



Intermediaries driving eco-innovation in SMEs: a qualitative investigation

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Abstract

Purpose – The purpose of this paper is to identify the role intermediaries can play in an small to medium-sized enterprise's (SME's) pursuit for corporate sustainability with a focus on eco-innovation. The research identifies drivers and barriers for eco-innovation, and highlights effects induced through collaboration between SMEs and local authorities, on the one hand, and consultancies, on the other.

Design/methodology/approach – This paper is based on an exploratory qualitative interview study among German SMEs of the metal and mechanical engineering industry that have participated in “Ecoprofit”, an intermediary based program that aims at introducing organizations to the concept of sustainable development through implementation of eco-innovations.

Findings – The key findings are that first, the proactive approach by a public intermediary (here local authority) is one essential push factor to trigger eco-innovations in SMEs with low absorptive capacity. Second, it is found that SMEs may need facilitation for eco-innovation from different types of intermediaries (public and private) with different levels of support, which can range from customized and individual to more loosely held support, such as networks.

Originality/value – This study discusses the challenges of corporate sustainability with a focus on eco-innovations for SMEs and proposes a “complex intermediary” consisting of a local authority and consultancies as one means to engage SMEs in sustainability. Moreover, it focuses on SMEs in the B2B context, organizations that are often overlooked despite their vast impact. Furthermore, by using a single industry approach, in-depth findings for the metal and mechanical engineering industry are presented.

Keywords Eco-efficiency, Eco-innovations, Sustainability-oriented innovation, Absorptive capacity, Learning networks, Inter-organizational learning, Public private partnerships, Intermediaries, Knowledge transfer, Small to medium-sized enterprises, Innovation, Germany

Paper type Research paper

1. Introduction

Small- and medium-sized enterprises (SMEs) are increasingly challenged to contribute to sustainable development (Jamali *et al.*, 2009; LePoutre and Heene, 2006; Luetkenhorst, 2004), that is, to be involved in alleviating social grievance as well as environmental degradation. On the one hand, SMEs can benefit from dealing with sustainability-related issues, for example, through cost saving (e.g. increased energy efficiency) or by realizing competitive advantage (e.g. successful new products). On the other hand, handling sustainability issues can become a very insolent and complex endeavor for some SMEs. In the context of sustainability, SMEs are faced with

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challenges such as resource constraints in terms of time, knowledge, financial, and human capital (European Commission (EUC), 2007; Lee, 2009; Perez-Sanchez *et al.*, 2003) as well as factors related to managerial and organizational structure such as no or few personnel dedicated to sustainability management or an ad hoc, informal management of sustainability issues (Jenkins, 2004; Spence, 1999). Yet, even though dealing with such issues may, at first, present a complex endeavor for some SMEs, they may collaborate with parties outside their organizational boundaries such as universities, governmental bodies, or consultancies to gain access to knowledge and to direct assistance to better deal with sustainability issues (Jenkins, 2009; LePoutre and Heene, 2006; Valliere, 2006). For the purpose of this paper, we refer to these external organizations as intermediaries (Howells, 2006).

Against this background, we are interested in the role of intermediaries in an SME's effort to engage in eco-innovation. Eco-innovations include enhanced processes, products, and organizational practices that reduce or avoid negative environmental impacts (van Hemel and Cramer, 2002; Rennings *et al.*, 2006; Beise-Zee and Rennings, 2005). We focused our research on ECOlogical PROject For Integrated Environmental Technology (Ecoprofit[®]) as it is a programme that aims to introduce organizations to the concept of sustainable development by use of a "complex" intermediary (i.e. composed of more than one party, as will be explained later) in which a local governmental body and an environmental consultancy provide direct and indirect forms of assistance to SMEs. Ecoprofit[®] emphasizes eco-efficiency, that is, the combination of economic and environmental performance to create economic gain while reducing negative environmental impact (Schaltegger and Synnestvedt, 2002). Eco-efficiency innovation can constitute a feasible first step for SMEs with limited resources (financial, time, knowledge) to initiate a more sustainable mode of business operations.

Based on an interview study among German SMEs from the metal- and mechanical engineering industry, we explore the role of a complex intermediary in the pursuit of more sustainable business operations of these SMEs. In particular, we focus on the question if and if so, how the model of Ecoprofit[®] has helped SMEs to implement changes. However, in order to have a long-lasting positive impact on the environment, it is essential that these activities are also a trigger for continuous change in the future. Therefore, we aim at exploring how lasting these changes are.

We will attend to the central questions of this paper in five steps. First, we will outline the current literature on sustainability in the context of SMEs. Here, we will place particular emphasis on eco-innovation and the role of intermediaries. On this basis, we will analyse Ecoprofit[®] as a complex intermediary constellation. In a second step, we will provide information on our qualitative interview study to then, in a third step, present the central findings. In a fourth step, we will discuss our findings, elaborating on potential reasons why SMEs are willing to interact with intermediaries arguing from an absorptive capacity perspective. Additionally, we will examine the long-term effects of the interaction with intermediaries. The purpose of this step is to derive propositions for future research. Following, this paper concludes with some final remarks regarding limitations and further research avenues.

2. Literature review

The integration of sustainability-related aspects and innovation can be beneficial for business: they can reduce costs (e.g. through an energy management system), reduce risks (e.g. through enhanced safety features), increase sales and profit margins

(e.g. through the introduction of premium organic brands), increase reputation and brand value, become more attractive as an employer (e.g. through better alignment between personal and company values), and build up innovation capabilities (Schaltegger, 2011). Despite these potential benefits, dealing with sustainability-related issues constitutes a challenge to most organizations. As a consequence, many instruments, concepts, and tools have been developed to assist businesses in their effort to alleviate environmental and social issues (e.g. Schaltegger *et al.*, 2007). However, most of these tools were designed for or are used by larger corporations (Graafland *et al.*, 2003). As SMEs are not simply smaller versions of their larger counterparts (Tilley, 2000; Welsh and White, 1981), they might require different tools or a different approach to dealing with social and environmental issues than those offered to large corporations. Therefore, this section of the paper will first explore the challenges SMEs face when wishing to implement changes towards sustainability and will then go on to discussing the potential role of intermediaries in this process. In a third and final step of the literature review, we will introduce Ecoprofit[®] as a complex innovation intermediary.

2.1 SME characteristics and eco-innovation

SME literature in general places much emphasis on identifying those aspects of SMEs that differentiate them from large corporations. These differences are often referred to as “characteristics” or “peculiarities”[1] (del Brio and Junquera, 2003; Spence, 1999; Vyakarnam *et al.*, 1997). In recent years, many scholars have explicitly addressed the question of such characteristics in the context of corporate sustainability, i.e. the integration of sustainability issues into core business (examples are: Jenkins, 2004; Moore and Spence, 2006; Preuss and Perschke, 2010; Perrini, 2006; Spence, 1999; Spence and Lozano, 2000; Spence and Rutherford, 2001; Schaper and Savery, 2004).

In summary, this body of literature puts forward a range of both disadvantageous and advantageous characteristics that may influence the integration of sustainability into business activities. Advantageous SME characteristics, such as informal ways of communication, flexible and lean organization structures (Bos-Brouwers, 2009) may lead to a less bureaucratic management of environmental and societal issues. The dominant and entrepreneurial role of the owner-manager, for instance, may affect the reaction to changing markets and can, hence, facilitate behaviour towards product innovation to conquer market niches (Jenkins, 2006). The peculiarities, i.e. the potential disadvantages, faced by SMEs imply certain challenges for innovation in the context of corporate sustainability (del Brio and Junquera, 2003) and its implementation in SMEs (Jenkins, 2006, 2009; Luetkenhorst, 2004; Russo and Tencati, 2009; Sweeney, 2007). Resource constraints, for example, lack of time, personnel, knowledge, and financial capital (Azzone and Noci, 1998; Bos-Brouwers, 2009; del Brio and Junquera, 2003; Spence, 1999) may result in fewer investments in and implementation of eco-innovations (Noci and Verganti, 1999). Overall, eco-innovation indeed occurs in SMEs, but to a varying degree, that is SMEs may follow a reactive, anticipatory, or innovation-based strategy (Noci and Verganti, 1999).

According to del Brio and Junquera (2003), SMEs tend to follow a more reactive approach towards the management of sustainability and towards innovation (both sustainability and non-sustainability related) (Scozzi *et al.*, 2005). As a result of this more reactive approach, SMEs seem to innovate more incrementally than radically (del Brio and Junquera, 2003). On top, the majority of SMEs are micro-businesses with less than ten employees (Census, 2011; Klees, 2008). To implement highly sophisticated

tools such as sustainability accounting (Bennett *et al.*, 2011), advanced employee training schemes (Kotey and Folker, 2007), or an elaborate stakeholder management may present an enormous and probably not accomplishable endeavor for such small organizations. Dealing with all potentially important stakeholders (e.g. customers, suppliers, regional organizations, NGOs) would consume a substantial amount of time that is one of the scarcest resources of SMEs. Advanced employee training schemes usually require large financial investments by the employer which is often unfeasible for a micro-enterprise. Similar arguments may also be found to apply to the remainder of the SME spectrum, thus organizations with up to 250 employees (EUC, 2007).

Whilst from a normative standpoint of sustainable development it would be best to consider the environmental, social, and economic dimensions in an integrated fashion – thus to engage in truly sustainability-oriented innovation (Hansen *et al.*, 2009) – this is not always practical for SMEs. Based on the outlined resource constraints and entailed difficulties in pursuing a corporate sustainability scheme, it could be argued that SMEs with a more reactive stance might be more drawn towards partial solutions and particularly those that have a clear and direct impact on their financial performance (Suh *et al.*, 2005). Therefore, actions that improve the financial performance (or are not diminishing it) while improving the environmental performance might be best suited for SMEs with an initially reactive approach towards sustainability to start their respective engagement. This ratio of economic value created to environmental impact added (Callens and Tyteca, 1999; Figge and Hahn, 2002) is often referred to as eco-efficiency (Dyllick and Hockerts, 2002; Schaltegger and Sturm, 1990). It is either improved by reducing environmental impact whilst keeping the same economic value, or by expanding economic value whilst remaining at a constant level of environmental impact (Schaltegger and Sturm, 1990; Schmidheiny, 1992). Eco-efficiency measures can be taken in various dimensions; these include energy, water, resource efficiency, material, waste, and pollution intensity (Verfaillie and Bidwell, 2000; von Weizsaecker *et al.*, 1997).

Eco-efficiency innovation can be applied to all types of innovation: process (production of goods and services with less input), product (more efficient products), and organizational (reorganization of structures or implementation of new management tools) (Rennings, 2000; Rennings *et al.*, 2006). Whilst improved eco-efficiency can be achieved through all innovation types (Ar and Baki, 2011), this paper focuses on process innovations as it is the more common form of innovation in the manufacturing industry (Bagliardi *et al.*, 2011) which lies at the centre of attention in this paper. Eco-efficiency process innovations enable the production of goods or services with less input of resources (e.g. energy) and encompass innovations in both end-of-pipe and cleaner production technologies (Rennings *et al.*, 2006).

In summary, eco-efficiency innovation might be a feasible starting point for SMEs to begin the process of corporate sustainability. However, the question remains how SMEs which struggle with a lack of time and personnel and which are not equipped with the necessary knowledge to implement eco-efficiency innovation are to be engaged in the process. Against this background, the next section of this paper will discuss how SMEs can access to and make use of essential external knowledge through collaboration with innovation intermediaries.

2.2 Role of intermediaries in eco-innovation

One possible solution for SMEs on their pathway to eco-innovation is to use collaborative initiatives to acquire knowledge outside their own organizational

boundaries (Clarke and Roome, 1999). By doing so, SMEs gain access to and exchange relevant ecology and sustainability-related information (Spence *et al.*, 2003). Moreover, SMEs can collaborate or seek network contacts to reduce time and knowledge constraints and increase their absorptive capacity (LePoutre and Heene, 2006). Absorptive capacity is of particular importance to the innovation performance of an organization and refers to an organization's ability to take in new impulses from outside and translate these into innovations (Cohen and Levinthal, 1990). It encompasses the process of recognizing and understanding external knowledge, assimilating it to the firm context, and continuing to create new knowledge (Lane *et al.*, 2006). Thus, collaborative approaches are crucial as they diffuse practices and policies (Battaglia *et al.*, 2010) and can, hence, support the implementation of eco-innovations.

Collaboration with external organizations can take different forms, for instance, networking, cooperation, and partnerships (Biondi *et al.*, 2002; Bos-Brouwers, 2009; Clarke and Roome, 1999; de Bruijn and Hofman, 2000; Hartman *et al.*, 2002; LePoutre and Heene, 2006; Murillo and Lozano, 2009; Torri, 2010). Networks are more loose forms of engagement as it is easier to leave them than cancel contractual agreements and thus, might be a potential option for SMEs wishing to engage in eco-innovation processes. However, as manufacturing SMEs are considered to have low networking skills (Bagliardi *et al.*, 2011), we will focus on a different form of collaboration, namely collaboration with (public) intermediaries as this is considered "good innovation practice" (Vermuelen, 2006).

Intermediaries are commonly understood as third-party organizations that help to achieve desired objectives (Perset, 2010) which may provide a necessary external impulse, motivation, and advice to initiate or continue with, for example, environmental protection (Gombault and Versteeg, 1999). Literature recognizes various types: governments and local authorities, NGOs, universities, consultancies – to name but a few (Afsarmanesh and Camarinha-Matos, 2009; del Brío and Junquera, 2003; Howells, 2006; Massa and Testa, 2008; Zeng *et al.*, 2010). These can be clustered into three distinct groups: public, non-profit, and private (Kolk *et al.*, 2008). Public intermediaries are governments and (publicly funded) science partners or universities, as well as other publicly funded bodies (Hansen and Klewitz, 2012). NGOs belong to the non-profit group whereas consultancies and industry associations fall into the private group. More specifically, in the context of innovation, an intermediary that assists in the innovation process – "innovation intermediary" – is "an organization or body that acts as an agent or broker in any aspect of the innovation process between two or more parties" (Howells, 2006, p. 172).

To make the potential role of such innovation intermediaries more tangible, we will briefly outline various levels of intermediation as identified by Howells (2006):

- Foresight, diagnostic and scanning/information processing: at this level of intermediation SMEs are able to gain a more comprehensive view of environmental challenges, what sustainability entails, access external expertise and benefit from resource exchanges (see also de Bruijn and Hofman, 2000; de Bruijn and Tukker, 2002; Hartman *et al.*, 1999, 2002; Roome, 2001). For example, Ceram assists businesses in identifying the latest technological changes and assists them in choosing the one most suitable for them.
- Knowledge processing, gathering, and combination: intermediaries at this level assist in combining knowledge from two or more parties. This knowledge can stem from different internal parties or from two distinct organizations.

- Gatekeeping and brokering: at this level, intermediaries can act as negotiators or support others in understanding and translating contractual agreements.
- Testing, validating, and training: here, intermediation involves actions such as prototyping, inspection or scaling of innovations undertaken by a business.
- Accreditation and standards: innovation intermediaries can also assist in selecting, implementing or certifying various standards, e.g. ISO 14001.
- Regulation and arbitration: this level of intermediation does not only refer to policy regulation but also to informal arbitration, for example, between consumers and producers.
- Intellectual property: intermediaries can help SMEs to protect their intellectual property through patents or other regulations.
- Commercialization: another level of intermediation aims at exploiting the innovation by identifying potential markets and consequent strategies for serving these markets.
- Assessment and evaluation: some of the intermediation activity also emphasizes the assessment of respective technologies in terms of performance.

Hence, collaboration between an SME and innovation intermediaries can lead to an enhancement of an SME's innovation capacity, and more specifically, result in building up absorptive capacity for eco-innovation. First, the innovation intermediary can support recognizing and understanding new external knowledge through knowledge processing; gathering and combination; as well as accreditation and standards. Second, the assimilation of external knowledge to the firm context can be facilitated at intermediation levels of assessment and evaluation; regulation and arbitration; testing, validating and training; as well as gatekeeping and brokering. Finally, the process of enabling the firm to continue to create new knowledge can be facilitated at the level of commercialization and intellectual property rights. We thus argue that through collaboration with intermediaries, SMEs are, on the one hand, able to locate, acquire, and utilize external knowledge necessary for eco-innovation, and, on the other, have access to direct assistance and can consequently supplement their scarce resources (e.g. time, financial, human). In this paper we focus on public intermediaries as agents of eco-oriented change in SMEs (Hansen and Klewitz, 2012). In the following subsection, we will now describe the Ecoprofit[®] initiative as one possible form of a complex intermediary.

2.3 An introduction to Ecoprofit[®]

The core idea of Ecoprofit[®], which originated in Austria in 1991 (Martinuzzi *et al.*, 2000), is to facilitate eco-efficiency innovation. It introduces organizations from various industries to eco-efficiency innovation through means of education as well as through the usage of customized problem solving. More specifically, it aims to improve the eco-efficiency of processes, products, practices, and services in organizations (Krenn and Fresner, 2009). In this collaborative scheme, local authorities, SMEs, and professional consultants work together to establish learning networks and to ultimately transfer eco-related knowledge into the SMEs (Zeyen *et al.*, 2011).

In his definition of an innovation intermediary, Howells (2006) refers to a single organization. However, in the case of Ecoprofit[®], the participating SMEs are facilitated by both consultancies, whose foremost role it is to provide the SME with direct

assistance, and local authorities, whose primary role it is to facilitate learning networks and collaboration with other companies or organizations. Due to this intertwined facilitation by local authorities and consultancies, we consider the Ecoprofit[®] initiative as a “complex intermediary” and we thus, consider it as one single actor.

The main objectives of Ecoprofit[®] are strengthening the company economically, improving competitiveness, reducing industrial emissions, and extending internal company know-how (Cleaner Production Centre (CPC) Austria, 2010; Ecoprofit[®], 2008a; Martinuzzi *et al.*, 2000). The improvement of competitiveness and the reduction of environmental impact are achieved through the implementation of eco-efficiency innovations in the respective companies.

In Germany, Ecoprofit[®] has been implemented in around 80 locations with currently over 2,000 participating organizations. At present, Ecoprofit[®] has three modules: the beginner programme (module 1), the Ecoprofit[®] club (module 2), and “from Ecoprofit[®] to EMAS/ISO” (module 3). During the second module, companies that have completed the first module can interact in a peer-learning and peer-coaching process, that is, a learning network is established. In this paper we will discuss the beginner programme in detail, as it introduces companies to eco-efficiency innovation and touch upon the learning network in the discussion of our findings, as it is one attempt of Ecoprofit[®] to establish lasting learning structures for sustainability.

Before introducing the beginner programme in companies, the region or city, during the preparation and license agreement phase (Phase 1), has to acquire the license from the CPC Austria. The idea and complete structure of the programme are then presented during a kick-off event (Phase 2) to interested companies. The costs of the beginner programme are usually covered by a mixture of public grants and company contributions of about €10,000 (CPC, 2010). The beginner programme consists of five phases.

In the workshop-series (Phase 3), the first knowledge transfer process with the participating companies takes place. Here, the employees of the companies are trained in the central aspects of an integrative environmental management system. Parallel to Phase 3 runs the operational implementation in which the companies receive individual consultations and are analysed externally (Phase 4). At the end of this phase, a firm-specific programme is developed and implemented collaboratively. Phases 3 and 4 represent a learning network which is, however, not formalized in the sense of the Ecoprofit[®] club, an extra module after the completion of the beginner programme. The implementation of the processes is evaluated by an independent commission (Phase 5). After successful completion of the programme, the companies receive a certificate, which they can use for marketing purposes. On the whole, it is the aim to strengthen both local authorities and local companies to contribute to sustainable regional development (Krenn and Fresner, 2009).

When relating the activities of Ecoprofit[®] back to Howells' (2006) levels of intermediation, we propose that Ecoprofit[®] serves for “scanning and information processing”, “knowledge processing”, “accreditation and standards”, and “regulation and arbitration” in that:

- Ecoprofit[®] offers support in identifying the best suitable eco-efficiency innovation to implement; it thus scans the information for the SME.
- This can alleviate restraints related to lack of time and personnel.
- Through the workshops and individual consultancies, knowledge is transferred to the participating SME and thus a lack of knowledge is counterfeited.

- Moreover, Ecoprofit[®] also serves as informant for legal and other regulatory enquiries that the SMEs might have that reduces risks related to environmental challenges.

Therefore, we consider Ecoprofit[®] a complex innovation intermediary that pays particular attention to information and knowledge transfer as well as direct assistance in implementing innovation so as to improve eco-efficiency in SMEs. In order to gain greater insights into Ecoprofit[®] and its role in the achievement of more sustainable business practices in SMEs, we conducted an exploratory interview study which will be presented in the following section.

3. Methodology

This paper is based on qualitative exploratory research and is of interpretative nature (Silverman, 2008). We chose a qualitative approach to gain greater understanding of the field of study (i.e. the role of intermediaries in an eco-innovation process) as this approach leaves space for insights that were not anticipated by the researcher (Stebbins, 2001; Wolcott, 2009). More specific, an interview study was undertaken. The following subsections outline the research sample, data collection, and method of analysis of the undertaken empirical work.

3.1 Research sample

The selection criteria of the sample was fivefold: all potential interview partners needed to be an SME, have participated in the Ecoprofit[®] scheme, and have completed it at least five years prior to the interviews, and operate in the metal- and mechanical engineering industry and had to be located in Germany. In the following paragraphs, we will elaborate on these five criteria:

(1) SMEs

The SMEs in our sample were required to be in line with the EU definition that classifies companies with <250 employees as such (The Commission of the European Communities (TCEC), 2003).

(2) Ecoprofit[®]

As discussed under subsection 2.3, Ecoprofit[®] can be considered a complex innovation intermediary. Therefore, it constitutes an appropriate programme to investigate the effects of collaboration between SMEs and intermediaries to achieve more sustainable business operations.

Moreover, we chose Ecoprofit[®] as it is recognized as best-practice example by the European Union (European Commission Environment (ECE), 2011; European Commission (EUCOM), 2004) and has received various international rewards, such as the “Dubai International Award for Best Practices to improve the Living Environment 2002” (CPC, 2010). Furthermore, it has already spread internationally to countries such as Germany, the Netherlands, Hungary, Slovenia, Russia, Italy, and China (Balcázar, 2010; Zeyen *et al.*, 2011).

As the beginner programme always follows the same general structure, a comparison between participating SMEs even from different local initiatives is feasible. This would not have been the case if the programmes would (i.e. interacted with altogether different types of intermediaries).

The sample for this exploratory study was selected from a privately owned, yet publically accessible database (Arqum (2010)) related to Ecoprofit[®].

- (3) Participation before 2005
One part of our research question is to investigate if sustaining change was reached through the collaboration with an innovation intermediary. For this purpose, it is essential that there is a time lag between participation and interview as significant changes in an SME's environmental behaviour should be expected with a delay between three and five years after programme participation (Altham, 2007; Hennicke and Ramesohl, 1998; Rosenfeld, 1996). With this time lag in our sample, we are able to better investigate the long-term effectiveness of such programmes, as several years of project duration, post project experience, and network establishment can be accounted for.
- (4) Metal- and mechanical engineering industry
To ensure better comparability of the findings, this paper presents a one-sector focus (Jenkins, 2006). The metal- and mechanical engineering industry was chosen for various reasons. First, this industry is one of the five major industries in Germany (Kritikos and Schiersch, 2010; Verband deutscher Maschinen- und Anlagebauer (VDMA), 2010). Furthermore, the industry is a key supplier to many other industries such as automobile, electronics, and construction and therefore faces pressures to implement sustainability (Steirt, 2009). Finally, it is an under-researched sector for two reasons: first, many studies of sustainability deal with industries operating in business-to-consumer markets. Second, sustainability-related issues and particularly corporate sustainability is primarily investigated in large companies to which > 80 per cent of metal- and mechanical engineering companies do not belong (Kritikos and Schiersch, 2010).
- (5) Germany
The single country focus was chosen in order to further enhance comparability. Sustainability-related issues are regulated and incentivized differently – both from a governmental and from a consumer perspective – between countries. Thus, we decided to focus Ecoprofit[®] initiatives located in Germany.

3.2 Data collection

During the conducted research, various types of data including information from the private database, interviews, company web sites, and corporate reports were collected. The latter were incorporated to supplement the database and interview data (Eisenhardt, 1989). The following paragraphs will outline which information was derived from which source.

Database: the private database was consulted to obtain data about eco-efficiency innovations implemented in the sample firms. The information is sector-specific and presents innovative eco-efficiency measures accomplished by companies who took part in the one-year Ecoprofit[®] scheme between 1998 and 2010. The data is structured according to the following dimensions: eco-efficiency measures taken in the companies (e.g. in the field of hazardous materials or energy consumption); achieved benefits (e.g. monetary); the year of implementation; contact information of the company; and the manager responsible for the programme.

Interviews: based on the information provided in the database, we conducted telephone interviews with seven SMEs from the metal- and mechanical engineering industry (see Table I for company characteristics). This paper followed Weaver *et al.*'s

Company code	Industry	Number of employees	Position of interviewee	Market and customer focus ^a
C1	Mechanical engineering	65	Owner-manager	Competitive market with national customers and focus on regional customers
C2	Mechanical engineering	170	Management – head of purchasing	Niche market with international customers
C3	Mechanical engineering	230	Management – head of maintenance	Niche market with international customers
C4	Metalworking	24	Owner-manager	Competitive market with national customers
C5	Metalworking	45-50	Management – sales manager	Competitive market with European customers but focus on national customers
C6	Metalworking	100	Owner-manager	Competitive market with national and focus on regional customers
C7	Metalworking	93	Management – head of maintenance	Niche market with international and national customers

Note: ^aThis reflects the interviewee's own perception

Table I.
SMEs investigated

(1999) suggestion that a high-level executive is the best source to acquire accurate data. Accordingly, the interviews were conducted with three owner-managers and four non-owner-managers. They took place between June and August 2010.

This research capitalized on semi-structured interviews to gain insight into the interviewee's perception by giving them the opportunity to answer freely within predefined topics (Silverman, 2008). The interview guideline comprised three sections: company structure, corporate sustainability with a focus on eco-efficiency, and the role of intermediaries.

All interviews were held by the same two authors. The interviews were digitally recorded and transcribed. For the preparation of the present paper, all data used (codes, quotes) was translated from German into English by the first author and carefully cross-checked by the second and third author.

Archival data: information that could be found on company web sites or in newspaper cuttings were used to supplement the data collected during the interviews. This data was obtained via a Google search of the respective company names.

3.3 Method of analysis

The purpose of an interview study is to identify commonalities and differences between responses of people in equal positions or situations. Therefore, in order to analyse the collected data, a thematic approach was chosen (Stebbins, 2001; Wolcott, 2009). In this process, researchers follow an iterative process in which they look for emerging patterns and themes in the data. This process was simultaneously done by the first and second author and cross-checked with the third author, thereby achieving greater objectivity in the identified themes (codes). Following, the qualitative data was quantified in that it was counted how often which code was mentioned to thereby determine its potential significance (Stebbins, 2001).

4. Research findings

The research findings are structured as follows: first, the eco-efficiency innovations achieved by the sample companies are presented. Subsequently, drivers and barriers encountered are shown. Finally, the effects and relevance of collaboration with intermediaries are laid out.

4.1 Eco-efficiency innovations achieved by the studied SMEs

Based on the Ecoprofit[®] database, the eco-efficiency innovations accomplished and the benefits perceived by the SMEs were analysed (see Table II). All measures were taken in a one-year period between the years 2000 and 2003.

The studied companies engaged most strongly in the categories waste/waste disposal, energy, and hazardous materials. According to the database, the companies derived both environmental and economic benefits from eco-efficiency innovation, whereby monetary benefits prevail.

Based on the initial findings on the nature of eco-efficiency innovation accomplished in the SMEs, the paper now turns to the qualitative data from interviews and corporate documents for a more in-depth analysis of drivers and barriers as well as on the role of the complex intermediary constellation.

4.2 Drivers and barriers of eco-efficiency innovations

The identified drivers for eco-efficiency innovation in our sample were clustered according to the business case for sustainability drivers as identified by Schaltegger (2011), namely: profit and sales margin; reputation and brand image: attractiveness for employees; risk management as well as cost and cost reduction. As shown in Table III, the studied companies most frequently related to cost-efficiency, proactive contact by external initiatives, and a desire for continuous improvement as central driving factors, hence, cost and cost reductions as well as risk management are the primary drivers.

One interviewee's statement that "It's mainly that there are too few people" (manager, C5). highlights our finding that the studied SMEs perceived the lack of resources (such as personnel and time) as a central barrier to deal with sustainability and eco-efficiency (see Table IV).

Surprising was that half the interviewees considered sustainability as irrelevant to their sector which is stressed by one of the owner-managers (C6): "There are only few environmentally harmful measures that are relevant here [referring to the sector].

Category of measure	Measure taken ^a	Companies involved ^b	Stated benefits
Waste/waste disposal	8	C1, C2, C3, C4, C5, C6	Monetary; reduction of waste and water consumption
Energy	7	C2, C4, C5, C6	Monetary; reduction of energy consumption
Hazardous materials	5	C2, C3, C7	Increased safety; monetary; reduction of environmental risks
Organization	4	C3, C6	Monetary; test procedure
Waste/sewage	3	C4, C6, C7	Monetary; saving of water
Emissions	2	C4	Noise reduction
Compliance/law	1	C5	Increased compliance

Table II. Areas of eco-efficiency innovation implemented during Ecoprofit[®]

Notes: ^aNumber of times listed in the database; ^beach company can undertake multiple measures in multiple categories

Identified drivers	Interview responses ^{a,b}	Example ^c
<i>Cost and cost reduction</i>		
Cost-efficiency	8	“It’s all about costs, costs, costs. That’s all that counts” (M)
Improve energy efficiency	1	“We changed several things [due to Ecoprofit], you save a lot” (M)
<i>Risk management</i>		
Avoid negative environmental impacts	3	“In the area of environment, see what you can avoid” (M)
Compliance with environmental legislation	2	“The reason for me to join [Ecoprofit] I thought that somewhere legal compliance is not given in our company” (OM)
Proactive contact by external initiative	5	“I was motivated really through an external hint from the city where we were contacted personally to get involved”
<i>Become more attractive for employees</i>		
Create common culture in company	3	“To keep it all stable here” (M)
<i>Reputation and brand image</i>		
Improve company image	2	“Today you can use it as an image advantage” (OM)
Company as part of the community	2	“You have closer contacts to the surrounding, regionally?” (OM)
<i>Profit and sales margin</i>		
Pressure on suppliers to comply with sustainability standards	1	“It’s extreme when you deliver to the large companies. They [the suppliers from the metal and mechanical engineering industry] cannot afford to not be certified” (M)
<i>Others</i>		
Become part of a network	1	“To be in a functioning network with others to exchange” (OM)
Benchmarking with other organizations	2	“To find out what the others are doing” (M)
Continuous improvement	4	“To see if you can do more here” (M)
Social responsibility of company	1	“That it’s our social responsibility as entrepreneur” (OM)
Environmental alignment of organizational development	1	“Really, we’ve been environmentally orientated for a long time, primarily due to personal reasons” (OM)

Notes: OM, owner-manager; M, managers that are not owners of the firm; ^anumber of times mentioned by the interviewee; ^binterviewees mentioned several themes more than once; ^ccited in parentheses is the source of the quotation; the findings are clustered using Schaltegger’s (2011) drivers for sustainability

Table III.
Drivers for tackling sustainability issues

That’s more relevant in the chemical sector or pharmaceutical, that’s where it makes sense. But here with us [...] in the sector are only few things damaging the environment” (owner-manager, C6).

4.3 Intermediaries and collaboration for eco-efficiency innovation

Part three of the interview picked up on the theme of collaboration with intermediaries during the Ecoprofit[®] scheme (see Table V). All of the studied companies deem the capacity to capitalize on external support mechanisms in the form of innovation intermediaries as relevant. Further, in comparison to conventional networks (such as

Identified barriers	Interview responses ^{a,b}	Examples ^c
Lack of resources (personnel, time)	8	“It’s mainly that there are too few people. Lack of time” (M) “Honestly, time is missing” (OM) “There is no one to take care of it” (M)
Irrelevant to sector	3	“It’s not asked, not wanted, not demanded here” (M)
Lack of knowledge about relevant sustainability issues	2	“On the one hand time and on the other hand knowledge is missing” (M)
Costs without equivalent benefit	1	“It only costs money” (OM)
Irrelevant to customers	1	“No one of our customers wants it” (OM)

Table IV.
Barriers in handling
sustainability issues

Notes: OM, owner-manager; M, managers that are not owners of the firm; ^anumber of times mentioned by the interviewee; ^binterviewees mentioned several themes more than once; ^ccited in parentheses is the source of the quotation

industry networks), innovation intermediaries were considered important by almost double as many SMEs. This is even more astonishing in that all studied companies are active members in at least one regional or industry network. One interviewee put it like this: “I strongly recommend networks like Ecoprofit[®] [...] really because through daily work you don’t realize such things [eco-innovations] and in a new network you need to take the time and then you get new impulses” (owner-manager, C6).

The interviewees also stated, in general, that it is crucial to acquire knowledge externally and receive support during the implementation phase (see Table V). The assessment of one interviewee that “[External help] is only interesting if we are not only given advice but are also supported during the implementation phase” (manager, C2) conjectures that it was particularly important for some SMEs that the external initiative goes beyond mere consulting to truly engaging in actual implementation.

4.4 Effects beyond Ecoprofit[®]

The findings suggest that intermediaries can facilitate eco-efficiency innovation in SMEs. Yet, the question remains whether these are a one-off activity, or a trigger for continuous innovation efforts. Therefore, the interviews also addressed sustainability measures taken after the one-year programme (i.e. the Ecoprofit[®] beginner module) had terminated.

The studied companies showed that a range of process and organizational innovations (e.g. ecological water management; ISO 9001) and, to a far lesser extent, product innovations were achieved after the participation in the Ecoprofit[®] scheme (see Table VI).

Despite the fact that the studied companies completed the Ecoprofit[®] programme at least seven years prior to the interviews, the overall number of eco-innovations undertaken remains low. Moreover, if considering that the studied companies received individual consulting phases and were accompanied in the implementation processes, it is surprising that although most companies did take further specific environmental measures, these remained of ad hoc nature and were limited in scope. Overarching organizational innovations in the sense of management instruments and tools, have not received broad attention. Only one of the companies introduced an ISO system with eco-indicators integrated in core business monitoring (see Table VI).

Different areas of perception on Ecoprofit [®]	Interview responses related to company code
General role of Ecoprofit [®]	<p>“Afterwards [Ecoprofit-scheme] you see all the things you can do more. [Ecoprofit] was only the first step was to deal with the topic [eco-innovation] and then to deduce measures which can also be turned into a competitive advantage” (C1)</p> <p>“To get knowledge-experts [during the Ecoprofit-scheme] outside of the company who can give me a relatively objective advice” (C1)</p> <p>“The environmental thing [implementing environmental measures] is important. Only visiting the courses [of the Ecoprofit-initiative] is not enough” (C3)</p> <p>“Now we have been involved in an environmental program in Bavaria [German: Umweltpakt Bayern] several times. These are things we have been learning from participating in the Ecoprofit-scheme” (C4)</p> <p>“Exchanging the data and coordination with other companies [in the ECOPROFIT-scheme] is very helpful” (C6)</p> <p>“I strongly recommend networks like Ecoprofit [...] really because through daily work you don’t realize such things [eco-innovations] and in a new network you need to take the time and then you get new impulses” (C6)</p>
Importance of going beyond consultancy	<p>“[External help] is only interesting if we are not only given advice but are also supported during the implementation phase” (C2)</p> <p>“Have an external firm come, who shows you the possible ways to have everything running and then to continue on your own. But now and then the external firm comes to supervise the processes” (C3)</p>
Other initiatives and networks	<p>“Ecoprofit is definitively finished. We are now following up on the data and are taking part in further workshops [other than Ecoprofit]. Now we are involved in a project about ecological water management” (C1)</p> <p>“There are networks in the technical field, family business networks or regional clusters [...]. In the field of sponsoring for example we meet regularly to think about what to do cheaper and better together” (C1)</p> <p>“We look for help in specific areas and we go to our industrial alliances, German chamber of industry and commerce and chamber of handicrafts” (C5)</p> <p>“Generally networks are useful [...] also the exchange at a roundtable or with the chamber of handicrafts” (C6)</p> <p>“We are of course involved in our industrial alliance and there you sometimes work on environmental issues together” (C7)</p>

Table V.
The interviewees’ perception on the benefits and short comings of Ecoprofit[®] and their involvement in other networks/initiatives

In the following section, we will now go onto to further discussing our findings.

5. Discussion

We will discuss the previously presented findings in three steps. First, we will argue that a complex intermediary may strengthen an SME’s absorptive capacity for eco-efficiency innovation. Second, we will elaborate on the role of the local authority as an external stimulus to change towards more sustainable business operations by also highlighting the reasons for SMEs to participate in a support programme like Ecoprofit[®]. In a third and final step, we will discuss the potential to induce long-term effects through a programme like Ecoprofit[®].

Type of innovation	Exemplary quotes from interviewees ^a
Process	<p>“We do quite a lot in the environmental area in terms of reducing waste disposal and hazardous substances – using all possible savings”</p> <p>“We did quite a lot [...] we changed our compressors, we changed the lighting system [...] we changed the heating”</p> <p>“We currently have a project [...] in which we try to reduce our waste water and mud even further”</p> <p>“New lighting systems with a light dome to get more daylight into our plants”</p> <p>“Not really. We placed solar cells on our roofs afterwards [after Ecoprofit]. But other than that nothing really”</p>
Product	<p>We do a lot as we produce products for others like the production of the under construction of solar cells”</p>
Organizational	<p>“No. Once we were ISO 9000 certified but we gave it back as none of our customers wanted it”</p> <p>“No [...] because there is already too much work and nobody has time to deal with them [instruments]”</p> <p>“We are ISO 9000 certified”</p> <p>Yes, we have done measures since Ecoprofit. We hired an engineering consultant to do an energy check for us” “We used energy check [with engineering consultant]. We use this because I don’t know any better ones”</p>

Table VI.
Eco-innovation adopted
beyond the Ecoprofit[®]
scheme

Note: ^aIn the case of two companies no further sustainability-oriented innovation after Ecoprofit[®] were achieved

5.1 Complex intermediary to strengthen an SME’s absorptive capacity

Businesses in our sample highlighted that being directly assisted by external consultants, actively supported and approached by local authorities and then linked to other SMEs during the one-year Ecoprofit[®] programme were the major benefits of participation. Hence, in our sample, the complex intermediary provided different levels of support through different types of intermediaries which successfully pushed incremental eco-efficiency innovations. This resonates with very recent literature on innovation that stresses the importance of the involvement of intermediaries, particularly knowledge institutions (Ar and Baki, 2011), and the importance to assist SMEs in change processes in terms of different levels of support, that is, handholding mechanisms (Friedman and Miles, 2002). A possible explanation for this could be found in interviewees’ statement that the transfer of network and personal knowledge was perceived to be beneficial to overcome day-to-day problems in the change management process towards more sustainable business operations. This is also in line with the findings of Bagliardi and Dormio (2009) who found that information from knowledge institutions is much more relevant for fostering innovation than that of networks (industry or regional). This could be further supported by the insight that through the direct assistance provided by the private intermediary (consultancy) in the form of, e.g., on-site consultation, SMEs in our sample, found it easier to translate abstract sustainability goals into actual business practice.

More important, though, is the notion that handbooks or similar information sources were considered less helpful by our sample SMEs. Referring back to the literature, a possible explanation for these perceptions might be related to the concept of absorptive capacity by Cohen and Levinthal (1990). Absorptive capacity is considered to be a function of prior related knowledge of the area of innovation at hand.

Therefore, handbooks might be considered to be of less use for those organizations that have no or little prior knowledge on eco-efficiency innovation. Thus, the knowledge that is supposed to be transmitted via the handbook (in terms of explicit knowledge) cannot be linked to any existing knowledge. There have been many studies testing the original concept by Cohen and Levinthal (e.g. Ar and Baki, 2011; Jantunen, 2005; Zahra and George, 2002) most of which have found a strong linkage between prior knowledge and the assimilation of new innovation. One of the few exemptions is Varis and Littunen (2010) who found no linkage. None withstanding, many studies also show that intra-organizational collaboration helps to overcome problems of knowledge deficiencies and thereby enhancing absorptive capacity (Ferlie *et al.*, 2001).

Nevertheless, there are other factors despite tacit or explicit prior knowledge that have a strong influence on the adoption of innovation. Some of these include strong leadership, a clear strategic mission, creative and innovative staff and a tolerance for failure (Greenhalgh *et al.*, 2004). These are required to create a receptive context for change (Greenhalgh *et al.*, 2004). In the case of the interviewed SMEs, there was no clearly recognizable environmental or sustainability strategy which again resonates with literature on SME characteristics discussed earlier. In contrast, some of the actions taken were rather spontaneous and not linked to the core business. However, this seems to hold true for many SMEs, particularly in the context of sustainability (e.g. Russo and Tencati, 2009).

Therefore, we propose the following statements for further research:

- P1.* Innovation intermediaries can strengthen an SME's absorptive capacity through providing direct support at the level of information and knowledge gathering as well as processing, testing, validation and training, and also at the level of evaluating the effectiveness of eco-efficiency innovations.

5.2 Activation of SMEs: the intermediary as external stimulus

Cost and cost reduction as well as risk management are primary motives to engage in eco-efficiency innovation in our sample. Particularly for SMEs, whose resource constraints are a major threshold to overcome, the cost saving potential of eco-efficiency innovations makes even incremental improvements in production processes or a reduction in emissions attractive. Interviewees agreed that Ecoprofit[®] was able to pull this monetary trigger to begin revising business processes more comprehensively. Overall, the sample SMEs have not yet started to view sustainability as an opportunity – with the exception of one company which is engaged in sustainability-oriented product innovation – but tend to take a reactive or anticipatory approach (see e.g. Noci and Verganti, 1999) to sustainability. Thus, for these types of SMEs an initial external stimulus, in terms of proactive approach through the public intermediary (local authority), is an important trigger for SMEs to engage in sustainability.

The reasons for this could be manifold. One potential explanation could be that the formal invitation by officials of the local authority created the need to respond. The SMEs in our sample were all family owned and mostly running operations in their local constituencies. Therefore, an invitation by the local authority might weigh in much heavier than it would for a large corporation with subsidiaries spread across the globe (Koschatzky and Zenker, 1999). Another aspect might be that the approach of a local authority is perceived as more legitimate or trustworthy than that of a consultancy. Third, another possibility could be that until the proactive approach, the SME had not considered any actions. This is partially indicated in one interviewee's statement that

they simply participated to get an understanding of what is possible and what others do. Yet another explanation is the fact that some of the interviewees considered their own environmental impact negligible. Their perception had never been challenged as some of them operate in very small business-to-business niche markets, thus could be considered to be located in a “blind spot” of public awareness. As a consequence, the proactive external approach and invitation to participate in the one-year programme might have been the initial impulse for reflecting this unchallenged position. Thus, we propose the following:

- P2a.* Innovation intermediaries are especially successful in activating reactive SMEs when they are perceived as legitimate intermediaries without self-interest or hidden agenda, as may be the case for local authorities with their public nature and their responsibility for the development of the local economy in which the SME's are embedded.
- P2b.* The external stimulus (e.g. direct invitation to participate in the initiative) can trigger a reflection process that can then result in an increased willingness to adopt eco-efficiency innovation.
- P2c.* A successful implementation of eco-efficiency innovations in SMEs with low levels of absorptive capacity is maybe best achieved by a combination of a public (local authority) and private intermediary (consultancy) as they provide complementary services: awareness raising (public partner) and facilitation of the implementation process through direct assistance (private partner).

5.3 Long-term effectiveness requires long-term support

The one-year beginner programme has been found to be an initial starting point for change. The measures businesses have realized afterwards were diverse: Some have followed the track outlined by the programme (though to varying degrees) and some have even gone back to business-as-usual with no further measures taken at all. These results indicate that Ecoprofit[®] will be able to trigger long-term effects if businesses are involved in concrete follow-up programmes. Within the Ecoprofit[®] scheme such a follow-up programme is the Ecoprofit[®] club. These clubs act on a regional base and serve as a central point for networking amongst SMEs subsequent to the beginner programme. Despite the existence of the club, only one sample company (C6) participated in it and uses it as a source of further learning about sustainability. The other six companies attribute this club no specific relevance. The reasons for this might be that those enterprises operating in manufacturing have low networking skills (Bagliardi *et al.*, 2011). Therefore, in order to foster sustained change towards sustainability, it seems important for most of the SMEs to be provided with more direct and customized handholding processes (Friedman and Miles, 2002):

- P3.* To achieve continuous sustainability-oriented change in SMEs with a particularly low absorptive capacity in this area, rather than broader club offers it is necessary to provide strongly customized handholding means (such as continuous on-site and individual support) in the long-term.

Despite the relatively low level of implemented sustainability measures, it was surprising that even SMEs in the blind spot of public awareness and scrutiny have

decided to learn about and to start implementing sustainability management at least to some degree. Given the business-to-business context of the sample firms, cost, risk, and intrinsic aspects seem to be another key for long-term commitment to sustainable development. More specifically, as all organizations interviewed were family businesses, the intrinsic motivation of the owner might have a significant influence on the overall approach of the business towards issues related to sustainability. This resonates with literature that argues that the values and beliefs of the family often very strongly influence the decisions made and actions taken in a business context (Sharma, 2004).

A potential explanation why some businesses terminated their path towards further sustainability-oriented innovations could be, that most of the measures taken during the one-year scheme can be considered as “low-hanging fruits” (Dunphy *et al.*, 2007). This term refers to actions taken that are simple, usually rather low in initial financial investments and that show quick results. Examples of these are light or water management systems that were some of the process and organizational innovations implemented by our interview partners during the Ecoprofit[®] year. Thus, once these fruits have been harvested, additional innovations become more difficult to implement and might require more resources in terms of finance, personnel, and time. Subsequently, the inherent resources constraints of SMEs (e.g. Russo and Tencati, 2009) might again pose a hurdle for more advanced and integrated innovations. However, at the same time, SMEs are far more flexible and can, sometimes simultaneously, adopt to markets and create new niches (O’Reilly and Tushman, 2004). It would be important to identify how to help SMEs to deal with the ambidexterity:

- P4.* Eco-efficiency innovation may present a feasible first step for SMEs with a low absorptive capacity on sustainability challenges to build up some initial capabilities to then deal with more complex environmental or sustainability-oriented innovations.
- P5.* SMEs that do not progress beyond picking the low-hanging fruits may need continuous customized support.

As the discussion of our findings from our exploratory interview study showed, collaboration with a complex intermediary consisting of public and private actors may lead to an increase in an SME’s absorptive capacity for sustainability-related issues through providing different levels of support, that is, direct assistance and more loosely held support. However, to continuously involve SMEs in the sustainability agenda that view sustainability from primarily a risk and cost reduction perspective as represented by incremental process innovations, programmes such as Ecoprofit[®] are challenged to develop an opportunity orientation in SMEs in order to spur more activities in the area of product and organizational innovation.

The interplay between local authorities, consultancies, and SME networks are nothing else than actors in regional innovation systems (e.g. Cooke, 2005; Cooke *et al.*, 1997) or breeding environments (e.g. Afsarmanesh and Camarinha-Matos, 2009). Regional innovation systems, also including further actors such as universities, aim at strengthening regional learning capacities so as to foster opportunity recognition for innovation (e.g. Afsarmanesh and Camarinha-Matos, 2009) and to ultimately enhance innovation in a specific geographical region (e.g. Cooke, 2005; Cooke *et al.*, 1997). The specificity of breeding environments (in contrast to their more general regional

innovation systems counterpart) is that they are not only connected through personal contact but also through information and communication technology. With regard to the work of intermediaries, information technology could be a good means to provide some of the handholding mechanisms across regions, make them more efficient, and thus make it more feasible to offer them in the long term.

6. Limitations and future research

SMEs face particular challenges such as resource constraints in finance, personnel, and time, yet are at the same time challenged to address societal demands to contribute to sustainable development. This paper took this situation as a starting point to investigate if innovation intermediaries in the form of a complex intermediary can help SMEs in this process and how lasting these changes are. In order to gain a more precise picture, we focused on eco-innovation and therein specifically eco-efficiency innovation. During our conducted interview study, we found that the initial approach by an external organization was a trigger to become involved in more sustainable business operations. Moreover, interacting with intermediaries who provide on-site support during the implementation was considered very helpful by our interviewees and indicates that particularly those SMEs that have limited prior knowledge are in need of more help than can be provided by handbooks or other forms of one-off information provision. Despite the eco-efficiency innovations implemented during the participation in the Ecoprofit[®] programme, some of the SMEs did not continue their transformation towards corporate sustainability. We discussed this finding and proposed the importance of long-term support for those SMEs that require it.

With these findings we can provide useful implications for future research as well as for practitioners despite the small sample size due to the focus on SMEs in one specific industry (metal- and mechanical engineering) and their interaction with the same complex intermediary for at least three reasons. First, metal- and mechanical engineering is an industry dominated by manufacturing. As a consequence, we insinuate that manufacturing-intense SMEs from other industries may display similar patterns. Second, The companies in our sample operate in a B2B context, hence have no or very limited contact to the end-consumer. This, again, is no specificity exclusive to metal- and mechanical engineering but is apparent in many other industries. Therefore, we suggest that our findings may also materialize in other SMEs operating in a B2B context. Third, our sample consists exclusively of family business. As identified in literature, the owner-manager plays a central role in family businesses (Bougrain and Haudeville, 2002). Therefore, we suggest that the patterns identified here could also applicable in the context of other family businesses.

The core implication brought forward by our study is that some types of SMEs require continuous handholding during their pursuit of sustainability whereas others deal with these issues by themselves once they have received initial help. Therefore, eco-innovation facilitation from different types of intermediaries (public and private) with different levels of support (from customized and individual to more loosely held support, such as networks) is recommendable. Overall, the proactive approach by a public intermediary (here local authority) is one essential push factor to trigger eco-efficiency innovations in SMEs with low absorptive capacity. Future large-scale studies should further investigate the reasons for these differences in order to determine a typology to be used by practitioners and scholars so as to develop tailor-made support schemes for the respective SME types. Moreover, cross-sectoral research should be conducted in order to gain greater understanding on the influences of industry norms

and values might have. Also, it would be interesting to analyse, the influence of the direct contact to end-consumers (i.e. a business-to-consumer context). As Ecoprofit[®] has a strong focus on eco-efficiency innovation, it would be interesting to analyse similar programmes focusing on other aspects of eco-innovation or even broader sustainability-oriented innovation (Hansen *et al.*, 2009). Through such a comparison, one could gain better insight into which kind of programme works for which type of sustainability challenge, or if overall more integrated programmes are necessary that deal from the beginning with the challenge to take an integrative approach to sustainability-oriented innovation management.

Note

1. The term “peculiarities” is often used when referring to disadvantageous SME characteristics such as inherent resource constraints.

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Further reading

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