a normative matter (Hart, 1995; Sharma, 2000; Aragón-Correa and Sharma, 2003). That is, firms are able to find solutions to the current challenges in the natural environment, while at the same time become more competitive (Hart, 1995; Aragón-Correa and Sharma, 2003; Esty and Winston, 2006).

While most empirical examinations of the strategic importance of environmental management practices have focused on larger firms, small and medium-sized enterprises (SMEs) remain an under-researched setting. SMEs are essential for the economies and industrialisation of nations. In OECD countries, for example, they account for more than 95 per cent of the total number of manufacturing firms, with an even larger share for certain service sectors (OECD, 2005). Correspondingly, this setting constitutes a large population of firms that exert significant environmental impact as a whole even though the contribution of an individual firm can be considered as low (Gadenne *et al.*, 2009; Constantinou *et al.*, 2010). For instance, in the European Union, SMEs generate approximately 64 percent of industrial pollution in terms of carbon emissions, volatile organic compounds and hazardous waste, among others. Indeed, the amount of pollution from SMEs can reach over 85% in some industrial sectors (Constantinou *et al.*, 2010). Further, in the UK it is estimated SMEs account for about 80% of pollution incidents and 60% of commercial waste (NetRegs, 2003).

Given the above, scholars and policymakers have increasingly recognised that SMEs have an integral role in providing solutions to environmental problems (Revell *et al.*, 2010). However, most of the existing academic knowledge in the ONE field related to environmental issues in SMEs has primarily justified how difficult it is for them to effectively implement environmental management practices (Tilley, 1999; del Brío and Junquera, 2003; Gadenne *et al.*, 2009). Recent research, however, has suggested that SMEs have a potential to actively addressing the issue of making products, processes, and technologies more natural environment ‘friendly’ (Bos-Brouwers, 2010; Revell *et al.*, 2010; Uhlener *et al.*, 2012). This stream departs from recognising the characteristics that distinguish SMEs from their larger counterparts (Merz and Sauber, 1995; Dean *et al.*, 1998; Yu, 2001) that facilitate the decision-making and actions towards the management of environmental issues. Some studies have also provided evidence of the organisational responses to current environmental challenges as a strategic parameter to boost SMEs’ competitiveness (Aragón-Correa *et al.*, 2008; Brammer *et al.*, 2012; Leonidou *et al.*, 2015).

This dissertation can be considered as part of the continuing efforts in this latter approach regarding the strategic management of environmental issues in the SME setting. I aim in general, to get some insight in relation to the influence of the adoption of environmental management practices on competitive advantage in such firms. This general purpose is specified in the form of four specific research questions that are formulated later in this chapter. My point of departure is the assumption that SMEs can engage with environmental protection through the implementation of portfolios of environmental management practices (Bos-Brouwers, 2010; Klewitz and Hansen, 2014; Johnson and Schaltegger, 2016). At the same time, I draw on the argument that “SMEs may be coming round to the idea that there is a business case for sustainability” (Revell *et al.*, 2010, p. 273). In that vein, exploring the strategic significance of these practices means moving a step forward in the study of the management of the interface between business and natural environment in SMEs.

Through this dissertation, I seek to address several gaps and calls for research in literature of the ONE field. With some exemptions (Aragón-Correa *et al.*, 2008; Leonidou *et al.*, 2015), studies that made attempts to provide evidence of the strategic significance of environmental management practices in SMEs are mostly based on anecdotal information and thus lack conceptual and theoretical foundations. In that vein, I draw on organisational change literature (Rajagopalan and Spreitzer, 1997), the resource-based view (RBV) of the firm (Rumelt, 1984; Wernerfelt, 1984; Dierickx and Cool, 1989; Barney, 1991), and the innovation-value-capturing-framework (Teece, 1986) to the formulation and hypothesis and the analysis of data. The engagement with the application of multiple theoretical lenses is consistent with the anchoring of the ONE field in terms of the dialogue with disciplines of strategy and organisational theory (Hoffman and Georg, 2013).

My interest in the strategic significance of environmental management practices in SMEs lies around a look at the relationship between these practices and competitive advantage. Literature in the ONE field has referred to the theoretical question whether *it pays to be green* to represent such a relationship (King and Lenox, 2001; Orsato, 2006; Russo and Minto, 2012). However, for the case of this dissertation, I particularly address the call for the exploration of variations of that question such as ‘how’ and ‘why’ *it pays to be green* (Reinhardt, 1998; King and Lenox, 2001; Orsato, 2006; Pelozo, 2009; Russo and Minto, 2012), in a specific context such as SMEs. From a methodological stance, this dissertation addresses the call for longitudinal analyses and the use of both quantitative and qualitative methods in that empirical setting (Worthington and Patton, 2005; Aragón-Correa *et al.*, 2008; Revell *et al.*, 2010; Leonidou *et al.*, 2015).

In order to meet the dissertation’s purpose, I followed a research design based on a mixed-method approach (Tashakkori and Teddlie, 2010; Creswell and Plano Clark, 2011). Quantitative and qualitative methods for data collection and analysis are combined sequentially so as to provide a context-specific characterisation of the central constructs and explore the relationships among them (Morgan, 1998; Creswell and Plano Clark, 2011). In terms of the empirical setting, the research design consists of an initial quantitative exploration of Danish manufacturing SMEs. Then, a qualitative case study and a quantitative analysis are carried out among in a narrower setting, i.e., Danish SMEs operating in the printing and graphic sector. The main findings of the different stages in the research design are reported in three articles. Table 1 provides an outline the results and the related objectives in each stage of the research design.

The remaining part of this dissertation is organised as follows. With regard to this chapter, after this section, I sketch out the structure of the dissertation (see Table 1) so as to provide the reader with an overview of the contents of each chapter. This is followed by a discussion of the theoretical background and previous findings that constitute the foundation of the thesis. Then, I present the research questions that guide the dissertation. Next, I elaborate on the discussion of central constructs that are recurrently used throughout the discussion in the articles. The chapter closes with an account of the research design and methods as well as the contents of the three articles and the relationship among them. The next three chapters (2, 3, and 4) correspond to the three empirical articles, respectively. Finally, in chapter 5, I discuss the dissertation’s main conclusions together with the contributions, limitations and practical implications.

Table 1. Dissertation structure

Chapter	Content	Aim
Chapter 1: Introduction	This chapter introduces the main topic of the dissertation by outlining the theoretical background and findings of previous research, i.e., the strategic significance of environmental management practices in SMEs in terms of their relationship with improved competitive advantage. Furthermore, I discuss two core constructs that are approached throughout the dissertation, i.e., environmental management practices and competitive advantage. Then, I present the research questions to be addressed in all the three articles. Subsequently, I discuss the considerations about philosophy of science, the empirical settings as well as research design and methods. Finally, I summarise the content of the articles and the relationship between them.	To introduce the call for research that has motivated this dissertation regarding the strategic aspects of environmental commitment of SMEs; To discuss the reasoning behind the combination of quantitative and qualitative research methods in order to address the dissertation's research questions; To explicate how the individual articles enhance our understanding of the relationship between environmental management practices and competitive advantage in SMEs.
Chapter 2: Article	<i>Focus:</i> The development over time in SMEs in terms of environmental initiatives at strategic level, the influence of managerial attitudes and strategic intent, and the effects on both lower costs and differentiation dimensions of competitive advantage. <i>Setting:</i> Multi-sector manufacturing SMEs in Denmark. <i>Key findings:</i> Danish SMEs have increasingly adopted environmental initiatives at strategic level predominantly driven by strategic intent in comparison with managerial attitudes, whereas the effects on lower costs and differentiation are similar at each point over time. Despite the overall positive effects found in the analysis, there are no clear patterns that could reveal a development in terms of the strength of the relationships.	To observe a form of organisational change among SMEs in terms of developments in the adoption of environmental initiatives at strategic level, the influence of motivators for such a change and the strategic outcomes
Chapter 3: Article	<i>Focus:</i> The identification and characterisation of complementary assets in SMEs. <i>Setting:</i> 15 Danish SMEs from the printing and graphic industry. <i>Key findings:</i> Two main complementary assets are identified and characterised, i.e., technology and process innovation and environmental communication. According to Teece's (1986) framework, complementary assets for technology and process innovation are generic, whereas two variants of complementary assets for environmental communication, i.e., reactive and proactive, are generic and specialised respectively. The nature of these complementary assets accounts for the materialisation of different competitive outcomes from the implementation of environmental management practices.	To further the understanding of the presence and characteristics of complementary assets that allow SMEs to materialise competitive advantage from the implementation of environmental management practices in terms of their content, involved processes and competitive implications.
Chapter 4: Article	<i>Focus:</i> The role of organisational capabilities for environmental communication in the competitive implications of environmental management practices in SMEs. <i>Setting:</i> 112 Danish SMEs from the printing and graphic industry. <i>Key findings:</i> Organisational capabilities for environmental communication mediate the relationship between environmental management practices and perceived competitive advantage.	To determine the role of organisational capabilities in explaining the influence of environmental management practices on perceived competitive advantage in SMEs.
Chapter 5: Conclusions	The overall contribution of the dissertation is discussed together with the theoretical contributions of each article. Furthermore, the implications for research and practice are discussed. Finally, the section sums up the general limitations of the studies given the followed approach research design and methods in the thesis implications for future research and practice are discussed.	To shed light on how the dissertation contributes to the ONE and strategy fields on a theoretical and managerial level.

1. Background research

Organisational responses to the demand for a preserved natural environment have gravitated around two main stances: A reactive approach, where firms are concerned for merely meeting the environmental regulations and stakeholder demands; and a proactive approach, where the interpretation of environmental issues as opportunities drives the rethinking of products and the interventions on operations, and technologies (Hunt and Auster, 1990; Roome, 1992; Aragón-Correa, 1998; Aragón-Correa and Sharma, 2003; Aragón-Correa *et al.*, 2008). Building on the latter approach, the literature has paid attention to the strategic significance of the related environmental management practices. In other words, to determine the extent to which corporate decisions and actions towards environmental protection become a source of competitive advantage (Hart, 1995; Porter and van der Linde, 1995; Shrivastava, 1995a; Reinhardt, 1998; Aragón-Correa and Sharma, 2003; Orsato, 2006).

A theoretical approximation to explain the competitive implications of environmental management practices, known as the Porter Hypothesis (Porter and van der Linde, 1995), states that firms incur in high costs due to the regulations imposed on their current levels of pollution. Pollution in turn is associated to a form of waste that stems from an inefficient use of resources. The need to reduce such higher costs will thus boost the development of innovations (e.g., new technologies and production approaches) that promote competitiveness (cost savings) by optimising the use of resources. At the same time, firms are able to gain ‘first mover advantages’ by spotting new market opportunities from the commercialisation of such innovations (Porter and van der Linde, 1995). However, this approach has been subject to some criticism due to the emphasis on regulation as driver of innovations in firms and hence, an assumption of the distribution of identical resources and their inherent mobility within an industry (Rumelt, 1984; Barney, 1991).

As a response to such criticism, drawing on the resource-based view (RBV) of the firm (Wernerfelt, 1984; Dierickx and Cool, 1989; Barney, 1991), it is argued that environmental management practices lead to competitive advantage because they imply the development of valuable, rare, difficult to imitate and non-substitutable resources and capabilities (Hart, 1995; Aragón-Correa and Sharma, 2003). Thus, environmental management practices account for heterogeneity across firms in the market place (Hart, 1995; Berchicci and King, 2007; Russo and Minto, 2012) as strategic attributes that are controlled by the firm are deployed (Wernerfelt, 1984). Subsequent empirical studies following this approach found that attributes such as shared vision (Aragón-Correa *et al.*, 2008), continuous improvement and innovation (Russo and Fouts, 1997; Sharma and Vredenburg, 1998; Christmann, 2000), management of stakeholder perspectives (Sharma and Vredenburg, 1998; Aragón-Correa *et al.*, 2008; López-Gamero *et al.*, 2009), organisational learning (Sharma and Vredenburg, 1998; López-Gamero *et al.*, 2009), and entrepreneurial orientation (Menguc *et al.*, 2010) are some of the organisational capabilities linked to superior environmental performance and improved competitive advantage in firms.

Despite the value of the above theoretical and empirical contributions to the ONE field, they have been subject to criticism because of their predominant focus on determining ‘whether it pays to be green’, which has evidenced an overall disparity in findings (Margolis and Walsh, 2003;

Peloza, 2009; Hoffman and Bansal, 2012; Russo and Minto, 2012; Dixon-Fowler *et al.*, 2013). Hence, researchers are primarily advised to recognise the complexity of environmental management practices in organisations. This implies the consideration of critical factors, processes and mechanisms that may moderate and mediate the influence of environmental management practices on competitive advantage (Peloza, 2009; Russo and Minto, 2012; Dixon-Fowler *et al.*, 2013). Such a shifting in focus seems to be inspired by the contingency theory in the study of organisational and strategic research (Burns and Stalker, 1961), which leads to suggest the need for addressing alternative questions like ‘how’, ‘why’ and ‘when’ it pays to be green (Reinhardt, 1998; King and Lenox, 2001; Orsato, 2006; Peloza, 2009; Russo and Minto, 2012; Dixon-Fowler *et al.*, 2013).

While the above findings stem from analyses on larger organisations, the inquiry among SMEs has been at a rather slower pace. Early research emphasises the scarce development of SMEs in their environmental approaches that characterises an overall reactive stance (Bianchi and Noci, 1998; Noci and Verganti, 1999; Tilley, 1999). They typically try to resist and avoid environmentally-related demands (Tilley, 1999) but respond to external pressures from regulation and salient stakeholders (e.g., customers and local communities) if their survival is compromised (Noci and Verganti, 1999; Worthington and Patton, 2005). Given this, considerable research moved towards the study of the barriers for the implementation of environmental management practices in SMEs in a proactive stance. Empirical studies indicated that a low awareness among owner-managers of environmental issues becomes a major cognitive obstacle to carry out environmental improvements (del Brío and Junquera, 2003). Low awareness stems mainly from the belief that the impacts on the environment are insignificant (Bianchi and Noci, 1998; Simpson *et al.*, 2004; Revell and Blackburn, 2007). Physical limitations like the overall lack of resources in comparison with larger firms makes any investment in environmental improvements to be perceived primarily as costly (Bianchi and Noci, 1998; Simpson *et al.*, 2004; Revell and Blackburn, 2007) rather than as a choice that provides opportunities to obtain competitive benefits (Worthington and Patton, 2005; Revell and Blackburn, 2007). Moreover, the lack of knowledge and expertise account for technical limitations even though owner-managers become aware and committed with environmental protection (Hillary, 2000; del Brío and Junquera, 2003). Thus, gaps between intentions and actual environmentally friendly behaviour have been found as a common denominator among these firms (Tilley, 1999; Gadenne *et al.*, 2009).

However, subsequent research suggests that SMEs are able to adopt alternative strategic stances towards environmental issues instead of merely being reactive (Hansen *et al.*, 2002; Aragón-Correa *et al.*, 2008; Parker *et al.*, 2009; Bos-Brouwers, 2010; Klewitz and Hansen, 2014). That is, they can strategically use their unique characteristics such as the agility to respond to changes in the environment and the flexibility in their decision-making processes and structures to anticipate business opportunities from environmental issues (Aragón-Correa *et al.*, 2008; Parker *et al.*, 2009; Bos-Brouwers, 2010; Darnall *et al.*, 2010; Klewitz and Hansen, 2014). Indeed, SMEs can even realise product, process and organisational innovations grounded on the pursuit of solutions to environmental challenges (Bos-Brouwers, 2010; Klewitz and Hansen, 2014). In this sense, empirical studies have further provided evidence of the effectiveness of customised environmental management practices that suit the abovementioned characteristics of SMEs (Heras and Arana,

2010; Granly and Welo, 2014). They emphasise on characteristics of alternative environmental management practices such as their practicality in terms of low costs and short implementation times (Heras and Arana, 2010; Johnson and Schaltegger, 2016); the integration with the daily work in order to meet concrete requirements (Granly and Welo, 2014); and the dominant incremental nature of their innovation processes inspired by possibilities of new materials and markets (Bos-Brouwers, 2010; Klewitz and Hansen, 2014).

The above seems to suggest that over time, the perception of SMEs regarding how they deal with the interface business-natural environment has been changing. Despite the growing support to the possibility of deploying a proactive approach to environmental issues among SMEs, research inquiring the strategic significance of such an approach in terms of the competitive implications remains relatively scarce. Studies have consistently suggested cost reductions as the typical strategic outcome (Bos-Brouwers, 2010; Brammer *et al.*, 2012), whereas aspects such as increased customer base and market share (Revell *et al.*, 2010; Jorge *et al.*, 2015; Leonidou *et al.*, 2016) are evidenced to a lesser extent. Thus, the first objective to be addressed in this dissertation is to empirically explore such a perceived development over time in SMEs, in terms of the adoption of environmental initiatives at strategic level, the influence of managerial attitudes and strategic intent as motivators, as well as the competitive implications in lower costs and differentiation (see **RQ 1** and **article 1**).

SMEs' business environment is typically perceived as hostile and highly uncertain (Covin and Slevin, 1989; Merz and Sauber, 1995), which limits the experimentation with different solutions to environmental challenges (Tilley, 1999; Hillary, 2004). SMEs may thus, find it safer to exhibit patterns of imitative behaviour, where they mimic the adopted practices of successful peers (DiMaggio and Powell, 1983; Chen and Hambrick, 1995). Under this rationale, the development of SMEs towards higher engagement with environmental management practices over time can be understood as the result of collective competitive behaviour. This might not necessarily imply a corresponding increasing positive influence on competitive advantage over time because competitors are expected to adopt portfolios of similar environmental management practices (Worthington and Patton, 2005).

According to Teece's (1986) innovation-value-capturing-framework, the above can be seen as a regime of weak appropriability, where firms are unable to fully capture the competitive benefits of their environmental management practices because of the imitative behaviour among competitors. Teece argues that, in order to boost competitive advantage under weak appropriability regimes, firms need to possess and develop complementary assets. Drawing on the RBV, complementary assets are understood as supporting resources and capabilities (Wernerfelt, 1984; Barney, 1991; Grant, 1991) that are required to achieve competitive advantage from the implementation of an innovation, strategy, or technology (Teece, 1986). In the context of the present research, complementary assets are required to outperforming competitors from the implementation of environmental management practices (Christmann, 2000).

Using a sample of larger firms of the chemical industry, Christmann (2000) empirically explores the role of complementary assets for process innovation and implementation. She finds that such form of complementary assets allows lower cost advantages to be gained from the implementation of pollution prevention practices. Few recent studies focusing on SMEs (Aragón-Correa *et al.*,

2008; Hofmann *et al.*, 2012; Leonidou *et al.*, 2015), although not subscribed to Teece's framework, draw on the RBV as a theoretical driving force to study the strategic aspects of environmental behaviour. However, resources and capabilities are treated as organisational antecedents that lead to the adoption of environmental management practices rather than strategic means that provide insight regarding the actual influence on competitive advantage. Moreover, the resources and capabilities addressed in such studies predominantly result from transferring related constructs studied in the context of larger firms (Sharma and Vredenburg, 1998; Christmann, 2000). Thus, the acknowledgment of SMEs as a particular community of firms rather than a mere smaller version of their larger counterparts (Welsh and White, 1981; Bos-Brouwers, 2010) seems to be overlooked.

Given these gaps in the literature, this dissertation also aims to identify and characterise the complementary assets, developed among a particular setting of SMEs, and that account for materialising competitive advantage from the implementation of environmental management practices (see **RQ 2**, **RQ3** and **article 2**). The abovementioned studies addressing the SME setting consistently indicate that environmental management practices have positive influence on competitive advantage and firm performance. Notwithstanding, from a methodological perspective, they have typically addressed a direct relationship between environmental management practices and competitive advantage. This suggests that ONE-related research in SMEs has mainly focused on determining 'whether' it pays to be green. In a similar vein, it is not surprising that it is also relevant for the SME setting to consider factors, processes and mechanisms that may moderate and mediate the influence of environmental management practices on competitive advantage. Therefore, this dissertation aims to determine the role of a particular form of organisational capabilities, i.e., environmental communication, as a mediator of the relationship between environmental management practices and perceived competitive advantage among a sample of SMEs (see **RQ 4** and **article 3**). In doing so, this dissertation subscribes to the above mentioned growing research that calls for addressing alternatives to the question 'does it pay to be green?' among firms.

2. Research questions

Research in the ONE field focusing on the context of SMEs has been growing over the last years. However, as noted above, previous studies has been primarily concerned on determining the extent to which such firms are able to proactively engage in environmental protection, the drivers and barriers of such an engagement, and the particular environmental management practices that they can adopt (del Brío and Junquera, 2003; Klewitz and Hansen, 2014; Johnson and Schaltegger, 2016). From an academic perspective, that is still a big step in the recognition and interest in the environmental significance of this setting provided the relative infancy of the ONE field. However, research that moves towards approaching the strategic aspects of the interface between SMEs and the natural environment is still needed.

Given the above, the overall research question that guides this dissertation is formulated as follows:

“How can SMEs be able to commit with environmental protection and improve their competitive advantage at the same time?”

In order to answer the overall research question, I focus on four research questions addressed in the three studies, which are respectively reported in three articles, as follows: The first study presents an overview about environmental management in SMEs, the motivators and the competitive outcomes by addressing: **RQ1**: *How have the adoption of environmental initiatives at the strategic level, the influence of motivators and the perceived implications on the competitive advantages developed over time among Danish SMEs?*

The second study furthers the understanding of the complementary assets in the context of environmental management practices in SMEs by addressing **RQ2**: *What are the complementary assets that SMEs can utilise in conjunction with their environmental management practices to improve competitive advantage?* And **RQ3**: *How are such complementary assets characterised?*

The third, and last study, aims to find explanations of the strategic significance of environmental management practices in SMEs by addressing **RQ4**: *How and why does the implementation of environmental management practices in SMEs lead to perceived improvements in competitive advantage?*

By addressing these research questions, this dissertation has some key contributions briefly outlined. In shedding light on the development of environmental management, motivators and competitive outcomes in SMEs, this dissertation provides insight into organisational change and development, as well as the internal drivers and outcomes. Moreover, this dissertation contributes to existing knowledge on the explanation of the heterogeneity in competitive behaviour among firms by means of a context-dependent application of the RBV and the innovation-value-capturing-framework.

3. Central constructs

3.1. Environmental management practices

Despite the consolidation of ONE as a research field from the early nineties, there is still criticism regarding the lack of clear concepts, precise definitions and coherent theoretical frameworks (Gladwin *et al.*, 1995; Lucas, 2010; Hoffman and Georg, 2013). A clear example of this lack of conceptual clarity is the variety of existing terms such as ‘corporate greening’ (Winn and Angell, 2000); ‘environmental technologies’ (Shrivastava, 1995a; Klassen and Whybark, 1999a), ‘environmental strategy’ (Hart, 1995; Sharma and Vredenburg, 1998; Sharma, 2000; Aragón-Correa and Sharma, 2003); ‘eco-innovation’ (Rennings, 2000; Wagner, 2007), and ‘corporate environmentalism’ (Banerjee, 2001; Banerjee *et al.*, 2003), which somehow point to organisational responses to challenges imposed by the natural environment.

Particularly, the concept of environmental strategy seems to be useful as it results from the engagement of the ONE field with a rigorous dialogue with disciplines such as strategy and organisational theory (Hoffman and Georg, 2013). Drawing on Mintzberg's notion of strategy (1989, p. 27), a broad definition of environmental strategy refers to a pattern in action "intended to manage the interface between business and the natural environment" (Sharma, 2000, p. 682). However, environmental strategy as a concept has to be carefully considered as it can be associated to politically correct rhetoric, intentions and plans rather than observable behaviour (Bansal and Roth, 2000; Winn and Angell, 2000; Rhee and Lee, 2003; Dahlmann and Brammer, 2011). Thus, building on the idea of 'pattern in action', scholars tend to agree in extending the definition of environmental strategy as patterns of environmental practices or initiatives aimed at mitigating a the impact on the natural environment beyond compliance with environmental regulations (Bansal and Roth, 2000; Sharma, 2000; Aragón-Correa and Sharma, 2003; Dahlmann and Brammer, 2011; Walls *et al.*, 2011).

In order to avoid the potential misunderstandings when working with the construct environmental strategy and in line with previous literature (Christmann, 2000; Sroufe *et al.*, 2002; González-Benito and González-Benito, 2005; Montabon *et al.*, 2007; Lucas, 2010; Uhlener *et al.*, 2012), I put forward the term *environmental management practices* as a central construct in this dissertation. That is, I build on the actual terms that define the construct environmental strategy as to unequivocally refer to observable behaviour. Environmental management practices are defined as organisational decisions and actions targeting the development and introduction of new or improved products, processes, organisational routines and/or management systems, particularly aimed at reducing the environmental burden of business' operations beyond the minimum regulatory requirements (Shrivastava, 1995a; Rennings, 2000; González-Benito and González-Benito, 2005; Lucas, 2010). This definition explicitly indicates that organisational decisions and actions can be carried out at different organisational fronts, which make it compatible with the core elements of the abovementioned terms. For example, when referring to actions towards the introduction of products and processes, it reflects the operational focus of environmental technologies as a set of techniques (technologies, equipment, operating procedures) towards pollution abatement and resource conservation (Shrivastava, 1995a; Klassen and Whybark, 1999a). Moreover, environmental management practices as a construct does not pose conflict with the concept of eco-innovation. Decisions and actions towards the introduction of new and improved products, processes, organisational routines and/or management systems do necessarily imply changes in such aspects towards the reduction of environmental burdens, which are the emphasis of eco-innovations (Rennings, 2000). The explicit of environmental management practices on actions naturally reflects the concept of environmental strategy conceived as a pattern of action (Sharma, 2000; Aragón-Correa and Sharma, 2003).

In article 1, this dissertation particularly approaches the concept of environmental initiatives at strategic level. Previous studies often utilise the terms 'practices' and 'initiatives' interchangeably in their discussions (Bansal and Roth, 2000; González-Benito and González-Benito, 2005; Lucas, 2010; Dahlmann and Brammer, 2011), which means that there is no conceptual divergence. On the other hand, when referring to *environmental initiatives at strategic level*, the article particularly addresses a subset of environmental management practices. That is, decisions and actions regarding

organisational routines and/or management systems (Judge and Douglas, 1998; Melnyk *et al.*, 2003; Lo *et al.*, 2012). Thus, *environmental initiatives at strategic level* can be seen as a subset of environmental management practices that are focused on a narrower spectrum of organisational aspects. The main reason of such a difference in terminology is purely technical. The article is based on existing data from previous surveys, whose original items and scales explicitly included the term ‘environmental initiatives’ (see Appendix A). In order to avoid potential bias, I decided to keep that term in the subsequent analysis and when reporting the results. However, with the exemption of article 1, this dissertation reiteratively uses the term ‘practices’ as literature uses it more often to formally refer to the construct here discussed (Christmann, 2000; González-Benito and González-Benito, 2005; Lucas, 2010), but also because the subsequent studies (articles 2 and 3) address a wider range of organisational aspects.

3.2. *Competitive advantage*

Scholars have been concerned for studying the sources of competitive advantage as a major research are in the strategic management field (Rumelt, 1984; Porter, 1985; Barney, 1991; Peteraf, 1993; Cockburn *et al.*, 2000). Broadly speaking, competitive advantage can be defined as the situation in which a firm consistently outperforms competitors through a value creating strategy not simultaneously being implemented by any current or potential competitors (Porter, 1985; Barney, 1991). Competitive advantage is thus used as a means to address heterogeneity within an industry (Peteraf, 1993) in terms of the distribution of resources and obtained returns (Barney, 1991; Cockburn *et al.*, 2000).

Some theoretical developments have been formulated to explain why a firm, at a given moment, is ahead of competitors in relation with performance (Cockburn *et al.*, 2000). They include the presence of superior leadership for a determined organisational structure (Chandler, 1962; Andrews, 1971); the characteristics of the industry structure and firm’s microeconomic environment (Porter, 1985); and the existence of resources and development of organisational capabilities (Wernerfelt, 1984; Barney, 1991). Under such frameworks, a broad spectrum of internal and external factors as well as conditions has been consequently proposed to shed light on the sources to achieve competitive advantage. Since this dissertation examines the management of the interface between business and the natural environment as one source of competitive advantage, I considered it necessary to narrowing the scope of the definition of competitive advantage. In doing so, I build on the abovementioned definition of the construct and at the same time, I particularly adopt Wagner and Schaltegger’s (2004, p. 559) notion about competitive advantage¹ as “that part of overall corporate competitiveness and economic performance of the company, which is created and influenced by environmental management.” By indicating the influence of environmental management, this extension of the definition of competitive advantage aims to be more specific in regards to such a ‘value creating strategy’ stated before. When

¹ Wagner and Schaltegger particularly label their concept of competitive advantage as ‘environmental competitiveness.’ In a similar vein, Esty and Winston (2006) advanced in suggesting the term ‘eco-advantage’. However, this dissertation uses the label ‘competitive advantage’ to denote the construct since such a name is typically used in the majority of studies of the ONE field.

narrowing the scope in the definition of competitive advantage, it is thus acknowledged that managers recognise environmental issues as “opportunities to cut costs, reduce risk, drive revenues, and enhance intangible value and establish deeper connections with customers, employees, and other stakeholders” (Esty and Winston, 2006, p. 14).

Drawing on Porter’s (1980) generic strategies, scholars in the ONE field have consistently suggested that there are at least two types of competitive advantage: lower costs and differentiation (Shrivastava, 1995b; Reinhardt, 1998; Christmann, 2000; Orsato, 2006; López-Gamero *et al.*, 2009). Competitive advantage in lower costs relates to savings at operational level and avoidance of potential regulatory liabilities and fines. It typically results from environmental management practices intended to prevent pollution by means of increasing efficiencies of production processes (Dechant and Altman, 1994; Hart, 1995; Shrivastava, 1995b; Christmann, 2000). Notwithstanding, operational costs can also be lowered when environmental management practices are carried out at product level (e.g., product designs with environmentally friendly attributes, (Hart, 1995; Shrivastava, 1995b; Hart, 1997). Competitive advantage in differentiation on the other hand, typically stems from environmental management practices targeting products-related aspects. Environmentally friendly attributes bring some distinctiveness to the products, which can be charged with a premium price, target environmentally concerned customers, and thus generate higher revenues (Shrivastava, 1995b; Reinhardt, 1998). Competitive advantage in terms of reputation and differentiation is also achieved at organisational level when implementing environmental management practices addressing management systems and procedures. That paves the way to gain legitimacy and build corporate reputation, which makes the firm to stand out among competitors (Hart and Milstein, 2003; Jiang and Bansal, 2003). In line with the above reasoning, the studies comprising this dissertation approach the abovementioned forms of competitive advantage in the context of SMEs.

3.3. Organisational resources, capabilities and complementary assets

It is argued that firm’s competitive advantage depends significantly on its organisational resources and capabilities, according to the RBV (Wernerfelt, 1984; Dierickx and Cool, 1989; Barney, 1991). While there is an overall agreement of the essential role of organisational resources and capabilities on the formulation of strategies, the boundaries between both concepts is not clearly defined. An earlier formal definition indicates that resources are “those (tangible and intangible) assets which are tied semi-permanently to the firm” (Wernerfelt, 1984, p. 172). However, Barney (1991, p. 101) regards resources as assets, capabilities, organisational processes, and firm attributes among others, which apparently suggests an overlap of concepts. Grant (1991, p. 118) in turn aims to address such an overlap and defines resources as “inputs into the production process” and “the basic units of analysis” that are the source of organisational capabilities. Examples of resources, according are thus capital, brand names, patents, skilled personnel, trade contracts, machinery and equipment, in-house knowledge of technology, etc. (Wernerfelt, 1984; Grant, 1991). In general, resources can be classified as physical, organisational and human resources (Barney, 1991). Organisational resources are strategically significant when they are valuable, rare, difficult to imitate by competitors and non-substitutable (*ibid*).

Organisational capabilities are in turn, the capacities for a team of resources to carry out some activity or task (Grant, 1991, p. 119). Differently put, organisational capabilities are the result of the cooperation and coordination of bundles of resources working together. They can be examined as functions, activities, and organisational routines performed with the necessary integration of resources (Snow and Hrebiniak, 1980; Nelson and Winter, 1982). In this sense, resources are the source of organisational capabilities, whereas organisational capabilities are more complex attributes that become the main sources of competitive advantage (ibid). Organisational capabilities are similar to what Prahalad and Hammel (1990) call ‘core competencies’, which are described as “the collective learning in the organisation, especially how to coordinate diverse production skills and multiple streams of technology” (Prahalad and Hamel, 1990, p. 82). As well as other scholars in the strategy field (Amit and Schoemaker, 1993; Henderson and Cockburn, 1994), this dissertation agrees on this view of the distinction between organisational resources and capabilities.

On the other hand, Teece (1986) suggests the concept of complementary assets when proposing his innovation-value-capture-framework. Complementary assets can be either resources or capabilities that are required for the successful appropriation of returns from an innovation (Teece, 1986). This means that complementary assets have a specific role. They are supporting organisational resources and capabilities of an innovation but not the main sources of competitive advantage as RBV scholars advocate. According to Teece, it is the innovation the main source of profits and competitive advantage. However, at some point it is necessary to utilise that innovation in conjunction with complementary assets for continuous profit and ensure sustained competitive advantage (Teece, 1986). Literature provides examples of complementary assets in the form of resources, such as manufacturing facilities, component parts and human capital, as well as organisational capabilities like superior marketing and service capabilities, and regulatory management (Teece, 1986; Tripsas, 1997; Rothaermel and Hill, 2005; Teece, 2006; Eggers, 2012; Ceccagnoli and Hicks, 2013). RBV’s Organisational resources and capabilities, and Teece’s complementary assets have common characteristics such as the value, rarity and non-imitability (Tripsas, 1997; Rothaermel and Hill, 2005). This makes the RBV a theoretical foundation of the innovation-value-capture-framework (Teece, 2006).

4. Research design and methods

4.1. Empirical setting

The overall focus of this dissertation is centred on the strategic aspects of environmental issues in SMEs. However, it is necessary to provide more details regarding the empirical setting approached throughout the different studies. SMEs in Denmark constitute the studied empirical setting, from where this dissertation sets off. Then, the research moves towards the examination of a narrower context of such firms: Danish SMEs operating in the printing and graphic sector. Therefore, the empirical setting is approached at both national and industrial levels.

SMEs in Denmark represent more than 95 percent of companies in Denmark with a workforce of over two million employees (Nielsen, 2014). Currently, the main concerns among Danish SMEs are the declining demand for products and services as well as the increasing requirements from the

government. To address these concerns, firms have been strongly focused on readjustments of costs, development of new products and identification of new markets, as well as the reinforcement of marketing and sales aspects (BDO, 2015). On the other hand, such firms are characterised by their considerable levels of external openness and willingness to collaborate so as to take ideas and knowledge from their partners (Burcharth *et al.*, 2015). Therefore, SMEs often organise themselves into regional or local partnerships in order to join efforts towards boosting their competitive position and ensure employment stability. Partnerships are not only between SMEs, but also educational institutions, research and development organisations, and professional associations (EurWORK, 2011).

SMEs in Denmark constitute a suitable context for studying environmental management issues and the strategic aspects. Addressing such firms would reflect the situation of the industry and businesses at national level due to their strong presence. In general, Denmark is recognised among the forerunners regarding environmentally responsible production and consumption with initiatives that can be traced back before the 1990's (Remmen, 2001; Christensen *et al.*, 2007). In the case of the SMEs, their current concern for the increasing requirements from the government includes the establishment of standards about the environmental performance of operations and products (Madsen and Ulhøi, 2016). Furthermore, the abovementioned areas on which SMEs are currently focused, affect to product-related and process-related aspects in business. They are widely known as the primary targets in the implementation of environmental management practices (Christmann, 2000; Lucas, 2010; Bansal *et al.*, 2014).

Danish SMEs have also been involved in multiple voluntary-based partnerships between business, authorities and institutions (e.g., GREENET, Green Network, groNet, Key2Green, etc.) with the specific purpose of addressing environmental concerns in their business activities. Partnerships have become a major engine behind the progress in environmental matters because they are platforms for the development of novel solutions related to environmentally-friendly technologies (Hansen *et al.*, 2002; GREENET, 2015; Miljøstyrelsen, 2015). As a result, SMEs' have developed higher levels of awareness and understanding of environmental problems and a more intense implementation of environmental management practices over the years (Remmen, 2001; Madsen and Ulhøi, 2016).

Manufacturing and production in Danish SMEs operating in several sectors are realised via outsourcing. Despite the challenges of this structure, firms have been proactive in addressing environmental concerns in those outsourced fronts in order to keep the control of their value chains (Dilling-Hansen and Jensen, 2013). In a similar vein, Danish SMEs have made efforts towards the management of environmental issues in their supply chain activities and related partners (Pedersen, 2009). Recently, in cooperation with the Danish Environmental Protection Agency (*Miljøstyrelsen* in Danish), firms are getting engaged with an extensive implementation of formal environmental management systems (Miljøstyrelsen, 2015). To meet this purpose, environmental management systems have been developed among the partnerships as customised alternatives intended for SMEs (e.g., Key2Green's environmental statement manual). However, certifiable environmental management systems such as ISO 14001 and EMAS have also been a well-accepted choice among such firms.

Changes in Danish SMEs when dealing with environmental issues are the result of a reflexive learning process that has gradually led to the development of new perspectives on the business case for environmental management practices (Remmen, 2001; Hansen *et al.*, 2002). Thus, Danish SMEs can potentially understand environmental protection as a competitive parameter to differentiate themselves from rivals based on advanced technological options and developed competences (Hansen *et al.*, 2002; Dilling-Hansen and Jensen, 2013). This dissertation builds on the above and thus considers Danish SMEs in general as an empirical setting that is relevant for investigating the competitive implications of environmental management practices. The noticed development in terms of environmental protection suits the aim of the study to go a step forward beyond determining whether or not SMEs are able to adopt proactive approaches in the management of environmental issues.

As previously mentioned, this research studies a narrower empirical setting to address part of the research questions. The choice of a specific industrial sector was the guiding criteria to narrowing the empirical setting. Firms in the printing and graphic sector were found as relevant context to fulfil the purposes of this dissertation. In general, printing and graphic firms are associated with activities that are known to exert significant impact on the natural environment in terms of resource consumption (e.g., virgin paper, inks, etc.), intensive use of energy (e.g. ink drying, toner fusing, etc.), and emissions (e.g., waste water, biocides, VOC, etc.) (Rothenberg and Becker, 2004; Larsen *et al.*, 2006; Viluksela *et al.*, 2010). Environmental impacts are manifested on air, water and soil (Johnsen *et al.*, 2006; Masurel, 2007) and stems from particular stages of the production process, such as prepress, printing and cleaning/de-inkability (Rothenberg and Becker, 2004) in both offset (Larsen *et al.*, 2006) and digital printing methods (Viluksela *et al.*, 2010). As a result, environmental protection costs are substantial and constitute a strategic issue for firms in this industrial sector.

More than 95 percent of printing and graphic firms in Denmark are SMEs (Danmarks Statistik, 2015a). Recently, this industry has been facing ever-increasing tough competition in the media market as printed matter and substitutes such as electronic media solutions are naturally becoming part of the same business arena (Grakom, 2015c). Thus, the industry now involves activities such as printing, bookbinding, label production, graphic design, communication, and advertising. Furthermore, printing and graphic companies are recognised as being at the forefront using cutting edge technology, and developing technical knowledge and skills for IT and communication besides the traditional graphic activities (*ibid.*).

In terms of environmental management issues, firms in this industrial sector are under very strict regulation but most of them are far above the demands from the Danish authorities. Printing and graphic firms are thus an example of the overall developments among SMEs in Denmark regarding the efforts towards environmental protection. The allocation of significant resources to environmental work has resulted in the implementation of environmental management systems and eco-labelling licenses in a large proportion of firms (Johnsen *et al.*, 2006; Larsen *et al.*, 2006; Grakom, 2015b). Over the last years, carbon footprint reduction in operations and products has been a general concern among these firms, and it has led to focusing efforts towards life-cycle analyses and the incremental adoption of alternative energy sources (Johnsen *et al.*, 2006; Grakom, 2015b).

In terms of the establishment of voluntary partnerships, Danish printing and graphic firms are not an exception. As an industrial sector, a significant amount of firms have organised themselves as an association to joint efforts to strengthen their competitiveness by monitoring the market conditions, legislations and technologies (see www.grakom.dk). The management of environmental issues has also been part of the *raison d'être* of this association. Through the association, firms have built a joint knowledge database (see www.miljonet.org) on the environmental impact of printed matter and related operations. Moreover, a customised eco-labelling carbon footprint license has been introduced, particularly intended for printed matter and/or graphic products. It was initially an initiative at national level but it has been well adopted by other printing and graphic firms in Europe (see www.climatecalc.eu). These efforts have resulted in improvements of the environmental performance of printing and graphic firms. For instance, paper and ink consumption have been reduced in above 38 percent and 28 percent between 2010 and 2014, respectively (Grakom, 2015a), whereas energy consumption and CO₂ emissions have been reduced in above 47 percent and 31 percent between 2008 and 2012, respectively (Danmarks Statistik, 2015b).

The abovementioned characteristics of this industrial sector make it highly suitable for the purposes of this dissertation. As previously mentioned, competitive advantage in firms is influenced by a broad variety of factors and conditions. By focusing on firms operating in a single industry, this dissertation aims to control for internal processes and business practices. In a similar vein, external influences (e.g. stakeholder pressures, regulations, and standards) can be controlled and thus characterise organisational attributes that account for variations of competitive behaviour in such firms provided an evidenced development in their environmental management practices.

4.2. Research design and methods

Researchers may be tempted to examine environmental management issues in the SME setting by simply replicating the approaches, methods and measurements intended for large firms. However, a mere replication can jeopardise the quality of findings since the specific organisational, structural and technological characteristics are different. This dissertation thus follows a mixed-method approach to address the research questions (Tashakkori and Teddlie, 2010) by acquiring richer insight of the units under study (Jick, 1979). A simplified definition of mixed-methods approach refers to the collection and analysis of qualitative and quantitative data in the same research (Creswell, 2003). However, more elaborated definitions go beyond the emphasis on data by considering the combination of research elements such as philosophical stances, assumptions and values (Johnson and Onwuegbuzie, 2004; Johnson *et al.*, 2007; Morgan, 2007). Research based on mixed-method approach is “inclusive, pluralistic, and complementary, and it suggests that researchers take an eclectic approach to method selection and the thinking about and conduct of research” (Johnson and Onwuegbuzie, 2004, p. 17). This suggests that following mixed-method approach also implies embracing a pluralism of paradigms. That is, a variety of worldviews and assumptions that may serve as the philosophical driving force of the research process (Teddlie and Tashakkori, 2010). This perspective rejects thus the incompatibility thesis (Howe, 1988), where the paradigms associated with qualitative and quantitative approaches are seen as contradictory and mutually exclusive (Burrell and Morgan, 1979). Paradigms are framed in a continuum rather than

‘either-or’ dualisms. Indeed, the paradigms associated with qualitative or quantitative approaches, in their seemingly purist form, might include nuances of the respective counterpart (Patton, 2002; Johnson *et al.*, 2007).

Despite the advocates of the mixed-method approach aim to reconcile paradigms historically seen as opposite, the development of a corresponding paradigm has been under intense debate. Indeed, the notion of *paradigm* as epistemological stance is questioned and re-interpreted. As an influential representative of the mixed-method approach community, Morgan (2007) sees four versions of the concept of paradigms at different levels of generality: i) as a *worldview*, paradigm refers to the all-encompassing perspective of the world; ii) as an *epistemological stance*, paradigm denotes a perspective about the nature of knowledge and the ways to generate it; iii) as *model examples of research*, paradigm refers to the best and typical solutions to problems; and iv) as *shared beliefs in a research field*, paradigm is a consensus regarding the most meaningful questions and the appropriate procedures to answering such questions. It is argued that Kuhn (1970) himself favours this last version (Morgan, 2007). Therefore, building on this last version, Morgan suggests that a paradigm correspond to shared “beliefs and practices that influence how researchers select both the questions they study and methods that they use to study them” (p. 49).

The majority of mixed-method proponents have embraced a pragmatic approach (Johnson and Onwuegbuzie, 2004; Morgan, 2007; Biesta, 2010; Creswell and Plano Clark, 2011). Pragmatism is purposefully seen as an approach rather than a paradigm because it “should not be understood as a philosophical position among others, but rather as a set of philosophical tools that can be used to address problems” (Biesta, 2010, p. 97). Key concepts of early proponents of the pragmatic approach, such as William James and John Dewey, are useful for mixed-methods research: i) *lines of action* that guide the selection of methodological combinations in a practical and outcome-oriented inquiry; ii) *warranted assertions*, as replacement of the unvarying truth, refer to the shared beliefs developed from the recognition of multiple routes of knowledge that stand behind the lines of action; and iii) *workability* that denotes the applicability and predictability of the lines of action and warranted assertions so as to better answering research questions (Johnson and Onwuegbuzie, 2004; Morgan, 2007). Under the above guiding concepts, a pragmatic approach stands for an instrumental view of both theories and methods. Rather than fully true or false, theories become more or less useful for understanding, predicting and explaining people and the world. In a similar vein, the researcher is free to make use of a combination of methods and procedures for answering the research question in such a way that it leads to complement strengths rather than overlap weaknesses (Johnson and Onwuegbuzie, 2004; Teddlie and Tashakkori, 2010). Thus, it has been natural to conclude that pragmatism partners the mixed-method approach (Johnson and Onwuegbuzie, 2004).

This dissertation follows a pragmatic approach as it rejects the implied incompatibility of traditional dualisms. It embraces deductive reasoning based on existing theories to be empirically tested but also makes use of inductive reasoning to interpret and characterise context-dependent situations (e.g., SMEs from a particular industry), when necessary. Thus, assumptions and epistemological stances are instrumentally used so as to provide statements and formulate hypotheses during the lines of action of the research program, considered as transitory (Johnson and Onwuegbuzie, 2004; Morgan, 2007). Correspondingly, the eclecticism and pluralism of data

sources and analyses gives the opportunity to draw diverse and, sometimes, divergent conclusions that account for the denial of an unvarying truth (Johnson and Onwuegbuzie, 2004; Teddlie and Tashakkori, 2010).

Furthermore, since the domain of the ONE field does not strictly fit within a single theoretical tradition or discipline (Hoffman and Bansal, 2012), following a pragmatic approach seem to be consistent. That is, conceptual systems and theories from disciplines within organisation and management literature are pragmatically chosen in this dissertation because they contribute to academic inquiry (Lewis, 1929). From an outcome-oriented perspective (i.e., workability), pluralism of theories, concepts and methods in this dissertation has served to offer in overall more evidence so as to better understand the research problem and answer the research questions (Creswell and Plano Clark, 2011). However, the emphasis in outcomes, and their workability in the pragmatic approach, goes beyond finding better answers to research questions. It also refers to the agreement of inquiry with culturally derived values and desired social ends (Dewey, 1939; Johnson and Onwuegbuzie, 2004). In the context of the practitioner-related viewpoint, the dissertation can be considered as part of the current ‘green wave’, which ultimately concerns for solving problems in the biophysical environment stemming from social consciousness. In that sense, the research inquiry on SMEs bear managerial implications that endorses such social consciousness and progress motivated, at least, by the strategic significance of environmental management practices.

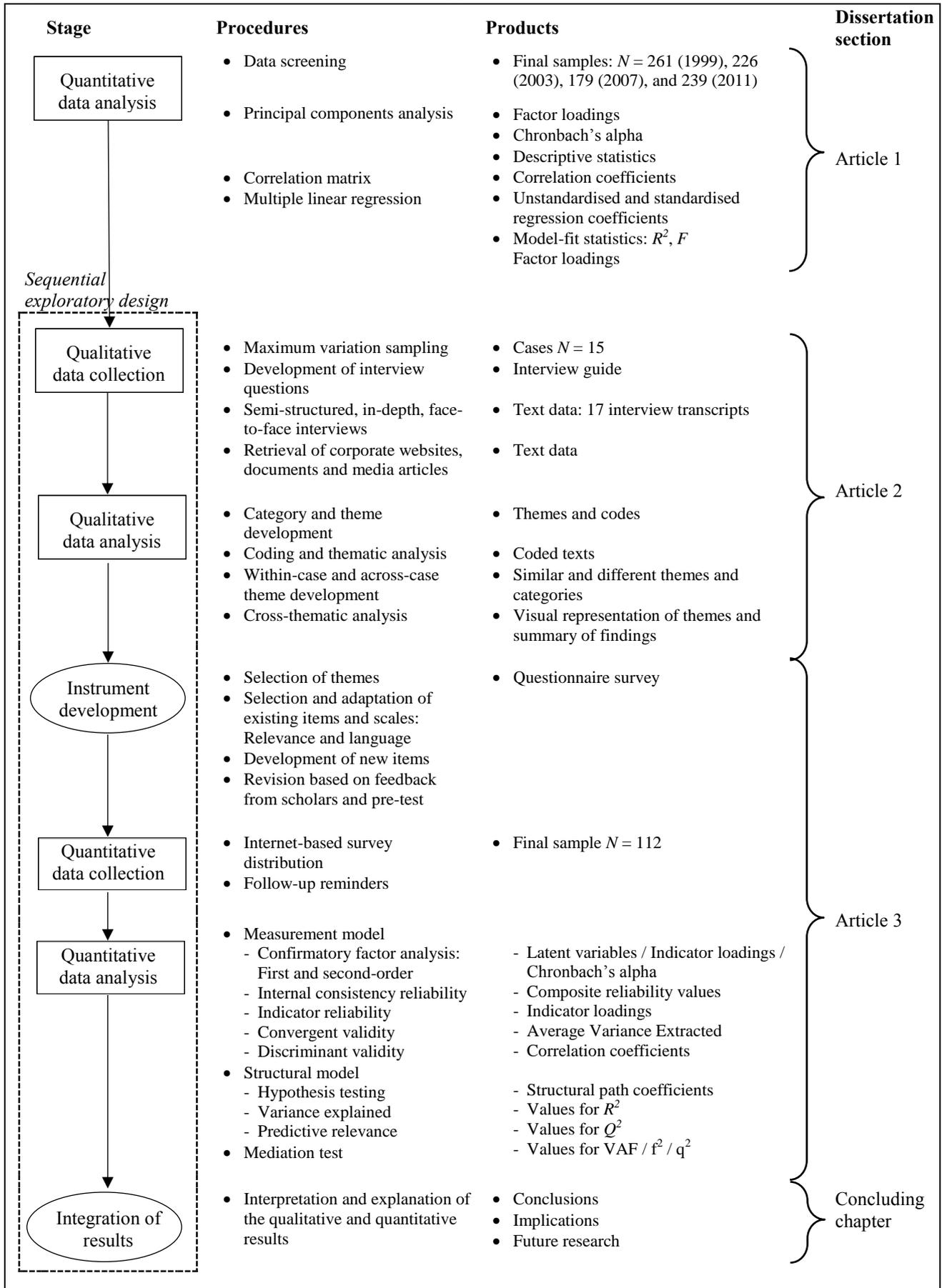
Quantitative and qualitative methods are coherently combined in this dissertation by following the overall typology of sequential designs (Creswell and Plano Clark, 2011), also known as complementary designs (Greene *et al.*, 1989; Morgan, 1998). This family of mixed-method designs consists of the use of qualitative and quantitative methods – and the associated inductive and deductive reasoning, respectively – one after the other over time to meet certain practical objectives. Practical objectives are for example to provide deeper explanations or test the findings of a previous method, guide purposive samplings, or develop the content for measurement instruments (Morgan, 1998). By embarking on such a type of mixed-method approach, the researcher is able to address exploratory and confirmatory questions with the aim to generate and verify theory (Creswell and Plano Clark, 2011). Thus, sequential designs exemplify a form of reasoning that goes back and forth between induction and deduction in order to meet the above mentioned practical objectives and further the inquiry process (Morgan, 2007). Results of an initial method are evaluated through the workability of the lines of action of the subsequent method in the sequential design (*ibid.*).

As Figure 1 shows, after a first study based on existing quantitative data, this dissertation follows a particular variant of the sequential designs known as the exploratory sequential design (Creswell and Plano Clark, 2011). Such a particular design is characterised by an initial qualitative exploration of a topic before building to a second, quantitative stage. In doing so, the research aims to use the findings from the qualitative method to develop and set up the subsequent quantitative method (Greene *et al.*, 1989). Creswell and Plano Clark (2011, p. 87) state that a quantitative method builds on qualitative findings “by developing an instrument, identifying variables, or stating propositions for testing based on an emergent theory or framework.” A sequential exploratory design suits the purpose of this dissertation because it helps to develop and test instruments that are contextualised for the case of a particular empirical setting (SMEs in the

printing and graphic sector) by covering the important topics and ask about them in an appropriate manner (Morgan, 1998). The development of instruments is what accounts for the connection between qualitative and quantitative methods in an exploratory sequential design (Creswell and Plano Clark, 2011).

The use of mixed-method approach in research on organisations and the natural environment has gained momentum over the last years (Molina-Azorín and López-Gamero, 2016). Particularly, by following multi-method approaches, scholars have contributed to the field in terms of the development and extension of theory (Sharma and Vredenburg, 1998; Bansal and Roth, 2000; López-Gamero *et al.*, 2009), the understanding of specific contexts (Rothenberg and Becker, 2004; Masurel, 2007), and the development of measurement instruments (Walls *et al.*, 2011). Notwithstanding, following a mixed-method approach imposes challenges in terms of the demand for a domain of skills of both quantitative and qualitative data collection and analysis techniques, as well as the required extensive time and resources (Johnson and Onwuegbuzie, 2004; Creswell and Plano Clark, 2011). An elaboration on the procedures used in each study of the sequential design and depicted in Figure 1 is provided below.

Figure 1. Overview of the dissertation's mixed-method approach



4.2.1. Quantitative study: Multiple regression analysis

Existing raw data (made available by my supervisor) from four repeated structured questionnaire-based surveys applied to Danish manufacturing firms in 1999, 2003, 2007 and 2011, respectively, are used to establish a 'base-line' of environmental management in Danish industry. In the first study, data are analysed with the purpose of examining among SMEs over time: (i) the development of environmental initiatives, (ii) the effects of such initiatives on competitive advantage in lower costs as well as differentiation and positioning, and (iii) the influence of managerial attitudes and strategic intent as motivators of environmental initiatives. The questionnaires were distributed via mail to the responsible individual for environmental issues or related functions in firms after telephonic contact to identify them. After two waves of follow-up reminders, it was possible to obtain sample sizes of 308 (1999-survey), 276 (2003-survey), 214 (2007-survey) and 289 (2011-survey) firms, which accounted for an overall response rate around 60% in all four repeated surveys. Since the original data were collected from both larger firms and SMEs, it was necessary to extract subsamples of firms for each year. In doing so, an operational definition of SMEs (i.e., firms with total number of employees between 10 and 250) was considered as criteria (Eurostat, 2010). Responses from firms with number of employees between the abovementioned limits were retained for subsequent analyses. Final sample sizes thus, were 261 (1999-survey), 226 (2003-survey), 179 (2007-survey), and 239 (2011-survey). Appendix A exhibits the complete final questionnaire of the study. However, data from some of the questions in that questionnaire were considered for the analysis.

Then, the study performs principal component analysis and multiple linear regressions in order to analyse the data. These techniques have been widely used in the field of organisations and natural environment to study the strategic significance of environmental issues in firms (Sharma and Vredenburg, 1998; Bansal and Roth, 2000; Christmann, 2000; González-Benito and González-Benito, 2005; Maas *et al.*, 2014). Principal component analysis, using varimax rotation as the extraction method, allows the related constructs of the study to be identified in terms of the measuring items from the questionnaire in all four datasets. Then, three multiple regression analyses were conducted in order to test statistically the relationships between the identified constructs in all four datasets. The first and second regression analyses examine the effects of environmental initiatives at strategic level on differentiation/positioning and lower costs, respectively. Then, the third regression analysis examines the effects of managerial attitudes and strategic intent on environmental initiatives at strategic level. In all three regressions the dependent variables are controlled by firm size, measured as a dichotomous variable. Finally, conclusions regarding the relationships between the constructs of interest over time are drawn by observing the respective regression coefficients from the models with better statistical fit.

Despite the study contribution regarding the longitudinal view of the strategic implications of environmental management of SMEs, some key limitations evidence the need of embarking in the aforementioned exploratory sequential design. There were no data measuring additional factors that could help in getting more insight on the competitive effects of environmental initiatives at strategic level. In other words, it is not possible to address nuanced versions of the traditional question about whether it pays to be green. Moreover, a questionnaire-based survey that originally

targets both SMEs and large firms from multiple sectors in all its four waves implied a formulation of items that tends to be generic and broad. Additionally, it has the underlying assumption that SMEs and large firms do not exhibit fundamentally different behaviour with regard to environmental management. Finally, a myriad of items and scales has become available in the literature to measure several aspects related to the competitive implications of environmental management in firms. It is thus necessary a selection of relevant topics with the proper adaptation of the respective items as well as the formulation of new context-dependent items, which is part of the purpose of the first stage in an exploratory sequential design (Morgan, 1998; Creswell and Plano Clark, 2011).

4.2.2. Qualitative study: Multi-firm case study

The aforementioned exploratory sequential design following the first quantitative study is carried out among firms in the printing and graphic sector in Denmark. Focusing on a single industrial sector has the advantage of controlling for internal processes and business practices as well as external aspects such as the regulations and demands from similar salient stakeholders (Sharma and Vredenburg, 1998; Slawinski and Bansal, 2012). A multi-firm, qualitative case study approach corresponds to the first stage of the exploratory sequential design. The purpose of the study is to describe and characterise organisational attributes in the form of complementary assets (Teece, 1986) that SMEs utilise to materialise competitive advantage from environmental management practices. A qualitative approach in data collection and analysis is appropriate because the focus is on interpreting and understanding a research problem in reality (Eriksson and Kovalainen, 2008). Further, following a design based on a case study approach suits examination of the research problem as it relies on the integration of several information sources to analyse theoretical elements from different viewpoints that are a context-specific (Eisenhardt, 1989).

Qualitative data has been gathered in this study from 15 SMEs (cases) after following a theoretical sampling procedure (Denzin, 1989; Eisenhardt, 1989) and from the Employer Association of that industrial sector (now called the Danish printing and graphic trade association, Grakom). In order to find contrasting cases, the sampling procedure relied on the maximum variation principle (Eisenhardt, 1989) based on structural characteristics of the firm (e.g., size, main processes and geographic location). The researchers made sure that the sampled firms met the afore-mentioned operational definition of SMEs in terms of number of employees (Eurostat, 2010). The Employer Association of the industrial sector supported the data collection through the provision of information about its member firms, which account for more than 90% of total production volume in Denmark.

In total, 17, semi-structured, face-to-face interviews comprise the primary sources of data in the study, which are distributed as follows: 15 interviews with respondents from the sampled SMEs. I targeted key informants that were in charge of environmental management in their firms, although in most cases, they had different functions in their firm (e.g., owner-managers, CEOs, CFOs, quality managers, production managers, and sales managers). Despite the potential influence of the answers from the respondents, in which they emphasise aspects related to their main activities in the firms, I decided to consider those informants as their knowledge on environmental issues in the

company allowed me to go deeper in the interviews and get more insight in connection with the approached topics in the study. Two additional interviews were carried out with environmental consultants at the Employer Association, which provided a more holistic view of the industrial sector as such.

An interview guide (see Appendix B) with open-ended questions was designed based on relevant literature and to help familiarising myself with the industry-specific environmental management and practitioner-perceived important topic-related issues. Secondary sources of qualitative data included corporate websites, media articles and additional documentation that interviewees provided about their firms. For the purpose of the particular qualitative study included in this dissertation, part of the answers given by the respondents to the questions in the interview guide were used. Even though the interview guide in appendix B seems to be structured, the way I conducted it with my respondents followed a semi-structured variant. In many cases, I was able to find answers to some of the questions related to general information of the firms (not precisely the same) beforehand by reading their websites. Furthermore, depending on the answers to the questions during the interview, I was able to ask additional questions that were not included in the interview guide in order to deepen my understanding of a particular topic. On the other hand, as the interviewees voiced their answers, I discarded subsequent questions and even sections of the interview guide that I found irrelevant and even inappropriate given what they had already said.

The study applies triangulation of all data sources (Riege, 2003) so as to obtain a comprehensive portrayal of the sampled SMEs as well as strengthen the validity and reduce bias of findings (Blaikie, 1991). Once the interviews were transcribed, they were analysed together with data from secondary sources through data reduction and categorisation (Miles and Huberman, 1994). Thematic categories included codes that represent specific concepts, meanings and attributes in the data (Gibbs, 2008) to be examined in the light of the theoretical constructs derived from the literature.

All interview transcripts and texts from secondary sources were coded and analysed using the package NVivo10. An initial codebook was developed and structured following the themes of the interview guide. Then, the codebook was refined, by including new codes and categories and merging existing ones during the coding process. The codebook was developed in NVivo10 by using *free nodes* and *tree nodes* so as to structure the hierarchies and levels of codes (Bazeley and Jackson, 2013). In order to be systematic during the coding process (Miles and Huberman, 1994), data for the individual cases were codified first, followed by a cross-case analytical comparison.

Two cycles of coding were carried out (Saldana, 2013). I used attribute and open coding for the first cycle of coding. Attribute coding allowed me to catalogue fact and descriptive characteristics of each case, such as occupation of the respondents, number of employees and product lines. Then, I used open coding to assign basic labels to the raw data with the purpose of developing an initial inventory of topics. Some of the purposes of coding when conducting qualitative research is to select, simplify and abstract the data (Miles and Huberman, 1994). The first cycle of coding allowed me to meet these purposes as I was able to create relevant categories and themes as well as discard irrelevant data.

During the second cycle of coding I applied analytic/thematic coding with the purpose of finding the major thematic ideas in the data (Gibbs, 2008), through contrasts with theoretical constructs in the literature and inductively. During this second cycle, I was able to find the proper ways to

display the data (Miles and Huberman, 1994) in the form of tables and figures in order to synthesise the findings and, ultimately, draw conclusions.

The open and analytic codes during data analysis (Strauss, 1987; Gibbs, 2008) were essential for characterising the specific complementary assets that emerged from the data. The iteration between data, codes and literature (Eisenhardt, 1989) helped, not only to sharpen the ‘thick’ description (Denzin, 1989) of complementary assets, but also to identify relevant items and scales in previous studies to be used in the subsequent quantitative analysis and the development of new ones. Furthermore, data analysis allowed me to get insight on the state-of-art of relevant and specific environmental management practices among the sampled firms that are related to their existing technologies, current environmental issues of concern and organisational characteristics. That in turn, guided a narrow selection of items and scales from the vast amount in the literature measuring related constructs such as environmental strategy (Aragón-Correa, 1998; Sharma and Vredenburg, 1998), environmental technologies (Klassen and Whybark, 1999a), and best practices (Christmann, 2000). In a similar vein, the study allows the competitive benefits stemming from implementing environmental management practices and complementary assets to be understood. The analysis helps accordingly to select the respective items for the subsequent quantitative analysis from studies addressing related constructs such as organisational benefits (Sharma and Vredenburg, 1998) business and organisational performance (Zhu and Sarkis, 2004; González-Benito and González-Benito, 2005), and competitive advantage (Christmann, 2000; López-Gamero *et al.*, 2009). This is very important for the overall exploratory sequential design because the combination of both qualitative and quantitative methods occurs when the selection and development of items for the quantitative study is informed by findings from the first qualitative study. Such a point of interface, where both methods overlap and integrate (Morse, 2010), denotes the respective conclusion and initiation of the qualitative and quantitative stages in the exploratory sequential design.

4.2.3. Quantitative study: Structural equation modelling

The second part of the exploratory research design has the overall purpose of testing part of the preliminary findings from the qualitative study in a larger sample of SMEs in the Danish printing and graphic sector. In particular, the study’s purpose is to determine the role of organisational capabilities for environmental communication in explaining the competitive effects of environmental management practices. The study starts with the selection, adaptation and development of items based on the qualitative results. The context-dependent analysis during the first qualitative stage helps in the preparation of the items of the questionnaire survey in an appropriate fashion (Morgan, 1998). That is, the use of understandable language and wording based on terms and expressions voiced by the interviewees so as to increase the reliability of the measures (Fowler, 2009). A final internet-based version of the questionnaire (see Appendix C) was elaborated after several revisions considering the comments made by both scholars and practitioners as input. An internet survey strategy has the advantage of optimising time, resources and reach respondents from distant geographical locations. (Fowler, 2009). Following previous studies on environmental management in SMEs (Aragón-Correa *et al.*, 2008; Gadenne *et al.*, 2009;

Uhlaner *et al.*, 2012; Leonidou *et al.*, 2015). The questionnaire was administered to a total of 446 owner-managers of member firms of Grakom. A final sample of 112 responses was reached after two waves of follow-up e-mail reminders and discarding non-usable responses that, in most cases, did not meet the operational definition of SME (Eurostat, 2010). Since there is no evidence of non-response bias, it can be thus assumed that the final sample is representative of the entire population. That is, the findings of the subsequent quantitative analysis can be generalised to the entire population of SMEs in the Danish printing and graphic sector.

For the purposes of the study, data from some of the questions in the questionnaire exhibited in appendix C were considered for the analysis. After carrying out factor analysis using varimax rotation to determine the underlying structure of data, the study performs Partial Least Squares-Structural Equation Modelling (PLS-SEM) in order to determine the quality of the measures and test the hypothesised relationships. PLS-SEM is a technique for that has been used in research on general management (Howell and Higgins, 1990; Avolio *et al.*, 1999; Gray and Meister, 2004; Gruber *et al.*, 2010) and recently introduced in the field of organisations and the natural environment (Bremmers *et al.*, 2009; Nejati *et al.*, 2014; Jorge *et al.*, 2015). The exploratory purposes of PLS-SEM and its robustness when having a relatively small sample size (Chin and Newsted, 1999; Hair *et al.*, 2011) make it suitable to the aim of the overall sequential design.

Two measurement models are estimated for: (i) environmental management practices, considered as a second-order latent variable and specified with three first-order latent variables (i.e., management-related, product-related, and process-related environmental management practices); and (ii) environmental management practices, specified with three latent scores as observed indicators, together with the other constructs (i.e., organisational capabilities for environmental communication, competitive advantage in lower costs, and competitive advantage in differentiation). Both measurement models are respectively evaluated in terms of internal consistency reliability, indicator reliability, as well as convergent and discriminant validity. Subsequent analyses include the structural model in order to test the hypotheses, together with the assessment procedures (i.e., variance explained and predictive relevance), and the mediation test of environmental communication. Conceptually, the study of mediator variables is intended to explain how and why the effect of the independent variable (i.e., environmental management practices) on the dependent variable (i.e., competitive advantage) occurs (Baron and Kenny, 1986; MacKinnon, 2008). Therefore, the guiding research question of this study (see **RQ4**) suits this study in spite of its quantitative nature.

5. Overview of the articles

This dissertation consists of three articles, which have been elaborated during my enrolment in the doctoral programme in management. The three articles can be read in its own as individual pieces of work that were written either individually or in collaboration with colleagues from the department. However, all three articles are tied together by a common perspective (i.e., the strategic aspects of environmental management practices), and a specific setting (i.e., SMEs). A brief outline of each article is provided as follows:

Article 1: Corporate environmental sustainability in Danish SMEs: A longitudinal study of motivators, initiatives, and strategic effects

Authors: Juan Felipe Reyes-Rodríguez, John Ulhøi and Henning Madsen

Number of words: 9316 without references

Status: Published in *Corporate Social Responsibility and Environmental Management*

Note: This article is a rewritten and extended final version of an earlier and significantly shorter article (4133 words) entitled *Managerial attitudes, strategic intent, environmental initiatives and competitive advantage* included in the proceedings of the 9th International Strategic Management Conference in Riga, June 2013.

RQ 1: *How have the adoption of environmental initiatives at the strategic level, the influence of motivators and the perceived implications on the competitive advantages developed over time among Danish SMEs?*

The first article (chapter 2) explores the development of environmental initiatives at strategic level, the influence of motivators and the effects on competitive advantage in SMEs. A quantitative analysis of four repeated surveys over a period of 14 years among Danish manufacturing SMEs revealed that there has been an incremental adoption of environmental initiatives at strategic level over time, which reflects evidences an overall maturity and integration of environmental issues into firm's strategy. The results show the strategic significance of such kind of initiatives as they exert positive and substantial influence on two dimensions of competitive advantage: lower cost and differentiation. Moreover, when analysing the effects of two motivators (i.e., managerial attitudes and strategic intent) on environmental initiatives at strategic level, it was found that both of them are positive. Notwithstanding, over managerial attitudes, strategic intent remains as the main driver of organisational change to dealing with the interface between business and natural environment. Despite the evidenced positive effects on competitive advantage and the overall positive influence of both motivators, the results do not show a clear tendency in terms of the strength of the relationships due to the alternation of effect sizes over time. Finally, while there were found statistically significant differences between small and medium-sized firms in the levels of environmental initiatives at strategic level, the competitive implications of such initiatives are in general robust with respect to firm size.

The article is thus, an initial empirical exploration of the overall relationships between the main constructs of this dissertation. The article's overall support to the traditional theoretical question 'whether' it pays to be green contextualised to multi-sector SMEs serves as a 'point to departure' of the whole research. The dissertation then, follows up by addressing nuanced versions of such a

theoretical question in a narrower empirical setting, which is a concern of the two subsequent articles.

Article 2: SMEs and the natural environment: In search of complementary assets to boost competitive advantage

Authors: Juan Felipe Reyes-Rodríguez and John Ulhøi

Number of words: 16156 without references

Status: Ready for submission

RQ 2: *What are the complementary assets that SMEs can utilise in conjunction with their environmental management practices to improve competitive advantage?*

RQ 3: *How are such complementary assets characterised?*

The second article (chapter 3) departs from the assumption that environmental management practices have impact on firm's competitive advantage given the results from the first article and from previous literature as well. This article however, moves a step forward when approaching the competitive effects of environmental management practices. It draws on the innovation-value-capture-framework (Teece, 1986) in order to suggest that the positive implications of environmental management practices on competitive advantage might not be long-lasting among SMEs. Thus, such firms are left facing weak appropriability regimes, according to Teece's framework.

Given this, the article draws also on the RBV (Wernerfelt, 1984; Barney, 1991) so as to identify and characterise complementary assets in SMEs. Complementary assets here are supporting organisational resources and capabilities utilised to materialise competitive advantage from environmental management practices. Based on a multi-firm qualitative case study in Danish SMEs from the printing and graphic industry, this study provides support of the weak appropriability regimes faced by such firms. Then, two complementary assets are identified: (i) technology and process innovation, and (ii) environmental communication. Both complementary assets are characterised in terms of their content, involved processes and mechanisms, as well as their competitive implications. Findings revealed that despite complementary assets for technology and process innovation can boost competitive advantage in terms of cost reductions, they meet the characteristics of generic complementary assets. The strong dependency on few leading technology suppliers implies that the key resources (such as for example external technical knowledge and core technologies) of these complementary assets can easily be acquired in the marketplace and replicated by competitors. Therefore, their strategic significance is limited because it becomes difficult to sustain competitive advantage.

On the other hand, two variants of complementary assets for environmental communication were found: reactive and proactive environmental communication. As a baseline approach to make

visible environmental management practices, reactive environmental communication is deployed as response to situational demands by using conventional signalling mechanisms (i.e., eco-labels and environmental certifications). Based on the results, it is suggested that this form of complementary assets can be regarded as generic (Teece, 1986). Reactive environmental communication comprises the allocation of general purpose resources, necessary for the avoidance of information search costs and, in overall, mere survival in the marketplace. However, these complementary assets are not sufficient for sustaining competitive advantage. On the other hand, complementary assets for proactive environmental communication are characterised by the delivery of messages covering a broad range of environmental issues (e.g., commitment, impact, and fit with business matters). They also comprise the use of advising mechanisms through richer forms of communication such as verbal and face-to-face interactions. SMEs' characteristics such as informality and flexibility favour the use of those interactions to find creative ways to develop and handle relationships with customers and other salient stakeholders. Since this form of environmental communication is based on difficult-to-imitate intangible skills possessed by key human resources, such complementary assets are regarded as specialised (Teece, 1986). Therefore, when utilised in conjunction with environmental management practices, proactive environmental communication paves the way to achieve and sustain competitive advantage due to extended customer base, stronger relationships with existing customers, improved reputation, and lower costs.

Article 3: Explaining the business case for environmental management practices in SMEs: The role of organisational capabilities for environmental communication

Author: Juan Felipe Reyes-Rodríguez

Number of words: 12716 without references

Status: Ready for submission

RQ 4: *How and why does the implementation of environmental management practices in SMEs lead to perceived improvements in competitive advantage?*

The third article (chapter 4) is aimed at determining the role of environmental communication in the relationship between environmental management practices and perceived competitive advantage in SMEs. I primarily draw on the RBV in order to conceptualise environmental communication as organisational capabilities through which environmental management practices lead to improvements in competitive advantage. Based on a quantitative analysis of data from 112 Danish SMEs in the printing and graphic sector, this study measures the central constructs of this dissertation (i.e., environmental management practices and competitive advantage) as well as the organisational capabilities for environmental communication. The results show that environmental management practices among the sampled firms consistently address product-related, process-

related and management-related aspects. Moreover, I found statistical evidence indicating that organisational capabilities for environmental communication mediate the relationship between environmental management practices and perceived competitive advantage. That is, environmental management practices have indirect effects on perceived competitive advantage in particular aspects such as lower cost and reputation, respectively.

The mediating role of environmental communication can be interpreted as follows: SMEs deploy organisational capabilities for environmental communication to making their environmental management practices visible to the scrutiny of external stakeholders. That is a precondition that must be fulfilled so that SMEs can actually outperform competitors in both cost-efficiency and reputational aspects. Notwithstanding, an effective visibility of environmental management practices implies delivering concrete information, demonstrative actions and facts. This is possible only when environmental management practices are truly implemented as they are the primary source of knowledge and information to be communicated outside the firm.

When looking at the article in the light of the whole dissertation, this article can be seen as a quantitative verification of part of the findings from the qualitative stage (article 2). The conceptualisation of environmental communication, as a form of complementary assets in the qualitative study, initially suggested that this construct might be a moderator of the relationship between environmental management practices and competitive advantage. From the statistical point of view, previous studies have approached complementary assets as moderators (Tripsas, 1997; Christmann, 2000; Arora and Ceccagnoli, 2006; Eggers, 2012). However, the quantitative analysis for this article suggests that environmental communication mediates such a relationship instead, which has conceptual implications. Environmental communication is therefore, approached here as organisational capabilities. Complementary assets are ultimately a form of organisational capabilities given the theoretical foundations of the innovation-value-capturing-framework on the RBV (Teece, 1986; Helfat and Lieberman, 2002; Teece, 2006).

The empirical evidence of organisational capabilities for environmental communication as a mediator variable provides insight on explaining ‘how’ and ‘why’ it pays to be green in SMEs. Thus, the article still responds to the call for research addressing more nuanced versions of the traditional question ‘whether’ it pays to be green in SMEs, which is the primary concern of this dissertation.

Appendix A. Final questionnaire used for the first stage of the research (Existing data)

ENVIRONMENTAL MANAGEMENT IN DANISH MANUFACTURING FIRMS

INTRODUCTION

Worries about the environment, at both local, regional and global level, can still grab the headlines. While this typically mainly concerned special interest groups and grass-roots movements to begin with, nowadays there is often a more general interest in the environment. The business community is also keeping a close eye on developments, and an increasing number of environmental initiatives are coming from this quarter. However, there is also a general scepticism about the situation; many people feel that, although there is widespread recognition of the problem, precious little is being done about it.

At the CORE research centre at Aarhus University, one of several projects on business and the environment involves a long-term project on the identification and analysis of environmental management in Danish firms. The collected data is used to determine both the extent of environmental management in Danish firms and to follow developments over time. The data also enables researchers to identify areas within environmental management which should be included in the education of future business leaders.

Data has been collected on five previous occasions, starting in summer 1994 and subsequently in autumn 1995, 1999, 2003 and 2007. This latest collection of data means that we can now analyse developments over the past 15 years. Similar surveys are being carried out in a number of other countries, which makes it possible to compare some of the results.

Note: All information is anonymous and treated with the strictest confidence. Therefore, individual firms will not be identifiable in any publication of the survey results.

Although some questions about the firm's activities may not seem relevant, we would appreciate you answering all the questions – you can always check the 'not relevant' answer – and returning the completed questionnaire.

Time: Experience shows that the questionnaire takes about 15 minutes to complete. We hope you can spare the time to help us.

Guidelines: See next page.

Returning the questionnaire: See the back page of the questionnaire.

Raw materials: The questionnaire is printed on paper which consists of at least 60% non-bleached recycled paper, and which conforms to the Nordic SWAN requirements.



GUIDELINES

Please note: If your firm has several different activities, please base your answers on the **main** activity. The person who fills in the questionnaire should regard him/herself as the **firm's** representative, irrespective of actual title.

To make things easier, each answer is represented by a number. To answer the question, just **circle** the appropriate number. For example, if your own main activity in the firm is in production, your answer will be as follows:

Q. 3 What is your own main activity in the firm?
(Please circle only one number)

General management	1
Financial management	2
Sales/Marketing	3
Production management	4
Project management	5
Quality management	6
Environmental management	7
Other	8 Please specify: _____

Another type of question is general questions with several sub-questions, all with the same multiple choice answers. Here, **all** sub-questions should be answered. Whether it is the one type of question or the other is indicated in brackets after the question (see the above example).

On the last page of the questionnaire, there is a space where you can add any comments you may have.

QUERIES

If you have any queries about the questionnaire, feel free to contact either of the following:

Henning Madsen
tel. 89486352
email: hem@asb.dk

John Ulhøi
tel. 89486459
email: jpu@asb.dk

Section I: General questions about the firm

Q. 1 Which industry is the firm's main activity in?
(Please circle only **one** number)

- Food, beverages and tobacco industries..... 1*
- Textile and clothing industry.....2*
- Wood, cork, and furniture industry.....3*
- Paper and graphical industry.....4*
- Tannery and chemical industry, etc.5*
- Stone, clay and glass industry.....6*
- Metal and machine industry.....7*
- Electronics industry.....8*
- Rubber and plastics industry.....9*
- Electricity, gas, heating and water supply.....10*
- Building and construction.....11*
- Other.....12 Please specify:_____*

Q. 2 How many full-time employees are there in the firm?
(Please circle only **one** number)

- Less than 10.....1*
- 10-19.....2*
- 20-49.....3*
- 50-99.....4*
- 100-249.....5*
- 250-499.....6*
- 500 or more.....7*

Q. 3 What is your own main activity in the firm?
(Please circle only **one** number)

- General management..... 1*
- Financial management..... 2*
- Sales/Marketing..... 3*
- Production management..... 4*
- Project management..... 5*
- Quality management..... 6*
- Environmental management..... 7*
- Other..... 8 Please specify:_____*

Q. 4 Is the firm regarded as a leader in its field?
(Please circle only **one** number)

- Yes, very much so 1
 Yes, to some extent 2
 No, not at all..... 3

Q. 5 How well do each of the following statements describe the firm?
(Please circle **one** number for **each** question)

	<i>Completely agree</i>	<i>Partly agree</i>	<i>Don't know</i>	<i>Partly disagree</i>	<i>Completely disagree</i>
<i>The firm's products are very price-sensitive</i>	1	2	3	4	5
<i>Product performance is crucial</i>	1	2	3	4	5
<i>The production form is non-technical</i>	1	2	3	4	5
<i>Production is based on patents</i>	1	2	3	4	5
<i>The firm carries out R&D</i>	1	2	3	4	5
<i>Product design is all-important</i>	1	2	3	4	5
<i>Changes in the firm's production form or products are dictated by changes in suppliers' specifications</i>	1	2	3	4	5
<i>Production is based on mass production</i>	1	2	3	4	5
<i>The production process is the most important part of the firm's activities</i>	1	2	3	4	5
<i>Production is based on advanced technology</i>	1	2	3	4	5
<i>Only experienced users can use the firm's products</i>	1	2	3	4	5

Section II: General questions about environmental conditions in the firm

Q. 6 Does the firm have an environmental approval?
(Please circle only **one** number)

- Not relevant*..... 1
- No*..... 2
- Yes, for parts of production*..... 3
- Yes, for all production*..... 4

Q. 7 Is the firm included in a compulsory scheme for the collection of environmentally hazardous waste?
(Please circle only **one** number)

- Not relevant*..... 1
- No*..... 2
- Yes, for some types of waste*..... 3
- Yes, for all types of waste*..... 4

Q. 8 Please answer the following general questions about the firm’s activities vis-à-vis the environment.
(Please circle **one** number for **each** question)

	<i>Completely agree</i>	<i>Partly agree</i>	<i>Don't know</i>	<i>Partly disagree</i>	<i>Completely disagree</i>
<i>The firm's activities result in large volumes of solid waste</i>	1	2	3	4	5
<i>The firm's activities result in large volumes of liquid waste</i>	1	2	3	4	5
<i>The firm's activities have a big impact on the environment</i>	1	2	3	4	5
<i>The firm discharges large volumes of waste water</i>	1	2	3	4	5
<i>The firm discharges large volumes of airborne pollution</i>	1	2	3	4	5
<i>The firm's activities result in a high level of noise pollution</i>	1	2	3	4	5

	<i>Completely agree</i>	<i>Partly agree</i>	<i>Don't know</i>	<i>Partly disagree</i>	<i>Completely disagree</i>
<i>The firm's activities require large amounts of energy</i>	1	2	3	4	5
<i>The firm's processes have a big impact on the working environment</i>	1	2	3	4	5

Q. 9 How big is the environmental impact of the firm's products in the following areas?
(Please circle **one** number for **each** area)

	<i>None</i>	<i>Very small</i>	<i>Small</i>	<i>Big</i>	<i>Very big</i>
<i>Extraction of raw materials</i>	1	2	3	4	5
<i>Suppliers' production process</i>	1	2	3	4	5
<i>The firm's own production process</i>	1	2	3	4	5
<i>Total logistics of supply, production and distribution</i>	1	2	3	4	5
<i>Use of the products</i>	1	2	3	4	5
<i>Disposal of the products</i>	1	2	3	4	5
<i>Recycling of the products</i>	1	2	3	4	5

Q. 10 How much influence do the following stakeholders **currently** have when the firm is considering or deciding on environmental initiatives?
(Please circle **one** number for **each** stakeholder)

	<i>No influence</i>	<i>Little influence</i>	<i>Some influence</i>	<i>A lot of influence</i>	<i>Enormous influence</i>
<i>Employer/Industry organisations</i>	1	2	3	4	5
<i>Distributors</i>	1	2	3	4	5
<i>Owners/Shareholders</i>	1	2	3	4	5
<i>Industry networks</i>	1	2	3	4	5
<i>Unions</i>	1	2	3	4	5
<i>Financial institutions</i>	1	2	3	4	5
<i>Consumer organisations</i>	1	2	3	4	5

	<i>No influence</i>	<i>Little influence</i>	<i>Some influence</i>	<i>A lot of influence</i>	<i>Enormous influence</i>
<i>Research and educational institutions</i>	1	2	3	4	5
<i>International authorities/legislation</i>	1	2	3	4	5
<i>Competitors</i>	1	2	3	4	5
<i>Customers</i>	1	2	3	4	5
<i>Environmental organisations</i>	1	2	3	4	5
<i>Suppliers</i>	1	2	3	4	5
<i>Local authorities/legislation</i>	1	2	3	4	5
<i>Employees</i>	1	2	3	4	5
<i>National authorities/legislation</i>	1	2	3	4	5
<i>The press</i>	1	2	3	4	5

Q. 11 How much **future** influence are the above stakeholders as a whole likely to have on environmental initiatives?
(Please circle only **one** number)

- A lot less..... 1*
- Less..... 2*
- Unchanged..... 3*
- More..... 4*
- A lot more..... 5*

Section III: The firm's current environmental initiatives

Q. 12 Has the firm recently carried out environmental **initiatives** in the following areas?
(Please circle **one** number for **each** area)

	<i>Not relevant</i>	<i>No</i>	<i>Is considering</i>	<i>To some extent</i>	<i>To a large extent</i>
<i>Soil protection and treatment</i>	1	2	3	4	5
<i>Reduction of solid waste</i>	1	2	3	4	5

	<i>Not relevant</i>	<i>No</i>	<i>Is considering</i>	<i>To some extent</i>	<i>To a large extent</i>
<i>Reduction of liquid waste</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Reduction of water consumption</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Reduction of waste water discharge</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Reduction of energy consumption</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Reduction of airborne discharges</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Reduction of noise</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Reduction of raw materials consumption</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Reduction of consumption of auxiliary materials</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Substitution of environmentally harmful substances</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Improvement of the working environment</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Sorting of waste at source</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Recycling of residues/surplus from production</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Return of surplus materials from customers for destruction/recycling</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Return of worn-out products from customers for destruction/recycling</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>R&D</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Total logistics of supply, production and distribution</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>

Q. 13 Has the firm recently **initiated** environmental collaborations with the following stakeholders?
 (Please circle **one** number for **each** stakeholder)

	<i>Not relevant</i>	<i>No</i>	<i>Is considering</i>	<i>To some extent</i>	<i>To a large extent</i>
<i>Employer/industry organisations</i>	1	2	3	4	5
<i>Distributors</i>	1	2	3	4	5
<i>Owners/shareholders</i>	1	2	3	4	5
<i>Industry networks</i>	1	2	3	4	5
<i>Unions</i>	1	2	3	4	5
<i>Financial institutions</i>	1	2	3	4	5
<i>Consumer organisations</i>	1	2	3	4	5
<i>Research and educational institutions</i>	1	2	3	4	5
<i>International authorities/legislation</i>	1	2	3	4	5
<i>Competitors</i>	1	2	3	4	5
<i>Customers</i>	1	2	3	4	5
<i>Environmental organisations</i>	1	2	3	4	5
<i>Suppliers</i>	1	2	3	4	5
<i>Local authorities/legislation</i>	1	2	3	4	5
<i>Employees</i>	1	2	3	4	5
<i>National authorities/legislation</i>	1	2	3	4	5
<i>The press</i>	1	2	3	4	5

Q. 14 Has the firm carried out any of the following initiatives or procedures for the documentation and control of its environmental efforts?
 (Please circle **one** number for **each** initiative)

	<i>Not relevant</i>	<i>No</i>	<i>Is considering</i>	<i>To some extent</i>	<i>To a large extent</i>
<i>Formulated and published an environmental policy</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Formulated and published a written environmental strategy</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Set specific environmental goals</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Assigned responsibility for carrying out environmental strategy</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Drawn up environmental accounts/audit</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Used an environmental audit system to check that the environmental plan is going according to plan</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Regular audits of environmental goals in order to ensure continuous improvements</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Published a separate environmental report</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Been certified according to ISO 14000</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Carried out quantitative measurements of key environmental indicators</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>

- Q. 15 How does the firm think that the following underlying factors influence considerations or decisions about environmental initiatives **today**?
(Please circle **one** number for **each** factor)

	<i>Not relevant</i>	<i>Not important</i>	<i>Little importance</i>	<i>Some importance</i>	<i>Very important</i>
<i>Improvement of the firm's general reputation</i>	1	2	3	4	5
<i>Owners' attitudes and opinions</i>	1	2	3	4	5
<i>Management's attitude and opinion</i>	1	2	3	4	5
<i>Preparation for a strategic positioning</i>	1	2	3	4	5
<i>Spotting new market opportunities</i>	1	2	3	4	5

Section IV: Results of environmental initiatives

- Q. 16 To what extent is the firm **currently** able to carry out environmental improvements in the following areas?
(Please circle **one** number for **each** area)

	<i>Not relevant</i>	<i>Not at all</i>	<i>To a small extent</i>	<i>To some extent</i>	<i>To a large extent</i>
<i>Soil protection and treatment</i>	1	2	3	4	5
<i>Reduction of solid waste</i>	1	2	3	4	5
<i>Reduction of liquid waste</i>	1	2	3	4	5
<i>Reduction of water consumption</i>	1	2	3	4	5
<i>Reduction of waste water discharge</i>	1	2	3	4	5
<i>Reduction of energy consumption</i>	1	2	3	4	5
<i>Reduction of airborne discharges</i>	1	2	3	4	5
<i>Reduction of noise</i>	1	2	3	4	5
<i>Reduction of raw materials consumption</i>	1	2	3	4	5

	<i>Not relevant</i>	<i>Not at all</i>	<i>To a small extent</i>	<i>To some extent</i>	<i>To a large extent</i>
<i>Reduction of consumption of auxiliary materials</i>	1	2	3	4	5
<i>Substitution of environmentally harmful substances</i>	1	2	3	4	5
<i>The working environment</i>	1	2	3	4	5
<i>Sorting of waste at source</i>	1	2	3	4	5
<i>Recycling of residues/surplus from production</i>	1	2	3	4	5
<i>Return of surplus materials from customers for destruction/recycling</i>	1	2	3	4	5
<i>Return of worn-out products from customers for destruction/recycling</i>	1	2	3	4	5
<i>R&D</i>	1	2	3	4	5
<i>Total logistics of supply, production and distribution</i>	1	2	3	4	5

Q. 17 To what extent has the firm been able to **reduce** environmental problems in the following areas?
(Please circle **one** number for **each** area)

	<i>Not relevant</i>	<i>Not at all</i>	<i>To a small extent</i>	<i>To some extent</i>	<i>To a large extent</i>
<i>Extraction of raw materials</i>	1	2	3	4	5
<i>Suppliers' production process</i>	1	2	3	4	5
<i>The firm's own production process</i>	1	2	3	4	5
<i>Total logistics of supply, production and distribution</i>	1	2	3	4	5
<i>Use of the products</i>	1	2	3	4	5
<i>Disposal of the products</i>	1	2	3	4	5
<i>Recycling of the products</i>	1	2	3	4	5

Q.18 How has the firm's contact or collaboration with the following stakeholders regarding environmental factors changed recently?

(Please circle **one** number for **each** stakeholder)

	<i>Significantly worse</i>	<i>Somewhat worse</i>	<i>Unchanged</i>	<i>Somewhat improved</i>	<i>Significantly improved</i>
<i>Employer/industry organisations</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Distributors</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Owners/shareholders</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Industry networks</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>unions</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Financial institutions</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Consumer organisations</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Research and educational institutions</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>International authorities/legislation</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Competitors</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Customers</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Environmental organisations</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Suppliers</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Local authorities/legislation</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Employees</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>National authorities/legislation</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>The press</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>

Q. 19 Does the firm disseminate environmental information regarding the procurement of natural resources and raw materials, the production process, and end products?

(Please circle **one** number for **each** group)

	<i>Not relevant</i>	<i>No</i>	<i>To a small extent</i>	<i>To some extent</i>	<i>To a large extent</i>
<i>To customers</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>To employees</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>To suppliers</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>To owners/shareholders</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>To the authorities</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>To the public</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Other: _____</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>

Q. 20 How does the firm disseminate information about internal environmental conditions?

(Please circle **one** number for **each** form of dissemination)

	<i>Not relevant</i>	<i>No</i>	<i>To a small extent</i>	<i>To some extent</i>	<i>To a large extent</i>
<i>In sales materials to customers</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>In production information to customers</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>In newsletters to customers</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>In newsletters to employees</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>In annual reports/annual accounts</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>In the general press</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>In the trade</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>At seminars for customers</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>At trade exhibitions/fairs</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>In reports to the authorities</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Other (Please specify): _____</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>

Q. 21 How have the firm's environmental initiatives affected the following main business areas?
 (Please circle **one** number for **each** area)

	<i>Very negatively</i>	<i>Negatively</i>	<i>No change</i>	<i>Positively</i>	<i>Very positively</i>
<i>Productivity improvements</i>	1	2	3	4	5
<i>Competitiveness</i>	1	2	3	4	5
<i>Short-term profit</i>	1	2	3	4	5
<i>Long-term profit</i>	1	2	3	4	5
<i>Market share</i>	1	2	3	4	5
<i>New market opportunities</i>	1	2	3	4	5
<i>Cost reductions</i>	1	2	3	4	5
<i>Product image</i>	1	2	3	4	5
<i>Sales</i>	1	2	3	4	5
<i>The firm's image</i>	1	2	3	4	5

RETURN OF THE QUESTIONNAIRE

Thank you for your time. Please return the completed questionnaire **as soon as possible**, and preferably within one week, in the pre-paid envelope provided.

Note that the following control number is solely for purposes of registering the return of your questionnaire. It will not be possible to identify individual firms when the results are published.

Control number: _____

COMMENTS

If you have any supplementary comments or elaborations, please write them in the space provided below. Alternatively, they can be enclosed separately with the questionnaire

Appendix B. Interview guide

INTRODUCTION

First of all, thank you for your time for this interview. I am Juan Felipe Reyes-Rodríguez, PhD researcher at Aarhus University. The research in which I am taking part is a mutual collaboration between the Graphic Association of Denmark and Aarhus University. The main focus of the study is on the relationship between environmental management and competitive advantage in such firms

This interview may take around 45 minutes and any information that you share with me will be kept confidential. I hope I can record our conversation so that I do not miss any details and piece of information. However, if at any time you may wish to interrupt the recording, please do so. Once more, thank you for your participation.

If there are other themes that you may want to add throughout our conversation, please mention that when you consider necessary.

QUESTIONS

A. GENERAL INFORMATION

1. Could you briefly describe your background and your work in this company?
2. Which are the main production processes in [COMPANY NAME]?
3. Which are the main products/services that the company offer to its customer?
4. How many employees work within your organisation?
5. Which customers are targeted? [B2B, B2C, or both]
6. Could you please describe your competitive strategy in [COMPANY NAME]? What makes your customers to prefer your products/services?

B. APPROACH TO ENVIRONMENTAL ISSUES

1. Which are the main environmental impacts of [COMPANY NAME] with respect to the natural environment (eco-systems) and human health? [e.g. Pollutants, critical consumption of energy and resources].
2. Has the firm taken initiatives regarding these issues? [experience]
3. Who is responsible for environmental issues in the company? [e.g. Specific department, person]
4. Which are at the moment [COMPANY NAME]'s priorities in environmental management?
5. Which are the key motivations for taking action in terms of improvements in [COMPANY NAME] environmental behaviour? [e.g. legislative compliance, costs, reputation, market expectations, move towards sustainability, etc.]
6. Where is [COMPANY NAME] compared with the competitors in the industry in terms of environmental management?

C. MANAGERIAL LEVEL

1. To what extent does the company consider environmental issues in its general decision and planning processes?
 - a. How did it reach that level of incorporation?
 - b. [why?]

2. Has **[COMPANY NAME]** stated clear environmental objectives? If not, why? If yes: Which is the overall objective?
 - a. Are they known to the employees?
 - b. How do you track/monitor your progress towards such objectives? If not, why?
 - c. Does **[COMPANY NAME]** issue any report informing about the progress towards such objectives?
3. Have you implemented any environmental certification/eco-labelling schemes? If not why, if yes:
 - a. Which labelling/certification schemes? Why such schemes?
 - b. How has been your experience in this (these) scheme(s)?
4. What are the outcomes out of such initiatives (e.g. formalisation, certification) (reputation, improved image, new customers, etc.)?
 - a. [If no outcomes, why?][barriers]
5. Which mechanisms/processes allow such initiatives to be turned into outcomes/benefits? [e.g. communication, negotiation techniques, specialised communication channels, marketing, etc.] [What and how do you do in order to turn these practices into outcomes/benefits]
 - a. How do they take place?
 - b. Who are involved?

D. PROCESS LEVEL

1. **[You mentioned some impacts in terms of...]**. In which business activities (stages in the production processes) do such impacts take place?
2. What has been implemented in your production process to prevent and mitigate such impacts? [e.g. new technologies, new policies, new arrangements, better practices, or other]
3. Has **[COMPANY NAME]** implemented radical changes (complete re-design) of the processes towards environmentally safer performance?
 - a. How was this re-design?
4. What were the outcomes out of such practices? [e.g. cost reduction, efficiency, etc.]
 - b. [If no outcomes, possible reasons]
5. Which mechanisms/processes allow such initiatives to be turned into such outcomes/benefits? [e.g. continuous improvement, searching for solutions etc.]
 - c. How do these mechanisms take place? (examples)
 - b. Who are involved?

E. PRODUCT LEVEL

1. Do you have any examples about modification of product' characteristics in order to reduce their environmental impact? [e.g. resource consumption/pollution]
 - a. Which reasons did drive these changes in product design?
 - b. How is this change process?
 - i. Who was in charge of this process (were there a 'fiery soul', an officially assigned person, etc?)
 - ii. Who were involved?
 - iii. How long did it take place?
 - c. Are such changes done on a sporadic or on a regular basis?
2. Has **[COMPANY NAME]** ever carried out a complete re-design of any product?

3. How was that experience? [why?, who was in charge?]
4. What are the outcomes out of such practices? [e.g. new customers, revenues, etc.]
 - a. [If no outcomes, why?]
5. Which mechanisms/processes allow such initiatives to be turned into outcomes/benefits? [e.g. negotiation techniques, specialised communication channels, etc.]
 - a. How do they take place?
 - b. Who are involved?

F. EMPLOYEE TRAINING AND INCENTIVES

1. How are the employees involved in environmental issues?
 - a. Do they actively provide ideas and/or solutions in order to improve environmental performance (bottom-up processes)?
 - b. Are there mechanisms or incentives to motivate and/or increase initiatives among the workforce?
 - i. If, yes, please give examples; if not, why not?
2. Has the company integrated environmental issues into the training programs for the employees?
 - a. What is the focus of this training?
 - b. How often does it take place?
3. What has [COMPANY NAME] got out of these programs/mechanisms? (employee satisfaction, retention, etc.)

G. GREENING OF THE SUPPLY CHAIN

1. How are [COMPANY NAME]'s suppliers considered when achieving environmental goals?
 - a. Are there mechanisms?
 - b. Which are the critical suppliers?
 - c. Which environmental issues does [COMPANY NAME] typically focus when choosing suppliers?
2. What are the outcomes out of such practices? [e.g. new customers, revenues, etc.]
 - a. [If no outcomes, why?]
3. Which mechanisms/processes allow such initiatives to be turned into benefits? (negotiation techniques, specialised communication channels, etc.)
4. How do they take place?
5. Who are involved besides the suppliers?

H. MANAGEMENT OF OTHER STAKEHOLDERS

1. How does the company obtain information about environmental issues? [Technical aspects, alternative solutions, managerial issues, etc.]
 - a. On a regular/ad hoc basis?
 - b. Which information channels have been developed?
 - c. How has your company developed its knowledge environmental base?
2. Do your customers demand an improved environmental performance? If so, please provide examples
 - a. Which are those customers?
3. Does your company have any kind of cooperation or joint work with your customers regarding environmental improvements? If yes,

- a. What does such cooperation involve? (please, provide some examples)
- b. Which environmental issues are addressed during such cooperation?
4. Has your company participated in any experience to exchange ideas or information regarding environmental issues with other stakeholders? (Government, financial institutions, NGOs, universities, media, etc). If yes,
 - a. Which topics have been addressed during such exchanges?
 - b. Have these experiences been beneficial? Why? Why not?
 - c. Has [COMPANY NAME] gone beyond such exchange of ideas and information with these stakeholders?
 - i. Any mechanism or joint initiative around environmental goals?
 - ii. Any strategic alliance?
 - d. How is your experience with the industrial sector? What did you get out of the participation in GA in your environmental dimension?

I. IMPLICATIONS ON COMPETITIVENESS

1. Do you see that the efforts towards environmental management have positive implications on the competitiveness of the firm?
 - a. If not, why?
 - i. How could you see that they contribute to improve competitiveness?
 - b. If yes, how the competitiveness is boosted?
 - i. Do you have any organisational process(es) in place that allow environmental management practices to be turned into improved competitiveness?
 - ii. How do you ensure that environmental practices are creating firm value? (tools? efforts? mechanisms?)
 - iii. How do these processes take place?
 - iv. Who are involved in such processes?

Thank you very much. I am very thankful for your collaboration and attention. Your contributions are very valuable for this stage of the research. Are the themes or issues that you wondered were not addressed during the interview? Or do you have other comments, thoughts or reflections?

A final question: In case I miss some particular information about what you said today, may I call you afterwards in order to clarify it?

In case you may be interested, I can share with you a document with the insights and conclusions of this study. Again, thank you so much!

----- END OF THE INTERVIEW GUIDE -----

Appendix C. Final questionnaire used for the last stage of the research

ENVIRONMENTAL MANAGEMENT IN THE PRINTING AND GRAPHIC SECTOR IN DENMARK

Worries about the environment, at both local, regional and global level, can still make the headlines. While this traditionally concerned special interest groups and grass-roots movements to begin with, nowadays there is often a more widespread interest in the environment. The business community has also for quite a while kept a close eye on developments, and an increasing number of environmental initiatives is coming from this quarter.

At the Strategy and Organisational Behaviour research group at Aarhus University, one of our ongoing studies is the investigation of the relationship between business and the natural environment in Danish printing industry. The survey is done in collaboration with the Graphic Association of Denmark (Grafisk Arbejdsgiverforening). In particular, we aim at determining the actual level of activity, including the nature of the processes and mechanisms that allow environmental responsibility to be integrated into the business strategy of such firms. Such a study will enable the researchers to identify areas within environmental management which should be included in the education of future business leaders and it will benefit the members of the Graphic Association of Denmark as the results can be used for future targeted initiatives, training and/or information campaigns.

Note: All information is anonymous and treated with the strictest confidence. Therefore, individual firms will not be identifiable in any publication of the survey results.

If your firm has many production facilities, please answer with reference to the facility at which you are located or with which you are most familiar. This is true of all sections/questions.

Although some questions about the firm's activities may not seem relevant, we would appreciate you answering all the questions – you can always check the 'We have not implemented anything regarding this practice at all' answer.

Time: Experience shows that the questionnaire takes about 20 minutes to complete. We hope you can spare the time to help us.

If you have any queries about the questionnaire, feel free to contact either of the following:

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Section I: Management systems and tools in your firm

This section contains questions related to your firm's general management systems and tools, as well as those which relate to the environment.

1.1. Does your firm have at least one person with **explicit responsibility** for environmental issues?

Yes.....1

No.....2

1.2. Under which of the following **headings** do the **responsibilities** regarding **environmental issues** mainly belong in your firm? (Please select only one option)

- General management 1
- Finance/accounting management 2
- Sales/Marketing 3
- External/Media relations 4
- Production/operations management 5
- Project management 6
- Quality management..... 7
- Environmental management 8
- Purchasing 9
- Human resources 10
- Other 11 Please specify: _____

1.3. Over the last three years, to what extent has your firm **implemented the following managerial practices**? (Please consider the scale in all specified practices)

1	2	3	4	5
We have not implemented anything regarding this practice at all.	We have been planning to implement this practice.	We have partially implemented this practice but not on a routine basis	We have implemented this practice an follow some routines	We have fully implemented this practice and it is a regular routine

Explicit definition of environmental policy.	1	2	3	4	5
Measurement or calculation of raw materials consumption.	1	2	3	4	5
Measurement or calculation of energy consumption.	1	2	3	4	5
Measurement or calculation of carbon (CO2) emissions.	1	2	3	4	5
Compensation of carbon (CO2) emissions through emission trading.	1	2	3	4	5
Measurement or calculation of waste output.	1	2	3	4	5
Clear environmental performance objectives based on own measurements (e.g. waste/consumption reduction targets, etc.).	1	2	3	4	5
Assignment of responsibilities to carry out environmental plans.	1	2	3	4	5

Audit system to check accomplishment of environmental goals.	1	2	3	4	5
Audit system to ensure continuous improvement regarding less environmental impacts.	1	2	3	4	5
The use of Quality Management Systems (e.g. ISO 14001).	1	2	3	4	5
The use of Environmental Management Systems (e.g. ISO 14001, EMAS, etc.).	1	2	3	4	5
The use of Environmental-/Eco-labelling systems (e.g. Nordic Swan, EU Flower, etc.).	1	2	3	4	5

1.4. At the moment, which of the following certifications/eco-labels does your firm have? (You can select more than one)

ISO 14001	<input type="checkbox"/>
EMAS (European Management and Auditing Scheme)	<input type="checkbox"/>
Nordic Swan	<input type="checkbox"/>
EU-Flower	<input type="checkbox"/>
Forest Stewardship Council (FSC)	<input type="checkbox"/>
Programme for the Endorsement of Forest Certification (PEFC)	<input type="checkbox"/>
ClimateCalc	<input type="checkbox"/>
Other (Please specify: _____)	<input type="checkbox"/>

Section II: Environmental management and technical aspects

In this section, you are asked to provide an overall picture of how your firm has sought to address the environmental impacts of its production activities and products through technical measures.

2.1. Over the last three years, to what extent has your firm **implemented the following technical practices?** (Please consider the scale in all specified practices)

1	2	3	4	5
We have not implemented anything regarding this practice at all.	We have been planning to implement this practice.	We have partially implemented this practice but not on a routine basis	We have implemented this practice and follow some routines	We have fully implemented this practice and it is a regular routine

Process modifications to reduce consumption of raw materials.	1	2	3	4	5
Retrofitting high-energy-consuming equipment.	1	2	3	4	5
Recycling programmes for residues and waste.	1	2	3	4	5
Use of recycled materials in production processes.	1	2	3	4	5

Recycling programmes for water.	1	2	3	4	5
Systematic treatment and disposal of problematic/hazardous wastes (e.g. chemicals, electronic waste, used printing plates, etc.).	1	2	3	4	5
Changes in working procedures to reduce energy and material consumption (e.g. maintenance, printer calibration, etc.).	1	2	3	4	5
Consideration of environmental aspects at offices and administrative locations (e.g. paper, toner recycling, etc.).	1	2	3	4	5
Switching off machinery which is not necessary instead of leaving them in standby mode.	1	2	3	4	5
Process modifications to reduce waste/emissions (e.g. paper, excess ink when changing from one colour to another, etc.).	1	2	3	4	5
Use of alternative energy sources (e.g. solar energy, wind power).	1	2	3	4	5
Use of clean technology/equipment.	1	2	3	4	5
Substitution of products containing volatile organic solvents by products with less volatile substances.	1	2	3	4	5
Changes in input materials to reduce energy consumption (e.g. inks for fast drying, paper for moisturising, etc.).	1	2	3	4	5
Solutions towards reuse of energy (e.g. heating systems, air circulation, lighting, etc.).	1	2	3	4	5
Substitution of other harmful substances by environmentally friendly ones (e.g. cleaning and washing agents, dampening solution additives, inks, etc.).	1	2	3	4	5
Product designs focused on reducing resource consumption and waste generation in product usage.	1	2	3	4	5
Use of packaging made from recycled/biodegradable materials.	1	2	3	4	5
Product designs focused on reducing resource consumption and waste generation during production and distribution.	1	2	3	4	5
Selection of cleaner transportation methods.	1	2	3	4	5

2.2. Please indicate the firm's **agreement** on the following **statements** (please consider the scale in all of the statements):

1	2	3	4	5
Completely disagree	Partially Disagree	Neither agree nor disagree	Partially agree	Completely agree

Our firm is among the first in the industry to try new methods and technologies.	1	2	3	4	5
Our firm focuses on using the latest technology in production.	1	2	3	4	5
Our firm has made capital investments in new equipment and machinery over the last three years.	1	2	3	4	5
Our firm maintains an on-going dialogue with suppliers regarding improvements in our current technology in production.	1	2	3	4	5
Our firm maintains an on-going dialogue with suppliers regarding new technologies to be implemented.	1	2	3	4	5

Section III: Communication and results of Environmental management

In this section, you are asked to provide an overall picture of how your firm has sought to communicate the environmental efforts to customers and the influence on business aspects

3.1. Please indicate the firm's **agreement** on the following **statements** regarding the **communication of environmental efforts** (please consider the scale in all of the statements)

1	2	3	4	5
Completely disagree	Partially Disagree	Neither agree nor disagree	Partially agree	Completely agree

Our firm regularly shares concrete information related to our environmental commitment (e.g. goals, achievements, audit results, etc.).	1	2	3	4	5
Our firm emphasises the environmental impact of our products in our marketing campaign.	1	2	3	4	5
Our firm emphasises the environmental impact of technologies and production methods in our marketing campaign.	1	2	3	4	5
Our firm regularly updates our website with concrete information related to environmental protection (e.g. news about new initiatives, projects, etc.).	1	2	3	4	5
Our firm uses other electronic means (e.g. Information	1	2	3	4	5

Systems) to share concrete environmental information of products/processes with customers.	
Our firm has developed mechanisms to educate/create awareness among customers about critical environmental issues (e.g., climate change, etc.).	1 2 3 4 5
Our firm gives advice to our customers on alternatives to make conscious choices of products based on environmental arguments (e.g. paper/ink types, acquisition of CO2 credits, etc.).	1 2 3 4 5
Our firm periodically elaborates voluntary environmental reports to our customers and the public.	1 2 3 4 5
Our firm uses mechanisms such as public presentations, workshops, seminars, press releases, etc., to communicate our environmental efforts to the public.	1 2 3 4 5
Our firm sponsors or collaborates with environmental groups/networks.	1 2 3 4 5

3.2. Please indicate the firm's **agreement** on the following **statements** regarding the **influence of environmental management on the business** (please consider the scale in all of the statements)

1	2	3	4	5
Completely disagree	Partially Disagree	Neither agree nor disagree	Partially agree	Completely agree

Relative to our competitors, environmental management in our firm helps/leads to...

...have lower costs of compliance with environmental regulations (e.g. decreased fee of waste treatment/discharge, etc.	1 2 3 4 5
...increase process/production efficiency (e.g. better use of printers, etc.)	1 2 3 4 5
...have better product quality.	1 2 3 4 5
...spot new market opportunities in order to attract more customers.	1 2 3 4 5
...have lower costs associated to recycling and reuse.	1 2 3 4 5
...increase productivity.	1 2 3 4 5
...achieve above-average market prices for our products.	1 2 3 4 5
...have lower cost due to energy consumption.	1 2 3 4 5
...have increased knowledge about effective ways of managing operations.	1 2 3 4 5

...achieve an overall better corporate reputation/image.	1	2	3	4	5
...have lower costs for materials purchasing.	1	2	3	4	5
...develop new technologies.	1	2	3	4	5
...have lower operational costs (e.g. production, distribution, etc.)	1	2	3	4	5
...development of new products.	1	2	3	4	5
...improved loyalty of existing customers.	1	2	3	4	5
...higher employee satisfaction/morale.	1	2	3	4	5
...establish better relationships with stakeholders (e.g. local communities, regulators, environmental groups, etc.).	1	2	3	4	5

Section IV: Firm characteristics

This section is intended to help us obtain a general picture of your firm’s market, size, and the nature of its commercial market.

4.1. Please indicate the approximate **percentage of sales** of your firm from 0 to 100 due to the following **activities**. For example, 70-30 and 20-80 (total must equal 100%)

Printing, pre-press, pre-media and/or bookbinding..... _____
 Advertising, graphic and/or communication design..... _____
Total..... 100

4.2. How many **people** are presently **employed full-time** by your firm? (Please select only one option)

Less than 10.....1
 10-192
 20-493
 50-994
 100-2495
 250-4996
 500 or more7

4.3. For each of the following **geographical locations of customers**, please indicate the **percentage of sales** of your firm from 0 to 100

Norway....._____
 Sweden....._____
 Germany....._____
 United Kingdom....._____
 Other countries....._____

4.4. For each of the following four **types of customers**, please indicate the **percentage of sales** of your firm from 0 to 100. For example, 60-10-5-25 and 20-5-25-50 (total must equal 100%)

Manufacturing firms _____
 Service firms _____
 Wholesalers/retailers _____
 Consumers/Individuals.... _____
Total **100**

4.5. Please indicate the **approximate percentage of sales** of your firm from **customers in the public sector** (e.g. national government, municipality, etc.) _____

4.6. Please rank the following **factors** according to their **importance** where **1** is the **most important** and **6** is the **least important** to your firm in order to **compete** in the **market**

Product price _____
 Product quality _____
 Customisation..... _____
 Delivery times _____
 Firm's image _____
 Broad coverage/range of products _____

4.7. Which is your **own main activity** in your firm? (Please select only one option)

General management..... 1
 Finance/accounting management 2
 Sales/Marketing 3
 External/Media relations 4
 Production/operations management 5
 Project management 6
 Quality management 7
 Environmental management..... 8
 Purchasing..... 9
 Human resources..... 10
 Other 11 Please specify: _____

COMMENTS

If you have any supplementary comments or elaborations, please write them in the space provided below.

CHAPTER 2:

CORPORATE ENVIRONMENTAL SUSTAINABILITY IN DANISH SMEs: A LONGITUDINAL STUDY OF MOTIVATORS, INITIATIVES AND STRATEGIC EFFECTS

Juan Felipe Reyes-Rodríguez, John P. Ulhøi and Henning Madsen

Abstract

While industry leaders proactively address environmental issues as an integrated part of corporate strategy, SMEs often perceive it as a means of cost reduction. The aim of this paper is to track the development of motivators, environmental initiatives and their perceived effects on competitive advantage among SMEs. For that purpose, we conducted a longitudinal analysis of four repeated surveys over a period of 14 years among Danish manufacturing SMEs. Results show that Danish SMEs have increasingly deployed environmental initiatives that are associated with both lower costs and a differentiation of competitive advantage. The study also shows that over managerial attitudes, strategic intent has been the main driver when adopting such initiatives. Furthermore, we found that despite some differences between small and medium-sized firms in terms of the levels of environmental engagement, the competitive benefits are generally robust regarding firm size. Before concluding, implications for future research and corporate managers are pointed out.

Keywords: Environmental management; managerial attitudes; strategic intent; competitive advantage; small and medium-sized enterprises; longitudinal study.

1. Introduction

The study of corporate environmental management has been carried out from a variety of disciplines and is thus scattered across domain-specific scientific outlets. Extant research has determined what motivates companies to respond to environmental issues, the organisational responses and their subsequent results (Sharma and Vredenburg, 1998; Christmann, 2000; González-Benito and González-Benito, 2006; Dahlmann and Brammer, 2011). However, the majority of this research has focussed on large enterprises and normally neglected small and medium-sized enterprises (SMEs), which after all make a major contribution to all economies and industrialised nations. In this sense, “the ‘smallness’ of the individual SME is not proportional to the collective ‘grandness’ of SMEs” (Morsing and Perrini, 2009, p. 2). Differently put, SMEs’ environmental significance deserves greater attention (Gadenne *et al.*, 2009) as, for instance, it is

estimated that such firms account for roughly 70% of industrial pollution around the globe (Hillary, 2000).

Despite a growing recognition of the role that SMEs play in reducing environmental problems, empirical evidence has traditionally suggested that such firms lack resources and are unaware of their impacts on the environment, potential improvements they could make and the business benefits, which prevents them from investing in environmental initiatives (Hillary, 2000; Gadenne *et al.*, 2009). Others have pointed to their reactive behaviour, which tends to limit SMEs to first and foremost meeting the regulations and avoiding penalties (Williamson *et al.*, 2006; Revell and Blackburn, 2007). Notable exceptions over the last few years have, however, shown that SMEs can in fact develop proactive approaches to the natural environment (Heras and Arana, 2010; Uhlaner *et al.*, 2012; Granly and Welo, 2014) in alignment with their resources and capabilities (Aragón-Correa *et al.*, 2008). As a positive effect of these approaches, opportunities for cost reduction and business growth have often emerged (Aragón-Correa *et al.*, 2008; Brammer *et al.*, 2012). Thus, the former predominantly reactive stance of SMEs may well be undergoing a more widespread process of changing towards a more strategic perspective. Two explanations may account for such a development: a growing recognition among owner-managers of strategic intent as a motivator for environmental initiatives (Revell *et al.*, 2010; Brammer *et al.*, 2012) and the potential for the translation of their strong environmental values and attitudes into such initiatives (Uhlaner *et al.*, 2012; Williams and Schaefer, 2013). This study provides empirical evidence documenting that such a development seems to be underway.

Most studies of SMEs and their relationship with the natural environment have been carried out in cross-sectional designs. This calls for studies that attempt to track the evolution of such interactions over time in order to establish whether or not a more profound change is under way. This study specifically takes up this challenge by mapping the development of the adoption of environmental initiatives at the strategic level over nearly a decade and a half (14 years) among Danish manufacturing SMEs. Therefore, the overall research question that has guided this exploratory investigation is as follows: How have the adoption of environmental initiatives at the strategic level, the influence of motivators and the perceived implications of the competitive advantages developed over time among Danish SMEs?

We argue that the adoption of strategic initiatives reflects a proactive behaviour. This has been made possible by a growing awareness of efficiency, focussing of efforts and organisational innovation that are triggered and lead to improved competitiveness (Halila, 2007; Granly and Welo, 2014; Klewitz and Hansen, 2014). Consistent with the growing recognition of the strategic view of environmental issues among SMEs pointed out in the literature, this study explores the development of the influence of internal drivers such as managerial attitudes and strategic intent. The heterogeneity of SMEs regarding the adoption of initiatives and competitive outcomes is approached through the analysis; that is, we distinguish between smaller and larger SMEs.

The paper starts off with a review of the literature on environmental initiatives at the strategic level and their perceived influence on competitive advantage, the motivators. Then, the research design is presented. Next, the results and discussion make it possible to identify potential strategic

shifts and/or patterns in the development of environmental management in our empirical setting. Finally, we conclude by addressing the key implications of the study.

2. Literature review

Studies on corporate environmental initiatives, strategic drivers and the perceived implications for competitive advantage have tended to focus mainly on environmental initiatives and how they affect the competitive advantage of the firms or industries in question. Less emphasis has been given to the main strategic factors that drive such initiatives. In order to place this study in the current academic discussion, we present the main insights from our review of previous research in the field. We have organised this into three streams: (i) environmental management and competitiveness, (ii) managerial attitudes and strategic intent and (iii) the development and change of environmental management.

2.1. *Environmental management and competitiveness*

The literature predominantly argues for win-win situations in which organisations are able to deploy environmentally responsible actions while maintaining competitive advantage (Hart, 1995; Porter and van der Linde, 1995; Shrivastava, 1995a; Russo and Fouts, 1997; Sharma and Vredenburg, 1998; Giménez Leal *et al.*, 2003; Heikkurinen, 2010). For instance, the use of environmental technologies may lead to improvements in production efficiency by conserving inputs and minimising costs derived from waste generation (Shrivastava, 1995a; Klassen and Whybark, 1999b). Conversely, competitive advantage is achieved by means of the development of firms' resources and capabilities associated with the adoption of proactive approaches towards environmental protection (Hart, 1995; Russo and Fouts, 1997; Sharma and Vredenburg, 1998; Aragón-Correa *et al.*, 2008; López-Gamero *et al.*, 2009).

Particular attention has been paid to the consideration of environmental issues in the planning and organisational processes at the strategic level (Judge and Douglas, 1998; Wagner, 2007, 2011). This set of initiatives involves the formalisation of green issues, provided by the structuration of new routine procedures for planning, goal setting, assignment of responsibilities, measurement, evaluation and reporting. Corporate commitment at this level also includes system analysis and management controls such as life-cycle analysis and audits (Hart, 1995; Aragón-Correa and Sharma, 2003; Menguc *et al.*, 2010). The implementation of environmental initiatives at the strategic level allows firms to make forward-thinking decisions to improve performance (Judge and Douglas, 1998; Wagner, 2007, 2011); that is, initiatives at this level are considered to be a fundamental part of a proactive environmental strategy, which the literature points to as a source of competitive advantage for firms (Hart, 1995; Sharma and Vredenburg, 1998; Aragón-Correa and Sharma, 2003; Menguc *et al.*, 2010; Walker and Mercado, 2015).

Competitive advantage that follows from the adoption of environmental initiatives at the strategic level can occur in two ways. First, it can be achieved in the form of differentiation and positioning (Jiang and Bansal, 2003; Heikkurinen, 2010); that is, firms that carry out such initiatives are expected to efficiently deal with the requirements of different stakeholders, which brings

visibility, credibility, legitimacy and social approval by the formalised mechanisms used to communicate credible information (Jiang and Bansal, 2003; Heras-Saizarbitoria *et al.*, 2011). Opportunities for differentiation, for example, may arise from demonstrating a systematic management of environmental issues that improve corporate image and strategic position in the market (Giménez Leal *et al.*, 2003; Heikkurinen, 2010; Klewitz and Hansen, 2014). To be differentiated allows the market access to be widened so as to address environmentally sensitive customers and more stringent standards (Judge and Douglas, 1998; Heras-Saizarbitoria *et al.*, 2011; Lo *et al.*, 2012).

Second, from an internal perspective, the adoption of environmental initiatives at the strategic level leads to competitive advantage in terms of lower cost and efficiency (Christmann, 2000; Lo *et al.*, 2012). The development of the policies and procedures for such initiatives points to the “wasteless” use and consumption of raw materials, energy and water. These initiatives also emphasise the tracking and monitoring of environmental efforts, which promotes awareness due to the provision of necessary information, and at the same time it motivates real improvements (Melnyk *et al.*, 2003). Such improvements take place in product design and production processes in the form of a reduction of inefficient processes and material waste (Christmann, 2000; Lo *et al.*, 2012). Therefore, environmental initiatives at the strategic level pave the way for improved resource productivity and making use of the opportunity costs of pollution (Giménez Leal *et al.*, 2003; Heras-Saizarbitoria *et al.*, 2011). Lower costs are also achieved in the form of a reduced risk of fines and sanctions by regulators as well as the achievement of economies of scale due to wider market access (Lo *et al.*, 2012).

Previous studies have found that SMEs are unable to deploy effective actions in the direction of increased environmental responsibility. It is argued that this is due to their lack of resources and environmental awareness since they are not convinced that there is an actual business case for making progress towards environmental protection (Gesternfeld and Roberts, 2000; Hillary, 2000; Revell and Blackburn, 2007). However, some research also indicates that SMEs are able to introduce proactive environmental responsibility, which becomes “one of the major determinants of corporate profitability” (Bianchi and Noci, 1998, p. 279) . This means that SMEs may deploy innovative, opportunistic and proactive behaviour that makes them able to develop valuable resources and capabilities for environmental improvement and competitive advantage (Aragón-Correa *et al.*, 2008; Parker *et al.*, 2009).

The implementation of environmental initiatives at the strategic level takes place among SMEs in a different manner from larger firms. Thus, SMEs tend to rely on business networks for the joint use of expertise or financial resources and for realising more benefits (Halila, 2007; Granly and Welo, 2014). Furthermore, tailored managerial systems for environmental initiatives tend to be implemented in SMEs according to their characteristics, internal dynamics and available resources (Heras and Arana, 2010; Granly and Welo, 2014). This suggests the ability of SMEs to strategically use these environmental initiatives to achieve competitive advantage (Hillary, 2004; Brammer *et al.*, 2012; Granly and Welo, 2014). Such behaviour can be seen as a kind of organisational environmental innovation as SMEs either create or modify managerial practices, procedures and systems (Halila, 2007, p. 167). That is, smaller firms are able to focus their efforts by the

formulation of process-oriented environmental policies that allow noteworthy cost reductions to be achieved (Heras and Arana, 2010; Bagur-Femenias *et al.*, 2013). Environmental initiatives at the strategic level in SMEs affect goals and measurement mechanisms, which raises awareness among the workforce of the improvement of the environmental efficiency of processes (e.g. reduction in consumption levels and residues, better waste sorting and handling; (Heras and Arana, 2010; Granly and Welo, 2014). This has consequences for firms' profitability and, therefore, for their competitive advantage (Perez-Sanchez *et al.*, 2003; Halila, 2007).

On the other hand, by carrying out environmental initiatives at the strategic level, SMEs have to become knowledgeable about environmental legislation and regulations, which facilitates compliance with norms (Heras and Arana, 2010) and supports communication efforts (Klewitz and Hansen, 2014). At the same time, these initiatives constitute a first step to promoting product-oriented eco-innovation that moves downstream in the supply chain and allows the meeting of customer needs by SMEs (Granly and Welo, 2014; Klewitz and Hansen, 2014). Therefore, environmental initiatives at the strategic level lead to market success in the form of differentiation, improvement in the external image of the company, customer satisfaction and a stronger position in times of crisis (Heras and Arana, 2010; Bagur-Femenias *et al.*, 2013; Granly and Welo, 2014).

2.2. Managerial attitudes and strategic intent

The adoption of environmental initiatives is determined by a variety of motivators including firm internal factors as well as external forces arising from the different stakeholders and institutions (Bansal and Roth, 2000; Banerjee *et al.*, 2003; González-Benito and González-Benito, 2006; Paulraj, 2009). This has also been a topic for academic inquiry in the context of SMEs (Williamson *et al.*, 2006; Parker *et al.*, 2009; Revell *et al.*, 2010; Brammer *et al.*, 2012) focussing on characterising the different patterns of behaviour towards the natural environment amongst such firms (Williamson *et al.*, 2006; Parker *et al.*, 2009; Battisti and Perry, 2011). Even though external drivers such as legislation and demands from customers and suppliers have been widely recognised as crucial drivers of actions towards environmental protection in SMEs, we are particularly focussing on specific internal factors such as managerial attitudes and strategic intent.

Managers' perceptions and interpretations of environmental issues have implications for the adoption of environmental initiatives (Sharma, 2000). According to the theory of planned behaviour (Ajzen, 1991), it is suggested that managers' attitudes influence their preferences for engaging in beyond-compliance activities and achieving pollution prevention (Cordano and Frieze, 2000; Papagiannakis and Lioukas, 2012). The personal values of managers shape their attitudes towards the preservation of the natural environment and their subsequent commitment (Papagiannakis and Lioukas, 2012). Therefore, managerial attitudes are recognised as significantly affecting the formulation of new environmental policies and goals for environmental leadership (Berry and Rondinelli, 1998; Cordano and Frieze, 2000), resource allocation and decision-making to build and deploy organisational capabilities towards environmental initiatives (Bansal and Roth, 2000; Sharma and Sharma, 2011; Colwell and Joshi, 2013), the coordination and encouragement of collaboration among different divisions and departments (González-Benito and González-Benito,

2006) and the conversion of institutional pressures into positive environmental actions (Colwell and Joshi, 2013).

In the case of SMEs, this motivator is more critical since this type of firm tends to be more “personal and reflect the personal values and commitment of the owners” (Fuller, 2003, p. 319). Regarding environmental issues, it has been suggested that even if SMEs demonstrate pro-environmental attitudes, they often experience “difficulties translating these ideals, aspirations and values into action” (Tilley, 1999, p. 241), which evidences a gap between what owner-managers intend and what they actually do (Cassells and Lewis, 2011).

However, the literature also recognises that the attitudes and sense of personal responsibility of owner-managers dictate the directions that SMEs follow regarding environmental protection (Cassells and Lewis, 2011; Williams and Schaefer, 2013). That is, managerial attitudes that imply awareness and strong environmental and ethical convictions allow smaller firms to implement sustainability tools and become pioneers of responsible behaviour (Williams and Schaefer, 2013; Johnson, 2015). Recent findings suggest that strongly committed attitudes shown by small business’ owner-managers “encourage an interest in ‘getting back to the land’”(Battisti and Perry, 2011, p. 182) by carrying out initiatives related to environmental systems, support and conservation (Gadenne *et al.*, 2009).

However, if environmental issues are perceived as potential opportunities, it invites the development of strategic intent, that is, the conscious and deliberate intention to drive, differentiate and to add a valuable component to environmental actions (Worthington and Patton, 2005). Once firms consider green issues as part of their strategic intent, environmental degradation becomes an argument to determine market imperfections and also a source of opportunities. It allows firms to increase efficiency and productivity, create new markets and reduce information asymmetry (Cohen and Winn, 2007). Therefore, the intention to enhance market position motivates active involvement in previously unrealised environmental innovations (Bansal and Roth, 2000). That reflects the intent to integrate environmental strategies into the entrepreneurial dimension of the firm (Aragón-Correa and Sharma, 2003) as a means to pursue “choices about products, markets, and ways of competing” (Aragón-Correa, 1998, p. 557).

Regarding the SME context, however, there are diverse insights. On the one hand, SMEs have been found to lack the strategic orientation to exploit opportunities and gain the competitive edge that motivates managerial decisions towards environmental responses (Worthington and Patton, 2005). Williamson *et al.* (2006) have documented that instead of the “business case” motivation, a narrower “business performance” criterion focussing primarily on cost reduction and efficiency seems to drive a functional or task-oriented environmental behaviour in SMEs (Williamson *et al.*, 2006). Findings, although not all in agreement, point out that strategic intent to pursue long-term financial benefits and market share/position payoffs are the primary drivers in SMEs of their environmental initiatives, more than regulatory pressures and public concern (Brammer *et al.*, 2012). This points to the growing resonance of the business case for environmental responsibility among SMEs and more confidence in taking it forward (Revell *et al.*, 2010), particularly with their strategic intent to wish to uphold the firm’s reputation, win business opportunities and strengthen the market position (Revell *et al.*, 2010; Brammer *et al.*, 2012; Uhlaner *et al.*, 2012). Therefore,

there is evidence in favour of advantage-driven SMEs (Parker *et al.*, 2009) that are able to adopt environmental initiatives by recognising not only cost savings but the “marketing and reputational benefits to be gained” (Battisti and Perry, 2011, p. 177) in response to non-regulatory pressures such as the industry, supply chain and customers, and who demand environmental improvement and are willing to pay for it (Simpson *et al.*, 2004; Uhlaner *et al.*, 2012).

2.3. *Change and development of corporate environmental management*

Change here refers to “self-transformation efforts intended to make companies more environmentally responsible” (Shrivastava and Scott, 1992, p. 12). It comes with many guises: in corporate environmental strategy through the implementation of clean technologies, in organisational structures and management systems, and in values when a firm moves from compliance towards excellence (Roome, 1992). It has been suggested that the business case for environmental management fits into a rational lens perspective of organisational change driven by goals such as the optimisation of performance (Rajagopalan and Spreitzer, 1997). The emphasis on goals regarding green transformation “aims at improving firm-nature relations [and] simultaneously aims to make firms more competitive and profitable” (Shrivastava and Scott, 1992, p. 12); that is, goals refer to end-states that are translated into decisions about environmental issues, for example, environmental initiatives at the strategic level (Papagiannakis *et al.*, 2014). On the other hand, from the resource-based-view, it is suggested that environmental management evolves due to the accumulation of green resources and capabilities (Hart, 1995; Sharma and Vredenburg, 1998). Together with the achieved goals and outcomes of carrying out environmental initiatives, the capabilities that are gradually developed allow for the upgrading of such goals during a feedback process. As a result, higher levels of environmental conduct and greater integration into the business strategy can be deployed over time (Papagiannakis *et al.*, 2014). The sequential and planned pursuit of goals within the bounds of the rational perspective of organisational change allows managerial attitudes and strategic intent to be considered as key motivators that facilitate the progressive implementation of environmental initiatives at the strategic level. These motivators, in turn, guide the content and process of the formulation of goals that lead to actions towards environmental responsibility.

A number of studies have introduced a variety of different taxonomies for organisational approaches to the natural environment, with stages ranging from a less developed, reactive and passive position to a more advanced and proactive environmental leadership (Hunt and Auster, 1990; Roome, 1992; Hart, 1995; Aragón-Correa *et al.*, 2008). Even though at a certain point in the timeline firms can exhibit a particular approach to the natural environment, it is also plausible that firms progress from one stage to another over time. However, in empirical literature few longitudinal studies have been carried out in order to evidence elements of change. Some studies have documented incremental levels of development over time that exhibit more proactive corporate environmental responses explained by institutional pressures and social concerns (Bansal, 2005; Lee and Rhee, 2007; Papagiannakis *et al.*, 2014). Such a development takes place due to feedback processes triggered by capabilities together with environmental outcomes and is also influenced by managerial values and attitudes (Papagiannakis *et al.*, 2014). However, inertial

patterns without substantial changes to environmental responsiveness are also evidenced in such longitudinal approaches (Dahmann and Brammer, 2011). The relationships between environmental management and competitive advantage over time also provide divergent findings, depending on the considered dimensions and measurements for environmental actions. For instance, poor financial performance reflected over time has been found to provide a broader indication of sustainable development (Bansal, 2005), but Gluch *et al.* (2013) found that even though Swedish companies have shown greater maturity and raised the levels of their environmental actions over time, the strengthening of their competitive position in the market is missing. However, when it comes to the adoption of managerial systems such as ISO 14001, these are reflected in improvements in financial performance as time passes (Heras-Saizarbitoria *et al.*, 2011). This provides evidence of an increasing integration of environmental issues into a firm's competitive advantage and business strategy (Papagiannakis *et al.*, 2014).

Studies of the evolution and development of environmental actions in SMEs over time are practically absent. However, in considering the discussion in the previous sections we have noted that, interestingly, in a similar geographic context for SMEs (United Kingdom), firms seem to have experienced a lack of strategic intent to guide their environmental responses in the past (Worthington and Patton, 2005). However, more recent studies of SMEs in the same country indicate that such firms are able to exhibit strategic intent (Battisti and Perry, 2011) as they “are increasingly willing to accept the idea that future economic growth is predicated on long term environmental protection” (Revell *et al.*, 2010, p. 284). This indeed suggests that SMEs' approach to environmental issues may be subject to positive development over time.

Based on the above discussion we formulated the following hypotheses to be tested:

H1: The adoption of environmental initiatives at the strategic level among Danish SMEs has increased over time.

H2a: The effect of environmental initiatives at the strategic level on competitive advantage in terms of differentiation and positioning among Danish SMEs is positive over time.

H2b: The effect of environmental initiatives at the strategic level on competitive advantage in terms of lower costs among Danish SMEs is positive over time.

H3a: The effect of managerial attitudes on the adoption of environmental initiatives at the strategic level among Danish SMEs is positive over time.

H3b: The effect of strategic intent on the adoption of environmental initiatives at the strategic level among Danish SMEs is positive over time.

H4a: The effect of environmental initiatives at the strategic level on competitive advantage in terms of differentiation and positioning among Danish SMEs increases over time.

H4b: The effect of environmental initiatives at the strategic level on competitive advantage in terms of lower costs among Danish SMEs increases over time.

H5a: The effect of managerial attitudes on the adoption of environmental initiatives at the strategic level among Danish SMEs increases over time.

H5b: The effect of strategic intent on the adoption of environmental initiatives at the strategic level among Danish SMEs increases over time.

3. Methodology

3.1. Sampling procedure

Data were collected by repeated questionnaire-based surveys of Danish manufacturing companies (in 1999, 2003, 2007 and 2011). A pre-test of the survey was performed prior to the first survey. In all surveys a sample of some 500 companies with 10 or more employees were randomly drawn from an electronic database. The sample consisted of new companies in every survey year in order to avoid missing information due to closure, mergers and acquisitions among firms. As an initial step, telephone contact with the sampled companies was established to identify the responsible manager for environmental issues or related functions. A questionnaire was then mailed to the selected companies, resulting in a response rate of around 60% in each of the four waves of the survey (in absolute numbers 308, 276, 214 and 289 respectively). Non-response bias analyses showed that there were no common patterns in the non-responding companies.

We retained responses from companies with between 10 and 249 employees, which accounted for above 80% of the responses. Thus, the final sample sizes considered for the subsequent analyses were 261 (1999), 226 (2003), 179 (2007) and 239 (2011). For the following analyses these companies were further split into two groups: small companies (between 10 and 49 employees) and medium-sized companies (between 50 and 249 employees; (Eurostat, 2010). We found that small firms predominated over medium-sized firms in all four surveys, accounting for 60–70% of the responding companies.

3.2. Measurements

The questionnaire included three questions focusing on environmental initiatives, their impact on competitive advantage, as well as motivators. Representing the different constructs involved in our hypotheses, each of them was developed into a scale of items based on input from the literature.

Ten items measured the extent to which environmental initiatives have been carried out at the strategic level (see Table A1 in the Appendix). Responses were on a five-point ordinal scale ranging from 1 for *not relevant* to 5 for *to a large extent*. Such initiatives referred to the formulation of an

environmental strategy, policies and specific goals, performance of audits, certification schemes (ISO 14000), the publication of environmental reports and the assignment of responsibilities among others.

Ten items reflected the impact of the environmental initiatives on the competitive advantage (see Table A2 in the Appendix). Responses were on a five-point ordinal scale ranging from 1 for *very negatively* to 5 for *very positively*. The items measured the impacts on productivity improvement, profits and market opportunities, as well as the product and firm's image.

In order to measure motivators, six items were applied (see Table A3 in the Appendix). Responses were given on a five-point ordinal scale ranging from 1 for *not relevant* to 5 for *very important*. The scale included items that evaluate motivations such as the intention to improve the firm's reputation, prepare strategic positioning and spot new market opportunities, as well as the attitudes and opinions of managers and owners. The items reflected managerial attitudes and strategic intent as part of these motivators.

The same three questions were asked in each of the four years that the survey was carried out. Thus, the analyses of these three questions over time provided the required information to test the formulated hypotheses.

As for firm size, a dummy variable was set equal to 0 for small firms and 1 for medium-sized firms.

4. Results

Initially, a factor analysis applying a principal component extraction followed by a varimax rotation was carried out on the three questions above in order to determine the underlying structures in the responses to the scale of items. In some cases we made modifications regarding the cut-values of the eigenvalues, which is suggested to be above 1.0 (Hair *et al.*, 2010), in order to keep the same number of factors. The details about the particular modifications are discussed below.

Next, multiple regression analyses using OLS were applied to determine the effects of environmental initiatives at the strategic level on competitive advantage, and the effects of motivators on the adoption of such initiatives. In particular, each regression analysis consisted of three models: (i) firm size as single predictor, (ii) only the extracted factors as predictors, and (iii) the extracted factors and firm size as predictors. This step-wise procedure was followed in order to establish the best choices in terms of fit. Furthermore, we calculated the variance inflation factor (VIF) after each regression to see whether results were subject to multicollinearity. Values were below the cut-values, indicating that estimations did not raise concerns about multicollinearity. Finally, the analysis of standardised coefficients of the models with the best fit allowed us to examine changes among the effects over time.

4.1. Initial analyses

Concerning environmental initiatives, Table A1 in the Appendix shows the results of the standardised varimax rotation of the items that composed a single factor in all four surveys. For such factors reliabilities were above 0.900 and variance explained was above 60%.

Regarding competitive advantage, the analyses of the surveys from 1999, 2003 and 2007 showed a two-factor structure for the items, but in 2011 they revealed a three-factor structure. Hence, we forced the extraction of only two factors in 2011 in order to be able to make a comparison with the previous surveys on the basis of the same structures in the subsequent analyses. That implied increasing the cut-value of the eigenvalues above 1.4 in 2011. We also obtained high reliabilities in the two factors every year as well as variances explained above 60% (see Table A2 in the Appendix). The first factor was called “differentiation and positioning” since it involved aspects related to product and firm image, market penetration and opportunities. The second factor was called “lower cost” since it explicitly included cost reduction, efficiency, productivity and profitability.

Concerning motivators, we found that the survey in 2007 reflected a two-factor structure with eigenvalues above 1.0, whereas in the other surveys the items loaded on a single factor. To ensure the same two-factor structure in each of the four years, we forced the extraction of two factors for 1999, 2003 and 2011 allowing the inclusion of a factor with an eigenvalue below 1.0 in each of these surveys. The obtained eigenvalues were 0.995, 0.903 and 0.919, respectively, which are very close to the conventional cut-value of 1.0. This decision had implications for the amount of variance extracted, which amounted to more than 70% in all cases.

In addition to that, in the sample for 2011, the item corresponding to “improvement of the firm’s general reputation” was a case of cross-loading of the two factors. We kept this item as part of the first factor so that we could keep the same structure among the items in each of the four years. However, to support our decision, we checked the reliability, which still remained acceptable (above 0.700; (Hair *et al.*, 2010). Finally, we called the first factor “strategic intent” since it included aspects of the external business environment (positioning, market opportunities and reputation). The second factor was called “managerial attitudes” since it explicitly involved managers’ and owners’ perceptions and attitudes (see Table A3 in the Appendix). An overview of the identified variables included in the following analysis can be found in Table 1, which shows the means, standard deviations and correlations of the variables (factors).

INSERT TABLE 1 HERE

4.2. Changes over time

The trend for each of the variables shows different patterns over time (see Figure 1).

INSERT FIGURE 1 HERE

As can be seen, the managerial attitude as motivator and differentiation advantage shows the same tendency with a decrease between 1999 and 2003, then an increase in 2007, and a decrease again in 2011. On the other hand, strategic intent to adopt environmental initiatives shows a decrease in 2003 with respect to 1999, followed by an increase in the years after that, with a significant change in 2011. The adoption of environmental initiatives at the strategic level shows a slowly increasing pattern, with the only major change between 1999 and 2003, but after that the differences are not very marked even though they are statistically significant in the profile analysis. Therefore, regarding the adoption of environmental initiatives at the strategic level, Hypothesis 1 is supported. Finally, lower cost advantage has a similar pattern to the adoption of environmental initiatives at the strategic level, with the only difference being that in 2011 there was a decrease with respect to 2007. These differences also remain significant.

4.3. Effects on competitive advantage

The results of linear regressions exhibited in Tables 2 and 3 below show the effect of environmental initiatives at the strategic level on differentiation/positioning and lower cost advantage. The statistically significant coefficients for all of the models evidence the positive influence of the constructs on both dimensions over time. Thus, both Hypotheses 2a and 2b are supported.

INSERT TABLE 2 HERE

When analysing the effect of firm size, we find that the effect on the differentiation/positioning advantage is positive and significant only for 2003 and 2011 in Table 2. However, the models for both these years show the poorest level of fit measured by the coefficient of determination. The firm size is found to have no significant effect on the differentiation/positioning advantage when it appears as an explanatory variable in the models together with environmental initiatives in all of the years. The results show that generally the best fit is obtained when the firm size is not included in the analysis (Model 2 in Table 2).

On the other hand, the analysis of the impacts on lower costs shows that the overall best fit is obtained when firm size is included together with environmental initiatives as predictors (Model 3 in Table 3). We found that in the beginning (1999), the positive impact on this dimension was higher in small firms compared to medium-sized firms due to the negative coefficient.

INSERT TABLE 3 HERE

In the surveys from 2003 and 2007 such an effect is not significant even though it remains negative. Interestingly, in 2011 there was a radical change since the effect is again significant but positive when looking at Model 3 in that year. As a whole, these results show that firm size does not seem in a unified and determinant way to guarantee benefits of competitive advantage.

4.4. *Effects of motivators*

The results exhibited in Table 4 show that Model 3 had the best results in terms of its fit in all of the years. We found that strategic intent is regarded as a significant driver for adopting environmental initiatives in SMEs over time, which allow us to support Hypothesis 3b.

INSERT TABLE 4 HERE

On the other hand, managerial attitudes and opinions in general show different effects. They were positive in 1999 and 2003, but with higher levels of significance (p-value < 10%) compared with strategic intent. There was no significant effect in 2007, but interestingly in 2011 both motivators had the same effect and significance level. Therefore, we found partial support for Hypothesis 3a. The effect of firm size is noteworthy in this analysis since it is positive and statistically significant when it is entered as the only explanatory variable and together with the two motivators.

4.5. *Comparison of effects*

To compare the size of the effect of environmental strategic initiatives on the competitive advantage over time as well as the motivators on environmental initiatives, we examined their respective standardised regression coefficients in the three preceding regressions (see Table 5). In doing so, we only considered the models that exhibited the overall best levels of fit in the three analyses to determine such coefficients: results for regression Model 2 in Table 2 relate to the impact on the differentiation/positioning advantage; regression Model 3 in Table 3 relates to the impact on lower cost advantage; and regression Model 3 in Table 4 relates to the effects of motivators. The examination of standardised regression coefficients allows direct comparisons of effects to be made without the influence of the different scales.

INSERT TABLE 5 HERE

The results show that the magnitudes of the coefficients related to the effects on competitive advantage do not follow the expected tendency to increase. The highest values occurred in 2003, and then the effects on differentiation/positioning and lower costs had a tendency to decrease. The effect on lower costs slightly increased in 2011 compared with 2007 as an exception to these patterns. Therefore, Hypotheses 4a and 4b are not supported. On the other hand, strategic intent has a greater effect on the deployment of environmental initiatives at the strategic level over time compared with managerial attitudes. However, both Hypotheses 5a and 5b cannot be supported, since the effects of both motivators do not follow any tendency to increase and they maintain a relatively stable pattern.

5. Discussion

In this study we have examined the development over time of environmental initiatives at the strategic level as well as the relationships with their motivators and outcomes. The development of environmental initiatives reveals the incremental and steady internalisation of environmental issues among the surveyed SMEs. This is manifested through the formalisation of environmental policies, goals, responsibilities and measurement mechanisms. Our findings thus support previous research regarding the potential for SMEs to deploy proactive approaches to dealing with the natural environment (Aragón-Correa *et al.*, 2008; Brammer *et al.*, 2012). Thus, contrary to the overall lack of change and widespread inertia exhibited by large firms (Dahlmann and Brammer, 2011), our findings evidence the maturity and integration of environmental efforts into a firm's competitive advantage and strategy, as previous studies have done (Gluch *et al.*, 2013; Papagiannakis *et al.*, 2014).

More specifically, the findings show that the natural environment is indeed recognised as an important competitive important factor. In this sense, responsible behaviour manifested through the adoption of environmental initiatives at the strategic level mainly accounts for the exploration of new market opportunities and the improvement of public image, as supported by previous studies (Heras and Arana, 2010; Bagur-Femenias *et al.*, 2013; Granly and Welo, 2014). Further, to a lesser extent this dimension of firm proactivity allows improvements to be achieved in productivity and profitability. This provides evidence that Danish SMEs, by deploying environmental initiatives to mitigate the environmental impact, are not only improving their image and reputation (Jiang and Bansal, 2003; Bagur-Femenias *et al.*, 2013), but they are also achieving cost reductions because they are focusing their efforts and the formulation of policies towards process efficiency (Heras and Arana, 2010; Granly and Welo, 2014). This potential for benefits also stems from the emphasis on awareness and the clear communication of information about environmental effort (Melnik *et al.*, 2003; Lo *et al.*, 2012) that characterises the initiatives approached in this study. This sustained environmental behaviour over time thus contrasts with the predominant perception that SMEs are firms that generally do not approach environmental management strategically (Tilley, 1999; Worthington and Patton, 2005). Interestingly, we suggest that the situation among Danish SMEs is consistent with experiences in the broader European context, where the integration of environmental aspects at firm level leads to the increase of market-, image-, and efficiency-related drivers of firm performance (Wagner, 2007, 2011).

There may, however, be good reason to pay attention to specific time spans in our analysis. For example, there was a tendency for a decrease of the effects on the differentiation/positioning advantage over the last three periods, with a substantial drop between 2003 and 2007. This means that even if the benefits in terms of differentiation/positioning are perceived, it has been more challenging for Danish SMEs to explore new markets and improve their image. One explanation may be the increasing adoption of environmental certification programmes as well as standards and eco-labels among the surveyed firms. This implies an internal formalisation of environmental issues and therefore less opportunity to be a first mover in this respect. Another explanation might be that this period showed rapid economic growth, where SMEs may have been sufficiently challenged to just keep pace with the fast growing demand.

It is difficult to predict the future development of lower costs and profitability, due to the alternating behaviour that was observed. However, looking at the two last periods, 2003–2007 and 2007–2011, there is a slightly increasing effect, although the difference remains marginal. That is, such an effect manifests a relative stability, which means that a possible future effect on lower costs could remain close to the same value (approx. 0.3). This supports the ambivalence that still prevails amongst SMEs' owner-managers about the benefits of their environmental efforts (Revell *et al.*, 2010). Given this situation, SMEs need to consider more innovative approaches to this facet of corporate environmental management if they hope to reap the future competitive benefits derived from green management.

The overall non-significant effects of firm size on the differentiation/positioning advantage allow us to state that over time, both small and medium-sized firms have indistinctively perceived this type of benefit from the adoption of environmental initiatives at the strategic level. The same does not entirely hold in the case of the lower cost advantage since the analysis revealed that in the beginning, small firms were more likely to perceive such benefits than medium-sized ones. The evidenced heterogeneity among small businesses pointed out in our findings contributes to the ongoing discussion about the role of firm size in the relationship between SMEs and the natural environment (Brammer *et al.*, 2012; Dixon-Fowler *et al.*, 2013).

The identified key drivers of environmental initiatives at the strategic level point towards the prominence of strategic intent as a determinant. This result is consistent with recent findings that prioritise strategic intent over legislation as the driving force of environmental management in the UK (Brammer *et al.*, 2012). At the same time, it challenges the evidenced limitation of the influence of this factor among SMEs in the same country in the past (Worthington and Patton, 2005). In particular, the strategic intent among Danish manufacturing SMEs points to the identification of new market opportunities, the preparation of firms' positioning and the improvement of the firms' reputation. It places them as advantage-driven firms that predominantly understand environmental sustainability as a business opportunity (Parker *et al.*, 2009; Battisti and Perry, 2011). On the other hand, the influence of managerial attitudes remains weaker in comparison to the strategic intent in the time horizon of our analysis, which means that environmental action may not be seen as an extension of owner-managers attitudes, as traditionally believed in SMEs' management (Cassells and Lewis, 2011). We can also suggest that in our empirical context there are still gaps between owner-managers' attitudes and actual actions (Tilley, 1999; Cassells and Lewis, 2011), resulting in minor strategic change (Dahlmann and Brammer, 2011). This can explain the slow pace of the adoption of environmental initiatives at the strategic level. Interestingly, in 2011 both managerial attitudes and strategic intent had the same influence on the adoption of environmental initiatives at the strategic level. This suggests that Danish manufacturing SMEs seem to have reached a point of relative balance between the exerted influences of both motivators. It will therefore be interesting to see if this trend prevails in future surveys.

In contrast to the effects on competitive advantage, firm size has remained a significant factor in determining the adoption of environmental initiatives at the strategic level. Our study was entirely focused on SMEs, but within this category we found differences between the levels of environmental engagement of small businesses and medium-sized businesses (Brammer *et al.*,

2012), given the higher propensity for the latter to adopt environmental initiatives over the former. If future surveys arrive at the same conclusion, it could be argued that firm size matters for the adoption of environmental initiatives at the strategic level, whereas the heterogeneity of size among SMEs does not guarantee distinctive impacts on competitiveness at all.

6. Conclusions, limitations and implications

This study differs from previous research in various ways. First, the study has been executed in Scandinavia, which has long been recognised for having implemented very strict environmental regulation and for being among the leaders in clean technologies. Second, we have adopted a longitudinal research design focused on small and medium-sized enterprises. Thus, it is possible to assess whether the greening process in this particular setting has become deeper and/or more enduring, and is not affected by specific macro-economic or regional political ad hoc circumstances. Third, we have chosen to focus on key strategic dimensions. Extant research has looked at the promotion of environmental proactivity and/or green corporate attitudes and values in a way that is often disconnected from the exerted influence of antecedents and drivers as well as from the effects on competitive outcomes. We believe that by combining the strategic outcomes that follow from managerial environmental attitudes, intent and initiatives in the same study, the basis for understanding the nature and the wider scope of the process of corporate strategic greening is significantly improved. To adequately understand the significance and endurance of the relationship of the firm and the natural environment, we believed it was necessary to investigate how managers' attitudes towards the environment, their strategic intent and the environmental initiatives undertaken by them have changed over time.

Three conclusions can be drawn from this study. First, there has been an increase in the adoption of environmental initiatives over the last 14 years (although at a moderate level). This should be seen in the light of the global business dynamics that have taken place during the period, which have seriously affected SMEs in general (a fast global economic growth followed by a global financial crisis). The data nonetheless suggests that the trend is enduring and thus reflective of an increasing internalisation of environmental concerns. Second, the study concludes that SMEs also engage in greening to improve their competitive position. More specifically, the study identified positive effects on their competitive advantage, predominantly on the differentiation and positioning of Danish SMEs in accordance with their strategic intent towards business growth as a consistent key driver of action over managerial attitudes. Third, the noted differences between small and medium-sized enterprises, particularly in terms of levels of environmental engagement, indicate that such firms are heterogeneous as prior research has suggested.

Given the aforementioned findings, it is important to note some limitations of this study. First, our analysis only explores a specific set of environmental initiatives in firms (leaving others out). Second, we did not investigate the influence of institutional and external pressures from the stakeholders to adopt environmental initiatives. Third, even though we analysed manufacturing SMEs, the multi-sectorial characterisation of our samples did not allow us to study particular environmental initiatives and the strategic outcomes of specific industrial activities. Building on

these limitations, future studies should investigate specific industrial sectors in order to determine if the arguments derived from this study still hold. Additional suggested avenues for research point to exploring the influences from institutional forces and critical stakeholders over time together with internal motivators such as the ones considered in this study. This in turn sheds light on the establishment of critical drivers that could predict future responses. Alternatively, the development over time of other environmental initiatives on different organisational fronts (i.e. operational, inter-organisational, etc.) could be studied in the context of SMEs.

The study has a number of important research and practical implications. The analysis reveals that it seems to be necessary to use concern about the natural environment as an argument to secure and/or increase the competitiveness of SMEs in the future and achieve a deeper appreciation of the principles of sustainable development, and there is also a need for more innovative and radical approaches. The latter may involve novel means of reporting environmental actions. This will allow the responses of firms to be addressed with comprehensive and validated systems of indicators that include measurements at more systemic levels (industrial sector, supply chain, etc.).

In terms of practical and/or policy implications, there are also some interesting messages to be sent. First, the study has shown that a long-lasting and enduring greening agency is not a privilege that can only be attained by large enterprises and/or innovators in industry. SMEs are perfectly capable of finding ways to utilise the green opportunities for strategic purposes. Second, considering more innovative approaches to future corporate environmental management initiatives will allow the strong footprint of the SMEs strategic intent to be addressed and new market opportunities to be identified. Last, but certainly not least, there is an important message to both environmental regulators and SME managers in regions known for having little environmental concern and only rudimentary environmental regulation. Tough environmental regulation is not working against SMEs competitive position. Rather, strict environmental regulation and environmental competitive advantages seem to mix well within SMEs.

Acknowledgments

We would like to thank the two anonymous reviewers who contributed with their time and ideas to improve this study.

Appendix. Results from principal component analyses

*** INSERT TABLE A1 HERE ***

*** INSERT TABLE A2 HERE ***

*** INSERT TABLE A3 HERE ***

Tables and figures of the article

Table 1. Means, standard deviations and correlations

Variables	1999		2003		Correlations (1999 below the diagonal, 2003 above)					
	Mean	S.D	Mean	S.D	1	2	3	4	5	6
1. Size	0.272	0.446	0.314	0.465		0.459**	0.201**	0.127	0.098	0.159*
2. Env. initiatives at the strategic level	3.625	2.167	4.282	2.674	0.205**		0.521**	0.444**	0.275**	0.343**
3. Differentiation/positioning advantage	5.628	1.237	5.571	1.109	0.060	0.333**		0.632**	0.179**	0.426**
4. Lower cost advantage	5.393	1.197	5.579	1.227	-0.067	0.267**	0.661**		0.065	0.271**
5. Managerial attitudes	7.982	2.350	7.880	2.431	0.040	0.251**	0.059	0.056		0.526**
6. Strategic intent	5.762	2.505	5.742	2.539	-0.018	0.348**	0.382**	0.260**	0.477**	

Variables	2007		2011		Correlations (2007 below the diagonal, 2011 above)					
	Mean	S.D	Mean	S.D	1	2	3	4	5	6
1. Size	0.352	0.479	0.322	0.468		0.270**	0.148*	0.220**	0.108	0.111
2. Env. initiatives at the strategic level	4.326	2.452	4.467	2.389	0.201**		0.343**	0.361**	0.319**	0.319**
3. Differentiation/positioning advantage	5.811	1.155	5.637	0.997	0.055	0.373**		0.549**	0.298**	0.470**
4. Lower cost advantage	5.853	1.212	5.794	1.151	0.026	0.304**	0.550**		0.294**	0.406**
5. Managerial attitudes	8.209	2.134	8.176	2.062	0.071	0.216**	0.251**	0.252**		0.523**
6. Strategic intent	5.862	2.412	6.261	2.243	0.058	0.408**	0.487**	0.357**	0.459**	

*p < 0.05; **p < 0.01

Figure 1. The general trend in the development of managerial attitudes, strategic intent, environmental initiatives at the strategic level as well as differentiation/positioning and lower cost advantage (measured on an index ranging from 0 to 10).

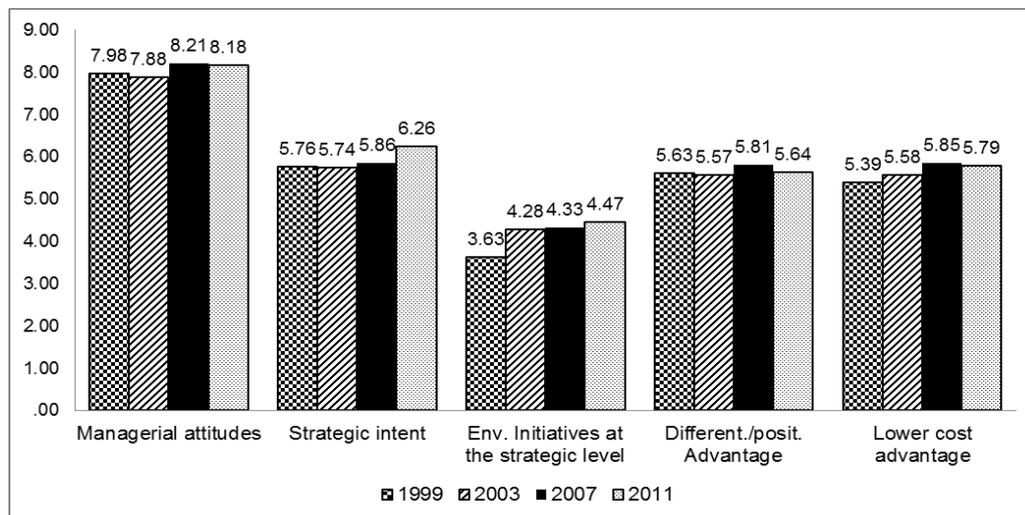


Table 2. Regression analysis: dependent variable – differentiation/positioning advantage

	1999			2003			2007			2011		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Intercept	5.582 (0.000)	4.925 (0.000)	4.926 (0.000)	5.419 (0.000)	4.633 (0.000)	4.632 (0.000)	5.765 (0.000)	5.041 (0.000)	5.050 (0.000)	5.535 (0.000)	4.991 (0.000)	4.979 (0.000)
Firm Size	0.168 (0.341)		-0.009 (0.959)	0.479 (0.003)		-0.164 (0.673)	0.133 (0.476)		-0.055 (0.765)	0.314 (0.024)		0.146 (0.292)
Env. Initiatives at strategic level		0.187 (0.000)	0.187 (0.000)		0.210 (0.000)	0.215 (0.000)		0.178 (0.000)	0.180 (0.000)		0.144 (0.000)	0.137 (0.000)
Adjusted R^2	0.000	0.107	0.103	0.036	0.268	0.265	-0.003	0.134	0.129	0.018	0.114	0.115
ΔR^2		0.107	-0.004		0.232	-0.003		0.137	-0.005		0.096	0.001
F	0.908	30.058	14.968	9.139	78.820	39.347	0.476	26.173	13.057	5.177	30.361	15.746
Num. obs	250	243	243	218	214	214	172	164	164	234	229	229

Significances are shown in brackets.

Table 3. Regression analysis: dependent variable – lower cost advantage

	1999			2003			2007			2011		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Intercept	5.442 (0.000)	4.841 (0.000)	4.881 (0.000)	5.474 (0.000)	4.689 (0.000)	4.683 (0.000)	5.830 (0.000)	5.188 (0.000)	5.210 (0.000)	5.617 (0.000)	5.004 (0.000)	4.974 (0.000)
Firm Size	-0.180 (0.293)		-0.351 (0.041)	0.334 (0.060)		-0.196 (0.266)	0.066 (0.736)		-0.147 (0.456)	0.539 (0.001)		0.340 (0.032)
Env. Initiatives at strategic level		0.146 (0.000)	0.161 (0.000)		0.202 (0.000)	0.217 (0.000)		0.153 (0.000)	0.160 (0.000)		0.175 (0.000)	0.158 (0.000)
Adjusted R^2	0.000	0.067	0.080	0.010	0.194	0.195	-0.005	0.087	0.084	0.044	0.127	0.141
ΔR^2		0.067	0.013		0.184	0.001		0.092	-0.003		0.083	0.014
F	1.111	18.224	11.349	3.576	52.888	27.096	0.114	16.543	8.528	11.860	34.242	19.733
Num. obs	247	240	240	221	217	217	173	165	165	235	230	230

Significances are shown in brackets.

Table 4. Regression analysis: dependent variable – environmental initiatives at the strategic level

	1999			2003			2007			2011		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Intercept	3.354 (0.000)	1.255 (0.008)	1.050 (0.024)	3.454 (0.000)	1.592 (0.007)	1.269 (0.016)	3.964 (0.000)	1.620 (0.020)	1.425 (0.039)	4.034 (0.000)	1.103 (0.076)	0.967 (0.110)
Firm Size	0.995 (0.001)		1.034 (0.000)	2.641 (0.000)		2.402 (0.000)	1.032 (0.008)		0.910 (0.011)	1.387 (0.000)		1.180 (0.000)
Managerial attitudes		0.119 (0.059)	0.103 (0.092)		0.131 (0.110)	0.122 (0.097)		0.047 (0.604)	0.036 (0.687)		0.240 (0.005)	0.226 (0.006)
Strategic intent		0.248 (0.000)	0.255 (0.000)		0.291 (0.000)	0.226 (0.002)		0.397 (0.000)	0.391 (0.000)		0.225 (0.004)	0.207 (0.006)
Adjusted R^2	0.038	0.126	0.169	0.207	0.120	0.295	0.035	0.158	0.185	0.069	0.125	0.173
ΔR^2		0.088	0.043		-0.087	0.175		0.123	0.027		0.056	0.048
F	10.851	18.050	17.010	58.233	15.653	31.005	7.147	16.942	13.849	18.175	17.378	17.006
Num. obs	250	238	238	220	216	216	171	171	171	234	230	230

Significances are shown in brackets.

Table 5. Standardised coefficients from regressions

Relationships	1999	2003	2007	2011
Env. initiatives at the strategic level → Differentiation/positioning advantage ^a	0.333 (0.000)	0.521 (0.000)	0.373 (0.000)	0.343 (0.000)
Env. initiatives at the strategic level → Lower cost advantage ^b	0.294 (0.000)	0.479 (0.000)	0.316 (0.000)	0.326 (0.000)
Managerial attitudes → Env. initiatives at the strategic level ^c	0.114 (0.092)	0.112 (0.097)	0.031 (0.687)	0.194 (0.006)
Strategic intent → Env. initiatives at the strategic level ^c	0.293 (0.000)	0.217 (0.002)	0.384 (0.000)	0.194 (0.000)

^a From Model 2 in Table 2; ^b From Model 3 in Table 3; ^c From Model 3 in Table 4. Significances are shown in brackets.

Table A1. Principal component analysis of environmental initiatives at the strategic level

	1999	2003	2007	2011
Environmental audit system	0.859	0.896	0.773	0.844
A written environmental policy	0.842	0.867	0.800	0.845
A written environmental strategy	0.837	0.847	0.823	0.784
Regular audits of environmental goals	0.836	0.911	0.894	0.890
Set specific environmental goals	0.823	0.872	0.893	0.859
Assignment of responsibility for carrying out environmental strategy	0.814	0.839	0.847	0.857
Publication of a separate environmental report	0.814	0.827	0.766	0.739
Drawing up environmental accounts/audit	0.796	0.860	0.764	0.721
Quantitative measurement of key environmental indicators	0.735	0.807	0.773	0.731
Certification according to ISO 14000	0.731	0.784	0.743	0.728
Cronbach's alpha	0.940	0.957	0.941	0.937
Variance explained	65.52%	72.57%	65.05%	64.04%

Table A2. Principal component analysis of competitive advantage

	1999		2003		2007		2011	
	Factor 1	Factor 2						
	Differentiation/ positioning	Lower cost	Differentiation/ positioning	Lower cost	Differentiation/ positioning	Lower cost	Differentiation/ positioning	Lower cost
New market opportunities	0.847	0.207	0.796	0.350	0.846	0.109	0.716	0.244
Product image	0.847	0.210	0.834	0.144	0.819	0.183	0.791	0.190
Market share	0.804	0.349	0.812	0.325	0.774	0.242	0.732	0.184
The firm's image	0.803	0.198	0.847	0.080	0.846	0.221	0.572	0.412
Sales	0.769	0.385	0.816	0.309	0.833	0.245	0.825	0.076
Cost reductions	0.166	0.767	0.185	0.788	0.050	0.827	0.172	0.744
Productivity improvements	0.209	0.717	0.462	0.573	0.420	0.614	0.225	0.730
Short-term profit	0.172	0.698	0.005	0.855	0.061	0.834	0.043	0.760
Competitiveness	0.506	0.669	0.525	0.650	0.493	0.677	0.419	0.687
Long-term profit	0.497	0.591	0.418	0.616	0.366	0.726	0.259	0.806
Cronbach's alpha	0.908	0.814	0.907	0.830	0.896	0.846	0.817	0.843
Variance explained	67.039%		69.011%		69.085%		60.982%	

Table A3. Principal component analysis of motivators

	1999		2003		2007		2011	
	Factor 1	Factor 2						
	Strategic intent	Managerial attitudes						
Spotting new market opportunities	0.837	0.119	0.850	0.190	0.823	0.157	0.893	0.159
Preparation for a strategic positioning	0.805	0.242	0.864	0.191	0.816	0.192	0.833	0.257
Improvement of the firm's general reputation	0.738	0.261	0.659	0.352	0.773	0.250	0.457	0.552
Owner's attitudes and opinion	0.177	0.932	0.214	0.905	0.202	0.914	0.132	0.907
Management's attitudes and opinion	0.290	0.899	0.280	0.880	0.245	0.900	0.249	0.852
Chronbach's alpha	0.758	0.882	0.775	0.847	0.768	0.844	0.737	0.814
Variance explained	76.531%		76.335%		76.214%		74.477%	

CHAPTER 3:

SMEs AND THE NATURAL ENVIRONMENT: IN SEARCH OF COMPLEMENTARY ASSETS TO BOOST COMPETITIVE ADVANTAGE

Juan Felipe Reyes-Rodríguez and John P. Ulhøi

Abstract

This study draws on the resource-based view of the firm and the innovation-value-capturing-framework to identify and characterise the complementary assets utilised to materialise competitive advantage of environmental management practices in SMEs. The capture of benefits from investments in environmental management practices necessitates that such benefits are appropriable. However, the nature of the environmental management practices and the possibilities for protecting against imitation suggest that firms can have weak possibilities to appropriate the competitive benefits of such investments. Based on a multi-firm case study among Danish SMEs in the printing and graphic industry, two complementary assets are identified and characterised: (i) technology and process innovation, and (ii) environmental communication. The analysis shows how SMEs still can realise different competitive outcomes given the nature of the complementary assets when utilised in conjunction with their implemented environmental management practices.

Keywords: Environmental management practices; competitive advantage; complementary assets; technology and process innovation; environmental communication; small and medium-sized enterprises (SMEs).

1. Introduction

The recognition of small and medium-sized enterprises (SMEs) as a community of firms that accounts for significant and negative impacts on the natural environment has become more widespread in the society. However, in meeting the demands from the different stakeholders at play in terms of the adoption of environmental management practices, SMEs can benefit from acknowledging the need to determine the strategic significance of their efforts. Over the last decade, considerable knowledge has been gained and a variety of useful tools have been produced regarding environmental management practices in SMEs. This development can be seen as a clear materialisation of a widespread recognition of SMEs' roles and responsibilities with regard to the global economy and the associated and accumulated ecological footprint following from their economic activities. The literature, however, has traditionally focused on the limited awareness and resources of SMEs, implicitly 'justifying' that they might be obvious reasons why SMEs may be

reluctant towards initiating the adoption of environmental management practices. Environmental management practices refer to corporate decisions and actions targeting the development and introduction of new or improved products, processes, organisational structures and/or systems, particularly aimed at reducing the environmental burden of business' operations (Shrivastava, 1995a; Rennings, 2000).

More recently, it has been argued that SMEs tend to overlook possibilities for making a business case for sustainability (Worthington and Patton, 2005; Revell and Blackburn, 2007). Nevertheless, another stream of studies has pointed to a 'greening' potential of SMEs (Aragón-Correa *et al.*, 2008; Revell *et al.*, 2010; Uhlaner *et al.*, 2012) in which owner-managers are actively engaged in solving environmental problems and motivated by opportunities to reduce costs, reach new customers, and improve their public image and reputation.

This study extends the understanding on organisational attributes that enable SMEs to appropriate the return from their investments in environmental management practices. The paper borrows the concept of complementary assets from the innovation-value-capturing-framework (Teece, 1986), which in turn draws on the resource-based view (RBV) of the firm (Wernerfelt, 1984; Dierickx and Cool, 1989; Barney, 1991). Our study aims to address the overall research questions: What are the complementary assets that SMEs can utilise in conjunction with their environmental management practices to improve competitive advantage? And, how are such complementary assets characterised? By so doing, we argue, that a needed business case for SMEs' engagement in environmental management can be made. The study particularly characterises the identified complementary assets in terms of their content, involved processes and competitive implications.

The empirical foundation of the paper is a multi-firm, case study approach, involving 15 SMEs from the printing and graphic sector in Denmark. Firms in this sector are facing increasing difficulties when trying to appropriate the return from their environmental management investments, despite of their remarkable sophistication of such practices. Differently put, such SMEs are left in a situation characterised by weak appropriability regimes (Teece, 1986). Under these conditions, it is expected that firms acquire and/or develop complementary assets, which become critically important to gain competitive advantage from their environmental management practices. We find that, contrary to what has been traditionally argued in the environmental management literature, the potential strategic return following from SMEs' investment in environmental management practices is not inaccessible but can in fact be realised. However, increasing investments in those practices do not automatically translate into improvements of the firm's competitiveness. For this to materialise, the existence and utilisation of complementary assets are required, which can respectively lead to different competitive outcomes. This points towards possible avenues for heterogeneity among SMEs' competitive behaviours when addressing their on-going environmental management practices in the broader context of the existing resources and capabilities.

The paper is organised in the following way. After the introduction, the paper reviews the existing literature on environmental management in general and on SMEs in particular, as well as literature on complementary assets. In section three, the research design and the data collection are

sketched out. Then, section four presents and discusses the study findings. The remaining section concludes and addresses relevant limitations and implications of the study.

2. Literature review

2.1. Environmental management practices in firms

Different taxonomies of organisational approaches have been offered in response to the interpretations and integration of environmental concerns into firm strategy (Hunt and Auster, 1990; Roome, 1992; Post and Altman, 1994; Winn and Angell, 2000). Despite the differences, there seems to be a consensus which places firms along a behavioural continuum that ranges from reactive regulatory compliance to proactive corporate commitment (Hunt and Auster, 1990; Post and Altman, 1994). In particular, these approaches involve different choices regarding environmental management practices regarding cleaner production technologies, waste management, products and processes that improve material/energy conservation, and concrete environmental policies, goals and procedures (Shrivastava, 1995a). The literature has also indicated that the choices regarding environmental management practices have implications on firm competitiveness (Hart, 1995; Shrivastava, 1995a; Sharma and Vredenburg, 1998). Various structural arrangements have led to different kinds of competitive advantage in terms of lower costs and differentiation (Hart, 1995; Christmann, 2000). Early arguments along these lines of reasoning assume that pollution represents an excess of unnecessary costs (Porter and van der Linde, 1995). Environmental management practices therefore correspond to improved operational efficiency (Porter and van der Linde, 1995; Shrivastava, 1995a). Another line of arguments draws on the RBV (Wernerfelt, 1984; Barney, 1991) stating that competitive advantage is achieved through the development and application of bundles of valuable tangible and/or intangible heterogeneous resources and capabilities within the firm – particularly when firms exhibit proactive levels of environmental management practices (Hart, 1995; Russo and Fouts, 1997; Sharma and Vredenburg, 1998). Moving towards proactive approaches implies learning and adaptation (Post and Altman, 1994) as well as the development and exploitation of organisational capabilities (Hart, 1995). Empirical studies have documented increasing levels of environmental management practices in firms over time, when developments aim at reaching a proactive approach (Bansal, 2005; Lee and Rhee, 2007; Slawinski and Bansal, 2012; Bansal *et al.*, 2014) It has been argued that progress comprises developments of both focused and broad environmental management practices to provide fast and deep responses to demands for environmental protection (Slawinski and Bansal, 2012). However, such developments do not necessarily follow a straight forward linear type of progress (Lee and Rhee, 2007; Bansal *et al.*, 2014).

On the other hand, the evidence of stronger positive impacts on competitive advantage stemming from proactive and advanced environmental management practices over time still remains inconclusive. Bansal (2005), for example, found that approaching higher sustainability is associated with low firm performance. In a longitudinal analysis of South Korean firms, Lee and Rhee (2007) concluded that a relationship between environmental management practices and performance cannot be supported. Given the inconsistencies in that relationship, it has been alternatively argued

that indeed, an inverted U-shaped frontier characterises the relationship between environmental management practices and firm performance (Schaltegger and Synnestvedt, 2002; Lankoski, 2008). That is, an optimal level of profit is achieved due to environmental management practices that not only mitigate the impact on the natural environment but also contribute to organisational learning and reputation (Lankoski, 2008). Further efforts beyond such an optimal level of environmental management practices, however, are unlikely to be profitable “due to increased marginal costs and decreased marginal benefits of environmental performance improvements and pollution abatement” (Schaltegger and Synnestvedt, 2002, p. 9). Therefore, an indefinite increase in the implementation of environmental management practices over time would not correspondingly lead to increased competitive benefits for the firm (Schaltegger and Synnestvedt, 2002). This stream in the literature, however, indicates that the implication of environmental management practices on competitiveness depends on how well it harmonises with firm-specific conditions and circumstances (Schaltegger and Synnestvedt, 2002; Lankoski, 2008). This would suggest the need to explore factors that may potentially account for variations in the U-shaped frontier among firms (Wagner, 2005; Lankoski, 2008).

2.2.SMEs and environmental management practices

Contemporary environmental management literature focusing on SMEs points to a lack of strategic orientation to exploit opportunities and competitive gains that motivate decisions on environmental management practices (Worthington and Patton, 2005). It has been argued that the adoption of environmental management practices is hampered due to lack of resources (Bianchi and Noci, 1998), environmental training of owner-managers (del Brío and Junquera, 2003), and conviction about the business case for making environmental improvements (Revell and Blackburn, 2007). Furthermore, the predominantly owner-managers of SMEs’ find it difficult to justify their environmental efforts as most of the customers are not willing to pay a premium price for environmentally friendly products and processes.

It has further been acknowledged that SMEs are not simply smaller version of their larger counterparts (Welsh and White, 1981; Bos-Brouwers, 2010) as they exhibit different competitive behaviours and responses to industrial environments (Chen and Hambrick, 1995). SMEs are characterised by their agility, flexibility and niche-targeting capabilities (Dean *et al.*, 1998), entrepreneurial vision and simple capital structure (Yu, 2001). SMEs can respond quickly to changes in dynamic environments (Merz and Sauber, 1995) due to their inherent flexibility following from their simple, less formalised and shortened decision making processes (Merz and Sauber, 1995; Yu, 2001). Thus, SMEs’ flexibility facilitates the quick response to the environmentally-related demands from stakeholders (Darnall *et al.*, 2010), as well as the management of external relationships and networks when acquiring resources for implementing environmental management practices (Hansen *et al.*, 2002; Aragón-Correa *et al.*, 2008; Roy and Therin, 2008). Furthermore, it has been argued that SME’s can take advantage of their aforementioned SMEs’ characteristics to facilitate the development of strategically relevant capabilities for shared vision, strategic proactivity and stakeholder management. Such capabilities are all found

to be determinants of the adoption of environmental management practices among such firms (Aragón-Correa *et al.*, 2008).

The above therefore, points to the ‘greening’ potential of SMEs to actively engage in implementing environmental management practices that address their products, systems and production methods (Uhlener *et al.*, 2012). Studies have documented that environmental management practices constitute an appropriate alternative to simultaneously reduce SMEs’ environmental impacts and reap competitive benefits (Aragón-Correa *et al.*, 2008; Brammer *et al.*, 2012; Leonidou *et al.*, 2015). More specifically, it has been suggested that SMEs have begun moving away from an absolute reluctance towards an increasing confidence about the business opportunities resulting from environmental protection (Revell *et al.*, 2010). In SMEs, cost reductions are the most common competitive benefits that result from adopting environmental management practices related to eco-efficient measures (recycling, energy saving and waste reduction; Aragón-Correa *et al.*, 2008; Bos-Brouwers, 2010). However, when environmental management practices are focused on product and organisational innovations (Klewitz and Hansen, 2014), they can relate to attracting more environmentally aware customers (Revell *et al.*, 2010), which favours better positioning in the market place (Brammer *et al.*, 2012; Triguero *et al.*, 2013).

Despite the SMEs’ progression towards higher engagement with environmental management practices, the successful maintainability of such an engagement cannot be guaranteed. Despite their flexibility, the typical lack of resources makes SMEs highly sensitive towards changes in their business environment, which are often perceived as hostile and highly uncertain (Covin and Slevin, 1989; Merz and Sauber, 1995). Specifically, goal ambiguity and technical uncertainty lead SMEs to fear failure and therefore they will tend to mimic the adopted practices of their peers (Cheng and Yu, 2008) based on sharing knowledge bases (McEvily and Marcus, 2005; Roy and Therin, 2008) that may become similar. In some cases, deviations from the typical competitive behaviour of the group may erode SMEs’ performance (Chen and Hambrick, 1995), which can also occur in the context of the implementation of environmental management practices, when intended as an strategical instrument. Therefore, it is possible that the inverted U-shaped frontier also describes the business case for environmental management practices among SMEs. In a similar way to the case of larger firms, it can be anticipated that variations in SMEs’ frontiers can occur due to both internal factors and external conditions.

2.3. Complementary assets

Drawing on the RBV, Teece (1986) introduced the concept of ‘complementary assets’ as part of his innovation-value-capturing-framework. Complementary assets are, strictly speaking, supporting resources or capabilities that may be physical, human or organisational that a firm possesses (Wernerfelt, 1984; Barney, 1991). They are supporting resources and capabilities because they are required for the successful capture of competitive benefits of an innovation (e.g., new or improved product, process and/or technology). However, when facing weak appropriability regimes, during which the firm is unable to fully capture the competitive benefits of an innovation due to increased rivalry and imitation, the access to complementary assets becomes absolutely critical to outperforming competitors (Teece, 1986). Complementary assets can be generic or specialised.

Generic complementary assets are assets that are not directly tailored to innovation; they have multiple applications and can easily be acquired in the market place (Teece, 1986; Tripsas, 1997). Some functional assets are suggested as being generic complementary assets due to their use in a broad range of settings. They are also employed to organise multiple business units and transfer knowledge between them (Helfat and Lieberman, 2002). Tripsas (1997) for example, found that manufacturing facilities in the typesetting industry constituted a generic asset due to a technological change that did not require specialised equipment. Helfat and Lieberman (2002) have argued that resources such as financial capital constitute generic assets. *Specialised* complementary assets consistently correspond to valuable, unique and inimitable resources that confer competitive advantage (Barney, 1991). Such complementary assets involve dependence on innovation and are difficult to acquire in the marketplace due to their use in specific settings and the development over long periods of time (Teece, 1986; Helfat and Lieberman, 2002). Firms enhance their competitive advantage when accessing and controlling specialised complementary assets in order to appropriate the benefits of an innovation (Teece, 1986; Tripsas, 1997). Empirical analyses have put forward specialised complementary assets in the form of *downstream* complementary assets such as commercialisation and marketing capabilities (Tripsas, 1997; Chiu *et al.*, 2008; Ceccagnoli and Hicks, 2013), regulatory management (Rothaermel and Hill, 2005); and *upstream* complementary assets such as component technology and production capabilities (Chiu *et al.*, 2008; Eggers, 2012).

The innovation-value-capturing-framework and particularly, the concept of complementary assets can be transferred into the field of organisations and the natural environment. As previously mentioned, environmental management practices comprise the development and introduction of new or improved products, processes, organisational structures and systems with the purpose of reducing the environmental burden of business' operations (Rennings, 2000). Following Teece's proposal, the innovations involved in environmental management practices may also be confronted by regimes of weak appropriability. That is, firms will find it difficult to appropriate the profits derived from environmental management practices if the corresponding knowledge and technologies become accessible for imitators (Ziegler and Rennings, 2004).

Depending on the efficiency of SMEs' absorptive capacity, companies may create competitive advantage from imitating successful and leading behaviour in the sector (Cockburn *et al.*, 2000). In a sector characterised by SMEs with a long track record of environmental management practices, the ability to absorb such knowledge is likely to be present among several of the competitors. Furthermore, the adoption of strategies may also be affected by patterns of imitative behaviour of successful competitors' practices (DiMaggio and Powell, 1983). With regard to environmental management practices in particular, imitative behaviour also appears to be a safer and more attractive option for SMEs (Worthington and Patton, 2005) as their lack of eco-literacy (Tilley, 1999) and technical resources (Hillary, 2004) increase goal ambiguity and technical uncertainty. We suggest that when SMEs follow a collective competitive behaviour based on imitating practices of their peers (Cheng and Yu, 2008), it is expected that such firms come to develop and possess a relatively similar knowledge base and portfolio of technologies. Those firms thus, are left with reduced possibilities to fully appropriate the competitive benefits of their investments in environmental management practices. In the light of the innovation-value-capturing-framework (Teece, 1986), SMEs can face weak appropriability regimes regarding the implementation of

environmental management practices. Furthermore, under this rationale, environmental management practices under regimes of weak appropriability may provide an explanation of the inconsistent maintainability of their positive impact on competitive advantage despite increasing efforts over time (i.e., inverted U-shaped frontier). That is, a SME can be an early mover in the implementation of certain environmental management practices, which can confer certain competitive benefits. However, such benefits may decrease over time as competitors can also benefit because they imitate such environmental management practices. As a consequence, in overcoming the weak appropriability regime, SMEs must have access to and utilise complementary assets in conjunction with their environmental management practices in order to boost their competitive advantage (Teece, 1986). As a matter of fact, complementary assets can be consistently considered as internal factors that can account for modifications in the U-shaped frontiers but need empirical exploration (Wagner, 2005; Lankoski, 2008).

Teece (1986) assumes a systemic perspective in his innovation-value-capturing-framework when indicating that “complementary assets may be other parts of a system” (p. 288). In the case of environmental management practices, it means that complementary assets can be developed as part of general business activities, which are not necessarily intended to deal with the protection of the natural environment (Christmann, 2000). Such a systemic perspective is salient when searching avenues for boosting competitive advantage. That is, despite a firm’s individual actions can be matched by competitors, it is the rich interdependencies among them and with other actions that fend off imitators (Rivkin, 2000) and lead to improved firm competitiveness (Ennen and Richter, 2010). This is because such interdependences constitute an overall strategy formulation that becomes an intractable problem. Imitators will find the evaluation of such a strategy to be time consuming and thus, they are left facing a web of constraints when trying to reconfigure their own systems (Rivkin, 2000). Some empirical studies have attempted to adopt such a systemic perspective (Judge and Douglas, 1998; Wagner, 2007; Hall and Wagner, 2012). Though such studies do not study complementary assets, they advance in understanding the embeddedness of environmental management practices in a system of relationships and interdependencies with other organisational processes and core functions. Notwithstanding, positive implications on firm competitiveness have been traced (Judge and Douglas, 1998), in the form of market-, image-, efficiency-, and risk-related benefits (Wagner, 2007; Hall and Wagner, 2012). It is Christmann (2000) who particularly draws on Teece’s (1986) framework, and finds that complementary assets for process innovation and implementation are required to gain cost advantage from the implementation of best practices towards pollution prevention. However, these results should be read with caution here as they stem from large firms in the chemical industry, which might not apply in the SME setting.

On the other hand, studies based on the RBV paradigm have suggested certain organisational capabilities when approaching the linkages between environmental management practices and competitive advantage (Hart, 1995; Russo and Fouts, 1997; Sharma and Vredenburg, 1998; Aragón-Correa *et al.*, 2008; Hofmann *et al.*, 2012; Leonidou *et al.*, 2015). They suggest certain organisational capabilities such as continuous innovation, integration of stakeholders, higher-order learning, strategic proactivity, and shared vision (Hart, 1995; Sharma and Vredenburg, 1998; Aragón-Correa *et al.*, 2008). Nonetheless, the majority of the empirical studies have addressed large

firms and approached organisational capabilities as drivers that pave the way to adopting environmental management practices. Despite there have been some explorations in the SME setting (Aragón-Correa *et al.*, 2008; Hofmann *et al.*, 2012; Leonidou *et al.*, 2015), organisational capabilities have been also treated as antecedents of environmental management practices. Therefore, a characterisation of complementary assets among SMEs, which can be utilised in conjunction with environmental management practices, remains practically absent.

3. Methodology

Given our objective to characterise and describe complementary assets that can be utilised in materialising competitive advantage from investments in environmental management practices, a qualitative case study approach has been chosen (Eisenhardt, 1989). The review of previous literature helps to identify foundational bricks for a conceptual framework with useful concepts and themes that guide the empirical work. A case study approach allows providing detailed and specific accounts based on an iterative process of data and theory, and followed by the formulation of concrete and empirically supported propositions (Eisenhardt, 1989).

In line with previous studies in the field (Klassen and Whybark, 1999a; Jiang and Bansal, 2003; Slawinski and Bansal, 2012), the case study targeted firms operating in single industry. Such a multi-firm, case study approach based on an intra-sectorial sample allowed us to control for internal processes and business practices. External influences can be also controlled as the industry-members are all exposed to similar pressures from the same stakeholder groups, and have to meet the same regulations, norms, and standards (Sharma and Vredenburg, 1998; Slawinski and Bansal, 2012).

3.1. Empirical setting

The Danish printing and graphic industry was chosen as an interesting empirical setting since printing processes have significant impacts on the natural environment in terms of emissions (e.g., waste water, use of biocides, volatile organic compounds, etc.), resource consumption (e.g. virgin paper, inks, etc.) and an intense use of energy, all of which ultimately affect air, water and soil (Johnsen *et al.*, 2006; Masurel, 2007). The impacts stem from particular stages of the production process, such as the prepress, the printing press and the finishing. Moreover, over 85% of the firms in the industry are SMEs and recently, the industry has been facing increasingly tough competition as both printed and electronic media solutions are naturally becoming part of the same business arena (interview with consultant at Employer Association). The industry has been recognised for being at the forefront of technology, developing technical competences regarding IT and communication besides the traditional graphic arts (*ibid.*). Industry-members carry out activities such as printing, bookbinding, label production, design, communication, and advertising (Grafisk Arbejdsgiverforening, 2014).

On the other hand, this industry has been very strictly regulated, but most of its firms are doing far more than required to comply with governmental regulations. Furthermore, quite a few of the firms in the sector have voluntarily adopted eco-labelling schemes (Larsen *et al.*, 2006). Over the

last years, there has been a general concern for the reduction of carbon footprint (CO₂ emissions) among the firms. As a response, firms have cooperated in collecting data for a common knowledge database (see www.miljonet.org) on the environmental impact of printed matter and the respective processes. Furthermore, an additional eco-labelling scheme regarding the carbon footprint of printed matter and graphic products has been introduced and also adopted by firms outside Denmark (see www.climatecalc.eu). Given the above, this industry has been found highly suitable for the purpose of our investigation.

3.2.Sampling

A theoretical sampling procedure (Denzin, 1989; Eisenhardt, 1989) has been used as our goal was to access cases that were valuable to investigate the existence and characterisation of complementary assets and broaden or refute the initial theoretical perspective. We got access to all member firms from the Employer Association (includes more than 90% of all firms in the sector) and identified extreme and polar cases so as to observe the phenomenon of interest transparently thus utilising intra-sector maximum variation (Eisenhardt, 1989). We primarily considered structural characteristics of the firm (size, main processes and geographic location) towards high variation among the potential cases. After this process, we selected 58 potential case firms to be studied and 15 of them agreed to participate. Following Jiang and Bansal (2003), we did not find any statistical difference between participants and non-participants after running an independent t-test. The test was based on data on gross profit and number of employees obtained from the Danish Business Information Bureau (KOB) database. Table 1 shows an overview of the participant firms in the empirical study.

INSERT TABLE 1 ABOUT HERE

All firms in our study are considered either small (between 10 and 49 employees) or medium-sized (between 50 and 249 employees; Eurostat, 2010) and are scattered across Denmark. Technologies and processes allow the majority of the firms to offer a broad range of products, whereas a small number of the firms are specialised in only one or two product lines.

3.3.Data collection

The primary data collection is based on 17 semi-structured, individual, face-to-face interviews with key respondents from the case firms (15 interviews respectively) and the Employer Association (2 interviews respectively). Table 2 presents the specific data sources and the profiles of the key informants.

INSERT TABLE 2 ABOUT HERE

To secure promised anonymity, no specific names of individuals or firms appear. Input to our interview guide included relevant academic and practitioner literature. It also incorporated the comments from a pilot test regarding the wording of questions and the flow of topics throughout the interview. All interviews ranged in length from 45 minutes to 2.5 hours each, and were digitally recorded and fully transcribed thereafter.

The interview-based data served two main purposes: First, to gain specific insight into what have been the current priorities in the environmental agenda faced among the firms and the particular environmental management practices. Second, to expose the perceived strategic significance of those environmental management practices, particularly focused on the mechanisms and processes that allow firms to turn such practices into competitive outcomes. The latter in particular, further enabled us to identify the presence and characterisation of complementary assets. To address the potential problem of social desirability bias, we aimed at maintaining the relationship and the wording of the questions in a neutral way (Nederhof, 1985). Interviewees were also explicitly encouraged to voice any other comment or specific examples they considered relevant.

Prior to the interviews, desk research was carried out involving secondary data including relevant websites and media sources. Most of the firms' websites had a link to the environmental management section (or similar), which was used as preparation for the interviews. Some of the informants provided us with additional documentation from their firms that they found relevant to share. Finally, focused web searches for business media articles (news, presentations, etc.) were also carried out to strengthen the analysis (see Table 2). In order to have a more complete, holistic and contextual portrayal of the case firms (Jick, 1979, p. 603), and to overcome problems of validity and bias (Blaikie, 1991), we applied triangulation of data sources (Riege, 2003), by combining data from the interviews with data from the desk research. No substantial discrepancies between what was publicly available and what was mentioned during the interviews were found.

3.4. Data analysis

Interviews, internal documents, websites and news were exported to QSR NVivo 10 software. Following Miles and Huberman (1994), we analysed the transcripts and secondary data through a categorisation and analysis of emergent concepts and ideas. Data reduction procedures were followed to keep data that were relevant to the purpose of the study. In a first cycle of coding, we used attribute coding technique in order to index descriptive information about the respondents and firms as well as open coding to assign basic labels to the raw data (Strauss, 1987). In the second cycle we proceeded with analytic and thematic coding to allow for a categorical and theoretical level of coding (Gibbs, 2008, p. 42). Although most categories emerged from the data, the analytic coding enabled us to identify deductively thematic categories based on theoretical constructs in the literature. Codes were introduced to represent specific elements regarding the strategic significance of environmental management practices. These emerging codes were modified iteratively throughout the analysis, seeking also to assess the fit with what is in the literature (Eisenhardt, 1989).

Three overall thematic categories were developed after this process: (i) environmental management practices, (ii) complementary assets, and (iii) influence on competitive advantage. The

three categories were divided into codes and into sub-codes (Miles and Huberman, 1994). Table 3 provides an excerpt of the codebook for the code ‘environmental communication’ and the respective examples.

INSERT TABLE 3 ABOUT HERE

Finally, we analysed the relationships between the different categories and codes from the data. Following Denzin (1989), we aimed at developing ‘thick’ descriptions that include the context, intentions and processes to come up with explanations.

4. Results

This section starts with an overview of the development among case firms in terms of the implementation of environmental management practices, followed by the description of the weak appropriability regime. Then, our data is used to single out possible organisational attributes that may serve as complementary assets. We identified two complementary assets and labelled them ‘technology and process innovation’ and ‘environmental communication’. They are characterised in terms of their content, process, and implications on firm competitiveness

4.1. Environmental management practices and the weak appropriability regime

Hart’s (1995, 1997) framework is used to organise environmental management practices into three categories. The first category corresponds to practices for pollution prevention by means of better utilisation of inputs, incremental process efficiency and waste elimination before it is generated. Case firms have practices of paper waste reduction, reduction of hazardous substances by means of recirculation, and a strong focus on increasing energy efficiency through heating and ventilation recycling and parametrisation of the manufacturing processes. All case firms have established environmental management systems that imply definitions of policies, goals and routines, and in several cases they have led them to obtain formal certifications (e.g., ISO 14001, EMAS).

The second category of environmental management practices for product stewardship aims at minimising the overall environmental impact of products. The sampled case firms have made significant efforts towards the use of environmentally friendly raw materials and the manufacturing of products that are easier to recover, recycle and reuse. They have implemented eco-labelling schemes that specify standards focused on raw materials, production processes, and final products.

Finally, the third category of environmental management practices comprises the search for a disruptive technological base that directly addresses the challenge for environmental sustainability. The sampled firms are particularly focused on clean technologies related to the supply of energy from renewable sources, mainly solar and wind energy. Table 4 summarises the environmental management practices carried out among the case firms in these three categories.

INSERT TABLE 4 ABOUT HERE

There is an overall significant development of the environmental management practices for pollution prevention, followed by an advanced implementation of product stewardship practices and the ramping up of practices towards the adoption of clean technologies. The widespread establishment of environmental targets, policies and procedures in our sample firms have in many cases led them to become certified by third parties (e.g. ISO, EMAS). This is consistent with findings in the SME setting (Granly and Welo, 2014). As can be seen from table 4, there is a growing commitment among the case firms to the climate change agenda. Practices such as the calculation and compensation of carbon emissions, the use of carbon compensated inputs and the actual search for renewable energy sources materialise that commitment. Some firms have even become officially certified according to eco-labelling schemes regarding carbon neutrality.

Moreover, we found that case firms were all way ahead of what is required in the environmental regulations and currently, their main focus is on meeting the demands of international standards. However, such ‘sophistication’ comes along with the increasing difficulty that such firms experience when setting new goals towards additional improvements to reduce the environment impact of their operations and products. In this regard, two of our respondents said:

Not much more can be improved, to be honest...we are, sort of very close to the limit about what is theoretically possible as to improvements.... yes, there is a lot of progress in environmental management in this [sector]... and yes, you grow but you also realise that it is difficult to keep getting better...(F14)

In January, a representative from Dansk Standard was here to audit us as to ISO 14001, and we were talking with him about the difficulty of setting new goals concerning the environment...I think that we are now at a point where it is hard to find better solutions. (F08)

Hence, there seems to be an overall maturity regarding the development of environmental management practices. In addition to the fact that the industry has reached the ‘theoretical’ limits for what can be done, it is emphasised that the entire industry is homogeneous in relation to the implementation of environmental management practices, and seemingly, it is hard to pre-empt competition in this. A manager exemplified this issue as follows:

... The whole industry is very well regulated in Denmark since the regulation is very tough. So, nobody is really ‘the best’ of us, as it was the case previously, not anymore. So, it’s difficult to step outside the rest of the industry on the environmental issues because we all are doing quite well in Denmark and, I think, in the Nordic region as well. (F09)

The homogeneity among the firms stems from their overall tendency to easily imitate environmental management practices adopted by their peers (Chen and Hambrick, 1995; Cheng and Yu, 2008). An environmental consultant clearly indicated it as: “No matter what you are doing as to improve the environment, 80% of your competitors can do exactly the same” (Environmental consultant at Employer Association). Such an imitative behaviour regarding environmental

management practices suggests that such practices have become part of normal business activities despite the afore-mentioned ‘sophistication’ relative to what regulations stipulate. That is, salient stakeholders and the market would expect a similar and advanced approach to environmental management practices from all firms in the industry. The quality manager at F13 illustrated this stance:

...We all have to get this [implementation of environmental management practices] into place, to find a way to manage it...it’s common ground that a good CSR and environmental policy are necessary to be on the market and to be a preferred supplier. (F13).

Therefore, it becomes difficult for those firms to capture competitive benefits solely from implementing environmental management practices. Competitiveness can be also jeopardised not only from the revenue side, but also in terms of increased costs when overinvesting in environmental management practices. Thus, it seems that competitive benefits can decrease among case firms once they have reached an ‘optimal’ level in their adoption of environmental management practices (Schaltegger and Synnestvedt, 2002; Lankoski, 2008).

...When you are so close to the theoretical limit of [environmental] improvement, when you just make one small investment, it could go totally wrong. I mean, if your paper waste just goes up 1% because you tried to make an improvement one place in the process, you have lost everything. 1% is extremely a lot of money in this company. (F14)

All of the above suggests that there is an overall inability among case firms to fend-off competitors based on the implementation of environmental management practices. In the light of the innovation-capture-value-framework (Teece, 1986), this situation exposes the existence of a weak appropriability regime in such firms with regard to environmental management practices. Therefore, the empirical analysis moves forward in determining and characterising complementary assets present among the firms that can be utilised to materialise competitive benefits from their environmental management practices.

4.2. Complementary assets for technology and process innovation

4.2.1. Content

During the interviews, the case firms consistently referred to their major investments in technologies and their efforts constantly to find ‘superior solutions’ in the manufacture. Most respondents recurrently highlighted the acquisitions of new machinery and equipment in the course of the implementation of environmental management practices. Particularly, there were some informants emphasizing the acquisition of cutting edge technologies: “we have just bought the fastest and most effective printing machine in the world” (F08); “we are using high-tech machines” (F07); as well as early adoption: “this company was the first, or among the first, to test the technology to see...how low they can go in the airflow to the dryer” (F13). However, the majority

of case firms also pointed to incremental changes in their existing technologies and manufacturing techniques. Examples include the automation of waste sorting and re-circulation, and adjustments of existing equipment to allow environmentally friendly inputs to be used (cf. Figure 1), which reflects the typical development- and incremental-based orientation of SMEs' innovation efforts (Santarelli and Sterlacchini, 1990; Mazzarol and Reboud, 2009). Interestingly, there was no mentioning of the failure to carry out technology and process innovation due to lack of financial resources. This challenges the traditional view regarding the inability of SMEs to carry out innovations to protect the natural environment due to resource constraints (Bianchi and Noci, 1998; del Brío and Junquera, 2003).

The ability to generate streams of changes and modifications in processes, technologies and parameters is associated with the presence of knowledge-based invisible assets and capabilities (Itami, 1987; Sharma and Vredenburg, 1998). We suggest that those capabilities correspond to complementary assets for technology and process innovation, which are consistently related with what Tripsas (1997) and Christmann (2000) denominate 'specialised manufacturing capability' and 'process innovation and implementation', respectively. Case firms that possess complementary assets for technology and process innovation utilise them when the implementing environmental management practices so as to guarantee a proper technical fit with the organisation (Ansari *et al.*, 2010). That is, the compatibility of the characteristics embodied by these practices with existing and new technologies in the firm (*ibid.*). The quality manager in F10 pointed out the following in this respect:

[Environmental issues] should be part of any major decision on what to do. For example, we are now installing a new printing machine, but we can't do anything about the, for example, energy consumption of the machine as such, but we can do [something about the energy] consumption for cooling the machine ... we bought a printing machine last year ... the machine was chosen to reduce waste. So in any major decision we have to decide: "what's the impact of this machine?" and "can we do anything to reduce the impact?" And last year we had a choice between different printing processes, but one of them was based on solvents, and we don't want to use solvents here. So, we chose not to go that way (F10).

In general, our data indicates that complementary assets for technology and process innovation have predominantly an inward focus on the technical core of case firms (Bansal *et al.*, 2014), which can pave the way to improve competitive advantage (Hart, 1995; Sharma and Vredenburg, 1998; Christmann, 2000) . However, it is necessary to understand the organisational processes and mechanisms involved in such complementary assets to determine their nature (i.e., generic or specialised complementary assets) and competitive implication according to the innovation-value-capturing-framework (Teece, 1986).

4.2.2. Process

Regarding the processes and mechanisms to realise technology and process innovation, most of the informants expressed that it is all the result of internal development. They also emphasised that continuous-improvement approaches is the recurrent stance that drives changes in processes, technologies and parameters. Correspondingly, continuous-improvement efforts fit well with the

implementation of environmental management practices directed towards pollution prevention (Hart, 1995; Sharma and Vredenburg, 1998; Christmann, 2000). A factory manager commented on this:

It's an ongoing improvement process. That's in the job...it is our main job to work with these processes all the time to improve them. That's what we spend our time on, or what we need to spend our time on (F04).

Decision-making around process and technology innovation following continuous-improvement methods among case firms is carried out by working groups that are commonly formed by owner-managers and members of core technical organisational functions (e.g. production management, quality management). Notwithstanding, respondents indicated that decision-making processes rely heavily on the insights provided by employees. The factory manager at F04 elaborated on this in the following way:

...If we have the possibility to make the improvement...then [the employee] comes and say, "I think we should do this and this, and this, and this." And then we say, "Okay, let's do that." We have absolute confidence and trust in our employees; in their qualities ... we are not leading them, or, we are leading them but we encourage them to be part of the leading (F04).

The CFO at F06 further added:

...Sometimes they [the employees] come and tell us "have you seen there is a product that is greener than the one we are working with?"...They want it [to participate] very much because they can see that they get some credit for it because they get a better place to work and they do not get all the [bad] stuff into their bodies because they are working with the green things and the good products...they are very focused on the environment out there. We have some very good employees who want to do the right thing (F06).

The above examples also imply that employee involvement and participation is stimulated by an atmosphere of motivation and open dialogue that follows unstructured and informal routines (cf. Figure 1). Participation of individuals from both top and plant level in decision-making processes thus, suggests that complementary assets for technology and process innovation are also based on cross-functional management (Hart, 1995; Russo and Fouts, 1997; Pujari *et al.*, 2003). It aims to use the 'voice of the environment' in the identification of opportunities towards the selection of environmentally benign materials and pollution prevention by using empowered employees (Hart, 1995; Pujari *et al.*, 2003). The informality of routines and the shorter lines of communication that characterise this cross-functional management among case firms are consistent with the noticeable strengths of SMEs that pave the way to carrying out innovation processes (Nooteboom, 1994; Bos-Brouwers, 2010).

On the other hand, informants recurrently referred to technical knowledge accumulation processes as a representative aspect when characterising complementary assets for technology and

process innovation. Among case firms, technical knowledge stems to a large extent from the interaction with leading technology suppliers. Interviewees indicated that those interactions comprise “an ongoing dialogue” (F08); and “contact with suppliers all the time” (F14), which is coherent with their continuous-improvement approach. Interestingly, some case firms recognised that they have strategically shaped those interactions towards the development of embedded ties with their leading technology suppliers by exchanging fine-grained information in their problem-solving arrangements (McEvily and Marcus, 2005). The factory manager at F10 clarified this stance:

... The suppliers have the full knowledge...A supplier will do a lot for you as a company...so you can get a lot of knowledge from your suppliers if you ask the right questions...10 years ago, we only saw our suppliers for the traditional Christmas lunches. Today, it goes in another, completely different, direction. Today, we don't have Christmas lunches [with suppliers], but regular contact and good cooperation, and we get knowledge and information, and this is what counts, what is valuable to us. It is technical information; it is what counts today (F10).

Despite the benefits in terms of a rich technical knowledge base, those interactions in most cases remain unstructured and follow informal routines, but nevertheless with some clarity due to the frequency of the contact. This supports the assertion of previous findings regarding the predominant informal inter-firm arrangements and cooperation among SMEs (Yu, 2001; Zeng *et al.*, 2010), which can lead to both incremental and radical technology and process innovation by accessing a wider range of knowledge and expertise (Sammarra and Biggiero, 2008).

INSERT FIGURE 1 ABOUT HERE

Besides embedded ties with leading technology suppliers, the investigated firms often acquire relevant technical knowledge from the Employer Association through consultancy and technical assistance in relation to incremental changes in production processes and routines. Furthermore, in the building up of embedded ties with leading technology suppliers, the Employer Association may be involved as a moderator to assist decision-making around the implementation of technological developments put forward by leading suppliers. An environmental consultant expressed the following on this:

...You [as Employer Association] still have to give them [the firms] some kind of strategic tool where they can narrow themselves, as detailed as possible, to their own situation. That is what they ask for...we will try to give them a figure they can make decision on new [technology] investment...if benchmark figures lead to new investments, or new decisions, in print shops, it will have a huge impact on the [technology] suppliers' behaviour (Employer Association).

From the data, we found that other sources of technical knowledge towards the development of complementary assets for technology and process innovation comprised external consultants and experts (F01, F02, F05, F06, F09, F10), certification bodies (F03, F08, F14), as well as universities and research institutes (F09, F10, F14). Therefore, the case firms have engaged in both vertical and

horizontal networks (Zeng *et al.*, 2010), where leading technology suppliers in the vertical networks have the greatest influence on the development of complementary assets for process and technology innovation (McEvily and Marcus, 2005). Given the documented continuous-improvement approach, case firms develop and utilise complementary assets for technology and process innovation as a result of the integration of their internal innovative efforts and the acquisition of external technical knowledge (Cassiman and Veugelers, 2006).

4.2.3. Implications on competitive advantage

From the data, we found that complementary assets for technology and process innovation are deployed in conjunction with the ongoing environmental management practices, which makes case firms potentially able to capture benefits of such practices (Christmann, 2000). The informants mainly pointed to cost savings, resulting from reduced amounts of paper waste and dangerous waste disposal (e.g. used printing plates), as well as lower energy consumption levels. By means of the acquired complementary assets, the case firms have also anticipated adjustments of manufacturing parameters (e.g. paper-sheets orientation, layouts, printing plates placement, etc.), stimulating a better utilisation of inputs, operational efficiencies and technological advances (Hart, 1995; Christmann, 2000; Bansal *et al.*, 2014). The production manager at F02 pointed out the following regarding this:

... [Implementing] new equipment makes us capable of meeting a different demand, being more [environmentally] friendly waste-wise, for instance. It makes us capable of having 'turnaround times' in a printing press, for instance, shorter than we would if using older printing press, meaning that the number of people and the power consumption, all that stuff remains the same. We can do more work; we can do more versatile work in the same period of time (F02).

Informants indicated furthermore, that the operational efficiencies allow them to improve positional aspects of their firms. They expressed this as: "we can adapt to a market that is changing" (F02) and "we are using the same sort of technology to have more customers" (F05). Thus, the potential to exploit opportunities make complementary assets for process and technology innovation valuable when leveraged with environmental management practices among case firms (Barney, 1991). This in turn suggests that the deployment of complementary assets comprise not only processes of accumulation but also exploitation and application of external technical knowledge to commercial ends (Cohen and Levinthal, 1990).

However, from the data, there seems to be some conflict regarding the extent to which those complementary assets among the case firms are specialised. As previously mentioned, external technical knowledge mainly comes from leading technology suppliers, but respondents reiteratively referred to the same few 'big players' in the market place (3-4 technology suppliers). We found that case firms have a long "history together" (F08) mostly based on their dependency on those leading technology suppliers. An environmental consultant expressed about this:

The suppliers are very often their [the firms'] main advisor in how to make offset technique play...and the main solvers of technical problems...So of course the supplier will create a kind of dependability on

themselves due to their technical advice and so on, so this might be the reason why they [the firms] keep the same supplier (Employer Association).

Given the above, we argue that similar core technologies and levels of external technical knowledge, as crucial constituents of complementary assets for technology and process innovation, can be readily available in the marketplace for firms in the industrial sector (Tripsas, 1997; Rothaermel and Hill, 2005). Hence, those complementary assets may potentially become generic (Teece, 1986; Rothaermel and Hill, 2005) that, despite being valuable, have limitations in conferring sustained competitive advantage (Barney, 1991; Nehrt, 1998). In the light of the RBV, it means that the availability of core technologies and technical knowledge from the same sources (i.e., leading technology suppliers and employer association) to a large number of firms weakens the rarity and uniqueness of this form of complementary assets, leading to competitive parity in the industry (Barney, 1991). Despite the afore-mentioned early adoption of core technologies by some respondents, the overall availability of financial resources in all case firms signifies that competitors can quickly catch up in the adoption of those technologies. Furthermore, as all the firms have been active in their continuous-improvement efforts when implementing environmental management practices, complementary assets for technology and process innovation seem to become necessary to fulfil general purposes (Teece, 1986), i.e., the implementation and capture of the value of environmental management practices given their technical nature (Christmann, 2000; Bansal *et al.*, 2014). We therefore suggest the formulation of the following propositions:

Proposition 1a. SMEs are able to develop complementary assets for technology and process innovation. The leverage of these complementary assets and the on-going environmental management practices eventually lead to reduced operational costs and increased efficiency.

Proposition 1b. Complementary assets for technology and process innovation in SMEs may potentially turn to be generic because the core technologies and technical knowledge base in which such complementary assets are rooted are readily available to competitors.

4.3. Environmental communication

4.3.1. Content

A second emerging theme, related to the complementary assets, deals with mechanisms towards the communication of firm's environmental issues to external stakeholders. We refer to this as complementary assets for environmental communication, which are suggested to be consistent with the downstream capabilities in the literature related to the innovation-value-capturing-framework (Rothaermel and Hill, 2005; Eggers, 2012; Ceccagnoli and Hicks, 2013). Complementary assets for environmental communication thus, leverage the on-going environmental management practices, by making them visible for public scrutiny (Bansal and Clelland, 2004; Maas *et al.*, 2014). As for the

content of this environmental communication, we characterise the *messages* that the firm conveys as the *source* or *sender* (Schramm, 1954; Berlo, 1960).

Several respondents referred to the communication of messages as to their overall environmental performance mostly in terms of the commitment and impact, i.e., inputs and outputs of their environmental practices (Du *et al.*, 2010). Respondents expressed this as “to show the customer in figures the extent to which we are saving the environment” (F07), “every year we have to upload this information...the yearly calculation of our performance including environmental aspects, for example waste and so on” (F13), “we tell them, ‘we did very well, we saved 40% compared to the energy consumption last year’” (F14), and “to show that we are working with improvements all the time” (F04). The achievement of certifications and eco-labels from third parties was generally referred to as the “most visible argument” (Employer Association) that is made available to their external stakeholders, typically the customers. Certifications and eco-labels are seen as instruments that help to avoid making “long explanations of how you are managing your company” (F03) and thus, they reduce information asymmetry by signalling their commitment with the natural environment (Connelly *et al.*, 2011; Delmas and Grant, 2014).

Looking at the focal points of the communicated messages, i.e., product-, process-, image-oriented, and environmental facts (Carlson *et al.*, 1996; Leonidou *et al.*, 2014), we found that they are predominantly oriented towards the product- and process-related aspects. At product level, the firms indicated this as: “75% of all paper in our production is either Swan-labelled or approved for Swan-labelled production” (F04, website), “we are telling new customers that we can make an FSC and a Swan [printed matter]” (F06), and “we tell the customers, ... you could have 2015 postcards like these and be sure they are CO2 neutral” (F05). Hence, product-level environmental communication points to describing the implications of the obtained eco-labels on product characteristics. Process-oriented environmental communication is strongly tied to the priorities of reduction of energy consumption and paper waste, giving a certain amount of specificity regarding their commitment and impact of the environmental management practices (Du *et al.*, 2010). Examples include: “We sort our waste and try to minimise it, and this is why we have invested in CIP4 technology, which reduces paper waste” (F06, website), “[our focus is] to give correct information to our customers...about material consumption, energy consumption, material data” (F10), “we also report them...saying, ‘now we have improved in this area reducing the gas consumption, and so on’” (F14).

However, some respondents recognised that showing overall commitment and impact (Du *et al.*, 2010) is not enough and is only the baseline of environmental communication efforts and therefore, it needs to be taken to a higher level. The sales manager at F08 made this stance very clear:

Actually, in the 90s, it was necessary for a graphic business to show the world that we were doing something about the environmental impact. Today, it's common that we do that and all expect it from us... Today, we have to take it a step further, and are actually advising our customers in reducing the print and paper used (F08).

The above quotation indicates that there are two stances in the complementary assets for environmental communication among the case firms based on the conveyed messages (cf. Figure 2). We labelled them as ‘reactive’ and ‘proactive’ environmental communication, respectively (Cheney and Christensen, 2001; Aerts and Cormier, 2009). On the one hand our data show that firms deploying complementary assets for environmental communication under a reactive stance merely tends to focus on conveying the afore-mentioned baseline content (i.e., commitment and impact). On the other hand, we also found evidence that firms, when recognising the need to take such a baseline approach to a higher level, move towards a proactive stance in environmental communication (Aerts and Cormier, 2009). They are more comprehensive in the content of their messages as they have been able to convey information about the fit and logical connection between environmental management practices and business matters (Du *et al.*, 2010) in addition to the overall environmental performance. Case firms expressed it as the “desire to provide a positive economic performance... [and] at the same time contribute positively to the local and global environment” (F08, environmental report), and that “climate action always leads to gains - both for the climate and the company” (F09, website). Communicating the fit with business matters also includes messages to make customers aware normally of the lower costs and the increased efficiency benefits stemming from more environmentally friendly alternatives in both products and processes. Respondents indicated: “...we can of course say, ‘if you do it like this, then we can, for example, reduce waste and cost’” (F10) and “saying to the customer, ‘listen, we’ve got a thinner liner, if we use that you can get more labels in the reel and actually you are saving resources because that’s what we are doing’” (F13).

Moreover, the messages in a proactive environmental communication relate to focal areas such as image-oriented claims and environmental facts (Carlson *et al.*, 1996; Leonidou *et al.*, 2014) in addition to the product- and process-related aspects. These focal areas are intended to raise awareness about concerning issues in the society as the CFO at F09 illustrated:

...We make a list to our customers and still coming out with a business profile selling all the stuff about [F09’s name], and we just made a summary of the UN climate report...but no [F09’s name] at all, no logos, no anything (F09).

The use of results from third parties indicates some form of transparency to the customers about the communicated environmental facts. Messages such as “Currently, more than 80% of Danish printed matter is produced at Swan Label-certified printing houses” (F14, website) and “the paper in Denmark mainly originates from sustainable forestry” (F12, website) contextualise those facts relating them to printing and graphic issues.

Thus by deploying complementary assets for proactive environmental communication, firms tend to pursue the ‘reduction of predictability’ of the baseline content in the reactive approach (Cheney and Christensen, 2001, p. 253). The comprehensiveness of content of proactive environmental communication among case firms in turn suggests that they seek creative ways to reduce information asymmetry and shape the view of stakeholders outside organisational boundaries (Cheney and Christensen, 2001; Bansal and Clelland, 2004). However, what firms are

communicating in connection with environmental issues is not sufficient to be conclusive regarding the characterisation of complementary assets for environmental communication in our data.

4.3.2. Process

Regarding how case firms communicate environmental issues, we found that the baseline approach among is to use corporate websites as the immediate channel to disclose information for public scrutiny. A common practice in several firms is to deepen their environmental communication upon request from their customers as the CFO at F06 stated:

We tell new customers that we can make a FSC and a Swan [labelled printed matter] ... if they ask us "can you tell us what you are doing about the printing process?"... We send them all the information describing what we are doing, what we are doing about the environment, what we are doing about the working environment, and what we are doing about the quality. It's all described in these three pages... We don't call our customers to tell them "we can do this" or "we can't do that." The customers are the ones that come to us and ask, and then we are reacting (F06).

As the previous example indicates, it is clear that a reactive stance is adopted towards complementary assets for environmental communication when the customers moderate most of the process. We found that case firms with a reactive environmental communication assume that the customer will necessarily get knowledge about environmental aspects in the firm normally via the interaction with their corporate websites. Then, the firms will react by customising the content of environmental communication as a result of eventual customer follow-ups. Typically, the reaction of firms consists of providing more detailed accounts in the course of the negotiation process. The owner-manager at F15 illustrated this stance:

... We use our website to promote our environmental profile. We are not sending out brochures every now and then, it's not like that. If I am visiting a client, I do not say: "now be aware of this and that." It is rather profiling via our websites. A lot of people check a firm's website before buying a product. ... So, in that way I think that it is more the individual customer that seeks information and makes sure before buying a product: "what kind of company are we dealing with? Does the company have a reasonable profile? Does the company work credibly to my eyes? Do I want to buy?" (F15).

During the analysis, it was found that environmental communication in some cases is also boosted when firms perceive potential concerns for the natural environment in connection with events or situations in the society. Thus, firms with a reactive environmental communication remain "waiting threats and opportunities to become manifest imperatives" (Cheney and Christensen, 2001, p. 253), which means that firms do not initiate the shaping of external conditions by means of environmental communication. The production manager at F04 stated in this regard:

We have tried to have focus on it [environmental issues], and to have our marketing to sell it for us, and we have done that. But it happens mostly when you have a talk about it or discussion about it worldwide.

When you have the G8 top meeting, then everyone is talking about it [the environment]. Then we get FSC and the Nordic Swan labels, and realise that we should be Climate Neutral and so on (F04).

The above example shows that the firm responds by showing the achieved certifications and eco-labels. They were recurrently identified as the immediate signalling mechanisms (Connelly *et al.*, 2011; Delmas and Grant, 2014) delivered in a reactive environmental communication. Those signals are intended to influence interpretations and specific actions of stakeholders during the communication process (Duncan and Moriarty, 1998). Interestingly, we found that case firms, which communicate about environmental issues in reaction to customer demands and other imperatives from outside, follow a reactive stance in the content of their environmental communication (cf. Figure 2). That is, such firms correspondingly deliver messages regarding the overall commitment and impact of the environmental management practices and focus mostly on product- and the processes-related aspects. This indicates that there is consistency between the content and the process in a reactive environmental communication. Therefore, we argue that a reactive stance constitutes a lower level in the development of complementary assets for environmental communication. At this level, it is external stakeholders, particularly the customers, as well as external situations, that drive the communication process whereas firms merely follow and defend themselves by using conventional signals (i.e., eco-labels and certifications).

We further found that efforts to go beyond a purely reactive approach consist of pointing to the specific environmental attributes of products and processes during negotiations with customers. In these situations however, the firms take the initiative to talk about those attributes even though they are not used as a major argument to persuade customers during the negotiation. The CEO at F07 expressed in this regard:

...I will not start by saying that we are environmentally certified. I will start with information on what kind of machines we have and what kind of products we are delivering and then the environmental [aspects] will come a step further down the road... (F07).

Despite their active role when showing initiative in the environmental communication, firms may be challenged due to resistance and scepticism from the customer as noted by the sales manager at F08:

They [the customers] hear from the third time when we are bringing [environmental issues] into the dialogue. They are a little bit too sceptical, you could say. There is a little bit of distance because it's not a theme that they know about. They have to listen and, maybe internally, talk about what that could bring (F08).

Unlike a purely reactive approach, it is assumed that customers may not necessarily have prior knowledge about the environmental management practices and the influence on the final product. Firms thus, commonly elaborate on what is already available in their websites. However, it is in these cases where firms have also found the opportunity to talk about the above-mentioned fit

between environmental management and business by advising about cost-efficient solutions together with environmental reasons (cf. Figure 2). Thus, the data signifies that the processes and mechanisms involved in proactive environmental communication are in accordance with the respective comprehensiveness of the content. The CEO at F07 provided the following example:

...If the customer thinks that he wants to write a book that is 25 x 34 cm and I say: “if you take this one, you can have half of it on this sheet because it will be like this.” Then I can say: “if you make it 23 x 31 cm, then you will be able to have so much as this on a sheet.” And then the customer will of course say yes, but he is not thinking about that [the waste] when he [talks to me]. So, I am trying to plan how the final product will be. It is cheaper and it is better for the environment (F07).

The environmental consultant at the Employer Association added:

We need to convince the customer to fit into the environmental profile and they do that by choosing the right format and the right finishing. Can you follow me? It’s about consultancy...whether or not you are capable of convincing your customers of the environmental consequences of a certain choice of paper quality or format (Employer Association).

Environmental grounds therefore are instruments to reinforce arguments to persuade customers through reasoning (Andersen, 2001) of which would be a convenient option for them from a cost-efficient point of view. We argue that such a form of advising is a manifestation of complementary assets for environmental communication as a platform to build relationships with customers (Duncan and Moriarty, 1998) which is consistent with a proactive stance (Cheney and Christensen, 2001; Aerts and Cormier, 2009). We found that a strong aim to transparently reduce information asymmetry is what shapes the development of relationships with customers by means of advising. As one respondent expressed, the aim is to “tie customers by making the right choices based on facts and not on feelings” (F09). Those firms clearly understand that “most of the environmental parameters within the process chains are invisible” (Employer Association), which makes them “more creative than others” (ibid.) in disclosing those parameters to raise awareness among customers. Mechanisms towards such a ‘more creative’ advising in a proactive environmental communication comprise uncovering specific environmental qualities of products and processes (e.g., fact sheets with estimated carbon footprint of different paper types) (F08, F09); education and training of customers on best environmental solutions (e.g., less waste) (F14); and influencing customer strategies or business models with a focus on the natural environment (e.g., circular economy and climate change) (F08, F09). Through advising efforts, firms are able to “have a defence in argument, in environment, for the products” (Employer Association). That is, stressing the link between the environmental management practices and the quality of the final products so that the customers are better informed. Furthermore, the continuous release of information on environmental management practices through a broader range of channels (e.g. newsletters, press releases, environmental reports, etc.) (F08; F09, F13, F14) adds to this proactive instance of complementary assets for environmental communication for relationship maintenance purposes (Andersen, 2001) such as informing, listening and answering (Duncan and Moriarty, 1998).

On the other hand, when describing the processes involved in a proactive environmental communication, respondents recurrently referred to terms like: “conceptual presentation” and “dialogue” (F08), “talk” and “tell” (F09, F14), “understand” (F13), and “educate” (Employer Association). This means that a proactive approach of complementary assets for environmental communication heavily relies on the use of verbal and face-to-face interactions, considered as the richest and most complete form of communication (Daft and Lengel, 1986). Additional non-verbal signals are also used to provide meanings and interpretations to customers (Duncan and Moriarty, 1998; Connelly *et al.*, 2011) about the development of their environmental management practices. The CFO at F09 provided an example indicating the use of a non-verbal signal to bridge the gap between what the firms tell they are doing and what they actually do:

You advise them [the customers] about carbon emissions and reducing or neutralising [CO2 emissions] when printing a magazine but if you, when you drive to the customers, arrive in a huge four-wheel diesel car – then that’s not appropriate and if they ask you what you have done more to reduce CO2 emissions, you don’t know what to say... A lot of management is about talk but you also need to act, you need to be the good example, you need to show what you can do... it made a huge difference when the CEO drove an electric car. It is not that I think it’s going to save the world but it’s a huge statement (F09).

The emphasis on advising customers together with the use of alternative non-verbal signals indicate that there is an overall detachment from the total reliance on eco-labels and certifications as single signalling mechanisms to inform about environmental management practices outside the firm. The CFO at F09 provided also an example about the different perspective about eco-labels when deploying complementary assets for proactive environmental communication:

I would say that those eco-labels are the smallest part of it... the guiding of your customers counts for 95% of it all. So, if you merely use the labels you reach 5%, and well, you will not succeed. That [eco-labelling] is not enough since, I believe, the majority of the firms in the industry have the Swan mark and/or, the Nordic Eco-label. That is not enough. (F09).

The above suggests that eco-labels are perceived as signals that fail at closing the information gap between the firm and the customers (van Amstel *et al.*, 2008). They turn to be unpersuasive as the customers are still uncertain (Harbaugh *et al.*, 2011) about the meaning of the labels and how environmental management practices and product qualities are linked to the labels (Delmas and Grant, 2014). Thereby, through verbal and face-to-face interactions when advising, firms not only offset the communication failures of the eco-labels and certifications, but also become more comprehensive in their environmental communication (i.e., the fit between environmental issues and business matters, image-oriented claims, facts, etc.). It is recognised that by means of this kind of interaction, firms with complementary assets for proactive environmental communication have taken “a step further and stepped closer to the customers” (F13). That allows the firms to better understand the problems which the customers face in comparison with other forms of communication (Andersen, 2001).

INSERT FIGURE 2 ABOUT HERE

Moreover, informants indicated that processes related to a proactive environmental communication also comprise actions towards bridging the internal gap between environmental management matters and functions such as sales and marketing. An environmental consultant pointed out the importance of training the sales and marketing people as a mechanism to close such a gap:

They [the firms] have a need for training their sales and marketing department in how they can advise the customers and develop a closer relationship to the customers due to the fact that the customers have recognised their lack of environmental knowledge, that they can potentially get from the printer [the printing firm]... necessary skills in the printing company will be the ones for developing their knowledge about the life cycle [environmental] impacts and the kind of raw materials to be taken into account to create the right profile [of the printed matter]...the next step is to be able to perform in such a way that they [the firms] show that knowledge to a customer (Employer Association).

Training schemes are oriented towards technical aspects such as raw materials, formats, design and finishing alternatives, emphasising on the extent of environmental impacts (e.g., waste and carbon footprint) resulting from choices made. We find that such training is a manifestation of environmental communication at internal level intended to stress the link between the environmental management practices and the characteristics of the final products. We further argue that the efforts to engage with customers through advising on environmental arguments boost the sharing of information about the same matters inside the firm. Therefore, under a proactive stance of environmental communication, “internal aspects of organisational communication merge in with the dialogue that organisations carry on with their environments” (Cheney and Christensen, 2001, p. 251). In some cases, the internal gap has been bridged e.g., when the responsible person for environmental management is also related to sales activities. If the person handling the environmental management practices additionally has some technical skills, this is also an indication of the transference of knowledge to the sales and marketing areas. The sales manager at F08 is an example of this situation:

I studied communication besides my normal job... I am sales manager, but I am also head of our advertising office and the communication division in our advertising office... I have a sales focus that is referring to environmental management and CSR. My job here is actually to use this in our sales work (F08).

The above also indicates that the development of complementary assets for proactive environmental communication has implied additional investments in training and allocation of key human resources. People in the sales and marketing areas, being key human resources, need to be able to acquire a proper technical knowledge base and develop abilities to creatively interact with customers. This is consistent with the indication of knowledge as well as communication traits and abilities as constituents of a communication competence in organisations (Jablin and Sias, 2001).

Conversely, the lack of emphasis on advising customers on environmental grounds among firms with a reactive environmental communication makes them rely mainly upon technological resources on which conventional communication channels (i.e., websites) are built.

There were also cases (F08, F09, F13) where firms with complementary assets for proactive environmental communication did possess those key human resources, whereas some other firms (F14) have decided to rely on the Employer Association to have access to them (i.e., environmental consultants to advise customers). In order to support the relationship development with customers (Andersen, 2001), the use of specific information systems (F13, F14) was mentioned as an important additional technological resource in order to maintain a routinised flow of information. The quality manager at F13 highlighted the value of such a resource in this way:

...It's a platform for suppliers and companies. They can become a member of [*information system's name*] and get into this platform, they have access to a self-assessment questionnaire, which is actually built upon the U.N. Global Compact and the ETI base code, the human rights and so on...some of the label suppliers won't go into that... they can't afford it. They don't have the resources for it. So, we might be different from some of the label suppliers (F13).

Firms that have become proactive in their environmental communication have thus developed arrangements of signalling mechanisms and communication channels, and allocated additional key resources in comparison with firms under the reactive counterpart.

4.3.3. Implications on competitive advantage

Among firms that deployed a reactive environmental communication, it was difficult to observe how they are able to outperform competitors out of deploying this form of complementary assets. The recurrent use of eco-labels and environmental certifications with the purpose of 'avoiding long explanations' suggests that those conventional signalling mechanisms help firms not to incur costs for information search (Cormier and Magnan, 1999; Connelly *et al.*, 2011) and to prevent the loss of sales. Furthermore, since it was indicated that this kind of environmental communication constitutes a baseline approach, firms allocate conventional resources (e.g., corporate websites) that are widely available among competitors and easy to be acquired in the marketplace (Teece, 1986). Reactions to situational demands and requests from customers suggest that firms act in a predictable fashion by showing typical signalling mechanisms (e.g., eco-labels and environmental certifications), which limits the strategic importance of this form of complementary assets (Broekhuizen *et al.*, 2013). The above indicates that the leverage between environmental management practices and reactive environmental communication among case firms count for competitive parity (Barney, 1991; Helfat and Lieberman, 2002). We therefore propose, that complementary assets for reactive environmental communication in are generic as they serve to fulfil the general purpose of survival in the marketplace (Teece, 1986). Given the above, we suggest the following propositions:

Proposition 2a. *SMEs are capable of developing complementary assets for reactive environmental communication. The leverage of these complementary assets and the ongoing environmental management practices account for survival in the market place.*

Proposition 2b. *Complementary assets for reactive environmental communication in SMEs are generic because the conventional resources used in such a baseline approach are readily available to competitors.*

On the other hand, firms that develop complementary assets for proactive environmental communication have reported competitive benefits from their leverage with environmental management practices. An outcome of this approach to environmental communication is the extension of the customer base, particularly attracting those that are engaged in environmental protection. The CFO at F09 stated in this regard:

I'm not saying that other companies are not serious about it [CO2 neutralisation] but we might take advising of our customers a little more seriously ...you cannot fool customers. They know if you mean it or if you just want to sell something to them, and I think that it might be the difference between us [the firm] and a lot of other companies in our industry. Our customers know that we mean it; we really mean that we need to reduce our carbon footprint... I think that some customers might choose us just because they want to know what this [CO2 neutralisation] is ... and a lot of customers choose us because they have the same focus areas, they are more active, they want to make a difference...and we want to promote it. We earn a lot of money on the climate (F09).

Furthermore, when the respondent talks about 'we might take advising of our customers a little more seriously' and 'our customers know that we mean it', it can be interpreted as an indication of the interdependence between complementary assets for environmental communication and environmental management practices. Differently put, the content (i.e., delivered messages) of a proactive environmental communication is backed up by the actual ongoing environmental management practices. The ultimate outcome of such a broadened customer base is the ability to capture increased profits as the above example pointed out.

By means of complementary assets for proactive environmental communication, the case firms indicated that they are able to shape behaviour and strategies of their current customers. That is, firms communicate about their own developments and foci of their environmental management practices, which can then be adopted by their existing customers. This happens especially when the content of proactive environmental communication is focused on the logical connection between environmental management and business (Du *et al.*, 2010) and not just on the environmental attributes of end products. As a consequence, relationships with customers are strengthened. In this respect, the sales manager at F08 indicated that, out of this kind of environmental communication, the firm has developed partnerships with their customers via shaping their strategies:

...When the dialogue and the concept we present to them [the customers] are accepted, and it is brought up to the management, they very often respond very positively because it [focal firm's approach to

environmental management practices] can be part of a future strategy for the company. By doing that, we are really into the management of the company, where decisions are made and we are advising them on a strategic level. That is very, very good because they see us as a partner... it brings us into a strategic level with the management and we cannot wish for more, actually. (F08).

Then, the CFO at F09 indicated a similar situation regarding CO2 neutralisation:

...You need to advise your customers to go for the electric car. You can neutralise the rest [printed matter] but just neutralising the climate impact [of printed matter], it doesn't help anything. So, if you do not have the right focus, your customers won't do it because then it's just an additional cost for carbon-neutralised paper, but if we have made everything that is possible to find the paper with the lowest carbon footprint then our customers say: "Okay, then we want to neutralise [CO2 emissions] of the last part [transportation] because now that makes sense" (F09).

The above examples clearly indicate that when proactive environmental communication influences the customers' strategies, it provides an opportunity to "shape external developments in ways considered favourable in terms of its own aspirations" (Cheney and Christensen, 2001, p. 253). Moreover, among the case firms that possessed complementary assets for proactive environmental communication, it was found that the leverage on such assets improved a firm's reputation not only among customers but other external stakeholders. The CFO at F09 expressed the following:

Talk less; act more and that will give us a lot of respect in other industries. Then very often, they will ask us to come and tell what we're doing. It can be the persons in charge of CSR in the companies that want us to come and say what we have done (F09).

Complementary assets for proactive environmental communication thus, allow firms to shape and influence the perceptions of stakeholders (Elsbach and Sutton, 1992), particularly when based on verbal accounts (Elsbach, 1994; Aerts and Cormier, 2009) and demonstrative accounts (Bansal and Kistruck, 2006). Competitive implications here rely on the potential of an improved reputation that confers value (Roberts and Dowling, 2002). That is, high-reputation firms also serve as a signal of the quality of products and services (ibid.), which can be used as an argument by existing and 'convinced' customers and stakeholders to influence the opinions of sceptical ones (Bansal and Clelland, 2004). With an extended customer base, firms can expect positive effects on profitability (Roberts and Dowling, 2002).

Finally, we also found evidence that firms with complementary assets for proactive environmental communication are capable of lowering costs and increase efficiencies. That is a consequence of effective advising and persuasion of customers as to environmentally friendly alternatives of products, particularly in terms of reduced waste. The quality manager at F13 illustrated that in the following way:

...Our sales people contacted one of these huge food supplier customers and said: "Listen, we can actually reduce some of your label sizes because the size of the lids and the cans you are using are almost

the same. So, if we reduce the label with two millimetres in length and in width, you can actually use the same labels on all of your packaging.” So, in that way, we have taken a step further and stepped closer to the customers because we want to understand them, understand what they are facing because they have also got the same amount of waste. So, if we can reduce the label size, he can get more labels in one reel and in that way, we reduce waste for both us and the customer (F13).

Then, the sales manager at F08 added:

...And it is easier to sell layout and easier to sell printing jobs when we are giving this [environmentally-based] advice. When you use us as a supplier, then you are advised on how you can get the most out of your money (F08)

The deployment of complementary assets for proactive environmental communication seems to reduce the distance to the customers. This form of complementary assets thus favours an effective product stewardship that integrates the perspectives of the involved parts during the product design stage (Hart, 1995; Vachon and Klassen, 2008). Changes in design parameters on environmentally sound grounds will anticipate internal operational benefits in terms of reduced costs and increased efficiencies during the production stages (Hart, 1995; Sharma and Vredenburg, 1998).

In line with Teece (1986), we argue that complementary assets for proactive environmental communication can be understood as specialised. The competitive outcomes in terms of extended customer base as well as reputational and cost-efficient improvements evidence the value of this form of complementary assets when leveraged with environmental management practices (Barney, 1991). Contrary to a reactive environmental communication, this form of complementary assets comprises the development of unique skills among key human resources. They take long periods of time to be developed and are the result of the interaction between different organisational areas (Rothaermel and Hill, 2005; Ceccagnoli and Hicks, 2013), which also adds to their social complexity (Dierickx and Cool, 1989). The inherent intangible nature of such skills and resources makes these complementary assets unique and difficult to replicate or obtain in the market via contracting by competitors (Teece, 1986; Barney, 1991).

Given the above, complementary assets for proactive environmental communication not only allow firms to appropriate competitive benefits of the environmental management practices (Teece, 1986), but also to sustain the distinctive advantage relative to competitors (Barney, 1991; Tripsas, 1997; Rothaermel and Hill, 2005). We thus, formulate the following propositions based on the results:

Proposition 3a. SMEs are able to develop complementary assets for proactive environmental communication. The leverage of these complementary assets and the on-going environmental management practices lead to competitive advantage that can be sustained.

Proposition 3b. *Complementary assets for proactive environmental communication in SMEs are specialised because these complementary assets rely on intangible resources that are difficult to imitate and acquire by competitors.*

5. Conclusion, limitations and implications

Environmental management practices have strategic significance for SMEs. However, to ensure a return from investment in environmental management practices, SMEs have to develop and utilise additional organisational attributes. We identified and characterised two complementary assets among Danish SMEs in the printing and graphic industry that are utilised in conjunction with the on-going environmental management practices (cf. Table 5). Complementary assets for technology and process innovation are referred to as complementary assets that can confer costs reductions and increased efficiencies when utilised in conjunction with environmental management practices. Our study extends previous findings on similar complementary assets (Christmann, 2000) by proposing that complementary assets for technology and process innovation can turn out to be generic among SMEs. The strong dependencies on few leading technology suppliers implies that the key resources (such as for example external technical knowledge and core technologies) of these complementary assets can easily be acquired in the marketplace and replicated by competitors. In consequence, their strategic significance is limited because it becomes difficult to sustain competitive advantage.

INSERT TABLE 5 ABOUT HERE

SMEs can also deploy downstream complementary assets such as environmental communication in conjunction with environmental management practices. Case firms exhibited two distinguishable approaches that are consistent in the respective content of their delivered messages and involved mechanisms. A reactive environmental communication constitutes the baseline approach, consisting of responses to situational demands by using conventional signalling mechanisms (i.e., eco-labels and environmental certifications). This form of complementary assets is referred to as generic because it is based on the allocation of general purpose resources (Helfat and Lieberman, 2002), necessary for being in business today but not sufficient for sustaining competitive advantage. On the other hand, complementary assets for proactive environmental communication are characterised by the delivery of messages covering a broad range of environmental issues and the use of advising mechanisms via the use of verbal and face-to-face interactions. SMEs' characteristics such as informality and flexibility (Merz and Sauber, 1995; Yu, 2001) favour the use of those interactions to find creative ways to handle relationships. We refer to this form of complementary assets as specialised because they are based on difficult-to-imitate intangible skills possessed by key human resources. They pave the way to achieve and sustain competitive advantage through an extended customer base, stronger relationships with existing customers, improved reputation, and lower costs.

Our findings further extend research on organisations and the natural environment based on evidence from an environmentally advanced and SME dominated business sector. The study drew on the innovation-value-capturing-framework (Teece, 1986) to characterise weak appropriability regimes in the context of the implementation of environmental management practices. We also showed the applicability of the RBV in the SME setting as in previous studies (Yu, 2001; Aragón-Correa *et al.*, 2008; Leonidou *et al.*, 2015). In doing so, we identified complementary assets that are utilised in conjunction with environmental management practices among such firms and determined their competitive effects. The respective competitive outcomes of the characterised complementary assets (see Table 5) show their effectiveness in order to overcome weak appropriability regimes. Alternatively, the identified complementary assets in the study can be seen as part of the factors that may account for variations in SMEs' U-shaped frontiers (Wagner, 2005; Lankoski, 2008). Our results thus, highlights the importance of existing resources and capabilities as sources of heterogeneity in SMEs' competitive behaviour (Chen and Hambrick, 1995; Yu, 2001), particularly when dealing with environmental protection (Hart, 1995; Aragón-Correa *et al.*, 2008). Finally, the underlying systemic perspective when approaching complementary assets provides some insights in regards to answering questions like 'when' and 'how' it pays to be green as more nuanced alternatives to the traditional question 'does it pay to be green?'

5.1. Limitations and future research

Our study also has some limitations. The research design is based on cross-sectional data. Including a longitudinal dimension would allow possible changes of their complementary assets to be tracked. A longitudinal analysis might determine whether SMEs become better at utilising their external knowledge over time and combine it with their internal resources so that complementary assets for technology and process innovation might become more specialised. Such a research design can also help in exploring the genesis of environmental communication by observing with more detail internal dynamics (e.g., internal signalling mechanisms, channels, etc.) and therefore provide insights on the linkages between internal and external aspects of that particular kind of communication. Further studies could also comprise cross-sectorial comparisons to identify possible patterns that might support or challenge those found in this study. For example, inclusion of SMEs from a R&D-intensive high-tech sector would shed more light on the existence and nature of complementary assets for technology and process innovation, including possible differences with regard to competitive benefits of environmental management practices. Last, but not least, considering the inclusion of service firms in future research would shed more light on how a close relationship with the customers might serve as a vehicle for developing specialised complementary assets for players operating in a sector characterised by limited potential for product differentiation and apparent low visibility of environmental management practices (Rueda-Manzanares *et al.*, 2008).

5.2. Implications

Collecting the benefits from investments in environmental management practices necessitates that the benefits are appropriable. The nature of the technology involved, and the alternatives for

protecting against imitation suggest that printing and graphic firms operate in an environment characterised by weak possibilities to appropriate the return of environmental investment. Our findings challenge the mainstream environmental management wisdom, that SMEs do not have the prerequisites for investing in environmental management practices. Our study therefore have important lessons for managers of SMEs as our study shows how SMEs can still succeed in realising some of that return by utilising their complementary assets. Nevertheless, there is also a need for a word of caution. SME managers should not expect that investment in environmental management practices automatically will increase their competitive advantage. For this to happen, attention should be paid to additional resources and capabilities that secure a higher return on investments in environmental management practices. Particularly, firms should consider the supporting resources and capabilities in addition to those of purely technical character, which have traditionally been associated with environmental management improvements. That would certainly broaden the spectrum of opportunities to leapfrog competitors out of the implementation of environmental management practices. For instance, we suggest that SMEs can take advantage of their flexible and low-bureaucratic structures and decision-making processes to innovate existing ways to reduce information asymmetries in relation to environmental issues among stakeholders. Last, but certainly not least, policymakers and industrial associations should support firms by providing relevant and updated information that allow them to broaden the content of their environmental communication (e.g., environmental facts related to the particular industry), but also by providing intermediate performance indicators that could guide them for example, in the adequate realisation of environmental communication at internal level.

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Tables and figures of the article

Table 1. Firm profiles in the case study

Firm ID	Number of Employees (2014)	Location (Region)	Last reported amount of total assets (1000 DDK)	Product range	Main offered products
F01	110	Capital	5,370.00	Broad	Books, magazines, reports, booklets and brochures
F02	39	Capital	8,477.00	Broad	Magazines, brochures, posters, stationery, business cards and forms
F03	20	Central Jutland	10,973.00	Broad	Magazines, brochures, posters, stationery, business cards and forms
F04	22	Capital	14,871.00	Broad	Books, paper line, flyers, folders, booklets, wrapping, labels, posters and roll-ups, signs and displays
F05	24	Central Jutland	25,432.00	Broad	Business cards, envelopes, blocks, stationery, flyers, folders, booklets, catalogues, books, labels, postcards, sales folders, posters, big formats
F06	70	Central Jutland	30,452.00	Broad	Magazines, brochures, flyers and banners
F07	60	Central Jutland	38,347.00	Narrow	Books, wrapping and packaging
F08	40	Southern Denmark	47,683.00	Broad	Books, magazines, folders and manuals
F09	60	Northern Jutland	49,486.00	Narrow	Labels
F10	50	Capital	55,710.00	Broad	Magazines, brochures, folders, catalogues, books and banners
F11	40	Central Jutland	60,153.00	Broad	Magazines, brochures, posters, stationery, business cards and forms
F12	120	Central Jutland	76,173.00	Broad	Labels, forms, brochures, magazines, catalogues, envelopes, posters, folders, plastic cards, business cards and reports
F13	50	Southern Denmark	79,780.00	Narrow	Wet glued labels and paper packaging
F14	80	Capital	293,303.00	Narrow	Newspapers
F15	170	Central Jutland	340,290.00	Broad	Commercial print, magazines, catalogues, brochures, folders

Table 2. Data sources

Data Type	Sources	Data Format	Length
Primary data: Face-to-face, semi-structured interviews	Key informants: Owner-manager (3), CEO (2), CFO (2), quality manager (3), production/factory manager (4), sales manager (1), and environmental manager/consultant (2)	Digital sound recordings and transcriptions	17 recorded interviews (26 hours in total).
Secondary data	Firms' websites, reports and internal documents	Brochures and electronic files	34 documents of approx. 16,790 words
	News from Employer Association's newsletters	Electronic files	92 files of approx. 96,525 words
	News from other diverse sources	Electronic files	47 files of approx. 101,618 words

Table 3. Example of coding

Code:	Environmental communication	
Sub-code:	Content of environmental communication	
Sub-sub-code:	Impact of environmental management practices	
Source	Interview	Document
F14	"If something comes up and we have made something like saved a lot of energy, we tell them [the customers]: 'We did very well, we saved 40% of energy last year.' or something like that." - <i>Interview with environmental manager</i>	"Our goal is to reduce electricity consumption in connection with leakage loss in the pressurised air system by 17 % The goal has been met as savings of 22 % have been realised after project completion." - <i>Issued report</i>

Table 4. Environmental management practices carried out by the case firms

Pollution Prevention	Product Stewardship	Clean Technologies
<p><i>Complying with environmental legislation and regulations from government (All)</i></p> <p><i>Better housekeeping practices</i></p> <ul style="list-style-type: none"> • Waste sorting (All) • Turn off lights and machinery according to routines (F06, F13, F14) <p><i>Waste and emission reduction</i></p> <ul style="list-style-type: none"> • Charting of materials/input consumption towards targets for reduction (All) • Charting of wastes towards targets for reduction (All) • Reduction of paper waste (All) • Recycling of paper (All) • Reduction of hazardous waste: printing plates, washing agents, VOCs, etc. (All) • Re-circulation of chemicals: washing agents, VOCs (F01, F04, F05, F06, F07, F08, F09, F11, F12, F14, F15) • Carbon compensation (F02, F04, F07, F08, F09, F13, F14) • Incremental modifications of processes and manufacturing techniques for better use of raw materials/inputs (All) • Continuous investments in new machinery/equipment for better use of raw materials/inputs (F02, F03, F04, F06, F07, F08, F09, F10, F12, F13, F14, F15) <p><i>Energy efficiency improvements</i></p> <ul style="list-style-type: none"> • Charting of energy consumption towards targets for reduction (All) • Incremental modifications of processes and manufacturing techniques for lower energy consumption (All) • Continuous investments in new machinery/equipment towards lower energy consumption (F01, F02, F03, F04, F06, F07, F08, F09, F10, F12, F14) • Switching to LED lightning (F02, F03, F05, F07) • Improvements in ventilation (F01, F02, F04, F07, F10, F12) • Internal closed loops of energy: heating, ventilation (F10, F04, F07, F10, F12, F14) • Closed loops of energy with other organisations (F09, F10) • Systems to generate heating out of waste (F04, F14) <p><i>Environmental Management Systems</i></p> <ul style="list-style-type: none"> • Environmental targets, policies and procedures (All) • Certifications: ISO, EMAS (F04, F06, F07, F08, F09, F10, F14) 	<p><i>Raw materials adaptation</i></p> <ul style="list-style-type: none"> • Substitution with eco-friendly substances: Vegetable-, water-based inks, biological varnishes, etc. (All) • Use of inspected/eco-labelled paper (all) • Use of Carbon/Climate compensated raw materials/inputs (F06, F09, F12) <p><i>Focus on closed-loops</i></p> <ul style="list-style-type: none"> • Carbon footprint calculation focused on some form of life-cycle-analysis (F02, F04, F08, F09) F13, F14) • Manufacturing of printed matter towards cradle-to-cradle (F09, F10, F13) • Manufacturing of biodegradable printed matter (F09) • Product take-backs, returns (F09) • Conversion of wastes into inputs between organisations (F01, F03, F04, F09, F10, F13, F14) <p><i>Certifications</i></p> <ul style="list-style-type: none"> • FSC (F01, F02, F03, F04, F06, F08, F09, F11, F12, F14, F15) • PEFC (F11, F14) • Nordic Swan (F01, F04, F05, F06, F08, F09, F11, F12, F14, F15) • EU-Flower (F14) • Carbon Neutral/Climate Neutral (F04, F07, F08, F09, F14, F15) 	<p><i>Renewable energies</i></p> <ul style="list-style-type: none"> • Alternative fuel vehicles (F09) • Reflective roofs / Solar panels (F04, F09, F13) • Hydroelectricity (F06) • Wind energy (F07, F08, F09, F13, F15)

Figure 1. Summary of findings of complementary assets for technology and process innovation

Environmental Management Practices	Complementary assets for technology and process innovation
	<p><u>Content</u></p> <ul style="list-style-type: none"> - Acquisitions of new machinery and equipment (F02-F11, F13-F15) - Incremental changes in existing technologies and manufacturing processes towards... <ul style="list-style-type: none"> · Waste sorting (F13) · Eco-friendly inputs (F04, F07, F10, F14) · Measurement and monitoring (F01, F05, F14) · Energy and waste reduction (all firms) <p><u>Process</u></p> <ul style="list-style-type: none"> - Continuous-improvement approach (all firms) - Cross-functional management in an atmosphere of informality and motivation (F01, F03, F04, F06, F07, F09, F10, F14) - Embedded ties predominantly with lead technology suppliers to acquire core technologies and technical knowledge based on problem-solving arrangements (all firms)

Figure 2. Summary of findings of complementary assets for environmental communication

Environmental Management Practices	Complementary assets for environmental communication: Reactive approach Evidenced in case firms F01-F06, F10, F15
	<p><u>Content</u></p> <ul style="list-style-type: none"> - Messages about overall commitment and impact of environmental management practices - Predominantly product- and process-oriented messages <p><u>Process</u></p> <ul style="list-style-type: none"> - Assumes that the customers should reduce information asymmetries by themselves - Customers drive the communication process and firms respond - Response to situational demands (threats and opportunities) - Use of conventional communication channels (e.g., webpages) and signalling mechanisms (e.g., eco-labels and environmental certifications) - Allocation of general purpose resources

Environmental Management Practices	Complementary assets for environmental communication: Proactive approach Evidenced in case firms F07-F09, F13, F14
	<p><u>Content</u></p> <ul style="list-style-type: none"> - Messages about commitment, impact of environmental management practices and their fit with business aspects - Product-, process-, image-oriented and environmental facts in messages <p><u>Process</u></p> <ul style="list-style-type: none"> - Assumes that the firm should reduce information asymmetries among customers - Firms raise awareness among customers through creative advising mechanisms and building of relationships - Influence of external developments in convenient ways - Based on verbal and face-to-face interactions, and additional communication channels (e.g., Press releases, information systems) and signalling mechanisms (e.g., fact sheets) - Allocation of skilled key human resources

Table 5. Strategic aspects of complementary assets in case firms

	Technology and process innovation	Environmental communication	
		Reactive	Proactive
Type of complementary asset	Generic	Generic	Specialised
Key resources	Technical knowledge base and core technologies readily available to competitors	General purpose resources readily available and/or easy to be developed by competitors	Intangible skills among key human resources difficult to imitate and/or acquire by competitors
Value generation	Cost reductions and improved efficiencies	Avoidance of information search costs	Extended customer base Stronger relationships with existing customers Improved reputation Cost reductions and improved efficiencies
Competitive outcome	Competitive parity	Competitive parity	Competitive advantage

CHAPTER 4:

EXPLAINING THE BUSINESS CASE FOR ENVIRONMENTAL MANAGEMENT PRACTICES IN SMEs: THE ROLE OF ORGANISATIONAL CAPABILITIES FOR ENVIRONMENTAL COMMUNICATION

Juan Felipe Reyes-Rodríguez

Abstract

Concerns for the preservation of the natural environment demand engagement of firms in terms of the rethinking of their operations, inputs and outputs. Small and medium-sized enterprises (SMEs), however, need to align such concerns with the overall pursuit of maintaining and improving their competitiveness. Drawing on the resource-based view (RBV) of the firm, this study aims to explain the potential of outperforming competitors associated with the implementation of environmental management practices. Findings based on data from 112 Danish SMEs operating in the printing and graphic industry suggest that the implementation of environmental management practices can boost perceived competitive advantage in terms of lower costs as well as improved reputation following from the development of organisational capabilities for environmental communication. Thus, the study provides some insight in regard to the questions ‘how’ and ‘why’ it pays to be green. After concluding on such findings, the paper briefly outlines avenues for further research and key managerial implications.

Keywords: Environmental management practices; environmental communication; organisational capabilities; perceived competitive advantage; small and medium-sized enterprises (SMEs), PLS-SEM.

1. Introduction

Continuous industrial growth and progress entail prosperity and wealth to society. This, however, has occurred at the expense of the deterioration of the natural environment, and thus has led to serious problems such as climate change, ozone depletion, threatened biodiversity, and soil erosion (Shrivastava, 1995b; Aragón-Correa *et al.*, 2008; Leonidou *et al.*, 2015). Consequently, societal awareness of environmentally-related areas of concern has grown and these areas have been included in governmental programs, institutions and eventually rules of the business game. Correspondingly firms have recognised the salience of the natural environment and its depletion due to their business activities, and are engaging in a ‘greening’ of their operations, inputs and

outputs (Sharma, 2000; Banerjee, 2001; Aragón-Correa *et al.*, 2008). Literature in the field of organisations and the natural environment advocates that managers deal with the interface between business and the natural environment in a strategic manner and not just as a normative matter (Hart, 1995; Sharma, 2000; Aragón-Correa and Sharma, 2003). That is, firms are able to reduce their impact on the natural environment by implementing environmental management practices, while at the same time becoming more competitive (Hart, 1995; Christmann, 2000; Aragón-Correa and Sharma, 2003). Environmental management practices refer to certain organisational decisions and actions around the development and introduction of new or improved products, processes, organisational structures and/or systems, with the purpose of ameliorating the impact of its business activities on the natural environment (Shrivastava, 1995a; Rennings, 2000).

While most empirical examinations of the strategic importance of environmental management practices have focused on larger firms, small and medium-sized enterprises (SMEs) remain an under-researched setting. SMEs are essential for the economies and industrialisation of nations. In OECD countries, for example, they account for more than 95 per cent of the total number of manufacturing firms, with an even larger share for certain service sectors (OECD, 2005). Correspondingly, such firms constitute a critical community in terms of environmental impact (Gadenne *et al.*, 2009). For instance, in the European Union approximately 64 per cent of pollution originate from SMEs (Constantinos *et al.*, 2010). Most of the existing knowledge related to environmental issues among SMEs has traditionally justified how difficult it is for SMEs to effectively implement environmental management practices (Tilley, 1999; del Brío and Junquera, 2003; Gadenne *et al.*, 2009). Recent research, however, has suggested that SMEs have a potential to actively addressing the issue of making products, processes, and technologies more ‘friendly’ to the natural environment (Bos-Brouwers, 2010; Revell *et al.*, 2010; Uhlaner *et al.*, 2012). Recognizing the strategic characteristics that distinguish SMEs (Merz and Sauber, 1995; Dean *et al.*, 1998; Yu, 2001), some studies have also provided evidence of the strategic focus of environmental management practices in paving the way to boost competitiveness (Aragón-Correa *et al.*, 2008; Brammer *et al.*, 2012; Leonidou *et al.*, 2015).

This study adopts the latter approach towards the strategic management of environmental management practices in the SME setting. In doing so, the resource-based view (RBV) of the firm (Rumelt, 1984; Wernerfelt, 1984; Dierickx and Cool, 1989; Barney, 1991) is used as a theoretical driving force. In spite using the RBV to explain the differences in competitive behaviour when implementing environmental management practices among large firms (Hart, 1995; Russo and Fouts, 1997; Sharma and Vredenburg, 1998; Christmann, 2000; Surroca *et al.*, 2010), its application to the SME setting still remains in its infancy.

In that vein, the aim of this research is to investigate a certain form of organisational capabilities that allows the influence of environmental management practices on perceived improvements of competitive advantage to be explained in a sample of SMEs. Thus, the underlying research question that guides the investigation refers to how and why the implementation of environmental management practices in SMEs lead to perceived improvements in competitive advantage. Much of the literature in the field of organisations and the natural environment focuses on the direct influence of environmental management practices on competitive advantage. However, there has

been a persistent call for insight on explanations of such an influence, which has recently gained urgency (King and Lenox, 2001; Peloza, 2009; Russo and Minto, 2012).

In addressing the research questions, organisational capabilities for environmental communication are proposed as an attribute that allows the strategic effects of environmental management practices to be realised among SMEs. Data from SMEs operating in the Danish printing and graphic industry have been collected and analysed to empirically investigate two issues: (i) The linkage between the implementation of environmental management practices and the development of organisational capabilities for environmental communication; and (ii), the impact of organisational capabilities for environmental communication on perceived improvements of competitiveness through the influence on aspects such as lower cost and reputation.

The following section reviews the background theory and research on environmental management practices and competitive advantage as well as SMEs' environmental issues. Then, the conceptual model and the related research hypotheses are developed. Subsequently, a description of methodological and research design issues is detailed, which is followed by the presentation of the analysis and study results. The remaining section discusses the key findings and, following the conclusion, outlines the implications for both research and managerial practice.

2. Theory and background research

2.1. Environmental management practices and competitive advantage

A significant body of research has focused on competitive advantage stemming from environmental management practices. During the 1990's, theoretical discussions (Hart, 1995; Porter and van der Linde, 1995; Shrivastava, 1995a; Reinhardt, 1998) emerged shedding light on how environmental management practices simultaneously mitigate firms' impact on the natural environment and contribute to boost competitive advantage. Key arguments pointed to the potential innovation and efficiency gains when adopting environmental management practices (Porter and van der Linde, 1995), and the potential to develop competitively valuable organisational capabilities (Hart, 1995).

According to Porter and van der Linde (1995), pollution is associated with inefficient use of resources during manufacturing activities thereby representing unnecessary costs. A firm will have resource inefficiencies due to limited process controls and suboptimal use of materials. Costs arise from the resulting unnecessary defects and waste disposal. Differently put, firms miss profit opportunities since resources are inadequately used in the quest to generate the highest value. The adoption of environmental management practices therefore comprises a stream of innovative solutions towards new technologies and production approaches stimulated by the need to reduce costs derived from pollution. By enhancing waste reducing resource productivity, competitive advantage is then to be achieved primarily via cost savings. Notwithstanding, firms are also able to gain 'first mover advantages' by targeting new market opportunities derived from commercialising their emergent new solutions and innovations (Porter and van der Linde, 1995). Particularly, concepts such as 'environmental competitiveness' (Wagner and Schaltegger, 2004) and 'eco-advantage' (Esty and Winston, 2006) have been suggested to denote the part of the overall

competitive advantage influenced or achieved by means of environmental management practices (Wagner and Schaltegger, 2004). That is, managers recognise “opportunities to cut costs, reduce risk, drive revenues, and enhance intangible value [and] build deeper connections with customers, employees, and other stakeholders” (Esty and Winston, 2006, p. 14).

Literature rooted in the RBV (Wernerfelt, 1984; Dierickx and Cool, 1989; Barney, 1991) has also argued that the firm’s ability to manage the constraints of the natural environment paves the way to develop valuable, rare, and imperfectly imitable organisational resources and capabilities (Hart, 1995; Russo and Fouts, 1997; Sharma and Vredenburg, 1998; Aragón-Correa and Sharma, 2003). A proactive stance when implementing environmental management practices is emphasised, i.e., patterns of practices that go beyond environmental compliance driven by the interpretation of environmental issues as opportunities (Hunt and Auster, 1990; Roome, 1992; Sharma, 2000; Aragón-Correa and Sharma, 2003). In that sense, accumulation and complex coordination of human and technical skills, together with heterogeneous resources such as technologies and physical assets, occur in the course of implementing environmental management practices (Hart, 1995; Russo and Fouts, 1997; Sharma and Vredenburg, 1998). Continuous improvement and innovation, integration of stakeholder perspectives, higher order learning and shared vision have been characterised as emerging organisational capabilities from the adoption of environmental management practices, and which simultaneously contribute to improving competitive advantage (Hart, 1995; Sharma and Vredenburg, 1998; Christmann, 2000; Aragón-Correa *et al.*, 2008). These organisational capabilities constitute a source of heterogeneity across firms because they are socially complex and deeply embedded in the firm (Teece, 1986; Barney, 1991); they are based on the deployment and combination of resources and assets (Amit and Schoemaker, 1993); and they are the result of path dependencies in learning processes over time (Dierickx and Cool, 1989). Competitive advantage thus, stems from such heterogeneity as barriers to imitation are raised (Rumelt, 1984); at the same time, organisational capabilities confer value and rent generation (Barney, 1991).

Competitive advantage in terms of lower costs is achieved when environmental management practices are directed towards a more efficient use of resources. At production level, environmental management practices comprise the redesign of production systems to reduce environmental impact, substitution of polluting inputs, waste reuse and recycling, and energy conservation programs (Dechant and Altman, 1994; Porter and van der Linde, 1995; Shrivastava, 1995a). Thus, reduction of waste disposal costs and savings from waste reuse and recycling are expected (Shrivastava, 1995a; Christmann, 2000). Alternatively, environmental management practices can be adopted to comprehensively mitigate environmental impact of products by extending the scope to address operations throughout their entire life-cycle. Through approaches such as ‘design for disassembly’ (Shrivastava, 1995a), ‘product stewardship’ (Hart, 1995), and ‘design for environment’ (Hart, 1997), firms can also prevent pollution during the product design, distribution, use and disposal stages. Thereby, costs related to potential product-take-back, environmental liabilities, and legal fees can be lowered (Shrivastava, 1995a; Christmann, 2000). Scholars subscribing to the RBV particularly argue that competitive advantage in terms of lower costs is achieved because environmental management practices contribute to developing organisational capabilities for continuous improvement and innovation (Hart, 1995; Sharma and Vredenburg, 1998; Christmann, 2000). Particularly, environmental management practices generate changes that

take place due to the experimentation so as to continuously find effective and efficient ways to ameliorate the environmental impact (Sharma and Vredenburg, 1998), relying on the intensive use of human skills and knowledge-based assets (Itami, 1987; Hart, 1995).

The implementation of environmental management practices for the reduction of emissions below regulatory requirements as well as for energy conservation can signal the firm's concern for the environment (Jacobs *et al.*, 2010). This can influence the judgments of stakeholders, which builds a greater goodwill and ultimately improves firm's reputation. (Fombrun and Shanley, 1990; Darnall *et al.*, 2010). At managerial level, environmental management practices also serve as a reputation building function. The establishment of environmental policies as well as the associated planning and control tools will guide an adequate development of products and processes, which assures firm's recognition from environmentally sensitive stakeholders (Russo and Fouts, 1997; Jacobs *et al.*, 2010). As a source of competitive advantage, superior firm reputation from the implementation of environmental management practices boosts value-creation as it can build customer loyalty and increase sales as well as attract and retain investors and better employees (Fombrun and Shanley, 1990; Russo and Fouts, 1997). Furthermore, improved reputation ensures the continuous engagement of stakeholders in corporate activities, which facilitates the spread of environmental management practices throughout the business system at large (Hart, 1995; Hart and Milstein, 2003; Surroca *et al.*, 2010).

From the RBV perspective, reputation is built because the firm develops organisational capabilities for stakeholder integration in the course of carrying out environmental management practices (Hart, 1995; Sharma and Vredenburg, 1998), that is, the active management of perspectives and external stakeholder expectations in order to integrate the 'voice of the environment' into product design and the associated manufacturing processes (Hart, 1995; Buysse and Verbeke, 2003). Through organisational stakeholder integration capabilities, firms can benefit from acceptance and improved reputation (Hart, 1995) as external stakeholders respond positively by mobilising a favourable public opinion (Buysse and Verbeke, 2003; Darnall *et al.*, 2010). In addition, these organisational capabilities comprise collaborative trust-based relationships built on extensive dialogue and flows of action (Sharma and Vredenburg, 1998). This accounts for social complexity, path-dependency and the raising of barriers against imitation (Dierickx and Cool, 1989; Barney, 1991).

In spite of the considerable advancements in both theoretical explanation and empirical verification, research has predominantly been concerned with determining direct associations between environmental management and competitive advantage. Differently put, the emphasis has been on determining whether it 'pays to be green.' However, some scholars have recognised that the business case for environmental management practices is highly complex, which means that a myriad of internal and external factors must be taken into account in its characterisation (Peloza, 2009; Russo and Minto, 2012; Dixon-Fowler *et al.*, 2013). They argue for a tendency to overlook both mediation processes (Peloza, 2009) and moderating factors (Dixon-Fowler *et al.*, 2013). Therefore, approaching mediating processes and moderating factors helps address more nuanced questions such as 'how', 'why' and 'when' environmental management practices can

simultaneously reduce the burden on the natural environment and boost competitive advantage (Reinhardt, 1998; King and Lenox, 2001; Russo and Minto, 2012; Dixon-Fowler *et al.*, 2013).

2.2. SMEs and environmental management

The literature focused on environmental management issues in SMEs has followed different paths (Klewitz and Hansen, 2014; Leonidou *et al.*, 2016). Particularly, scholars have looked at aspects such as environmental awareness (Revell and Blackburn, 2007; Gadenne *et al.*, 2009), owners-managers' attitudes (Worthington and Patton, 2005; Williams and Schaefer, 2013), drivers and barriers for the adoption of environmental management practices (Parker *et al.*, 2009; Revell *et al.*, 2010), and the specific portfolios of implemented environmental management practices (Gadenne *et al.*, 2009; Klewitz and Hansen, 2014). Such a variety of topics has served as supplementary building blocks towards the study of the competitive implications of environmental management practices among SMEs.

On the one hand, research has highlighted SMEs' inability to effectively adopt environmental management practices (Gadenne *et al.*, 2009) due to lack of resources (Bianchi and Noci, 1998), awareness and expertise among managers (del Brío and Junquera, 2003), and strategic orientation towards opportunities to reap competitive gains derived from implementing such practices (Worthington and Patton, 2005; Revell and Blackburn, 2007). Therefore, SMEs tend to overlook the potential benefits of environmental management practices, making it difficult to overcome the barriers already mentioned (Johnson and Schaltegger, 2016). Furthermore, it has been argued that the ineffective adoption of environmental management practices is associated with gaps between intention and action (Tilley, 1999; Gadenne *et al.*, 2009). That is, even if SME owner-managers are aware of environmental issues (e.g., impact, regulations, etc.), there is a disparity regarding the translation into actual implementation of environmental management practices (Gadenne *et al.*, 2009; Johnson and Schaltegger, 2016; Leonidou *et al.*, 2016).

Conversely, research has shed light on proactive stances of SMEs towards environmental issues (Aragón-Correa *et al.*, 2008; Bos-Brouwers, 2010; Heras and Arana, 2010; Uhlaner *et al.*, 2012; Leonidou *et al.*, 2015). This stream of literature argues that well-known strategic characteristics of SMEs such as flexibility, agility and niche targeting (Dean *et al.*, 1998) as well as simple capital structures and entrepreneurial vision (Yu, 2001) constitute advantages that pave the way to true commitment to environmental management practices. Particularly, when considering these characteristics, SMEs are able to adopt alternative portfolios of environmental management practices that are simple to implement and still cost-effective (Heras and Arana, 2010; Johnson and Schaltegger, 2016). Results in terms of an improved environmental situation have been evidenced as superior over adopting portfolios of environmental management practices traditionally intended for larger firms (Heras and Arana, 2010). Furthermore, SME's flexibility comprises simple organisational structures, decision-making processes and low formality (Merz and Sauber, 1995; Yu, 2001). Hence, such firms are able to respond quickly to changes in their business environments (Merz and Sauber, 1995), particularly in the form of increasing demands for environmental action from salient stakeholders (Darnall *et al.*, 2010). Flexibility also allows SMEs to manage external relationships in order to acquire critical resources, such as knowledge and technologies, required to

implement environmental management practices (Aragón-Correa *et al.*, 2008; Roy and Therin, 2008).

In sum, this suggests that SMEs are able to move a step forward from a reluctant stance towards a ‘greening’ potential, where they actively engage in taking real action related to environmentally friendly products, systems and production methods (Revell *et al.*, 2010; Uhlaner *et al.*, 2012). This stream of research has recently provided more insight regarding the influence of environmental management practices on competitive advantage. Indeed, it has been shown that SMEs seem to benefit more from environmental management practices than larger counterparts (Dixon-Fowler *et al.*, 2013). Improvements in competitive advantage in the form of lower costs have been found as the most common outcome when adopting environmental management practices related to efficiency of processes (Aragón-Correa *et al.*, 2008; Bos-Brouwers, 2010; Brammer *et al.*, 2012). Notwithstanding, when focusing on product and organisational innovations that are environmentally sound (Klewitz and Hansen, 2014), opportunities to improve firm reputation, attract environmentally aware customers (Revell *et al.*, 2010; Jorge *et al.*, 2015) and increase market shares (Brammer *et al.*, 2012; Leonidou *et al.*, 2016) have also been uncovered. Such recent findings thus suggest that “SMEs may be coming round to the idea that there is a business case for sustainability” (Revell *et al.*, 2010, p. 273), when operationalised as the implementation of environmental management practices.

In spite of the growing interest among scholars, research on the business case for environmental management practices is still in its infancy. Few studies have advanced in applying the RBV when addressing organisational resources in the form of financial, technical and human investments (Leonidou *et al.*, 2015), as well as organisational capabilities such as shared vision, stakeholder management and strategic proactivity (Aragón-Correa *et al.*, 2008). Such studies, however, have understood the role of organisational resources and capabilities as attributes that pave the way for the adoption of environmental management practices rather than as a means to explain how such practices can boost competitive advantage. On the other hand, some few studies (Leonidou *et al.*, 2015; Leonidou *et al.*, 2016) have started to look at both internal and external moderators so as to provide some insight into ‘when’ it pays for SMEs to be green. Thus, the need for looking at the previously mentioned nuanced questions is even more urgent in this particular setting. Explanations on ‘how’ and ‘why’ the implementation of environmental management practices lead to improvements in SMEs’ competitive advantage are scarce; that is, from an operational perspective, the study of organisational processes and mechanisms that mediate such an influence (Peloza, 2009). In addressing this gap, this study builds on the RBV in order to suggest that organisational capabilities for environmental communication constitute a mediating attribute that SMEs can develop to explain the business case for environmental management practices. In the following section, the paper elaborates on the characterisation of this form of organisational capabilities and the reasoning with respect to the linkage with environmental management practices and perceived competitive advantage.

3. Research model and hypotheses

To bridge some of the gaps previously identified, a conceptual model was developed (see figure 1). The conceptual model indicates that environmental management practices lead to the development of the organisational capabilities for environmental communication. Also, the conceptual model indicates that such organisational capabilities contribute to improving the perceived competitive advantage in terms of lower costs as well as reputation.

INSERT FIGURE 1 ABOUT HERE

From an operational perspective, therefore, the conceptual model depicts organisational capabilities for environmental communication as a mediator variable that helps to explain ‘how’ and/or ‘why’ the effect of environmental management practices on perceived competitive advantage occur (Baron and Kenny, 1986; MacKinnon, 2008). Three main hypothesised effects and two effects of a control variable are formulated below.

3.1. Effect of environmental management practices on environmental communication

To make environmental management practices competitively valuable, firms need to make them visible by providing credible information (Reinhardt, 1998); differently put, to open such practices to “greater public scrutiny” (Hart, 1995, p. 1000). Firms thus need to develop organisational capabilities for environmental communication to signal their qualities and values, particularly related to firm’s environmental protection, that are presumed as unobservable (Spence, 1973; Connelly *et al.*, 2011). Organisational capabilities for environmental communication comprise the processes and mechanisms that strategically address the interactions and exchange of information between a firm and its external stakeholders regarding the firm’s environmental commitment and related practices (Bansal and Clelland, 2004; Hunter and Bansal, 2007; Du *et al.*, 2010; Maas *et al.*, 2014). Particularly, such organisational capabilities are deployed with a view towards reducing information asymmetries between the firm and its stakeholders (Cormier and Magnan, 1999; Connelly *et al.*, 2011) with respect to the commitment with environmental protection as well as the motives, the impacts, and the relevance for business of the implemented environmental management practices (Du *et al.*, 2010; Leonidou *et al.*, 2014).

Drawing on the RBV and communication theory, organisational capabilities for environmental communication can be understood as “the set of abilities, henceforth termed *resources*, which a communicator has for the use in the communication process” (Jablin *et al.*, 1994, p. 125). Knowledge and communication capacities are suggested as part of such resources that are allocated to respectively determine the content and delivery process of the demonstrative and factual messages (Jablin and Sias, 2001; Bansal and Clelland, 2004; Bansal and Kistruck, 2006). The ongoing implementation of environmental management practices serves as the direct source of the necessary knowledge on technical aspects and routines to be translated into demonstrative messages at both product and process levels (Bansal and Kistruck, 2006; Leonidou *et al.*, 2014). Otherwise,

organisational capabilities for environmental communication would lead to mere illustrative expressions (Bansal and Kistruck, 2006) and greenwashing (Delmas and Burbano, 2011; Walker and Wan, 2012). On the other hand, communication capacities and abilities are required to encode and decode the messages (Jablin and Sias, 2001) in relation to the ongoing environmental management practices. They include the effective use of a repertoire of channels, the extent of personalisation and language variety during the communication process (Daft and Lengel, 1986; Aerts and Cormier, 2009).

Since SMEs' patterns of organisational communication are based on a strong focus on informality and interpersonal interactions (Smeltzer and Fann, 1989; Nielsen and Thomsen, 2009), organisational capabilities for environmental communication will have a tacit nature in this setting. This contributes to the social complexity and ambiguity of such organisational capabilities (Wernerfelt, 1984; Barney, 1991; Amit and Schoemaker, 1993), which helps to prevent imitation (Rumelt, 1984; Dierickx and Cool, 1989; Barney, 1991). Furthermore, given the strong focus on personal interactions, the communication capacities and abilities are expected to rely heavily on individuals in this setting. It is argued, therefore, that the deployment of organisational capabilities for environmental communication in SMEs will be strongly based on verbal and face-to-face interactions, regarded as the richest form of communication (Daft and Lengel, 1986; Aerts and Cormier, 2009). Such interactions occur, for example, when customers are advised in their choices based on arguments related to environmental qualities of products and processes. Communication through advising is a mechanism to make visible SMEs' environmental management practices visible (Reinhardt, 1998). At the same time, effective advising mechanisms imply that those practices must be actually in place to provide the technical knowledge to be used during the interactions and thus, make credible the exchanged information. Therefore, this account suggests the following hypothesis:

Hypothesis 1: The implementation of environmental management practices will contribute to the development of organisational capabilities for environmental communication in the SME.

3.2. Effects of environmental communication on perceived competitive advantage

The degree of engagement in the communication of environmental issues can determine cost savings of a firm at different levels. In the absence of communication with respect to environmental commitment and related practices, stakeholders will tend to assume the worst, perceiving that the firm may be signalling that it is unresponsive (Cormier and Magnan, 1999; Bansal and Clelland, 2004). Stakeholders can therefore choose to collect data from external sources (ibid), but even if they do so, there could be still information asymmetries as they are not able to fully identify firm's responsiveness towards environmental protection (van Amstel *et al.*, 2008). This is more critical in the case of SMEs because information and data on their environmental commitment, practices, and performance can be hardly obtained from public sources (Aragón-Correa *et al.*, 2008; Torugsa *et al.*, 2012). Thus, a lack of communication damages the relationships with stakeholders, which can ultimately lead to increased costs due to penalties and litigations (Walker and Wan, 2012). A

continuous delivery of credible information demonstrating firm's environmental commitment and related practices, combined with a skilful use of communication channels, makes stakeholders more confident (Cormier and Magnan, 1999; Bansal and Clelland, 2004). A strong confidence of stakeholders helps to avoid potential costs associated with penalties and litigations even though environmental mishaps occur (Bansal and Clelland, 2004; Walker and Wan, 2012).

On the other hand, organisational capabilities for environmental communication are developed to actively shape stakeholders' behaviour and persuade them of convenient choices (Pomeroy and Johnson, 2009; Cornelissen, 2011; Maas *et al.*, 2014), which can also lead to the reduction of firm's operational costs (e.g., reduced raw materials, waste, etc.). For example, a firm can persuade customers of a convenient choice, namely a product or manufacturing technique with superior environmental qualities that offers cost-efficiency benefits (Leire and Thidell, 2005). In this case, the firm signals involvement in caring for the natural environment that has also the possibility to confer value to customers (Connelly *et al.*, 2011). SMEs can take advantage of their communication mechanisms based on verbal and face-to-face interactions when addressing customers as they reduce information equivocality (Daft and Lengel, 1986; Aerts and Cormier, 2009; Nielsen and Thomsen, 2009). Furthermore, using concrete and demonstrative information helps to build up strong arguments for the convenient choice for customers during such interactions. Managers can point out the consequences of environmental management practices on the attributes of a product or process and the associated cost-efficiency benefits to reinforce their own attractiveness compared to any other less-environmentally-friendly alternative (Andersen, 2001; Leonidou *et al.*, 2014). That is, to show the congruence between their environmental management practices and business aspects (Du *et al.*, 2010) as a means to persuade customers through reasoning (Andersen, 2001). Therefore, the SME can lower operational costs because of the clever use of organisational capabilities for environmental communication to persuade customers of an environmentally friendly product and/or manufacturing technique that is also cost-efficient for the customer. A competitive advantage in lower costs can be perceived due to pre-empting competitors in the development of such organisational capabilities. Given the above, the following hypothesis is suggested:

Hypothesis 2a: *The development of organisational capabilities for environmental communication will lead to the perceived achievement of competitive advantage in terms of lower costs in the SME.*

SMEs' managers perceive that a strategic management of external organisational communication in general may offer tools that can be applied to raise awareness of their activities and reputation in general (Nielsen and Thomsen, 2009). In a similar vein, potential reputational benefits of firms' environmental efforts tend to be lower when environmental management practices are less visible to stakeholders (Hart, 1995; Gilley *et al.*, 2000). According to organisational communication theory, it is argued therefore that organisational capabilities for environmental communication can contribute to "establishing and maintaining favourable reputations with stakeholder groups upon which the organisation is dependent" (Cornelissen, 2011, p. 5). That is, the firm is able to achieve a positive

exposure as such organisational capabilities are developed in order to manage perceptions and impressions of stakeholders (Elsbach and Sutton, 1992; Bansal and Clelland, 2004).

Stakeholders interpret the meaning of the information they receive, judge the intention of the messages and then determine their actions and behaviour towards the firm (Euske and Roberts, 1987; Wong *et al.*, 2014). However, they can quickly become sceptical when it comes to information related to environmental efforts (Du *et al.*, 2010). In this sense, reinforcing the visibility of environmental commitment and related practices through organisational capabilities for environmental communication can raise confidence and support of stakeholders. This is because stakeholders perceive that the firm is signalling organisational conformity to social norms on environmental protection (Bansal and Clelland, 2004; Wong *et al.*, 2014). Therefore, the firm is able to build higher reputation and better image as environmentally friendly, which can be perceived as source of competitive advantage relative to rivals lacking organisational capabilities for environmental communication. A higher reputation is attractive to new customers since it also serves as a signal of the quality of products and services (Roberts and Dowling, 2002). Alternatively, existing customers that believe in the reputation of the firm can also influence the perceptions of those that are sceptical (Bansal and Clelland, 2004). The increased organisational visibility due to higher reputation as an environmentally friendly firm is crucial for SMEs since the relative societal obscurity that normally characterises such firms is associated to reactive and resistive stance towards environmental issues (Bowen, 2002; Darnall *et al.*, 2010). The above discussion leads to suggesting the following hypothesis:

Hypothesis 2b: *The development of organisational capabilities for environmental communication will lead to the perceived achievement of competitive advantage in terms of reputation in the SME.*

4. Methodology

4.1. Empirical setting

The Danish printing and graphic industry was chosen to test the hypotheses of this study. Three reasons justify this choice. First, Denmark provides a suitable context for studying environmental management issues among SMEs. SMEs account for more than 95 percent of companies in Denmark (Nielsen, 2014). The country is among the forerunners regarding environmentally responsible production and consumption with initiatives that can be traced back before the 1990's (Remmen, 2001; Christensen *et al.*, 2007). Furthermore, at industrial level, the understanding of environmental problems and the implementation of environmental management practices have developed over the years (Remmen, 2001; Madsen and Ulhøi, 2016). Particularly, changes in manufacturing firms are the result of a reflexive learning process that has led to the development of new perspectives on the business case for environmental management practices, going from resource savings and cost reductions to competitive advantages of environmentally sound products (Remmen, 2001).

Second, printing and graphic firms are associated with activities that are known to exert significant impact on the natural environment in terms of resource consumption (e.g., virgin paper, inks, etc.), intensive use of energy (e.g. ink drying, toner fusing, etc.), and emissions (e.g., waste water, biocides, VOC, etc.) (Rothenberg and Becker, 2004; Larsen *et al.*, 2006; Viluksela *et al.*, 2010). Environmental impacts are manifested on air, water and soil (Johnsen *et al.*, 2006; Masurel, 2007) and stems from particular stages of the production process, such as prepress, printing and cleaning/de-inkability (Rothenberg and Becker, 2004) in both offset (Larsen *et al.*, 2006) and digital printing methods (Viluksela *et al.*, 2010). As a result, environmental protection costs are substantial and constitute a strategic issue for firms in this industrial sector. In Denmark, more than 95 percent in that industrial sector are SMEs (Danmarks Statistik, 2015a). Recently, this industry has been facing ever-increasing tough competition in the media market as printed matter and substitutes such as electronic media solutions are naturally becoming part of the same business arena (Grakom, 2015c). Thus, the industry now involves activities such as printing, bookbinding, label production, graphic design, communication, and advertising. Furthermore, printing and graphic companies are recognised as being at the forefront using cutting edge technology, and developing technical knowledge and skills for IT and communication besides the traditional graphic activities (*ibid.*).

Third, regarding environmental management issues, firms in this industrial sector are under very strict regulation but most of them are far above the demands from the Danish authorities. Printing and graphic firms have also experienced the above mentioned overall developments regarding the focus and content of efforts towards environmental protection. The allocation of significant resources to environmental work has resulted in the implementation of environmental management systems and eco-labelling licenses in a large proportion of firms (Johnsen *et al.*, 2006; Larsen *et al.*, 2006; Grakom, 2015b). Over the last years, carbon footprint reduction in operations and products has been a general concern among these firms, and it has led to focusing efforts towards life-cycle analyses and the incremental adoption of alternative energy sources (Johnsen *et al.*, 2006; Grakom, 2015b). In doing so, firms have built a joint knowledge database (see www.miljonet.org) on the environmental impact of printed matter and operations. Furthermore, an additional eco-labelling carbon footprint license particularly aimed at printed matter and/or graphic products has been introduced. It was initially a Danish initiative but it has been well adopted by other firms in Europe (see www.climatecalc.eu). These environmental effort have resulted in reductions in paper and ink consumption above 38 percent and 28 percent between 2010 and 2014, respectively (Grakom, 2015a), and reductions in energy consumption and CO₂ emissions above 47 percent and 31 percent between 2008 and 2012, respectively (Danmarks Statistik, 2015b). Given the above, this industrial sector was found highly suitable for the purpose of the study.

4.2. Sampling and data collection procedures

In line with previous studies in the field (Sharma and Vredenburg, 1998; Christmann, 2000; Aragón-Correa *et al.*, 2008; Vachon and Klassen, 2008), a single industry approach was chosen to control for internal processes, business practices, and external influences as all industry members are exposed to similar demands from stakeholder groups, and have to comply with the same regulations, norms, standards, and market expectations (Sharma and Vredenburg, 1998; Vachon and

Klassen, 2008). Furthermore, restricting the analysis to a single industrial sector and a specific geographical area allows extraneous confounding effects to be controlled and to focus on the variables of interest (Aragón-Correa *et al.*, 2008).

Consistent data on SMEs' specific environmental management practices, communication and competitive benefits are not available from any published sources at present. Therefore, a questionnaire survey was developed to collect data and measure the constructs of the study following a four-stage procedure. First, a preliminary theory-based version of the questionnaire was designed based on a potentially useful scale and items from previous and related studies. Second, the refinement in the selection of such items and the formulation of new ones were carried out after interviewing owner-managers of firms and environmental consultants from the printing and graphic trade association. Third, the new version of the questionnaire was revised by six scholars and two practitioners and, based on their feedback and comments, scales and items were further revised and refined. Fourth, since the questionnaire was initially designed in English, it was translated into Danish. A back-translation procedure helped to ensure linguistic consistency of the final version.

By following an internet survey strategy, the questionnaire was administered to a sample of 446 owner-managers of the member firms of the Danish printing and graphic trade association (Grakom). Such firms account for more than 90 percent of total production volume in the Danish printing and graphic sector (Interview with head of the environmental division at Grakom), which ensures the representativeness of the sample despite it being a pre-recruited, non-probabilistic panel (Couper, 2000). To achieve the highest possible response rate, Grakom's seal of approval was included in the cover section of the survey questionnaire so that the respondents were familiar with the origin of the survey. However, to reduce possible social desirability bias, it was explicitly stated in the survey that the analysis would be aggregated and no particular firm would be individually identifiable. Furthermore, items and questions were formulated on the basis of specific actions and practices rather than generic ethical claims (Banerjee, 2001). All data were managed, controlled and analysed by the author.

Given the focus of this study, the appropriate respondents were individuals in a firm with most knowledge about the competitive strategy, resources and capabilities as well as environmental issues. Hence, as it is usual in strategic and environmental management research (Sharma and Vredenburg, 1998; Christmann, 2000), general managers and/or owners were targeted. In the SME setting particularly, those individuals play a crucial role in shaping environmental management practices and strategies as well as their effects on perceived competitive advantage (Aragón-Correa *et al.*, 2008; Leonidou *et al.*, 2015). Furthermore, previous studies have evidenced that the perceptions of a single but well-qualified respondent may provide better indications a firm's instance in comparison with perceptions of several informants in the case of SMEs, where decision-making tends to be highly centralised (Chandler and Hanks, 1993; Lyon *et al.*, 2000).

Following Dillmans's (2007) tailored design method, two waves of follow-up e-mail reminders were sent out five and six weeks after the original questionnaire was distributed. Of the 446 distributed surveys, 134 were completed and returned, yielding a response rate of 30.04 percent. This response rate compares favourably to the previously reported 18 percent to 23 percent response rates of internet surveys targeting owner-managers of SMEs (Rothenberg and Becker, 2004;

Hörisch *et al.*, 2015). Responses from firms indicating that at least 10 percent of sales corresponded to printing-related activities were retained to ensure that all items regarding environmental management practices were relevant and consistently measured. As a result, 20 responses were discarded. For operational purposes, the study considered firms with less than 250 employees as SMEs. Particularly, firms with less than 50 employees were regarded as small-sized, whereas medium-sized firms were those with a number of employees between 50 and 249 (Eurostat, 2010). Given this definition of SMEs, two additional responses were discarded, leaving a final sample of 112 firms. Small-sized firms predominated over medium-sized ones, accounting for 83 percent of the total number of sampled firms. On average, 76.71 percent of the total sales volume in the sampled firms is due to printing-related activities (e.g., pre-press, pre-media, printing, and bookbinding), while the remaining 23.29 percent of total sales volume comes from graphic, advertising and communication-related activities. Moreover, on average, 27.40 percent of the total sales volume derives from exports to recurrent geographical destinations such as Norway, Sweden, Germany and the United Kingdom, among others.

To draw conclusions about the relationships between the measured variables, it was important that the responding firms were representative of the mailing sample. For this purpose, a wave analysis was carried out to determine whether a self-selection bias existed such that firms with certain structural characteristics were more likely to respond to the survey. This procedure relies on the observation that in mail and internet surveys, non-respondents tend to be more similar to late respondents than to early respondents (Fowler, 2009).

Hence, by following the procedures of Armstrong and Overton (1977), a wave analysis was performed to address non-response bias; a comparison was made between participants who responded promptly to a survey and those who responded after follow-up procedures. Statistical tests of independence of means and frequencies for respondents to the first e-mail invitation and after the subsequent reminders did not reveal significant differences between the groups in either variables such as size (number of employees), sales volume of activities (printed-related vs. graphic-related), and export volume (percentage of sales).

Finally, the existence of common method bias in the data had to be addressed as data of each firm was provided by the same respondent at the same time. Hence, relationships between variables may be artificially inflated. In consequence, two main procedures were employed. First, in order to reduce the effects of consistency artefacts, items measuring the endogenous variables were set up following the formulation of the items measuring the exogenous variables (Salancik and Pfeffer, 1977). Second, Harman's single-factor test (Harman, 1967; Podsakoff and Organ, 1986) was carried out. There were no common method bias problems because results revealed five factors with eigenvalues larger than 1.0 accounting for 76.40 percent of the variance. The first factor only accounted for 17.66 percent of the variance.

4.3. Measures

The measurement of the different constructs relied on managers' self-perceptions, which is commonly accepted in strategic and environmental management research (Sharma and Vredenburg, 1998; Christmann, 2000; Aragón-Correa *et al.*, 2008; Leonidou *et al.*, 2015). The majority of the

items were derived and adopted from previous literature and others had to be formulated (see Appendix). Existing measurement scales were also identified by reviewing prior research. However, in some cases, measurement scales were adjusted to make sure that the distances between consecutive points in a scale remained constant when observing the corresponding meanings.

4.3.1. Environmental management practices

A group of 12 items was used to measure the extent of firms' implementation of environmental management practices. The measurement comprised managerial and technical aspects. Managerial aspects cover the range of practices that a firm adopts to assign responsibilities, use of environmental management systems and the monitoring of goal accomplishments. Technical aspects covered practices towards process and product-related innovations for pollution prevention. Previous studies focused on the SME context (Aragón-Correa *et al.*, 2008; Brammer *et al.*, 2012; Leonidou *et al.*, 2015) have also assessed environmental practices related to such aspects. Responses were on a five-point Likert scale, ranging from 1 for 'we have not implemented anything regarding this practice at all' to 5 for 'we have fully implemented this practice and it is a regular routine'. Exploratory principal components analysis with varimax rotation showed that these items formed three factors with eigenvalues above 1.0. The three factors were labelled as 'Management-related', 'Process-related', and 'Product-related' environmental management practices, respectively (see Appendix).

4.3.2. Organisational capabilities for environmental communication

Five items were used to measure firms' deployment of organisational capabilities for environmental communication. The measurement included the release of concrete information regarding environmental projects and initiatives as well as environmental issues in products and processes. Additional aspects such as advising customers based on environmental grounds as well as raising awareness about environmental issues and firm efforts were also included in the measurement. Due to the relative scarcity of scales and items in the literature as regards this construct, and even more in the SME setting, the majority of the items are formulated after the round of interviews in the questionnaire development stage. Ten items were initially considered to measure the construct. However, it was necessary to discard five items due to low values in their communalities (below 0.5) after conducting exploratory principal component analysis (Hair *et al.*, 2010). Responses were on a five-point Likert scale, ranging from 1 for 'completely disagree' to 5 for 'completely agree'. Exploratory principal components analysis with varimax rotation showed that these five remaining items formed one factor with eigenvalue above 1.0 (see Appendix).

4.3.3. Perceived competitive advantage

Two groups of self-perceived items were seen as measuring perceived competitive advantage relative to the firm's competitors: perceived competitive advantage in terms of lower costs (3 items), and perceived competitive advantage in terms of reputation (3 items). Rather than accounting measurements of financial performance, this measurement is used for the following

reasons: First, many factors in addition to corporate actions resulting from concern for the natural environment affect the firm's financial performance (Christmann, 2000). Hence, the measurement was narrowly formulated to capture the influence of environmental management on certain aspects of perceived competitive advantage (see Appendix). Second, SMEs' owner-managers are more open to disclosing their perceptions on performance rather than offering precise quantitative data (Aragón-Correa *et al.*, 2008). Subjective performance measurements have been widely used in organisational research (Lawrence and Lorsch, 1967; Dess, 1987). Previous studies in the field of organisations and the natural environment have also analysed the mentioned forms of perceived competitive advantage among large enterprises (Sharma and Vredenburg, 1998; Christmann, 2000; López-Gamero *et al.*, 2009) as well as SMEs (Brammer *et al.*, 2012; Leonidou *et al.*, 2015). Furthermore, by indicating a reference group to assess perceived competitive advantage, the measurement was carefully developed in order to capture the effects on a firm's perceived competitive advantage in its industrial sector. That is, the measure assessed perceived competitive advantage in terms of both lower costs and reputation relative to the firm's competitors rather than focusing on overall and absolute benefits (see Appendix). Responses were on a five-point scale, ranging from 1 for 'completely disagree' to 5 for 'completely agree'. An exploratory principal components analysis with varimax rotation showed that the items of lower costs formed one factor with eigenvalue above 1.0. In relation to perceived competitive advantage in terms of reputation, again the items formed one factor with eigenvalue larger than 1.0.

4.3.4. Control variable

Firm size is known to be an important contextual property to be considered when studying the strategic significance of environmental management practices among both large firms (Russo and Fouts, 1997; Christmann, 2000) and SMEs (Aragón-Correa *et al.*, 2008; Brammer *et al.*, 2012; Jorge *et al.*, 2015). Despite the interest in SMEs of the present study, it must be acknowledged that such a setting does not represent a homogeneous community of firms (Brammer *et al.*, 2012). Firm size can account for differences among such firms regarding their levels of perceived competitive advantage because it is a common proxy of visibility and resource availability to obtain economies of scale benefits (Darnall *et al.*, 2010; Brammer *et al.*, 2012). Therefore, in line with previous studies addressing the SME context (Aragón-Correa *et al.*, 2008; Jorge *et al.*, 2015), firm size is included as a variable to control for potential differences in perceived competitive advantage in lower costs and reputation, respectively. The variable was measured as the logarithm of an organisation's number of employees.

5. Analysis and results

5.1. Selected modelling approach

Structural Equation Modelling (SEM), also known as the second-generation multivariate model (Fornell, 1982), was applied. Specifically, the Partial Least Squares-Structural Equation Modelling (PLS-SEM) approach was employed to analyse the data and test the research hypotheses using the

SmartPLS 2.0 software (Ringle *et al.*, 2005). For the purpose of this study, PLS-SEM is more suitable than covariance-based SEM because (i) it is robust, especially when sample sizes are small relative to the number and complexity of constructs, i.e., in this case, the use of hierarchical latent variable models; (ii) it is appropriate for exploratory approaches when previous theoretical background is scarce; (iii) it allows formative and reflective constructs to be used together in the same model; (iv) it is stable as non-convergent solutions are unlikely to result; and (v) it is reliable as its bootstrapping-based capabilities can provide solid results despite limitations in terms of sample size (Chin and Newsted, 1999; Hair *et al.*, 2011). For this study, the modelling strategy follows Hair *et al.*'s recommendations (2011; 2014) for evaluating both measurement and structural models; this is consistent with the two-step approach advocated by Anderson and Gerbin (1988) in covariance-based SEM. That is, adequate validity and unidimensionality are assessed in the measurement model prior to testing the structural effects.

5.2. Measurement Model

In the measurement model, the construct related to environmental management practices is analysed as a hierarchical (second-order) latent variable model (Wold, 1982; Lohmöller, 1989). Previous studies have consistently approached and operationalised similar measurements as being part of a hierarchical latent variable (Aragón-Correa *et al.*, 2008; Menguc *et al.*, 2010; Delmas *et al.*, 2011). The use of such a hierarchical latent variable implies that , the overall assessment of the measurement model follows a two-stage approach (Wetzels *et al.*, 2009; Wilson, 2010).

In the first stage, a measurement model is estimated only for the environmental management practices second-order latent variable by using the repeated indicators approach (Wold, 1982; Lohmöller, 1989). That is, the second-order latent variable is specified with all the indicators of all the three first-order latent variables (i.e., management-related, process-related, and product-related environmental management practices), which in turn are specified with their respective indicators (see figure 2). Furthermore, the construct is specified as a reflective-formative type of latent variable, i.e., reflective first-order latent variables make up a formative second-order latent variable (Hair *et al.*, 2014). In the context of the study, a reflective-formative type of latent variable means that an increase in effort dedicated to one particular aspect represented by a first-order latent variable implies an increase in the overall development of environmental management practices. However, an increase in the overall environmental management practices does not necessarily imply an increase in each of the three aspects represented by the first-order latent variables.

INSERT FIGURE 2 ABOUT HERE

During this stage, latent variable scores, representing the first-order latent variables, were computed and saved (Lohmöller, 1989; Wilson, 2010), which is one of the advantages of PLS-SEM (Chin, 1998; Hair *et al.*, 2011). Results of this first measurement model are shown in table 1.

INSERT TABLE 1 ABOUT HERE

According to the assessment criteria, consistent results of this first measurement model were found. *Internal consistency reliability* was met since all the three first-order latent variables had composite reliability values greater than 0.7, denoting a reliable measurement of the underlying constructs (Bagozzi and Yi, 1988). All of the indicator loadings were statistically significant and higher than 0.7, which accounts for *indicator reliability*. In addition, the three first-order latent variables showed *convergent validity* because all values of average variance extracted were above the threshold level of 0.5 (Fornell and Larcker, 1981). Finally, *discriminant validity* was checked and evidenced because the squared root of the respective average variance extracted for each pair of latent variables were always larger than their shared correlation (Fornell and Larcker, 1981).

In the second stage of the two-stage approach, the second-order latent variable is re-specified, this time using the calculated latent variable scores as observed indicators. A second measurement model is then estimated, which includes the second-order latent variable and the first-order latent variables corresponding to organisational capabilities for environmental communication and the two forms of perceived competitive advantage (see table 2).

INSERT TABLE 2 ABOUT HERE

Results of the second measurement model also met the assessment criteria. Composite reliability values were greater than 0.7, which means that there is *internal consistency reliability* of the underlying constructs in the model (Bagozzi and Yi, 1988). There was also evidence for *indicator reliability*, because all of the indicator loadings were statistically significant and higher than 0.7. *Convergent validity* was met since all values of average variance extracted were above the threshold level of 0.5 (Fornell and Larcker, 1981). Finally, there was also evidence for *discriminant validity* because the squared root of average variance extracted between each pair of latent variables exceeded their shared correlation (see Table 3) (Fornell and Larcker, 1981). Alternatively, discriminant validity was confirmed as none of the indicators had cross-loading values larger than their loadings on the respective latent variables (Hair *et al.*, 2011).

INSERT TABLE 3 ABOUT HERE

A final analysis included checking for potential multicollinearity between the indicators (calculated latent scores) of the formative second-order latent variable as well as the statistical significance of their respective weights (Diamantopoulos and Winklhofer, 2001; Podsakoff *et al.*, 2006). Absence of multicollinearity was checked by examining the variance inflation factor (VIF) values, which ranged from 1.70 to 1.76, and therefore, below the threshold value of 3.3. As for the weights of the indicators, Table 2 shows that only the indicator corresponding to product-related environmental management practices was not statistically significant. However, following the requirements of Hair *et al.* (2014), it was not necessary to discard such an indicator because the corresponding loading is larger than 0.50 and statistically significant. The estimation of weights also allows a hierarchy of influence of the indicators to be established in the explanation of the

second-order latent variable. Thus, the indicator corresponding to management-related aspects is the one that best accounts for environmental management practices in the sampled SMEs.

5.3. Structural model

5.3.1. Assessment of the structural model and hypothesised paths

To test the significance of the hypothesised paths, a structural model following a bootstrapping procedure of 5000 sub-samples was run with 112 cases, which corresponds to the final sample size of the study (Hair *et al.*, 2011). The following criteria were considered when assessing the structural model: the magnitude and statistical significance of the structural path coefficients; the percentage of variance explained of each endogenous latent variable (R^2); and the predictive relevance for each endogenous latent variable (Q^2). Table 4 shows the results of the structural model.

INSERT TABLE 4 ABOUT HERE

A complementary approach when estimating the structural model included the construction of bootstrap confidence intervals (see table 4) to assess the stability of structural path coefficients (Henseler *et al.*, 2009). The variances explained for organisational capabilities for environmental communication and perceived competitive advantage in terms of both lower costs and reputation were considerable (i.e., R^2 values larger than 0.3). In addition, by means of the blindfolding procedure, values of Q^2 greater than zero were found for organisational capabilities for environmental communication and for perceived competitive advantage in terms of both lower costs and reputation. Hence, the structural model has adequate predictive relevance. (Chin, 1998; Hair *et al.*, 2011).

According to table 4, the statistically significant parameter predicting that environmental management practices contribute to the development of organisational capabilities for environmental communication ($\beta = 0.668$, t -value = 10.951, $p < 0.001$) supports Hypothesis 1. A positive and statistically significant parameter estimate for the path between organisational capabilities for environmental communication and perceived competitive advantage in lower costs ($\beta = 0.468$, t -value = 7.022, $p < 0.001$) provides support for Hypothesis 2a. Finally, Hypothesis 2b, regarding the relationship between organisational capabilities for environmental communication and perceived competitive advantage in reputation was supported given the positive and statistically significant parameter ($\beta = 0.567$, t -value = 9.034, $p < 0.001$).

The influence of firm size as control variable was tested for the dependent variables in the structural model. Results showed that the influence of such a variable was positive and statistically significant only on perceived competitive advantage in terms of lower costs ($\beta = 0.228$, t -value = 2.982, $p < 0.01$).

5.3.2. Assessment of mediating effects

A subsequent analysis assessed the intensity and statistical significance of organisational capabilities for environmental communication as a mediator in the structural model. In doing so, the

non-hypothesised structural paths between environmental management practices and both lower costs and reputation perceived competitive advantage were estimated (i.e., direct effects). Mediation is then assessed by examining: (i) the comparison between direct and total effects of environmental management practices on both lower costs and reputation perceived competitive advantage; (ii) the variance accounted for the indirect effects (VAF; Hair *et al.*, 2014); (iii) the statistical significance of the mediation (Hair *et al.*, 2014); and (iv) the effect sizes in terms of variance explained (f^2) and predictive relevance (q^2) of endogenous latent variables (Hair *et al.*, 2011).

In this model, environmental management practices have statistically significant direct effects on perceived competitive advantage in both lower costs ($\beta = 0.523$; t -value = 5.083; $p < 0.001$) and reputation ($\beta = 0.436$; t -value = 4.548; $p < 0.001$). At the same time, the total effects of environmental management practices on both lower costs ($\beta = 0.644$; t -value = 8.647; $p < 0.001$) and reputation ($\beta = 0.650$; t -value = 9.161; $p < 0.001$) are statistically significant. Since both direct effects remained statistically significant, organisational capabilities for environmental communication are considered a partial mediator (Baron and Kenny, 1986; MacKinnon, 2008). However, the substantial coefficients of both total effects thus suggest that the mediation is relevant. Then, VAF indicators (i.e., the ratio of the indirect effects to the total effects; Hair *et al.*, 2014) showed that 18.76 percent and 32.83 percent of the effects of environmental management practices on perceived competitive advantage in lower costs and reputation, respectively, are explained via the mediation of organisational capabilities for environmental communication. VAF indicators confirm the partial mediation of organisational capabilities for environmental communication because they are higher than 20 percent but lower than 80 percent (Hair *et al.*, 2014).

Subsequently, statistical significance of the mediating effects was tested by analysing the indirect effects of environmental management practices on both lower costs and reputation perceived advantage. Rather than the often used Sobel test, the test was carried out by following the bootstrapping approach (Preacher and Hayes, 2004; Hair *et al.*, 2014). The former has limitations because of its low power, distributional issues, and the necessary assumption of large sample sizes (Mackinnon *et al.*, 1995; Preacher and Hayes, 2004). Thus, the latter is recommended as an alternative that suits the PLS-SEM method properly (Hair *et al.*, 2014). Indirect effects were statistically significant for perceived competitive advantage in both lower costs ($\beta = 0.121$; t -value = 1.996; $p < 0.05$) and reputation ($\beta = 0.214$; t -value = 3.878; $p < 0.001$). Hence, the mediating effects of organisational capabilities for environmental communication were statistically significant. Finally, the obtained values of effect sizes f^2 and q^2 for both environmental management practices and organisational capabilities for environmental communication are shown in table 5.

INSERT TABLE 5 ABOUT HERE

According to guidelines to evaluate values for f^2 and q^2 (Chin, 1998; Hair *et al.*, 2014), in overall, results show that effect sizes for environmental management practices were regarded as medium (i.e., larger than 0.15 but lower than 0.35). On the other hand, the majority of effect sizes for organisational capabilities for environmental communication were small (i.e., larger than 0.02 but lower than 0.15). Interestingly, results showed that the mediation of organisational capabilities

for environmental communication led to improvements in both variance explained and predictive relevance for perceived competitive advantage in reputation larger than the respective improvements for perceived competitive advantage in lower costs (see table 5).

6. Discussion, conclusions and implications

This study addresses the discussion about the strategic significance of environmental management practices in the context of SMEs. The analysis shows that if firms implement portfolios of environmental management practices, they can indeed boost perceived competitive advantage by developing organisational capabilities for environmental communication. This finding, however, challenges previous literature arguing for a discordance between environmental protection and competitiveness in SMEs (Worthington and Patton, 2005; Revell and Blackburn, 2007; Gadenne *et al.*, 2009). The study therefore supports that there are opportunities for a business case for sustainability provided the development of organisational capabilities (Hart, 1995; Sharma and Vredenburg, 1998; Aragón-Correa *et al.*, 2008).

In the light of the formulated hypotheses, this study particularly argues for an indirect influence of environmental management practices on perceived competitive advantage in the sampled SMEs. An elaboration on this claim is provided. First, the results provide evidence for the argument that the implementation of environmental management practices in the sampled SMEs, comprising management-related, process-related and product-related aspects, leads to the development of competitively valuable organisational capabilities (Hart, 1995; Sharma and Vredenburg, 1998), in this case, organisational capabilities for environmental communication. Moreover, the relationship between these two constructs is also an indication of the congruency between the delivered messages to external stakeholders when deploying such organisational capabilities and the corresponding actions (Hunter and Bansal, 2007; Aerts and Cormier, 2009). Second, the results show that the development of unique and valuable organisational capabilities for environmental communication lead sampled SMEs to perceive that they outperform competitors in terms of lowered costs and higher reputation. This is in line with evidence from recent studies on the possibility of SMEs saving substantial operational and legal expenses as well as obtaining a better corporate image and leadership in their markets when engaging with mitigating their environmental impact (Aragón-Correa *et al.*, 2008; Brammer *et al.*, 2012; Jorge *et al.*, 2015; Leonidou *et al.*, 2015). Notwithstanding, the findings particularly stress the importance of organisational capabilities for environmental communication in making visible environmental management practices to the scrutiny of external stakeholders as a precondition to pursue the noted perceived competitive benefits (Hart, 1995; Reinhardt, 1998; Bansal and Clelland, 2004; Aerts and Cormier, 2009; Du *et al.*, 2010). A proper visibility of environmental management practices is enabled when the organisational capabilities for environmental communication deliver concrete information, demonstrative actions and facts at the product and process levels (Bansal and Clelland, 2004; Du *et al.*, 2010; Leonidou *et al.*, 2014) and comprise advising mechanisms through verbal interactions (Daft and Lengel, 1986; Aerts and Cormier, 2009).

With respect to the effects of firm size, results showed that larger businesses in the sampled SMEs are able to perceive greater reductions in their costs compared to their smaller counterparts. It can be suggested that larger SMEs may be able to reap economies of scale benefits due to resource availability (Bowen, 2002; Brammer *et al.*, 2012). Nevertheless, the perceived achievement of competitive advantage in reputation seems to be robust regardless of firm size. This can be explained by the overall low societal visibility that commonly characterises SMEs (Chen and Hambrick, 1995; Bowen, 2002). Interestingly, these findings in general challenge Dixon-Fowler *et al.*'s (2013) conclusion from a meta-analysis, which states that the smaller the firm, the more evident its competitive benefits.

In sum, the paper's contribution to the literature is four-fold. First, in line with previous literature (Yu, 2001; Aragón-Correa *et al.*, 2008), the study shows the applicability of the RBV in a context of SMEs when approaching organisational capabilities for environmental communication as a competitively valuable attribute. Such organisational capabilities are complex, causally ambiguous (Dierickx and Cool, 1989; Barney, 1991), and imply the allocation of valuable resources such as knowledge as well as communication capacities and skills (Jablin *et al.*, 1994; Jablin and Sias, 2001). Unique characteristics of SMEs such as flexibility, simplicity and informality (Dean *et al.*, 1998; Yu, 2001; Aragón-Correa *et al.*, 2008; Bos-Brouwers, 2010) can favour the development of organisational capabilities for environmental communication. Second, it is emphasised the instrumental role of this form of organisational capabilities as an organisational attribute that mediates the relationship between environmental management practices and perceived competitive advantage. In answering the overall research questions of this study, it can be alternatively said that environmental management practices can boost perceived competitive advantage in SMEs through, or because of, the development of organisational capabilities for environmental communication. The results thus address the urgent call in previous literature for alternative questions around the business case for environmental management practices such as 'how' and 'why' it pays to be green (King and Lenox, 2001; Pelozo, 2009; Russo and Minto, 2012).

Third, the study provides support for the strategic relevance of SMEs' adoption of management-related, process-related and product-related environmental management practices in paving the way to the achievement of competitive advantage in terms of lower costs and reputation. Particularly, when studying mediating attributes, the evidenced positive effects on those forms of perceived competitive advantage address the call for a "holistic view" of the benefits that can be gained besides cost reductions (Pelozo, 2009, p. 1530). Therefore, the study suggests that implementing environmental management practices can be an appropriate alternative for SMEs (Aragón-Correa *et al.*, 2008; Brammer *et al.*, 2012; Jorge *et al.*, 2015; Leonidou *et al.*, 2015), since it can contribute to a favourable impact on firm competitiveness comparable to that among their larger counterparts (Sharma and Vredenburg, 1998; Christmann, 2000; López-Gamero *et al.*, 2009; Dixon-Fowler *et al.*, 2013). Fourth, the study also contributes to literature on organisational communication. It empirically explores the strategic relevance of a certain form of organisational communication related to specific issues, such as environmental management and related practices. The analysis particularly sheds light on the purposeful use of such communication by organisations to meet their mission and goals (Hallahan *et al.*, 2007), that is, the perceived achievement of competitive advantage. This seems to challenge previous findings arguing for an overall non-strategic approach

to organisational communication in the SME setting, in which it is just matter of managers' personal values and mindset (Nielsen and Thomsen, 2009). Moreover, when considering organisational capabilities for environmental communication together with environmental management practices, it can be argued that they empirically support a more integrative view of organisational communication. That is, the alignment of organisations' behaviours, symbols, and messages with the aim to appear consistent and coherent across different audiences (Christensen and Cornelissen, 2011).

6.1.Limitations and future research

There are some limitations in the study which should be mentioned. Despite the Danish printing and graphic industry being a relevant setting for the study of environmental management issues and their strategic significance, the intended control for industrial sector and geographical location limits the potential to draw broad inferences and generalizable conclusions. Thus, it is necessary to replicate the study to SMEs with other business activities and which belong to different geographical settings. This would allow researchers to verify the external validity of the found relationships by determining whether they hold in SMEs operating under different technological, competitive, regulatory and socio-cultural conditions. Moreover, the cross-sectional design of this study did not allow me to analyse of dynamic effects on organisational capabilities for environmental communication and perceived competitive advantage. Time has to elapse before organisational capabilities are developed and acquire strategic relevance. Thus, a longitudinal analysis would be fruitful for exploring the shaping of such form of organisational capabilities. At the same time, addressing the implications on perceived competitive advantage in a broader time span is helpful in determining short and long-term effects. Possibly, such short and long-term effects can be evidenced depending on the facet of competitive advantage. For example, the achievement of positional benefits, such as reputation by means of deploying organisational capabilities for environmental communication, takes considerable time while benefits in the cost-efficient path may be perceived sooner.

Literature in strategic management commonly argues that competitive advantage is achieved when a firm systematically earns superior returns compared to its competitors (Schoemaker, 1990; Priem and Butler, 2001). Given this, the lack of measurements and links to financial performance are further methodological limitations of this study that must be acknowledged. Rather, the study relied on perceptual measures from key respondents in line with much other research on environmental and strategic management. Measurements on competitive advantage, however, were carefully designed in order to ask respondents to evaluate firm performance relative to competitors'. Future studies should aim for using objective measurements and consider the ultimate link to financial performance despite the difficulties regarding the information availability of SMEs.

Since in this study the understanding of organisational capabilities for environmental communication points to interaction with stakeholders outside the focal SME, a step forward in future research would be to consider external forces that may shape the influence on perceived competitive advantage. For instance, aspects such as stakeholders' environmental sensitivity (Menguc *et al.*, 2010), market dynamism (Aragón-Correa and Sharma, 2003; Leonidou *et al.*,

2015), and competitive intensity (Russo and Fouts, 1997; Leonidou *et al.*, 2015) can certainly be critical in determining the effectiveness of organisational capabilities for environmental communication in paving the way to outperforming competitors. Finally, the percentages of variance explained of both forms of perceived competitive advantage accounted for the mediation of organisational capabilities for environmental communication (less than 40 percent, see Table 4) calls for further research. Including other mediating organisational capabilities and/or processes in addition to those for environmental communication can be helpful in elaborating on the differences in competitive aspects in the SME setting. Differently put, this study echoes Peloza's (2009) urgent call for thinking "more broadly and measure mediating processes, intermediate outcomes, and end state metrics" (p. 1530) in order to understand how and why environmental management practices create value for SMEs. All in all, future research addressing the SME community should continue to shift focus when studying environmental issues among such firms. That is, moving from the exclusive emphasis on determining whether or not SMEs are able to actively engage with environmental management issues towards providing insight about the conditions, mechanisms and processes that potentially favour the business case for such an engagement.

6.2. Implications

In spite of the limitations of the study, relevant implications for managerial practice can be identified. SMEs cannot blindly expect that the mere implementation of environmental management practices will automatically translate into a strategic device to become more competitive. Managers of those firms should also strive to make visible those practices to stakeholders. However, when pursuing visibility by means of deploying organisational capabilities for environmental communication, SMEs must (i) include concrete, factual and verifiable information in the messages subject to public scrutiny, and (ii) take advantage of what qualities characterise them (e.g., simplicity, informality, etc.) in order to explore rich and effective communicative mechanisms, such as verbal and face-to-face interactions. The failure to observe this may actually jeopardise their competitive position rather than exploiting further the strategic benefits of environmental management practices. Last but not least, regulators, suppliers and industrial associations can also be helpful in supporting SMEs' initiatives towards the visibility of their environmental management practices. They can actively provide valuable technical information and details related to specific environmental qualities of SMEs' technologies, products and processes. In this manner, SMEs are more confident with respect to the comprehensiveness in the content of the messages delivered (Hunter and Bansal, 2007) when deploying organisational capabilities for environmental communication. Thus, SMEs may actually leverage on regulators, suppliers and industrial associations in order to strategically develop organisational capabilities for environmental communication.

Acknowledgments

I would like to thank the Danish printing and graphic trade association for their support in my data collection.

Appendix. Construct operationalisation

INSERT TABLE A1 ABOUT HERE

Tables and figures of the article

Table 1. Results of the first stage in the Measurement model

Constructs	Scale items	Standardised loadings	t-value	Chronbach alpha	CR	AVE
Management-related environmental management practices	EMP1	0.949	72.065	0.932	0.952	0.832
	EMP2	0.919	40.345			
	EMP3	0.930	36.208			
	EMP4	0.847	23.323			
Process-related environmental management practices	EMP5	0.881	32.812	0.902	0.927	0.719
	EMP6	0.822	22.204			
	EMP7	0.825	19.831			
	EMP8	0.856	30.120			
	EMP9	0.854	28.030			
Product-related environmental management practices	EMP10	0.886	31.976	0.833	0.900	0.750
	EMP11	0.897	27.890			
	EMP12	0.812	14.565			

Notes: CR=Composite reliability; AVE=Average Variance Extracted. Acronyms for scale items used in this table are listed in the Appendix

Table 2. Results of the second stage in the Measurement model

Constructs	Scale Items/Indicator of first-order latent variables	Standardised loadings	t-value	Weights	t-value	Chronbach alpha	CR	AVE
Environmental management practices	MGEMP	0.926	19.906	0.600	4.581	N/A	N/A	N/A
	PCEMP	0.824	12.356	0.362	2.583			
	PDEMP	0.749	8.192	0.195	1.371			
Org. capabilities for environmental communication	ENC1	0.908	50.634	0.245	15.487	0.903	0.928	0.723
	ENC2	0.889	31.683	0.245	14.537			
	ENC3	0.845	22.803	0.238	14.063			
	ENC4	0.853	25.351	0.241	14.236			
	ENC5	0.747	12.172	0.205	7.213			
Perceived competitive advantage: Lower costs	CAC1	0.927	43.069	0.401	17.560	0.891	0.931	0.818
	CAC2	0.917	49.043	0.375	16.347			
	CAC3	0.869	25.721	0.328	12.082			
Perceived competitive advantage: Reputation	CAR1	0.937	46.957	0.341	22.904	0.928	0.954	0.874
	CAR2	0.939	57.991	0.340	16.600			
	CAR3	0.929	48.556	0.389	14.428			
Firm Size	SIZE	1.000	N/A	1.000	N/A	1.000	1.000	1.000

Notes: CR=Composite reliability; AVE=Average Variance Extracted; MGEMP = Management-oriented environmental management practices; PCEMP = Process-oriented environmental management practices; PDEMP = Product-oriented environmental management practices. Acronyms for scale items used in this table are listed in the Appendix. MGEMP, PCEMP, and PDEMP are the latent variable scores calculated during the first stage of the measurement model.

Table 3. Correlation Matrix

Constructs/variables	1.	2.	3.	4.	5.
1. Firm size	1,000				
2. Environmental management practices	0,480*	N/A			
3. Org. capabilities for environmental communication	0,367*	0,668*	0,850		
4. Perceived competitive advantage: Lower costs	0,400*	0,616*	0,552*	0,904	
5. Perceived competitive advantage: Reputation	0,311*	0,621*	0,604*	0,722*	0,935

*p < 0.01

Notes: Diagonal elements in bold face are the square root of the construct's average variance extracted (AVE); N/A = Not applicable.

Table 4. Results of the structural model: PLS path coefficients

Hypothesised path	Path coefficient	t-value (bootstrap)	Percentile bootstrap 90% confidence interval		Result
			Lower	Upper	
<i>Main effects</i>					
H1: Environmental management practices → Org. capabilities for environmental communication	0.668**	10.951	0.568	0.769	Supported
H2a: Org. capabilities for environmental communication → Perceived competitive advantage: Lower costs	0.468**	7.022	0.358	0.578	Supported
H2b: Org. capabilities for environmental communication → Perceived competitive advantage: Reputation	0.567**	9.034	0.464	0.670	Supported
<i>Control effects</i>					
Firm size → Perceived competitive advantage: Lower costs	0.228*	2.982	0.102	0.353	Supported
Firm size → Perceived competitive advantage: Reputation	0.103	1.316	-0.026	0.231	Not supported
R ² for perceived competitive advantage: Lower costs					0.349
R ² for perceived competitive advantage: Reputation					0.374
R ² for org. capabilities for environmental communication					0.447
Q ² for perceived competitive advantage: Lower costs					0.264
Q ² for perceived competitive advantage: Reputation					0.301
Q ² for org. capabilities for environmental communication					0.297

*p < 0.1; *p < 0.01

Notes: R²=Percentage of variance explained of endogenous latent variables; Q²=Predictive relevance of endogenous latent variables.

Table 5. Effect sizes for explained variance and predictive relevance

Latent variable/construct	Perceived competitive advantage: Lower cost		Perceived competitive advantage: Reputation	
	f ²	q ²	f ²	q ²
Environmental management practices	0.272	0.168	0.180	0.114
Org. capabilities for environmental communication	0.039	0.027	0.119	0.086

Notes: f²=Effect size on variance explained; q²= Effect size on predictive relevance.

Table A1. Construct operationalisation

Construct	Order	Item code	Item description	Sources
Environmental management practices	Second-order		Compound of three dimensions and twelve indicators	
Management-related environmental management practices	First-order	EMP1	Audit system to check accomplishment of environmental goals	Aragón-Correa (1998); González-Benito and González-Benito (2005)
		EMP2	Assignment of responsibilities to carry out environmental plans	
		EMP3	Audit system to ensure continuous improvement regarding less environmental impacts	
		EMP4	The use of Environmental Management Systems (e.g. ISO 14001, EMAS, etc.)	
Process-related environmental management practices	First-order	EMP5	Substitution of harmful substances by environmentally friendly ones (e.g. cleaning and washing agents, dampening solution additives, inks, etc.)	Sharma and Vredenburg (1998); González-Benito and González-Benito (2005)
		EMP6	Substitution of products containing volatile organic solvents by products with less volatile substances	
		EMP7	Process modifications to reduce consumption of raw materials	
		EMP8	Process modifications to reduce waste/emissions (e.g. paper, excess ink when changing from one colour to another, etc.)	
		EMP9	Changes in working procedures to reduce energy and material consumption (e.g. maintenance, printer calibration, etc.)	
Product-related environmental management practices	First-order	EMP10	Product designs focused on reducing resource consumption and waste generation in product usage	González-Benito and González-Benito (2005)
		EMP11	Product designs focused on reducing resource consumption and waste generation during production and distribution	
		EMP12	Selection of cleaner transportation methods	
Org. capabilities for environmental communication	First-order	ENC1	Our firm has developed mechanisms to educate/create awareness among customers about critical environmental issues (e.g., climate change, etc.)	Own elaboration; ENC3 adapted from Wong <i>et al.</i> (2014)
		ENC2	Our firm uses other electronic means (e.g. Information Systems) to share concrete environmental information of products/processes with customers	
		ENC3	Our firm regularly updates our website with concrete information related to environmental protection (e.g. news about new initiatives, projects, etc.)	
		ENC4	Our firm uses mechanisms such as public presentations, workshops, seminars, press releases, etc., to communicate our environmental efforts to the public	
		ENC5	Our firm gives advice to our customers on alternatives to make conscious choices of products based on environmental arguments (e.g. paper/ink types, acquisition of CO2 credits, etc.)	
Perceived competitive advantage: Lower costs	First-order	CAC1	Relative to our competitors, environmental management in our firm helps to have lower costs of compliance with environmental regulations (e.g. decreased fee of waste treatment/discharge, etc.)	Sharma and Vredenburg (1998); Christmann (2000); González-Benito and González-Benito (2005)
		CAC2	Relative to our competitors, environmental management in our firm helps to increase process/production efficiency (e.g. better use of printers, etc.)	
		CAC3	Relative to our competitors, environmental management in our firm helps to have lower operational costs (e.g. production, distribution, etc.)	
Perceived competitive advantage: Reputation	First-order	CAR1	Relative to our competitors, environmental management in our firm helps to achieve an overall better corporate reputation/image	Sharma and Vredenburg (1998); Delmas <i>et al.</i> (2011)
		CAR2	Relative to our competitors, environmental management in our firm helps to improve loyalty of existing customers	
		CAR3	Relative to our competitors, environmental management in our firm helps to establish better relationships with stakeholders (e.g. local communities, regulators, environmental groups, etc.)	

Figure 1. Hypothesised conceptual model

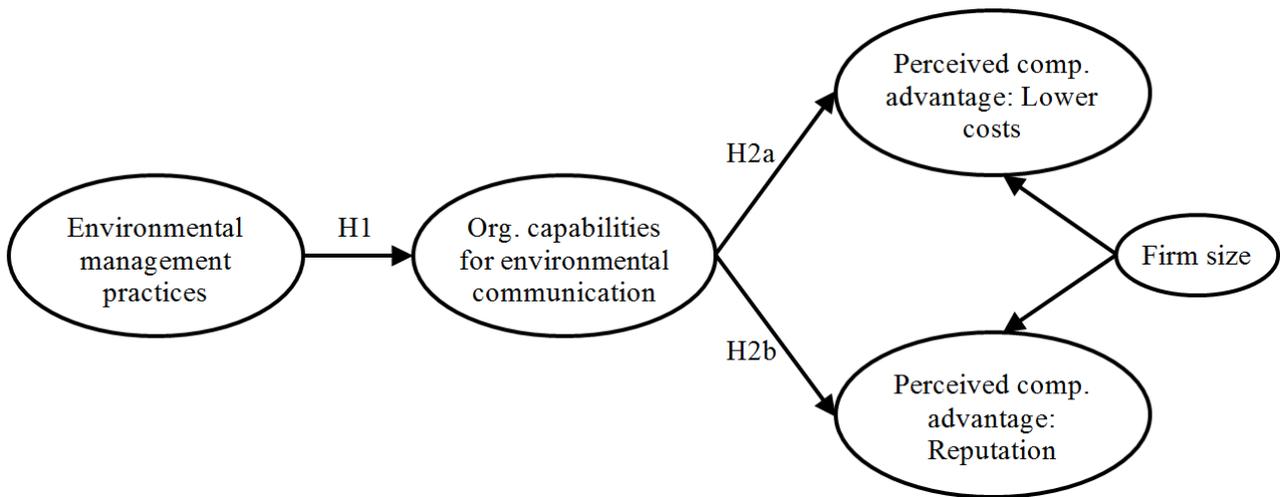
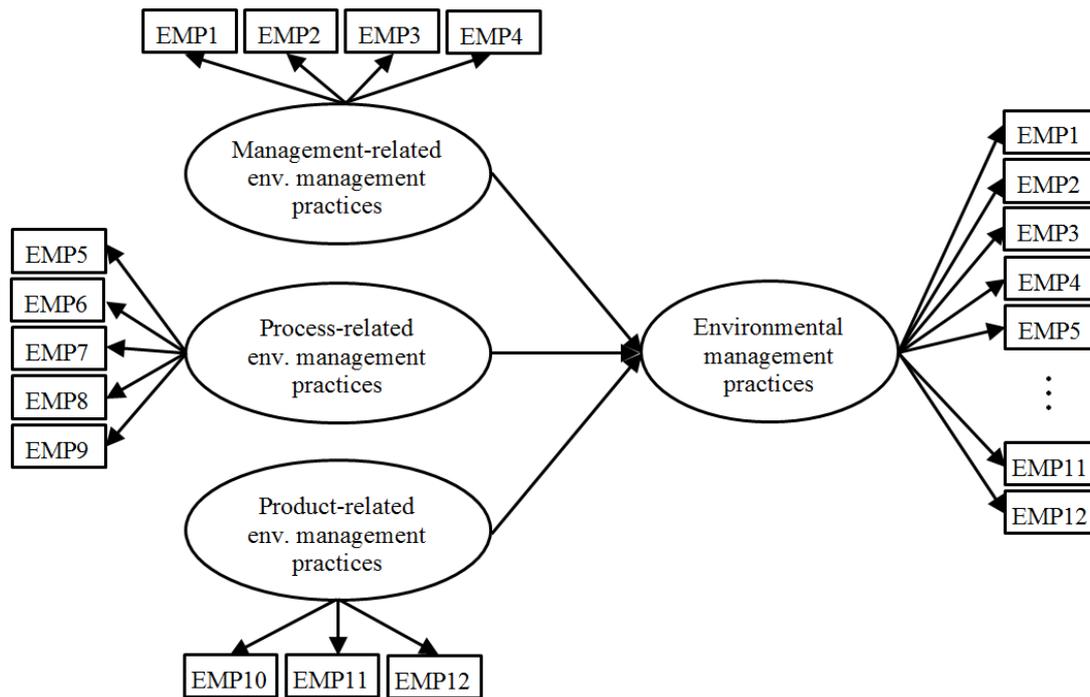


Figure 2. Conceptual representation of the repeated indicators approach to specify environmental management practices as a reflective-formative latent variable



Notes: Acronyms for scale items used as indicator variables are listed in the Appendix

CHAPTER 5: CONCLUSIONS – CONTRIBUTIONS, LIMITATIONS AND IMPLICATIONS

1. Summary

My aim with this dissertation has been to explore how SMEs can be able to commit with environmental protection and improve their competitiveness at the same time. This overall research question is based on the proposition that SMEs have gone through changes in their perceptions of their stance towards the natural environment, which has paved the way to an increasing adoption of proactive approaches with regard to environmental protection. Thus, a step forward in the research agenda needs to be focused on determining the strategic significance of environmental commitment among such firms. In addressing the overall research question, this study explored the materialisation of environmental commitment by means of the implementation of environmental management practices, the competitive outcomes derived from environmental management practices, and certain organisational attributes that account for the achievement of such competitive outcomes.

This PhD research addresses the strategic significance of environmental management practices among SMEs in several ways, reflected on three independent yet interrelated empirical research papers. The papers focus on: The development over time of environmental initiatives at strategic level, the influence of motivators and the impacts on competitive advantage (chapter 2); the identification and characterisation of complementary assets (chapter 3); and the role of organisational capabilities for environmental communication in the competitive implications of environmental management practices (chapter 4). These three papers collectively contribute to a deeper understanding of how SMEs can view the natural environment as a competitive opportunity and how certain organisational attributes are involved. In summary, this PhD thesis showed that SMEs can behave as advantage-driven firms (Parker *et al.*, 2009), where the pursuit of business and market opportunities drives the adoption of environmental management practices. The positive implications for competitive advantage in aspects such as lower costs, differentiation and reputation evidence the strategic relevance of implementing environmental management practices. However, a deeper examination of such strategic relevance indicates that SMEs are able to develop organisational attributes, i.e., technology and process innovation and environmental communication, which lead to the materialisation of competitive outcomes from the adoption of environmental management practices. This thesis thus, provides more insight in relation to how SMEs can harmonise the concern for the natural environment with their business-related goals. In particular, it is an attempt to open up the ‘black box’ that has characterised the linkage between environmental management and firm performance (Klassen and McLaughlin, 1996; Grewatsch and Kleindienst, 2015).

2. Overall contribution

Previous literature has called for moving away from the focus on SMEs as reactive entities due to commonly known constraints (e.g., resource scarcity, low awareness of environmental issues, etc.), and instead to focus on the potential for an strategic approach to environmental protection (Aragón-Correa *et al.*, 2008; Torugsa *et al.*, 2012; Klewitz and Hansen, 2014). This dissertation addresses this call by firstly exploring different environmental management practices that SMEs implement. Specifically, this PhD research approaches particular portfolios of environmental management practices (i.e., management-related, product-related, process-related) that are actually implemented among such firms. At the same time, the adopted environmental management practices imply different orientations with regard to the ultimate reform to the natural environment, ranging from pollution prevention measures to approaches towards clean technologies (Hart and Milstein, 2003). This research further addresses the strategic approach to SMEs' environmental management practices when evidencing the impacts on different forms of competitive advantage and how organisational attributes (i.e., complementary assets and organisational capabilities) are developed to determine the achievement of diverse competitive outcomes.

Furthermore, scholars have argued that, in order to further the understanding of competitive advantage resulting from the adoption of environmental management practices, research should move away from asking whether or not it pays to be green (Reinhardt, 1998; King and Lenox, 2001; Pelozo, 2009; Hoffman and Bansal, 2012; Russo and Minto, 2012). They rather call for asking “when, where and how corporate activity can simultaneously promote economic and environmental growth” (Hoffman and Bansal, 2012, p. 14). In this vein, this dissertation characterises and explores certain organisational attributes (i.e., technology and process innovation and environmental communication) among SMEs that may act as complementary assets and mediating organisational capabilities. They determine the achievement of competitive advantage given the implementation of environmental management practices. Moreover, this dissertation shows that the characteristics of such organisational attributes as complementary assets account for different competitive outcomes (i.e., competitive parity vs competitive advantage, see **article 2**).

Finally, the engagement with multiple theoretical lenses when conducting this research, together with the use of a mixed-method approach, addresses the call for embracing theoretical paradigms in addition to the prevailing stakeholder theory for getting further insight on environmental management in SMEs that goes beyond anecdotal information (Leonidou *et al.*, 2015; Johnson and Schaltegger, 2016).

In sum, this dissertation recognises the complexity of the strategic significance of environmental management when uncovering attributes that can determine competitive gains at different fronts. This step further in the analysis of the competitive implications of environmental management targets a community of firms that has traditionally been sceptical about the integration of environmental issues in their business activities. Overall, it was valuable to investigate SMEs' alignment of environmental commitment and related practices with additional organisational processes and mechanisms so as to pursue a business case for environmental sustainability. Without this understanding, SMEs' response to environmental challenges in isolation will become, in Reinhardt's (1998) words, “just sloganeering” (p. 44).

3. Specific contributions of each article

First article (chapter 2): This article investigated SMEs' development over time concerning the adoption of environmental initiatives at strategic level, the influence of managerial attitudes and strategic intent as motivators, and the effects on competitive advantage in lower costs and differentiation. The findings revealed that SMEs are able to internalise environmental concerns in their strategies progressively, which can have positive consequences for competitiveness. Further, although the adoption of environmental initiatives is the reflection of attitudes and moral values of SMEs' owner-managers, it is primarily considered as a means to pursue business opportunities and reputational benefits. The substantial improvements of competitive advantage in differentiation and positional benefits are thus consistent with such an exhibited opportunistic behaviour. Therefore, the article contributes to a better understanding of the nature of SMEs' process of corporate strategic 'greening' in a wider scope. That is, the investigation of motivators, environmental initiatives and subsequent competitive outcomes. By examining the development of such process over time, the study contributes to literature on strategic organisational change, particularly regarding the integration management of environmental concerns. Based on the noted results, it can be argued that the business case for environmental management in SMEs fits into a rational lens perspective of organisational change as it is predominantly driven by goals such as the optimisation of business performance (Rajagopalan and Spreitzer, 1997). Finally, the adoption of a longitudinal research design for the purpose of the study is itself another contribution to research on environmental management in SMEs in terms of methodology. The majority of previous empirical studies on the topic rely on cross-sectional designs and have reiteratively called for analyses of data gathered over longer time-frames.

Second article (chapter 3): The findings of this article showed that SMEs are able to develop complementary assets, which allow them to realise competitive advantage from the implementation of environmental management practices. The main contribution of the article concerns the application of Teece's (1986) innovation-value-capturing-framework to SMEs in the context of environmental management. In doing so, the article characterised the weak appropriability regimes that SMEs face in their environmental management practices, which justifies the development of complementary assets. Then, two main complementary assets among such firms were found, i.e., technology and process innovation and environmental communication. Technology and process innovation were characterised as generic complementary assets, whereas two variants of environmental communication, i.e., reactive and proactive, were respectively categorised as generic and specialised complementary assets. Since the innovation-value-capturing-framework is rooted on the resource-based view of the firm, the article thus contributes to the applicability of such a theory in the SME setting. Therefore, the article is subscribed to the stream of literature that argues for the critical role of resources and capabilities when examining the strategic aspects of environmental management in SMEs (Aragón-Correa *et al.*, 2008; Torugsa *et al.*, 2012; Leonidou *et al.*, 2015). Furthermore, the article's focus on complementary assets as supporting resources and capabilities implies a complex and contingent approach to the linkage between environmental management practices and competitive advantage. In this sense, the article contributes to getting some insight with respect to theoretical question 'when does it pay to be green?' in particular.

Third article (chapter 4): This article showed that organisational capabilities for environmental communication mediate the relationship between environmental management practices and perceived competitive advantage in SMEs. Organisational capabilities for environmental communication are deployed so as to showcase environmental management practices targeting management-related, process-related and product-related aspects. As a result, SMEs are able to perceive improvements in competitive advantage in aspects such as lower costs and reputation. When addressing organisational capabilities for environmental communication as a mediating attribute, the study contributes in shedding some light on explanations of how and why environmental management can boost competitive advantage in SMEs. Furthermore, the study contributes to a better understanding of the strategic approach to organisational communication among SMEs. That is, the purposeful use of organisational communication focused on environmental issues to meet firm's mission and goals.

4. Implications

This dissertation holds several implications and recommendations for researchers, managers and policymakers. The results of this dissertation invite researchers keep focusing on the study of how environmental management can acquire strategic value in the SME setting and thus, reconsider the traditional assumptions. Opportunities for achieving competitive advantages in a world of increasing global competition tend to decline whereas the overall public concern for environmental protection is gaining momentum. Therefore, scholars should engage with the study of supporting organisational mechanisms and processes that facilitate the integration of environmental concerns into the main strategies and influence the ultimate effects on SMEs' competitiveness. For this purpose, the RBV and the innovation-value-capturing-framework can still be considered as theoretical driving forces as I did in this dissertation. However, building on literature from other disciplines (e.g., organisational communication and organisational behaviour) can help to enhance the understanding of such organisational mechanisms and processes. Finally, researchers are invited to reflect on how common characteristics of SMEs (e.g., informality, flexibility, etc.) favour a strategic approach to environmental issues and how they offset the limitations in terms of slack resources.

SME owner-managers and practitioners have got themselves into a position where they are critical actors for the shaping of the future. This is not a negligible responsibility as challenges such as environmental sustainability must be on the business agenda. Corporate strategies to deal with environmental concerns should be seen as opportunities for value creation, not only for firms but also for the society in general. However, SME owner-managers should not expect that the mere investment in environmental management practices will automatically increase the competitive position of their firms. They need to examine the existing organisational resources and capabilities that can support an implementation of environmental management practices that succeeds in both reducing environmental harm and boosting firm competitiveness. At the same time, it would certainly be wise for SMEs to reallocate and/or acquire physical, financial, technical, and human assets towards the development of additional supporting organisational resources capabilities, when needed, so as to ensure the continuous capture of competitive benefits following

environmental management practices. The creation of appropriate networks to join efforts with other firms is suggested as an effective means for the development of those supporting resources and capabilities (Hansen *et al.*, 2002; Halila, 2007; Zeng *et al.*, 2010).

In more detail, the findings in this dissertation suggest that SME owner-managers should pay attention to the development of supporting resources and capabilities in addition to those of a pure technical character and traditionally associated with environmental proactivity. They should strive to showcase their environmental efforts to stakeholders through the deployment of ‘downstream’ organisational capabilities such as environmental communication. For this purpose, SMEs can take advantage of their flexible and low-bureaucratic structures and decision-making processes to find innovative mechanisms for the reduction of information asymmetries with stakeholders. Further, the deployment of organisational capabilities for environmental communication must meet the purpose of delivering information related to environmental commitment and efforts that is concrete and verifiable. Otherwise, the competitive position stemming from environmental management practices may be jeopardised.

Even though this dissertation was focused on examining the strategic approach to environmental commitment of private actors, there are some key messages for public policymakers to be sent. Imposing strict environmental regulations does not harm the SMEs’ competitive position. Rather, ‘raising the bar’ of environmental regulations seems to be compatible with the ability of SMEs to obtain competitive benefits and meet their strategic goals. Thus, public policymakers need to communicate with and convince SMEs that addressing environmental concerns in business will allow them to leapfrog competitors in strategic positioning and operational aspects. However, public policymakers should not merely focus on imposing more regulations, but higher quality regulations instead. That is, regulations that favour environmental protection and strategic development of SMEs. For instance, tax burdens on the use of energy from fossil fuels. This would incentivise such firms to proactively develop competitively valuable organisational capabilities based on technical and managerial innovativeness, which would help to ‘pull up’ the environmental performance of their industries.

Literature argues for an overall ignorance and low awareness of environmental issues among SMEs (del Brío and Junquera, 2003; Gadenne *et al.*, 2009). It is expected that there is also low awareness of the importance of showcasing environmental efforts in other contexts besides the one studied in this dissertation. Therefore, regulators, suppliers and industrial associations are invited to illuminate and support SMEs with regard to initiatives for the visibility of their environmental management practices and its strategic value. They can provide relevant and updated information that allow them to broaden the content of their environmental communication. For instance, suppliers would offer detailed information about the environmental qualities of technologies and raw materials whereas industrial associations would provide environmental facts related to their respective sectors. In this manner, SMEs ensure the comprehensiveness in the content of the messages delivered (Hunter and Bansal, 2007) when developing organisational capabilities for environmental communication.

5. Limitations and future research avenues

In this dissertation, I have outlined a range of theoretical and empirical contributions around the strategic relevance of environmental issues in SMEs. Nevertheless, the choices that I made in relation with approach, design and methods during the research process entail a number of shortcomings and limitations that must be addressed.

Time-related constraints are part of the common challenges the researcher faces when following a mixed-method approach (Johnson and Onwuegbuzie, 2004; Creswell and Plano Clark, 2011). Thus, I limited the second and third studies in this dissertation to the analysis of qualitative and quantitative cross-sectional data respectively, although the first study is based on data collected over several years. It may be worthwhile for future research to embark on a longitudinal study to uncover possible modifications in the nature of the identified complementary assets. For instance, to explore whether SMEs become better at utilising their external knowledge over time and combine it with internal resources so that complementary assets for technology and process innovation become more specialised. At the same time, a longitudinal analysis would help in determining short and long-term effects on competitive advantage provided the development of the strategic organisational attributes addressed in this dissertation. Finally, longitudinal work could confirm the direction of causality between environmental management practices, organisational capabilities and competitive advantage.

The results of the studies reported in chapters 3 and 4 should be interpreted with certain caution. Both qualitative and quantitative data come from SMEs operating in one specific industrial sector. While addressing a single industry allows internal process, business practices and external influences to be controlled, the generalisability of findings is limited. Thus, future studies should examine whether the characterisation of complementary assets and organisational capabilities suggested in this thesis hold in other industries under very different regulatory, technological and competitive conditions. The same applies to the evidenced relationships between the main constructs, i.e., environmental management practices, organisational capabilities, competitive advantage. In a similar vein, the study of SMEs in different geographical areas would be an interesting additional research avenue to be followed. The studied SMEs in this PhD research are located in Denmark, a country that has long been recognised for the implementation of very strict environmental regulation, the leadership in the adoption of clean technologies, and the overall high public concern for environmental issues. I would like to study firms located in countries with low environmental awareness and determine the similarities and/or differences in relation to the findings of the current study. That would certainly allow me to get valuable insight regarding the strategic relevance of environmental concerns in SMEs.

Both quantitative studies (chapters 2 and 4) rely heavily on self-reported measures provided by SME managers. I acknowledge this as a methodological shortcoming shared with much other research on environmental and strategic management. Despite the difficulties regarding the availability of public information of SMEs, future studies should aim for using more direct objective measures of the theoretical constructs in order to enhance the confidence of the results reported in this thesis.

This PhD thesis has entirely adopted an endogenous approach. The examination of drivers such as strategic intent and managerial attitudes as well as firm attributes in the form of organisational capabilities and complementary assets has provided valuable insights around the overall research question. However, as in the case of large enterprises, SMEs do not operate in a vacuum. They are surrounded by several external forces that may influence their strategic approach to environmental issues. Scholars have argued for the importance of institutional forces and stakeholder demands as critical external drivers of greening in both large and small firms (Bansal and Roth, 2000; Buysse and Verbeke, 2003; Parker *et al.*, 2009). Further, certain external factors such as competitive intensity (Russo and Fouts, 1997; Leonidou *et al.*, 2015), stakeholders' environmental sensitivity (Menguc *et al.*, 2010), and complexity and dynamism of the market (Aragón-Correa and Sharma, 2003; Leonidou *et al.*, 2015) have been suggested as contingencies that determine the business case for environmental management. Thus, a natural research avenue should consider the examination of external factors together with the internal aspects and attributes addressed in this dissertation. This would shed more light on SMEs' strategic approach to their greening processes. In fact, future research would be more fruitful if it considers investigating the influence of external factors not only on the adoption of environmental management practices, but also on the development of the organisational capabilities and/or complementary assets characterised in this thesis. In this vein, possible research avenues could be: (i) to determine the extent to which the degree of critical stakeholders' concern for environmental issues shapes the development of organisational capabilities for environmental communication; and (ii) to determine whether the complexity and dynamism of the market boost the development of complementary assets for technology and process innovation that can be characterised as specialised.

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